



ESPHM

2018

10th EUROPEAN SYMPOSIUM
OF PORCINE HEALTH MANAGEMENT

BARCELONA / SPAIN

PROCEEDINGS

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9TH-11TH MAY



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WELCOME MESSAGE

Dear friends,

On behalf of the 10th European Symposium of Porcine Health Management (ESPHM) Organizing Committee, it is my great pleasure to welcome you to Barcelona, Spain. Once again, the ESPHM is a joint collaboration among three parties including the European College of Porcine Health Management (ECPHM), the European Association of Porcine Health Management (EAPHM) and, for the ESPHM 2018, the Centre de Recerca en Sanitat Animal (CRESA) at Institut de Recerca i Tecnologia Agroalimentàries (IRTA) as Local Organizing Committee (LOC).

The ESPHM in Barcelona is the 10th edition of the symposium, representing the complete consolidation of a meeting that started in Copenhagen (Denmark) in 2009 with 220 delegates. Since then, the congress has evolved at all levels, with more than 1,540 delegates in the last edition in Prague (Czech Republic) in 2017. This is an evident proof of the increasing interest that the scientific contents of the ESPHM offers, not only for European veterinarians but also to the international community. Although settled in Europe, the ESPHM aspires to be a source of updated knowledge and know-how in its field for the whole world.

None of the above has been and will be feasible without the contribution of speakers, delegates and chairpersons as well as the funding of partners and supporters. Our deep thanks to all of them; they are the core of the ESPHM 2018! Moreover, our deep appreciation to diplomats and residents of the ECPHM and members of the EAPHM, since they represent the soul and the spirit of the ESPHM.

Spain is a magnificent and beautiful country and tourist/vacation possibilities are almost endless. Barcelona is a cosmopolitan city in which you will feel at home. You can choose from culture to environment and nature, from sea to mountains, from exhibitions to partying... you will surely meet up with your match. Discover, taste, experience and enjoy!

WELCOME TO BARCELONA FOR THE ESPHM 2018!

Joaquim Segalés

Chair of the 10th European Symposium of Porcine Health Management Organizing Committee



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PROGRAMME AT A GLANCE

TIME	WEDNESDAY 9 TH	TIME	THURSDAY 10 TH	TIME	FRIDAY 11 TH
		08.00	Registration	08.00	Registration
		08.30 - 10:00	Keynote Session	08:40 - 10:00	Keynote Session
		10.00 - 10:30	Coffee Break & Poster Viewing	10.00 - 10:30	Coffee Break & Poster Viewing
11.00	Registration & Poster Display	10.30 - 12:30	Parallel Sessions	10.30 - 12:30	Parallel Sessions
13.00 - 13:30	Opening	12.30 - 13:30	Lunch Break & Poster Viewing	12.30	Closing Ceremony
13.30 - 15:00	Keynote Sessions	13.30 - 15:00	Keynote Session		
15.00 -15:30	Coffee Break & Poster Viewing	15.00 - 15:20	EAPHM, Peter Hogedal Award & JPHM		
15.30 - 17:30	Parallel Sessions	15.20 - 16:20	Parallel Sessions		
17.40 - 19:00	ECPHM Annual general Meeting	16.20 - 16:40	Coffee Break & Poster Viewing		
18.30 - 19:30	Welcome Reception	16.40 - 18:00	Parallel Sessions		
		18.00 - 19:00	EAPHM Annual General Meeting		
		20.00	Symposium Farewell Dinner		

KEYNOTES





KEYNOTE ADDRESS: OPENING

KL-01

PORK PRODUCTION IN SPAIN

M.A. Higuera Pascual.

ANPROGAPOR Director, Madrid, Spain

Introduction

The Spanish pig sector has become, by its own merits, in the most important livestock sector in Spain representing more than 38% of the final livestock production with an approximate turnover of 6.000 million euros. Considering the total of the agri-food sector, it is in the second place in economic importance behind the fruit and vegetable sector and in this case the pig sector represents 14% of the final Spanish agricultural production.

Together with the industrial and processor sector, the total of the pig sector represents approximately 2% of the Gross Domestic Product of Spain. Regarding export, pork meat and processed product reach 5.022 million of euros of billing in 2017.

Spanish pig producers have had to face a big change in mentality, with a great evolution in the recent years adapting to the new challengers. The biggest change has been to move from an sector that has to import pork in 80's with a trade restriction due to ASF to became in one of the most importer players at export markets worldwide. These changes in the sector and the regulations that have applied it in relation to management, environment and animal welfare, have created a producer that looks at the XXI century as a professional producer, entrepreneur, knowing of their relationship with the environment and knowing that the commercial future is outside the European Union. Nowadays, the efforts made to be competitive in markets of third countries are rewarded. Competitiveness in third countries does not have to be only in prices, where there are other countries such as the US or Brazil that will always be more competitive than the EU, but rather as a product where quality of production and food security is the target of UE pork and, Spanish Pork.

In this global context, in which the evolution of the markets will drive production in Spain and in the European Union, it is where the link between production and industry to face the market challengers is more needed. The competitiveness of the industry must be based on the efficiency of the production, and the development of the production is based on the opportunities that new markets offer to the industry and therefore improving the positioning of the Spanish products, favoring the increase in demand and that motivates the controlled growth of production at farm level.

Structure

The Spanish model of production, beyond the type of farms and the evolution of these, is characterized by two aspects that make it unique: a sectoral agreements and the different business models.

From the point of view of structure of the production sector, in the year 2000 Royal Decree 324 was published, establishing the basic rules for the management of pig farms. This basic regulation of management and build of pig farms, currently under review, a series of very innovative principles were established that have served to make a structured growth of the sector: maximum size of the pig farm and a minimum distance between farms are the two more well-known principles of this regulation. Regarding the size of a new pig farm in Spain is limited to 720 LU (Units of Livestock) with the possibility of increasing this number until a 20% under the criteria of each Autonomous



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Community. That's means that that maximum capacity of a Spanish pig farms after the year 2000 are:

- Closed cycle: 750 breeding sows.
- Production of piglets 6 kg: 2,880 breeding sows.
- Production of piglets 20 kg: 2,400 breeding sows.
- Fatteners from 20 to 100 kg: 6,000 places.

On the other hand, the legislation establishes a minimum distance between farms that, as a general rule, is 1 km. This distance is increased to 2 km in the case of genetics, multiplication or artificial insemination centers. The main reason for the stablish a maximum size and physical separation was a sanitary reason to prevent the spread of diseases or in the case of having to address them, to be able to do it in the most efficient and fastest way possible. All these were lessons learned after the eradication of the African Swine Fever in 1992.

Regarding business models, Spain is radically different from the other countries of the European Union, where the independent farmer or cooperative are the more common models. In the case of Spain and from the 70's, the integration model was developed, which is an evolution of the American model and something like the avian model. At present, and according to our reports the integration model is around 63-65% of the total pigs that are produced in Spain. Other business models are present in Spain: Cooperatives is around 15-17% of total production and the model of independent farmer would be 18-20%. And within these business models, in Spain we can find different production business systems, among which we can highlight: Production "niche" as Iberico de Bellota, Independent producers, large scale producer, Cooperative, Agro-feed and food enterprise and integration.

These production systems have affected the evolution of the number and size of farms in Spain. In 2007, before the first crisis of raw materials, the number of production pig farms was 65.922 and has been reduced to 46.783 (-29.03%) in March 2018. This reduction has not been linear in all categories. The evolution (in percentage) of the number of farms for each category size from 2007 until 2018 has been:

- First Group. Farms up to 120 LU. -25.49%.
- Second group. Farms from 121 to 360 LU. + 13.61%.
- Third group. Grains of more than 360 LU. + 41.89%.
- Reduced Group. Farms of less than 4.8 LU. -44.5%.

Production

For swine production in Spain there has had a before and after from the application of animal welfare regulations. Before 2013, either due to the crises in 2007 and 2010 or because of the uncertainty about what would happen with animal welfare regulations, pig production in Spain was stabilized at around 41 million of slaughtered pigs. Since 2014 production in Spain has not stopped growing with an added circumstance, live pigs exports have been kept and the import of piglets has been reduced.

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Slaughtered pigs evolution:

	2013	2014	2015	2016	2017	2018*
Slaughtered pigs (heats)	41.418.466	43.483.573	45.890.524	49.083.785	49.658.875	50.396.300**
Carcass weight equivalent (tones)	3.431.219	3.620.222	3.854.658	4.181.091	4.249.161	4.378.883***

*Forecast.

**Forecast in GIP.

***Estimated forecast based in GIP.

On this slaughtered pigs' evolution, all categories are present. Going on more detail it is possible to spit these slaughtering is:

- Piglets. For production of roasted piglet ("Cochinillo"). 4% of the total production. 1.985.000 heads.
- Sows. 1.85% of the total production. 920,000 heads.
- Iberian Pigs. It is a very important production in Spain with an important quantity and quality. 7.2% of the total production. 3.564.150 heads.
- Heavy pig. 21% of the total production. 10,840,000 heads.
- Lean pig. 65.5% of the total production. 32,530.00 heads.

Future and conclusion

Global market is an opportunity and a risk. In European Union, in addition, there is other two important factor that are going to affect the develop of European production: regulation and the consumer/citizen who is going to drive the way that we understand the pig production nowadays to other that must face challenges of today and tomorrow as:

- Market access.
- Free trade agreements.
- Animal Health: ASF, AMR, biosecurity.
- Animal Welfare.
- Environment.
- Pig producers image.

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KL-02

WHAT ARE THE COSTS OF PIG DISEASES IN THE FIELD?

J. Font Puig, J. Rocadembosch, O. Miró, J. Argerich

SIP CONSULTORS, Barcelona, Spain.

The rising cost of raw materials, which began at the end of 2006, and the globalization of markets have generated strong fluctuations in the prices of commodities. This the reason why exists significant financial tensions in the livestock sectors.

This complex situation requires that pig production companies focus on obtaining a product of: 1) the highest quality (food safety, animal welfare, respect for the environment, meat quality) and 2) at the minimum cost (productive efficiency).

SIP offers a specialized service to help farmers to improve their level of efficiency and competitiveness. Thus, we collect technical and economic information, we prepare monthly monitoring reports and we carry out periodic meetings with more than 200 companies, which manage over one million sows. The majority of these companies are located in Spain, but we also work in Italy, Portugal and recently in Mexico.

During our professional experience, we have observed that producers who maintain a good control of diseases are able to keep better levels of efficiency in a sustained manner. Moreover, these farms have some characteristics in common: they are located in areas of low animal density and they are managed by producers who are disciplined and rigorous with biosecurity measures (maintenance of physical barriers of the farm, sanitary control of animals who have to enter, staff and visitors checked entrance, exhaustive execution of animals vaccination, systematic protocol of sanitary vacuum and hygiene and disinfection of facilities).

Occasionally there are errors or accidents that cause the appearance of some diseases which unfortunately may end up in great economic losses. In these cases, during our monthly monitoring reports, we notice strong alterations in the technical parameters that allow us to quantify their economic repercussion.

Disease cost will depend on the affected factors, severity of the alteration and duration of the process.

Economic impact changes depending on the disease. However even a single disease may have different economic impacts depending on the virulence of the microorganism, the resilience of the animals and the effectiveness of treatments implanted.

The most frequent case we face with is porcine reproductive and respiratory syndrome (PRRS). Fortunately, since we can control porcine circovirus 2 infections due to vaccination, PRRS does not usually affect severely the fattening, but it generates important losses in sows and nurseries. Abortions, premature farrowing, appearance of secondary infectious agents are the responsible of these losses. In these acute cases, economic losses can range between 75 and 150 € per sow and year, depending on the farm.

Currently, the most frequent diseases that have the greatest economic impact are PRRS, dysentery, *Actinobacillus pleuropneumoniae* and colibacillary enteric processes.

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KEYNOTE ADDRESS: Return on investment. Where is the money?

KL-03

ECONOMIC EFFICIENCY OF ANIMAL HEALTH INTERVENTIONS

D. Holtkamp¹, M. Jiménez², R. Menjón Ruiz², R. Jolie³

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Introduction

The practice of food animal veterinary medicine has changed dramatically in the last 50 years. Arguably, the biggest changes that have occurred in that time are due to economics rather than advancements in science. Specifically, the consolidation of swine and other food animal industries has led to fewer and bigger farms, which in turn has meant fewer and more specialized decision makers. In 1994, 27 percent of the annual pig crop in the United States was produced on operations with at least 5,000 head. By 2014, the percentage of the annual pig crop produced on operations with at least 5,000 head had risen to 93 percent (NASS, 2015). A similar consolidation trend is occurring globally. Swine veterinarians now practice population or herd medicine almost exclusively, a single animal health decision may involve millions of animals and the decisions increasingly are driven by economics. The cost of making economically poor animal health decisions has gotten very large and it is no longer acceptable to rely on an educated guess.

The tools to make economically good animal health decisions already exist. A cost-benefit analysis (CBA) is a systematic process for calculating and comparing benefits and costs of a decision. Both the cost and the benefit are calculated in a common unit, which is money in the local currency. When the cost and the benefit of an animal health intervention occur close in time, such as within one year of each other, the time value of money may be ignored. Otherwise, future benefits, or costs, may be discounted to estimate all costs and benefits at their present value. For many animal health interventions, including vaccines and antimicrobials, the costs and benefits occur close in time and the time value of money may be ignored.

CBA can be used to determine if decisions to implement animal health interventions are good economic decisions. CBA can also be used to compare alternative animal health interventions when more than one is under consideration. CBA may be performed prospectively to determine what the expected costs and benefits would be if an intervention is implemented or retrospectively to determine if the expected costs and benefits of an intervention was achieved after it was implemented. The primary difference between a prospective and retrospective analysis is the sources of data used to estimate the benefits, and in some cases the costs, and the analysis of the data.

Estimating the cost of animal health interventions either prospectively or retrospectively is generally easier and more certain than estimating the benefit. For example, the cost of vaccinating one thousand pigs with a single dose of a vaccine that costs €1 per dose is €1,000 plus some additional labor. While the cost of other interventions may be somewhat more complicated to calculate and not as certain, they are generally much easier to calculate and more certain than the benefits.

The primary benefit of animal health interventions is the improvement in productivity that results from reducing the burden of disease. Other benefits may include reduced antimicrobial treatment, diagnostic and veterinary costs. In addition, reductions in inter-pig variation in growth and weights may result in lower feed and other input costs and higher revenues as more pigs may be sold in the target weight range at higher prices.

Calculating the economic benefit of improved productivity involves a two-step process. First,



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estimate the changes in productivity attributed to the intervention and, second, estimate the economic value of the productivity changes. For a retrospective CBA, historical production records may be used to estimate the productivity changes that occurred after the intervention was implemented. When historical data are used retrospectively to estimate productivity changes attributed to the intervention, the analysis may be described as a quasi-experimental design, sometimes called the pre-post-intervention design. The quasi-experimental design is a non-randomized study design which makes it prone to confounding. For example, consider the weight of pigs at placement. In a randomized controlled study, if weight at placement may be associated with the outcome, every effort will be made to make sure there was not any systematic allocation of pigs to study groups that results in one treatment group of pigs that are heavier than another at placement. In non-randomized studies the opportunity to deal with confounding variables in the study design is absent but confounding variables may be included in the statistical analysis. If the confounding effects are adequately represented in the statistical analysis, the remaining differences in the productivity changes, adjusted for the other confounding effects, between the pre- and post- intervention periods may be more confidently attributed to the intervention. It is, however, impossible to account for all potentially confounding effects in a pre-post-intervention study design. Diagnostic and clinical data collected pre-intervention, post-intervention or both may also be used to estimate the severity of the pathogen burden and disease to support the attribution of productivity improvements to the intervention.

To estimate the economic value of productivity changes attributed to an intervention for a retrospective CBA, all other variables, such as production outcomes not impacted by the intervention, pig prices, diet prices and the size of the herd, must be held constant. Budgeting models may be used to isolate the economic value of productivity changes. Budgeting models are a set of equations that calculate how profit changes as productivity outcomes change. Pig prices, diet prices, the size of the herd, and other variables not impacted by the intervention may be held constant for both before and after intervention scenarios so that the estimated change in profit is due to changes in productivity outcomes only.

The objective of this case study was to conduct a CBA to compare productivity and profitability of growing pigs in the nursery and finishing phase of production before, during and after interventions to control respiratory disease were implemented in a 3,600 sow production system in Spain. The interventions were made to stabilize the sow farms for porcine reproductive and respiratory syndrome virus (PRRSV), to produce pigs that were negative for the virus at weaning, and to uniformly vaccinate all gilts and pigs for *Mycoplasma hyopneumoniae* (*Mhp*) so the pigs from all 3 sow farms could be comingled into a single nursery.

Methods

Production system

A 3,600 sow production system in Spain with 3 sow farms, 2 nursery sites and multiple finishing sites was the subject of this case study. The inventory of each sow farm varied; Sow 1 (1,430 sows), Sow 2 (980 sows) and Sow 3 (1,200 sows). Prior to implementation of the interventions, pigs from 2 sow farms were comingled into one nursery and pigs from the other sow farm were raised in a second nursery. During and after implementation of the intervention, pigs from all 3 sow farms were comingled into a single nursery with 10 rooms and 1,800 pigs per room. Hypor females and Danbred sire lines were used. Pigs were weaned at approximately 3 weeks of age.

Production, clinical and diagnostic data

Nursery and finishing data was provided by the production system. The data included 126 completed batches of nursery pigs closed out between March 2014 and February 2017 and 174 batches of finishing pigs closed out between November 2013 and February 2017.

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A diagnostic and clinical survey was also completed prior to implementation of the intervention to evaluate the burden of respiratory disease in the system. Lung lesions suggestive of *Actinobacillus pleuropneumonia* (APP) and *Mhp* were evaluated at slaughter. APP lesions were evaluated with the slaughterhouse pleuritic evaluation system (SPES) (Dottori et al., 2007), which was based on the extension and location of pleural adhesions. *Mhp* was scored on a scale from 0 to 5 based on the percentage of lesion-affected lung surface (Bollo et al., 2008). Clinical signs associated with APP, *Mhp*, porcine circovirus (PCV) and PRRSV were also observed. Serum was collected from pigs at birth, weaning and the end of the fattening period. APP antibody response at the end of the fattening period was measured with an ELISA (Idexx APXIV). Presence of PCV at birth and PRRSV at weaning was measured by PCR (LSI VetMAX™ Porcine Circovirus Type 2) (LSI VetMax™ PRRSV EU/NA). Finally, PRRSV antibodies were assessed in pigs at birth, weaning and at the end of the fattening period by ELISA (Ingezim PRRS 2.0).

Comparison periods and summary of intervention and vaccine use

The comparisons made were between the three periods described in Figure 1. In April 2015, the intervention was initiated to improve productivity and reduce antibiotic use in the finishing phase of production. The vaccination program for PRRSV, PCV and *Mhp* during each comparison period is summarized in Table 1. Prior to initiation of the intervention (Before Intervention), PRRSV vaccination was done to acclimate replacement gilts prior to entry and in sows to maintain immunity in the sow herd. In April 2015, when the intervention was initiated, the PRRSV vaccine was changed from Vaccine A to Porcilis® PRRS (MSD Animal Health). In addition, piglets were vaccinated with Porcilis PRRS at 14 to 21 days of age during the intervention period (Intervention), starting in May 2015. The PRRSV vaccination program in gilts and sows during the intervention was continued after the intervention (After Intervention) but PRRSV vaccination of pigs was discontinued. The productivity of batches of nursery and finishing pigs during the Intervention and After Intervention periods were compared to the productivity of batches prior to initiation of the intervention (Before Intervention). The vaccination program for PCV and *Mhp* varied during each period as outlined in Table 1.

Legend:

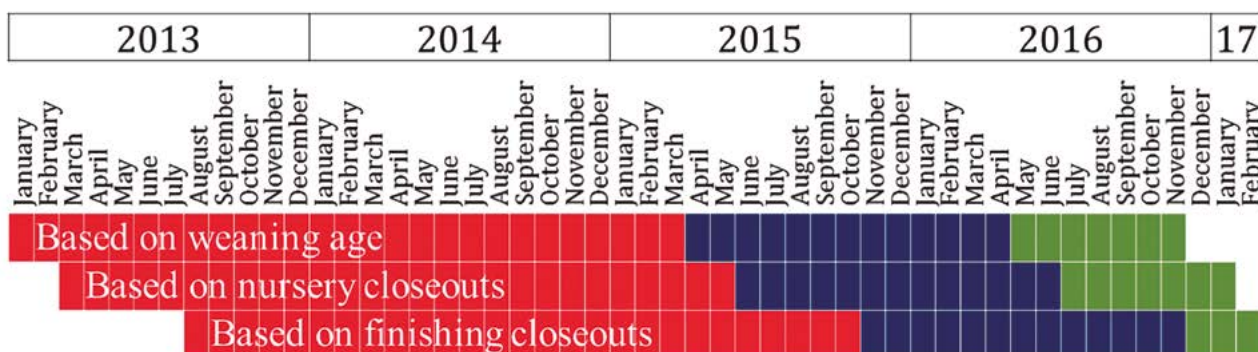
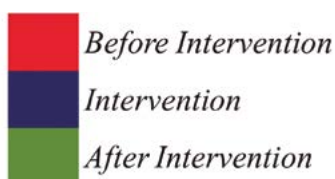


Figure 1. Timeline of comparison periods evaluated.



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Table 1. Summary of respiratory vaccine programs for each comparison period.

Vaccine program for PRRSV		Comparison Period		
Animal	Vaccination Details	Before Intervention	Intervention	After Intervention
Replacement gilts	Vaccine	PRRSV Vaccine A	Porcilis PRRS	Porcilis PRRS
	Number of vaccinations	2 doses prior to entry	2 doses prior to entry	2 doses prior to entry
Sows	Vaccine	PRRSV Vaccine A	Porcilis PRRS	Porcilis PRRS
	Number of vaccinations	Mass vaccination, 3x/year	Mass vaccination, 3x/year	Mass vaccination, 3x/year
Pigs	Vaccine		Porcilis PRRS	
	Number of vaccinations		1 dose at 14 to 21 days of age	

Vaccine program for PCV and <i>Mhp</i>				
Animal	Vaccination Details	Before Intervention	Intervention	After Intervention
Replacement gilts	Vaccine	<i>Mhp</i> Vaccine A ¹ and Porcilis PCV	<i>Mhp</i> Vaccine A and Porcilis PCV; Porcilis PCV M after January 2016	Porcilis PCV M
	Number of vaccinations	2 doses prior to entry	2 doses prior to entry	2 doses prior to entry
Pigs	Vaccine	<i>Mhp</i> Vaccine A ¹ and Porcilis PCV	<i>Mhp</i> Vaccine A and Porcilis PCV; Porcilis PCV M after January 2016	<i>Mhp</i> and PCV Vaccine B
	Number of vaccinations	1 dose at weaning	1 dose at weaning	1 dose at weaning

¹ Sow 1 and Sow 2 only. Replacements gilts and pigs for Sow 3 were not vaccinated for *Mhp*.

Analysis of production data

The simple unadjusted averages of key productivity outcomes in the nursery and finishing phase were calculated by comparison period (Before Intervention, Intervention and After Intervention) using pivot tables in Microsoft Excel[®] (Excel 2016). To assess the statistical significance of differences in the average values of key productivity outcomes between comparison periods, key productivity outcomes in the nursery and finishing phase were analyzed as response variables in linear regression models in JMP (SAS Institute). Comparison period and other potentially confounding variables were included as explanatory variables to account for differences in key productivity outcome between comparison periods that may not be due to the vaccine changes and efforts to control respiratory disease. In the nursery phase, explanatory variables included comparison period, sow farm from which the majority of pigs were sourced, whether the males were castrated or intact, the average days on feed and the month the batch was closed. Weight of pigs at entry into the nursery was also analyzed as a response variable with the same explanatory variables except for average days on feed. For the finishing phase, explanatory variables included comparison period, feed type, genetics of the dam, days on feed and month the batch closed. Weight of pigs at entry into the finisher was analyzed as a response variable with the same explanatory variables except for feed type and average days on feed.



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Economic analysis

The average profitability of pigs in the nursery, finishing and wean-to-market (nursery and finishing combined) phases were estimated in a budgeting model, where the productivity outcomes for each comparison period could be entered. All other entered parameters in the model were held constant for all comparisons. Key parameter values that were held constant are summarized in Tables 2A for the nursery and 2B for finishing.

Table 2A. Standard values for key parameters in nursery budgeting model for the economic analysis.

Parameter	Standard value in model	Source
Target days on feed, nursery	44	Close-out data; average for all groups in dataset
Pigs placed per week	1,736	Assuming breeding female inventories for all 3 sow farms and 25 pigs/female/year
Nursery spaces available	11,500	Calculated as function of pigs placed per week and target days on feed
Price of weaned pig (€/pig placed)	€ 27.00	Company average, November 2013 to February 2017
Average nursery diet price (€/tonne of feed)	€ 500.00	Company average, November 2013 to February 2017
Capital investment in nursery buildings and improvements (€/pig space)	€ 250.00	Company average, November 2013 to February 2017
Feeder pig price (€/pig)	€ 50.00	Company average, November 2013 to February 2017
Average price of cull pigs (€/pig)	€ 0.00	Company average, November 2013 to February 2017

Table 2B. Standard values for key parameters in finishing budgeting model for the economic analysis.

Parameter	Standard value in model	Source
Target days on feed, finisher	129	Close-out data; average for all groups in dataset.
Pigs placed per week	1,685	Pigs transferred from nursery.
Finisher spaces available	34,000	Calculated as function of pigs placed per week and target days on feed
Carcass yield (% of live weight)	75%	Industry standard
Price of feeder pig (€/pig placed)	€ 50.00	Company average, November 2013 to February 2017
Average finisher diet price (€/tonne of feed)	€ 225.00	Company average, November 2013 to February 2017
Capital investment in finisher buildings and improvements (€/pig space)	€ 275.00	Company average, November 2013 to February 2017
Market pig price (€/kg carcass wt.)	€ 1.75	Company average, November 2013 to February 2017
Average price of cull pigs (€/pig)	€ 50.00	Company average, November 2013 to February 2017



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The vaccine cost for the economic analysis for each comparison period is summarized in Table 3. In pigs and replacement gilts, multiple PCV and *Mhp* vaccines were used and the timing of when changes were made did not correspond with the timeline for the Before Intervention, Intervention and After Intervention periods. Therefore, for this analysis, a single generic vaccination program for PCV and *Mhp* was modeled. The cost of PCV and *Mhp* vaccination in replacement gilts and pigs was €1.30 / gilt or pig.

Table 3. Cost of the respiratory vaccines for replacement gilts, sows and piglets, (€/pig weaned).

	Before Intervention	Intervention	Change from Before Intervention	After Intervention	Change from Before Intervention
Cost of PRRSV vaccines per pig weaned (€/pig)	€0.13	€1.29	€1.16	€0.17	€0.04
Cost of PCV and <i>Mhp</i> vaccines per pig weaned (€/pig)	€1.30	€1.30	€0,00	€1.30	€0,00
Total cost of all respiratory vaccines per pig weaned (€/pig)	€1.43	€2.59	€1.16	€1.47	€0.04

The productivity results in Tables 4A and 4B; standard values for other parameters in Tables 2A and 2B and vaccine costs in Table 3 were entered into the budgeting models. Separate analyses were conducted for the nursery, finishing and wean-to-market (nursery and finishing combined) phases of production. The number of pigs produced in the nursery phase was transferred to the finishing phase model. The same pig price (price of feeder pig) used to calculate revenue in the nursery model was used in the finishing model to calculate the cost of pigs placed (Tables 2A and 2B). For each phase of production, both unadjusted and adjusted means for the key productivity outcomes (Tables 4A and 4B) were analyzed. The productivity outcomes in Tables 4A and 4B were entered regardless of whether the difference between the comparison periods was statistically significant at $p < 0.05$.

Results

Productivity

The resulting least squares means for each response variable represent the mean for each comparison period adjusted for the other explanatory variables included in the statistical model. The simple unadjusted means and adjusted means from the regression analysis are summarized in Table 4A for the nursery and 4B for finishing. In the nursery, least squares means of all production outcomes were higher for batches of pigs in the Before Intervention comparison period except mortality, which was lower. Differences between the Before Intervention comparison period and the Intervention and/or After Intervention were statistically significant ($p < 0.05$) for average entry weight, mortality, feed conversion and average daily gain. In finishing, least squares means of all production measures were higher for batches of pigs in the Before Intervention comparison period except average daily gain, which was lower. Differences between the Before Intervention comparison period and the Intervention and/or After Intervention comparison periods were statistically significant for all of the production outcomes in finishing. Antimicrobial use in finishing, measured by medication costs, declined by €0.74 and €0.68 per pig started for the unadjusted and adjusted means during the Intervention period and by €1.16 and €0.85 per pig started in the After Intervention period.



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Table 4A. Unadjusted and adjusted means for key productivity outcomes in nursery by comparison period. Statistical significance between comparison periods is indicated by different superscript^{a,b,c} (p<0.05).

	Before Intervention	Intervention	After Intervention
Entry weight (kg / pig started)			
Unadjusted means	6.7	6.4	6.2
Least squares means ¹	6.6 ^a	6.4 ^b	6.4 ^b
Mortality (% of pigs started)			
Unadjusted means	1.70%	2.54%	3.30%
Least squares means ²	1.35% ^a	1.84% ^{a,b}	2.20% ^b
Runts (% of pigs started)			
Unadjusted means	1.24%	0.94%	1.91%
Least squares means ²	1.52% ^a	0.83% ^a	1.39% ^a
Medication costs (€ / pig started)			
Unadjusted means	€ 0.95	€ 0.78	€ 0.65
Least squares means ²	€ 1.05 ^a	€ 0.94 ^a	€ 0.85 ^a
Feed conversion (kg feed / kg gain)			
Unadjusted means	1.673	1.588	1.636
Least squares means ²	1.652 ^a	1.518 ^b	1.524 ^{a,b}
Average daily gain (kg / day)			
Unadjusted means	0.37	0.33	0.28
Least squares means ²	0.36 ^a	0.32 ^b	0.28 ^c

¹Adjusted for sow farm, males castrated or intact and month batch closed.

²Adjusted for sow farm, males castrated or intact, days on feed and month batch closed.



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Table 4B. Unadjusted and adjusted means for key productivity outcomes in finishing by comparison period. Statistical significance between comparison periods is indicated by different superscript^{a,b,c} (p<0.05).

	Before Intervention	Intervention	After Intervention
Entry weight (kg / pig started)			
Unadjusted means	21.9	20.6	17.1
Least squares means ¹	22.3 ^a	20.8 ^b	17.8 ^b
Mortality (% of pigs started)			
Unadjusted means	4.95%	2.51%	1.83%
Least squares means ²	4.80% ^a	2.67% ^b	3.01% ^b
Runts (% of pigs started)			
Unadjusted means	2.10%	1.22%	1.23%
Least squares means ²	2.15% ^a	1.27% ^b	1.21% ^{a,b}
Medication costs (€ / pig started)			
Unadjusted means	€ 1.44	€ 0.70	€ 0.28
Least squares means ²	€ 2.08 ^a	€ 1.40 ^b	€ 1.23 ^b
Feed conversion (kg feed / kg gain)			
Unadjusted means	2.792	2.650	2.541
Least squares means ²	2.726 ^a	2.593 ^b	2.471 ^c
Average daily gain (kg / day)			
Unadjusted means	0.72	0.77	0.84
Least squares means ²	0.74 ^a	0.78 ^b	0.83 ^c

¹Adjusted for genetics of the dam and month the batch closed.

²Adjusted for feed type, genetics of the dam, days on feed and month the batch closed.

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Economic outcomes

The results of the economic analyses for the nursery, finishing and wean-to-market phases of production are summarized in Table 5 on a €/pig started basis. In the nursery phase, profitability changed relatively little during the Intervention or After Intervention Periods compared to the Before Intervention period. The decline in the Intervention period was less than €1 per pig placed when either raw means or adjusted least squares means for production outcomes were entered in budgeting model. Profitability in the After Intervention period increased by just over €1 per pig started when either raw means or adjusted least squares means were entered in the budgeting model. Compared to the Before Intervention period, profitability in finishing increased by €13.10 and €11.64 per pig started, for unadjusted and adjusted means respectively, during the Intervention period and by €17.48 to €14.34 per pig started in the After Intervention period. For the combined wean-to-market phase, profitability increased by €12.19 and €11.09 per pig started in the Intervention period and by €17.67 and €15.30 per pig started in the After Intervention period relative to the Before Intervention period.

Table 5. Summary of economic analysis of the value of productivity changes in the Intervention and After Intervention periods compared to Before Intervention; profit and change in profit (€/pig started in nursery).

	Before Intervention	Intervention	Change from Before Intervention	After Intervention	Change from Before Intervention
Nursery					
Unadjusted means	€ 6.93	€ 6.52	-€ 0.40	€ 8.27	€ 1.34
Least squares means ¹	€ 7.35	€ 7.08	-€ 0.27	€ 8.92	€ 1.57
Finishing					
Unadjusted means	€ 10.53	€ 23.64	€ 13.10	€ 28.01	€ 17.48
Least squares means ²	€ 13.43	€ 25.06	€ 11.64	€ 27.77	€ 14.34
Wean-to-market (combined nursery and finishing)					
Unadjusted means	€ 17.15	€ 29.34	€ 12.19	€ 34.82	€ 17.67
Least squares means ^{1,2}	€ 20.39	€ 31.48	€ 11.09	€ 35.69	€ 15.30

¹Production outcomes in nursery adjusted for sow farm, males castrated or intact, days on feed and month batch closed.

²Production outcomes in finishing adjusted for feed type, genetics of the dam, days on feed and month the batch closed.

Benefit: cost ratios for the Intervention and After Intervention periods are shown in Table 6. To calculate benefit:cost ratios, the cost of the intervention was calculated as the additional respiratory vaccine costs per pig started relative to the Before Intervention period. The benefit was the change in profit per pig started relative to the Before Intervention period.



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Table 6. Benefit:Cost ratio using the value of adjusted least squares means productivity improvements.

	Before Intervention	Intervention	Change from Before Intervention	After Intervention	Change from Before Intervention
Wean-to-market profit per pig started (€/pig)	€ 20.39	€ 31.48	<i>Benefit of intervention:</i> € 11.09	€ 35.69	<i>Benefit of intervention:</i> € 15.30
Total cost of all respiratory vaccines per pig started (€/pig)	€1.43	€2.59	<i>Cost of intervention:</i> €1.16	€1.47	<i>Cost of intervention:</i> €0.04
Benefit:Cost ratio			9.6:1		382.5:1

Discussion and conclusions

This study demonstrates the use of historical production data, and an enterprise budgeting model to conduct a retrospective CBA to assess the economic efficiency of animal health interventions. The interventions included stabilization of the sow farms for PRRSV, vaccination of growing pigs for PRRSV and vaccination of all gilts and pigs for *Mhp* so the pigs from all 3 sow farms could be comingled into a single nursery. The interventions were made to improve productivity and reduce use of antibiotics in the finishing phase of production, which they did. The approach to estimate the economic value of those changes addresses the challenge of isolating changes in productivity outcomes attributed to an animal health intervention from those attributed to other causes. The benefit:cost ratios estimated for the Intervention and After Intervention periods, 9.6:1 and 382.5:1 respectively, were relatively large and demonstrated that the interventions were successful from an economic perspective. Although antimicrobial use in finishing was not measured directly, medication costs in finishing, declined by €0.68 to €0.74 per pig started during the Intervention period and by €0.85 to €1.16 per pig started in the After Intervention period.

Limitations of the analysis include the short duration of time for which data were available following the intervention which made it challenging to isolate the impact of the intervention. In addition, other confounding variables that were not measured and not included in the analysis may have explained, in part, some of the changes in the productivity outcomes.

Acknowledgments

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KEYNOTE ADDRESS: African swine fever. ASF in domestic pigs and wild boar: two parallel worlds

KL-04

IS ASF A HUMAN DRIVEN DISEASE?

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African swine fever (ASF) is considered internationally as one of the most dangerous animal diseases of pigs. The disease is affecting trade and having serious socio-economic impact on people's livelihood. No drugs or vaccines are available to fight ASF.

The ASF epidemic currently affecting parts of Eastern Europe started in Georgia in 2007 and reached the eastern borders of the European Union in January 2014 when Lithuania reported first cases in wild boar. So far mainly wild boar populations in the Baltic States and east of Poland were affected. However, in June 2017 ASF has been notified also in wild boar in the eastern part of Czech Republic, 400 km away from the endemic regions in Eastern Europe.

Initially two main epidemiological scenarios were forecasted. ASF would fade out spontaneously from the local wild boar population or, alternatively an epidemic wave would start moving westward very rapidly, affecting large areas of Europe. However, both epidemiological hypotheses proved to be wrong. The virus did not fade out nor assumed an epidemic wave behavior. On the contrary the infection survived locally with a steady low prevalence (below 5%). Field data as well as experimental studies on ASF indicate an overall high case-fatality rate and a rather low contagiousity and low mortality during the initial phase of infection. Within that context, a revision of the current understanding and approaches towards ASF control and eradication is needed. In domestic pig populations the low contagiousity is rather an advantageous feature reducing the urgency in the implementation of control measures. For wild boar however, in combination with the environmental stability of the virus and high animal densities, the low contagiousity represents a disadvantage for effective control.

In wild boar populations ASF shows a pattern of habitat bound persistence lacking a tendency of dynamic spatial spread. Therefore ASF in wild boar can be considered a habitat-borne disease where infected carcasses in combination with the tenacity of the virus and the low contagiousity play a key role in capturing the disease within affected areas. Such circumstances are likely to contribute substantially to months or even years of pathogen persistence explaining the current picture of ASF spreading rather slowly and with continuing circulation in affected areas.

Human activities such as transportation of contaminated meat or meat products which then end up either in a domestic pig stable, e.g. via swill feeding, or as illegally disposed waste at places where wild boar have access, e.g. in the forest, are seen as main cause of ASF spread over long distances. However, illegal trade and uncontrolled movements of infected pigs may also occasionally contribute to virus spread.

Biosecurity shortcomings were the overall common finding and the most serious factor responsible for virus introduction in domestic pig holdings. Therefore, farm biosecurity has to be addressed more rigorously, particularly all aspects related to human activities. Information campaigns with all stake holders (farmers, veterinarians and staff) are a vital issue.

For keeping the high risk period as short as possible passive surveillance has to be enhanced in ASF restricted and risk areas. For example in breeding farms all dead gilts, sows and boars have to be compulsory tested for ASF even if farm mortality is below the normal threshold.



**KEYNOTE ADDRESS: African swine fever.
ASF in domestic pigs and wild boar: two parallel worlds**

KL-05

WHERE IS THE VACCINE AGAINST ASF AND WHAT ELSE CAN WE DO?

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African swine fever is one of the major threats for the swine industry worldwide, for which there is no vaccine available.

Little is known about the mechanisms involved in protection and even less about the viral antigens that could induce such protection, an uneasy task taking into account that ASFV encodes more than 150 proteins. In spite of this reality, great advances have been achieved in the last years; on one hand, several live attenuated vaccine prototypes have been successfully tested in experimental conditions and on the other hand, new expectations have been opened regarding the potential use of safe and efficient subunit vaccines in the near future.

In this paper we will try to summarize the main results obtained in the field of ASF-vaccinology, partially focusing our attention on the work performed in our laboratory, always in collaboration with both public and private partners.

The potential commercialization of a safe and efficient vaccine against ASF would be essential not only to control the current outbreaks threatening the European Union from the East but should also contribute to reduce the epidemiological pressure of ASFV in many regions of sub-Saharan Africa, where the virus remain endemic for ages provoking devastating consequences.

Commercialization of ASF vaccines in Africa could not only contribute to alleviate the poverty of the area but also to reduce the risk of future exportations of ASFV.

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KEYNOTE ADDRESS: Biosecurity from theory to practise

KL-06

HOW TO ASSESS BIOSECURITY ON-FARM?

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Introduction

Pigs are susceptible to a wide range of endemic and epidemic diseases, including zoonotic infections, which can affect health, welfare and productivity, and thereby have a major economic impact. The implementation of biosecurity measures along the production chain presents itself as one of the major solutions to minimize the risk of introduction of these diseases into a farm, as well as their spread within the farm (Anon., 2010a). Biosecurity is a term used to describe management measures for the prevention of pathogens entering a farm (external biosecurity) or the spreading of pathogens within the farm (internal biosecurity) (Amass and Clark, 1999; Vangroenweghe et al., 2009).

The present manuscript will discuss the importance of biosecurity and how biosecurity can be scored in pig herds. In a third part, the results of scoring biosecurity in pig herds from different European countries (Prohealth project) will be presented.

Importance of biosecurity

Different studies have shown positive associations between biosecurity and some production parameters (Laanen et al., 2013; Postma et al., 2016) and between biosecurity and farm profitability (Corrégé et al., 2012; Siekkinen et al., 2012; Rojo-Gimeno et al., 2016; Collineau et al., 2017). In addition, a higher biosecurity level had a positive impact on reducing the amount of antimicrobials used in Belgian pig production (Laanen et al., 2013; Postma et al., 2016). This is promising considering that antimicrobial use in pig production has been identified as one of the highest among livestock sectors in the EU (Filippitzi et al., 2014; Carmo et al., 2017).

Despite these documented positive effects and the recognized importance of biosecurity measures, there are still major shortcomings in the implementation of these measures among European pig farms (Laanen et al., 2013; Backhans et al., 2015; Filippitzi et al., 2017). There are several examples of spread of diseases due to insufficient implementation of biosecurity measures, such as the porcine epidemic diarrhea (PED) (Scott et al., 2016), African Swine Fever and the highly pathogenic strain of porcine reproductive and respiratory syndrome (HP-PRRS) (Brookes et al., 2015). Thus, it is highly needed to continue emphasizing the importance of biosecurity in disease prevention.

Assessing biosecurity in pig herds in an objective and quantitative way is a necessary first step to create and/or increase the awareness of the farmer. It also allows the farmer to benchmark his/her farm and to implement proper changes to improve the biosecurity level.



KEYNOTE ADDRESS: Biosecurity from theory to practise

Scoring system

A web-based tool based on a questionnaire Biocheck.ugent® has been developed by Ghent University (Laanen et al., 2010) and been used in over 5000 pig herds in 40 different countries. For the PROHEALTH project, some minor revisions were made by the different consortium members. The on-line tool can be accessed by the following web-addresses and is free for use:

<https://www.survey.ugent.be/lime/index.php/691653/lang-en>

The questionnaire is divided into a number of subcategories, each containing questions related to specific items of management and biosecurity. There are six subcategories for external biosecurity and six for internal biosecurity.

The subcategories within external biosecurity include purchase policy, vermin and bird control, location and environment, removal of carcasses and waste, access check, and equipment. The subcategories of the internal biosecurity are management of diseases, farrowing and suckling period, nursery period, fattening period, cleaning and disinfection, and compartmentalization, working lines and equipment. Detailed information about the questionnaire is described by Laanen et al. (2010). Each subcategory and each question within a subcategory has a weight based on information from scientific literature, expert opinion and general knowledge of management and infection risks e.g. purchase of breeding animals implies a higher risk for disease transmission than not purchasing breeding animals. Depending on the response to a question, a higher or lower score is obtained for that question, for that subcategory and finally for the entire questionnaire. The final score for management and biosecurity for a herd may vary between 0 (absence of any measure) and 100 (presence of all biosecurity measures). The questionnaire and scoring tool is applicable for every type of pig herd e.g. sow herds and fattening herds. In the case of a fattening pig farm, the tool will adapt and calculate the score for fatteners, without showing questions for sows and piglets. The questionnaire has been pretested in farms from different countries.

After completing the questionnaire, a general score is obtained and provided to the farmer. In addition, the results for external and internal biosecurity as well as the score for each subcategory are provided. The scores are visualized by a spider chart which immediately compares the farmer's result with the average results of his country and the average results throughout the world. This allows the farmer to identify those items related to biosecurity requiring further improvement.

Results of biosecurity scoring in pig herds in the prohealth project

The biosecurity was scored in sow herds from 6 different European countries: Belgium, Denmark, Finland, Germany, The Netherlands and Spain. The farms are considered to be fairly representative for the pig farms in the different countries. However, as they were not randomly selected, a full representation cannot be guaranteed.

A total of 236 sow farms completed the questionnaire. The aim of the project was to include 50 herds in the six participating countries. For different reasons this number of farms could not be met in every country. The number of farms where the biosecurity was assessed are shown in the table below. In every country the same questionnaire was used, the way in which data was collected differed slightly per country.

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KEYNOTE ADDRESS: Biosecurity from theory to practise

Table 1. Number of sow farms in different EU countries where biosecurity was scored

Country	Data were collected through...	Number of participating farms
A	farm visit	52
B	telephone interview	27
C	farm veterinarians	51
D	farm visit	29
E	the integration	50
F	telephone interview	27
Total number of farms		236

An overview of the general characteristics of the sow farms is provided in Table 2.

Table 2. General characteristics of the sow farms in the six participating countries

Country	Average number of sow places	Average years of experience	Average FTE (full time equivalents) per farm	Sow per FTE
A	363	23	1.7	214
B	914	14	5.2	176
C	382	21	2.7	141
D	918	26	3.7	248
E	971	19	5.2	187
F	237	26	2.2	108
Average	613	21	3.4	180

The farms could be classified arbitrarily into three types of farms: farms where piglets left the farm at weaning or at the end of the nursery, or farrow-to-finish pig herds where the pigs remained on site until slaughter age (Table 3).

Table 3. Type of farms with sows that participated in the study in the 6 EU countries

Country	Type of farm: pigs until ...			Total
	weaning (3-4 weeks)	end of nursery (9-12 weeks)	end of fattening (6-7 months)	
A	1	9	42	52
B	0	27	0	27
C	4	18	29	51
D	2	12	15	29
E	11	15	24	50
F	3	8	16	27
Total	21	89	126	236

To compare the external biosecurity scores between countries, analysis of variance was performed (ANOVA, post hoc Bonferroni, IBM SPSS®) between the participating countries (Table 4). The overall external biosecurity score was highest in country B (87.5) and lowest in country A (67.3) (p < 0.05). Country C and D did not significantly differ from each other regarding overall external biosecurity score (p > 0.05).



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Table 4. External biosecurity scores and subcategories in farms of the 6 EU countries.

Country	Subcategory within external biosecurity						External Biosecurity	
	1	2	3	4	5	6	Score	
A	86.5	66.1	42.8	70.4	61.6	59.0	67.3	
B	95.9	84.7	73.0	94.5	89.0	80.4	87.5	
C	92.2	75.6	57.4	86.5	74.9	49.4	76.3	
D	93.7	78.1	57.2	78.1	79.4	40.7	75.4	
E	94.2	70.1	68.3	88.7	75.0	76.0	80.0	
F	82.3	58.6	56.1	75.7	73.1	88.1	71.4	
Average	Scores	90.8	71.8	58.1	82.1	74.0	64.1	75.7
	SD	10.3	14.0	18.7	14.8	20.8	32.2	10.2
	min - max	49.9 - 99.8	31.2 - 95.7	0.0 - 100	32.3 - 100	0.0 - 100	0.0 - 100	41.0 - 96.0

The same was done for the internal biosecurity scores. In table 5, the countries are ranked according to the overall internal biosecurity scores. Country B had a significantly higher internal biosecurity (64.6) compared to countries A and C (55.0 and 51.2, respectively) ($p < 0.05$). Country F had the lowest overall internal biosecurity score (46.4) compared to countries B, E and D (64.6, 60.1 and 57.6 respectively) ($p < 0.05$).

Table 5. Internal biosecurity scores and subcategories in farms of the 6 EU countries.

Country	Subcategory within internal biosecurity						Internal Biosecurity	
	7	8	9	10	11	12		
A	59.8	58.2	58.9	62.2	45.9	50.2	55.0	
B	100.0	46.1	57.6	0.0	46.8	90.3	64.6	
C	59.7	47.7	55.0	41.0	39.9	58.5	51.2	
D	71.6	52.4	69.8	45.2	55.8	41.9	57.6	
E	79.3	55.3	56.8	50.7	47.8	69.8	60.1	
F	81.7	45.9	38.3	49.4	44.8	31.3	46.4	
Average	Scores	72.5	51.8	56.8	44.1	46.2	57.5	55.7
	SD	22.0	20.0	17.7	38.6	19.7	25.0	13.5
	min - max	15.0 - 100	0.0 - 100	7.1 - 89.3	0.0 - 100	7.1 - 100	0.0 - 100	13.0 - 91.6

The following conclusions and implication can be made:

- The external biosecurity category that had the highest average score was “purchase of animals and semen” (90.8), the one with the internal biosecurity lowest average score was “weaning period” (44.1).
- The external biosecurity category that had the lowest average score was “feed, water and equipment supply” (58.1). Where most farms do take measures concerning the animals they purchase, a lot of farms fail to do this for other things that enter the farm. For example, feed trucks cannot fill the feed bins without entering the clean road, water quality is not checked annually and/or no measures are taken for material supply, like disinfection or quarantine. In some countries however, an annual check of the water quality is imposed by quality labels.



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- The internal biosecurity category that had the highest score was “Disease management” (72.5). Many participating farms were regularly visited by their farm veterinarian and stick to predetermined vaccination and medication protocols.
- The overall scores for external biosecurity were higher than the scores for internal biosecurity meaning it is easier for farmers to implement management measures for the prevention of pathogens entering a farm rather than to implement measures to prevent the spreading of pathogens within the farm.
- There was a large variation between countries, likely due to differences in farm and country characteristics and other factors.
- There was a large variation in scores between farms, meaning that there is still room for improvement in many pig farms.
- The results of the online biosecurity scoring tool can serve as an instrument to introduce and evaluate improvement strategies. They are currently used in ongoing research aiming to find risk and protective factors for production diseases in pig farms in Europe.

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KL-07

IMPLEMENTATION OF BIOSECURITY IN THE PIG INDUSTRY: SOCIAL AND INSTITUTIONAL FACTORS

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Spread and establishment of infectious diseases is a challenge for the livestock industries, as it can significantly affect animal and public health, on-farm productivity and trade arrangements. Implementation of biosecurity pre-border, at the border and post-border is crucial for the prevention of disease introduction and spread at a farm, region or country level and to minimize the impact of disease outbreaks. International and national organizations have developed and implemented biosecurity policies to prevent the spread of emergency animal diseases from infected to non-infected countries or regions within a country; however, at a farm level biosecurity implementation is in most cases responsibility of the industry and the individual farmers (Enticott et al. 2012; Higgins et al. 2016; Hernández-Jover et al., 2016).

Farm biosecurity is defined as a set of measures to prevent properties from the entry and spread of pests and diseases, with the level of farmer engagement with farm biosecurity being affected by a diverse range of factors. Biosecurity is important for all type of livestock enterprises; however, intensive production systems, such as pig production, where transmission of disease is more likely due to higher animal density and contacts, appropriate implementation of biosecurity plays a significant role in preventing disease spread.

There is a significant number of studies that have investigated biosecurity implementation at a farm level among different types of livestock producers, including commercial and non-commercial enterprises and different animal species (e.g. Boklund et al., 2004; Barclay, 2005; Casal et al., 2007; Brennan and Christley, 2012; Garforth et al., 2013; Lambert et al., 2012; Sahlström et al., 2014; Schembri et al., 2015; Hernández-Jover et al., 2016). Some of these studies have gone a step further and investigated not only the level of implementation of biosecurity but also the institutional and social factors influencing producers' engagement with and attitudes towards biosecurity. In general, findings from these studies indicate that livestock producers are highly committed to the health of their animals; however, their knowledge and implementation of biosecurity and their understanding of their responsibility as part of the biosecurity system is limited, with the perception that biosecurity risk originates externally and as such, should be managed by government.

On-farm biosecurity implementation is not solely influenced by economics and rational judgements, but rather by a multitude of influences and factors, including internal and external factors and socio-economics and demographic factors. This is true for all livestock production systems. For example, some of the internal factors identified are the level of knowledge of principles of disease transmission, the perceptions of the potential risks and the perceptions of responsibility in preventing disease. These factors are in turn affected by external factors, such as the level of available information and support for producers (e.g. industry, government), the regulatory context, the producer networks, the media, etc. Furthermore, impacting on these factors and perceptions, there are demographic characteristics and economic drivers that will have a strong influence on what producers do and believe.

Research in biosecurity within the pig industry confirms pig producers have similar drivers than other livestock producers for decision-making in relation to biosecurity. Some key farm characteristics influencing producer biosecurity engagement is herd size and the motivations for keeping pigs. In general, pig farms with bigger herd sizes, which would also be considered commercial, have better



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biosecurity than small-scale pig properties (Norémark et al., 2010, Lambert et al., 2012, Sahlström et al., 2014, Schembri et al., 2015). In relation to motivations for keeping pigs, those producers identifying income as a reason for raising pigs, mainly among non-commercial producers, are more likely to follow biosecurity principles in their property than those who keep pigs for other reasons, such as family tradition or home consumption (Schembri et al., 2015). However, more complex factors or drivers such as trust in those providing advice on biosecurity have also been identified as crucial for practice adoption in the pig industry (Hernández-Jover et al., 2012).

The reasons for adopting biosecurity practices is complex, with producer knowledge on biosecurity and diseases, perception of risk, attitudes in relation to animal health and trust all playing a significant role, and any program to improve biosecurity engagement need to consider this complexity (Hernández-Jover et al., 2014).

The current paper will explore the findings from some these studies and discuss them in the context of pig production, identifying key social and institutional factors to consider for improving engagement of producers with biosecurity.

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KL-08

MANAGING LARGE LITTERS

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Introduction

In the course of domestication, selective breeding has delivered more than 100% increase in litter size in pigs. Denmark has seen the most dramatic progress in this trait; an increase in total born per litter of four pigs has occurred over a 13 year period (Rutherford et al. 2013) with current born alive per litter averaging 16.3 compared with a general commercial benchmark of 13.8 in Europe (SEGES 2016; AHDB Pork, 2016). However, large litter size has a number of associated welfare challenges for both piglets and sows (Rutherford et al., 2013; Baxter et al., 2013). There is a general consensus that larger litters have higher piglet mortality (see Baxter and Edwards 2018 for review). The occurrence of stillbirths has increased, which is in part linked to the longer farrowing durations associated with super-prolific breeds. For live-born piglets, large litter size is a risk factor due to an associated increased proportion of low birth weight piglets being born (Kerr and Cameron, 1995; Roehe, 1999; Sorensen et al., 2000), and the concomitant higher risk of mortality in small piglets. The impacts of large litter sizes on sow welfare involve issues related to the process of carrying, delivering and raising a large litter (Rutherford et al., 2013).

When litter size routinely exceeds the ability of individual sows to successfully rear all the piglets (i.e. viable piglets outnumber functional teats) there are significant management challenges for staff that must intervene to raise these extra piglets. Interventions include split suckling; cross-fostering; use of nurse sow systems and early weaning, including split weaning; and use of artificial rearing systems. These interventions require diligent stockpersonship and there are risks to the health and welfare of both piglets and sows (Baxter et al. 2013), particularly if performed poorly. This paper will discuss the different interventions and the potential to optimise management and nutrition to mitigate for the health and welfare concerns associated with large litters.

Optimising management

Colostrum intake and fostering

Piglets must ingest colostrum as soon as possible after birth. Colostrum increases core body temperature and is important for both energy balance and immune protection. Piglets will have access to colostrum continuously for approximately 12 hours from the start of farrowing before cyclical let-down of milk occurs every 20 minutes. Immature organ development will impact upon the piglet's ability to process any milk it obtains and there is a finite amount of time before gut closure commences (approximately 48h) when it is important for the piglet to obtain and process colostrum (Cranwell, 1995). Getting to the udder, commanding a functional teat and suckling colostrum quickly not only aids thermoregulation and the acquisition of immunoglobulins and nutrients, but also aids gut closure. Major factors in being able to achieve this are the behaviour of the mother and the level of competition at the udder (i.e. the litter size). If the sow is calm during farrowing, adopting a lateral lying posture and exposing her udder, piglets will have safe passage to suckle colostrum. Reducing stress in the periparturient sow will help achieve this desired passive state and improve farrowing progression. Ensuring appropriate sow condition, minimising heat stress and providing enrichment to allow nest-building behaviour and reduce frustration (Thodberg et al. 1999; Jarvis et al. 2001, 2002; Damm et al. 2005) are all important



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management factors. However even if maternal behaviour and physiology are optimised additional interventions are necessary when litter size exceeds functional teat number and when there is a greater number of low vitality, growth-retarded piglets (Baxter *et al.* 2013).

Giving assistance to low vitality piglets will improve survival outcomes. For example, Muns *et al.* (2014) demonstrated that providing an oral supplementation of sow colostrum to piglets weighing less than 1.35 kg within 4 h of birth increased IgG levels at d4 postpartum. Other interventions include split suckling and cross-fostering to achieve litter equalisation or standardisation (i.e. similar size piglets).

Split suckling and cross-fostering:

Split suckling is a technique employed on the initial sows farrowing in a batch when fostering opportunities are limited. It involves dividing the litter into two groups and allowing each group a specified period of non-competitive time at the udder to ingest colostrum. This can be labour intensive and careful time management is needed to ensure piglets on this regime are attended to regularly and alternated correctly. Therefore, if fostering opportunities are available, it is the preferred option. If performed correctly, cross-fostering enhances piglet survival (English *et al.*, 1977; Cecchinato *et al.*, 2008) and can reduce the need for further management interventions for piglets that would otherwise suffer from remaining in a large litter, or those low birth weight piglets that are failing to compete for a productive teat with their larger littermates. However, there are various welfare concerns associated with some fostering practices. These concerns relate to the time after birth when fostering occurs and the problems with over-fostering (Baxter *et al.*, 2013). Moving too early (i.e. before 6 h old) may deprive the piglet of access to colostrum, whilst moving too late (i.e. after 24-48 h old) results in greater fighting, more disrupted suckling episodes and a greater chance of rejection by the foster mother (Price *et al.*, 1994). Some farm managers will repeatedly cross-foster piglets, moving them from sow to sow in an attempt to achieve more homogenous weaning weights. However, such practices are very disruptive for both the sow and piglets and thus counter-productive, with continuously cross-fostered piglets failing to suckle regularly, acquiring facial lacerations and showing no improvement in weaning weights (Robert and Martineau, 2001).

Nurse sow strategies:

The use of nurse sows as a solution to the challenges of large litters is now close to ubiquitous in countries such as Denmark and the Netherlands. On average 15% of weaned sows in Danish herds are used as nurse sows after having nursed their own litter for 1-3 weeks (Pedersen, 2015). However, such systems have yet to be widely used in other countries. There are two main types of management process that involve using nurse sows; namely, one-step and two-step. One-step management involves weaning piglets which are at least 21 d old from a “chosen” nurse sow and then fostering on surplus piglets from newly farrowed sows when the piglets are at least 12 h old. The nurse sow then rears this second litter to at least 21 d of age, when they are weaned, and she returns to a dry sow facility for service. Two-step management, sometimes called “cascade fostering” involves the use of two lactating sows. An intermediate sow (interim sow) is identified and her litter is weaned at 28 d of age (or at least 21 d old) and then a second-step nurse sow is identified whose piglets are 4-7 d old. These piglets are all fostered onto the intermediate sow. The second-step sow is then given surplus, large, newly farrowed piglets (for full details see Baxter *et al.*, 2013). Though there are welfare concerns for nurse sows relating to both the behavioural restriction associated with extended periods in a farrowing crate to raise an extra litter (Baxter *et al.* 2018) and also to potential physical damage such as shoulder lesions (e.g. Sørensen *et al.* 2016), piglet survival can be improved. The success relies on careful selection and management of the nurse sows (e.g. consider her mothering abilities (e.g. milk quality and yield, number and quality of teats, attentiveness in lying down, lack of aggressiveness toward the piglets...)).

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Artificial rearing:

Artificial rearing systems are now widely used in the Netherlands, the USA and increasingly in Germany, to deal with surplus piglets. For example, the Rescue Deck system is a specially designed unit that is recommended to sit above the farrowing crates and houses either surplus or low viability piglets. The decks are fully slatted, heated and lit and have artificial milk, water and, when piglets are older, a creep feeding system. Piglets are typically housed there from 3-20 d old and often this system does indeed “rescue” piglets that would otherwise die. However, scientific evidence regarding the advantages and disadvantages of artificial rearing systems in terms of welfare and the long-term survival prospects of “rescued” piglets is sparse. The limited evidence available suggests there are significant welfare compromises for piglets (Rzezniczek et al. 2015). If such practices are to be adopted, they require further investigation.

Optimising nutrition

Mothers matter – feeding for farrowing fitness and high lactational feed intake:

Preparing the peri-parturient sow for the exhaustive process of parturition and lactation is an important component of ensuring piglet survival, as well as good sow health and welfare. For the modern super-prolific sow, parturition is a marathon event; it is not uncommon for sows carrying large litters to have farrowings lasting 9h (Hales et al. 2015), where 4-5h was previously classified as a long farrowing (Oliviero et al. 2010). Longer farrowing duration increases the risk of both maternal and uterine fatigue leading to stillbirth or a live-born piglet compromised by hypoxia (Alonso-Spilsbury et al. 2005). Sows are also under increased metabolic pressure when attempting to meet the nutrient needs for high milk production during lactation. If they are unable to meet these requirements from feed intake, they will catabolise their own body tissues to supply the necessary nutrients and rapidly lose body condition which can have detrimental outcomes (for instance shoulder lesions, loss of body condition and lower residual reproductive output and thus shorter longevity (Ocepek *et al.*, 2017). Getting things right at the time of farrowing depends on a correct preparation during gestation (Mullan and Williams, 1989). Sows need to enter the farrowing accommodation neither too thin, limiting body reserves to draw on during the immediate post-farrowing period when feed intake is low, nor too fat, as this make sows more clumsy and liable to crush piglets and will reduce their voluntary food intake during the lactation period. A high fibre diet during gestation will help to promote intake in lactation, by accustoming the gut to higher volume of feed (Quesnel et al., 2009). Inclusion of fibre in the immediate pre-farrowing period will also help to reduce constipation which can occur at the time of farrowing and predispose sows to health problems such as MMA (Oliviero et al., 2009; Farmer et al., 1995), which can seriously impair welfare of both the sow and her litter. Fibre inclusion can also reduce sow restlessness in the post farrowing period (Peltoniemi and Oliviero, 2015) and promote greater and prolonged uptake of energy from the gastrointestinal tract (see Theil 2015 for review).

After farrowing, nutrient intake from feed needs to increase dramatically to keep pace with the requirements for milk production. To achieve this, the sow needs both a palatable and nutrient dense diet. Giving too much feed too soon after farrowing, however, can in some circumstances predispose sows to problems of MMA (Papadopoulus *et al.*, 2010) and a phased increase over the first days before feeding fully to appetite may be necessary. This ensures that feed is always fresh and of good hygienic quality, rather than accumulating in the trough and becoming stale or mouldy in warm farrowing house conditions. Ensuring plentiful water availability is also very important as the newly farrowed sow is unwilling to work hard to obtain water from drinkers with a low flow rate, and will reduce both water and feed intake to suboptimal levels under these conditions (Leibbrandt *et al.*, 2001). Drinkers should be able to supply two litres per minute and the quality of the water is also important. Another common problem which reduces feed intake is a high ambient temperature. Whilst a warm farrowing environment is important for piglet survival,



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it imposes stress on the sow who will reduce voluntary intake by 0.17kg for every 1°C increase in temperature above 16°C (Black et al, 1993). Reducing farrowing room temperatures as piglets start to use locally heated creep areas, from the 22-20°C which is common at the time of farrowing to 18-16°C which is more comfortable for the sow, will have large benefits for feed intake. Avoiding heat stress can be a major challenge in some parts of the world, where ambient temperatures in summer often greatly exceed these values. In these circumstances, nutrient intake can be aided by providing feed little and often and at cooler times of the day and providing localised cooling for the sow through water drip systems or cooling plates will also help (McGlone *et al.*, 1988).

Feeding for piglet robustness:

Given the importance of birth weight for piglet survival, nutritional interventions have focussed on ways to improve embryo quality and subsequent birth weight and uniformity, including use of fermentable ingredients in sow’ diets prior to breeding (Van den Brand *et al.* 2009), and essential amino acids at the time of placental development (Wu *et al.* 2004). More recently efforts have been focused at how best to deal with the increasing population of intrauterine growth retarded (IUGR) piglets; Amdi *et al.* (2013) found that piglets born with severe IUGR had less brain sparing if their mothers were fed palm acid distillate, whilst essential fatty acid supplementation in late gestation can increase piglet vitality (Rooke *et al.* 2001; Bontempo and Jiang, 2015). Campos *et al.* (2012) published a recent review on these offspring benefits, whilst Meunier-Salaün *et al.* (2001) and De Leeuw *et al.* (2008) discussed the influence of nutritional interventions on sow welfare. Table 1 summarises examples of nutritional interventions to improve piglet and sow outcomes.

Table 1. Examples of sow nutritional interventions to improve piglet survivability

Nutritional intervention	Stage administered	Outcome	Reference
Fermentable substrates - dextrose	Lactation and pre-service	↑BW, ↑ litter uniformity, ↓ total mortality	Van den Brand <i>et al.</i> 2009
Arginine supplementation	Throughout gestation	↑ embryo survival, ↑ placental vascularisation ↑ BW	Hazeleger <i>et al.</i> 2007 Mateo <i>et al.</i> 2007
Carnitine supplementation	Throughout gestation	↑ BW ↓ % non-viable piglets	Eder <i>et al.</i> 2001 Eder & Brandsch 2002
DHA supplementation	Last 4wks of gestation Last 4wks of gestation + lactation	↓ stillbirths ↑ piglet vitality	Adeleye <i>et al.</i> 2012
High fibre diets (e.g. unmolassed sugar beet pulp)	Transition period immediately before farrowing Lactation (last 2wks) Pre-mating	↓ constipation ↓ sow restlessness ↑ energy uptake from GIT ↑ litter size ↑ embryo survival Improved sow welfare (↓ stereotypies, ↑ fermentation, ↑ gut distension, ↓ hunger, ↓ aggression)	Oliviero <i>et al.</i> , 2009; Farmer <i>et al.</i> , 1995; Oliviero <i>et al.</i> 2015; Theil 2015 Ferguson <i>et al.</i> 2003, 2004, 2006 Vestergaard 1997, De Leeuw <i>et al.</i> 2004 Quesnel <i>et al.</i> , 2009
Fish oil	Day 60-115 gestation	↓ latency to suckle ↑ survival	Rooke <i>et al.</i> 2001, 2003
Palm acid distillate	Day 100-110 gestation	↓ brain sparing in IUGR piglets	Amid <i>et al.</i> 2013
Dietary fat	Late gestation	↑ colostrum yield ↑ lipid and lactose content in colostrum ↑ colostrum IGF-1 conc.	Hansen <i>et al.</i> 2012 Farmer and Quesnel 2009 Quesnel <i>et al.</i> 2015

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Feeding for enhanced colostrum yield

Lactational output of the sow is a vital aspect of determining how much colostrum the piglets receive. A variety of dietary interventions can affect the composition of colostrum and therefore piglet survival. For example high fibre gestation diets (Quesnel et al. 2015) and dietary fat inclusion late in gestation may improve colostrum yield (Hansen et al. 2012) and increase total lipid and lactose content in colostrum, as well as colostrum IGF-1 concentration (Farmer and Quesnel 2009). Bontempo et al. (2015) demonstrated that dietary conjugated linoleic acid affected fatty acid composition and positively affected immunologic variables in colostrum, and could be transferred to the offspring via the dam during suckling (Bee, 2000).

Conclusions

Though the multifactorial nature of piglet mortality means single causal factors are difficult to identify, the recent focus on genetic selection strategies to increase litter size, and the associated negative impacts on survival, is a likely contributing factor hindering any substantial advances. These super-prolific breeding programmes to achieve production targets of 35-40 piglets per sow per year are likely to persist. However such targets challenge both the sow and piglets, with both immediate and long-term outcomes on health, welfare and survival.

The link between litter size and mortality can be influenced by a more balanced selection policy, incorporating survival traits as well as litter size traits in the breeding index and assigning appropriate weightings to each (Su et al. 2007; Nielsen et al. 2013). It can also be influenced by optimised nutritional programmes for sows during gestation and lactation which enhance fetal development, neonatal vigour and sow welfare, and changed management practices on the farm to provide additional support for supernumerary piglets. This demands a high level of both time and skill to be successful.

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KL-09

HOW TO DEAL WITH DISEASE IN LARGE LITTERS

E. Marco

Marco vetgrup SLP, Barcelona, Spain.

What is a large litter? Obviously, the definition of a large litter depends on the type of swine breed we talk about. For an Iberian sow a large litter would be to achieve 10 total born, while for a modern sow a large litter means something else. There are different genetic lines on the market with differences in prolificacy, but we could define a large litter as a litter, which is larger than the rearing capacity of its mother. If a sow at farrowing delivers more piglets than she has teats, a cascade of events will follow which can have an impact on disease. Large litters put farmers; production experts, veterinarians and nutritionist under huge pressure to try to wean as many pigs as possible. Often this pressure forces us to forget some basic and important rules when dealing with health. Achieving large numbers of pigs at weaning is a key element in swine production but unless most of them reach market weight, all our efforts will be worthless. Let's review the key elements when dealing with health:

1. High colostrum intake.

Colostrum provides piglets with passive immunity for protection against pathogens, with the energy necessary for thermoregulation and body growth, and with growth factors that stimulate intestinal growth and maturation (1). Large litters are associated with lower birth weights (2) and piglets with low birth weight have been associated with lower colostrum intake (3). Pigs with low birth-weights and low colostrum intake have a higher probability of dying either pre-weaning or post-weaning and also a higher probability of reaching lower weights at the end of finishing (4). Any measure applied directed at assisting farrowing will reduce hypoxic pigs during farrowing and will help low birth weights to drink enough colostrum having a positive impact on health (5). Therefore, providing good temperature to the piglets, especially to those with lower birth weight will have an indirect impact on colostrum intake as piglets are stronger to reach the teat and suckle (6). On the other hand, any measure directed to increase sow's colostrum yield will be also helpful as individual colostrum intake reduces the larger the litter. Increasing a sow's feed intake in last days of gestation (from day 108) can increase colostrum yield (7). Also, changing the source of fat in the gestation diet can influence the quality of the colostrum (8).

2. Hygiene.

It is common to consider the farm's hygiene protocols as correct, without any type of audit. Too often rooms are washed partially, or not allowed to dry before animals are moved in again. A good washing procedure should eliminate organic matter, not just from floors, but also from feeders and drinkers. Some studies comparing the efficacy of cleaning and disinfection protocol in different farms found that, too often, drinkers and feeders are not properly cleaned (9). A good all in all out procedure has to include completely emptying the room and good cleaning and disinfection. Drying of the room has to be considered a key element of the cleaning and disinfecting procedure to eliminate not just bacteria, present in the room but also common viruses on our farms like PRRS(10). Minimizing exposure of suckling piglets to pathogens would be an integral part of controlling pre-weaning mortality, with the keystone being AIAO (11). Moving foster sows from other farrowing room has to be considered a violation of the all in all out system as contamination coming from another farrowing room will also be moved in, not allowing a real separation or break



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between batches. Washing sows before farrowing was reported to lower pre-weaning mortality and lower mastitis incidence (12). Minimizing transmission of pathogens between batches requires applying some basic hygiene rules between them: clean the piglet processing trolley among batches, clean and disinfect tools between batches, wash hands and changing boots or shoes between batches (13). Avoiding lesions by not teeth clipping or if tail-docking cauterising the wound will help to reduce infection in piglets (14). Used needles can potentially spread pathogens from pig to pig (15), so changing needles not just between litters but also between piglets will help with disease prevention.

3. Batch management.

As we have seen before, large litters have been associated with lower birth-weights and low birth-weights have been associated with lower weights at 42 days of age (16) and early finishing (17). Days to slaughter are determined by initial weights (18). In practice, to optimize space utilization, it is common practice to move slow growers back, mixing them with younger animals (different batch) in order to give them more time to reach market weights. These movements of pigs are usually done as early as before weaning, or as late as, at the end of finishing. These movements are braking the integrity of the batch, not respecting the all in-all out practices which have been recognized as one of the most effective tools to control health and to improve performance of pigs during the grow-finishing period (19). Batching systems allow farmers to maintain batch integrity and this has been recognized as being one effective tool when managing disease (20). Working with large litters will put batch integrity at risk when weaning numbers are prioritized. Therefore working with batching systems which create a longer interval between batches could have a negative impact on production, but farmers perceive it helps to keep good hygiene on their farms by maintaining batch integrity (21). For some pathogens such as *L. intracellularis*, *M. hyopneumoniae* and *A. pleuropneumoniae*, an improvement in health status was observed after the change in management system. Moreover, the five-week batch management system showed more consistent improvement over time as compared to the four-week batch management system (22).

4. Keeping litter integrity.

Large litters are characterized by the fact that sows produce more piglets than their actual rearing capacity. Farmers have applied the technique known as cross-fostering to overcome this problem. Cross-fostering is not a technique associated just with large litters, but with them its frequency of use has increased. Foster mothers easily exceed 10% of those present in a farrowing batch, representing at least double that number of piglets transferred as a two step fostering is the most common system applied. When more than 20% of the piglets are moved around, litter integrity is lost in the majority of them. For certain pathogens, sow's carrier status is not the same, influencing the health status of their litter at weaning (23,24). The percentage of pigs colonized at weaning can determine the clinical expression for some diseases, as is the case for *M. hyopneumoniae* (25). For other pathogens mixing pigs will favour their transmission (26). Cross-fostering pigs can influence the immune status of piglets and therefore the expression of disease, when it is done very soon after farrowing (27,28). Limiting the amount of cross-fostering performed on farms to only moving piglets within the first 24 hours after farrowing and moving the minimum amount needed to fill available teat spaces has been reported to decrease mortality during PRRS outbreaks (29). Little research has been done on the effect of cross fostering on other diseases and their effect in later stages but some recent work done at Wageningen University shows that disease spread can be reduced on farm by avoiding mixing from birth to slaughter. Respiratory diseases and treatment costs can be reduced with improvements in pig health and performance (30). With the continuing trend of larger litter sizes, it seems difficult to avoid cross fostering completely. However, systems

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such as rescue cups and improved milk replacers, that can supplement sow's milk and rearing potential, can be used to maintain litter integrity (31).

Genetic improvement is a challenge for farmers, nutritionists, production advisers and veterinarians. When managing health, it is important to remember that for a long time very basic health rules were abandoned as antibiotics could cover the effects of not following them. In such scenarios, production was prioritized giving us a wrong impression of what has to be considered good management. In current conditions, with sows producing larger litters than ever and under pressure to reduce antibiotic usage, it becomes essential to start by having the correct sanitation bases. The four points detailed above include the basic rules for managing disease. Obviously, to overcome some of the inconveniences of bringing them into practice new technologies will have to be introduced in swine farming and some common practices will have to be changed. We, as swine advisers will have to play an important role helping farmers to understand and implement those changes.

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ORAL PRESENTATIONS





ORAL PRESENTATIONS

HERD HEALTH MANAGEMENT & ECONOMY

HHM-OP-01 to HHM-OP-06

RESIDENT SESSION

RES-OP-01 to RES-OP-06

VIRAL DISEASES

VVD-OP-01 to VVD-OP-06

VETERINARY PUBLIC HEALTH

VPH-OP-01 to VPH-OP-06

BACTERIAL DISEASES I

BBD-OP-01 to BBD-OP-03

WELFARE & NUTRITION

AWN-OP-01 to AWN-OP-03

BACTERIAL DISEASES II

BBD-OP-04 to BBD-OP-07

MISCELLANEOUS

MIS-OP-01 to MIS-OP-04

IMMUNOLOGY & VACCINOLOGY

IMM-OP-01 to IMM-OP-06

REPRODUCTION

REP-OP-01 to REP-OP-06



HERD HEALTH MANAGEMENT & ECONOMY

Wednesday, 9 May 2018, 15:30-17:30

HHM-OP-01

SWINE HEALTH SYNDROMIC SURVEILLANCE BASED ON CLINICAL SIGNS AND PRESUMPTIVE DIAGNOSIS DATA REPORTED AT FARM LEVEL

Ana Alba Casals (Spain)

HHM-OP-02

DEVELOPING SAMPLING GUIDELINES FOR ORAL FLUID-BASED PRRSV SURVEILLANCE

Marisa Rotolo (United States)

HHM-OP-03

B-ESECURE: ELECTRONIC SYSTEM TO MEASURE AND IMPROVE BIOSECURITY ON PIG FARMS

Victor Geurts (Netherlands)

HHM-OP-04

EARLY DETECTION OF CLINICAL RESPIRATORY DISEASE IN GROWING PIGS USING CONTINUOUS SOUND MONITORING AND AN ALGORITHM-BASED RESPIRATORY DISTRESS INDEX

Dale Polson (United States)

HHM-OP-05

CONGENITAL TREMOR-ATYPICAL PORCINE PESTIVIRUS (CT-APPV) OUTBREAK IN A MULTIPLYING FARM: ESTIMATION OF THE EFFECT ON PERFORMANCE AND ECONOMICS

Ad Groof De (Netherlands)

HHM-OP-06

BIOLOGICAL MARKERS ASSOCIATED WITH ROBUSTNESS OF PIGLETS AT WEANING

Catherine Belloc (France)



HERD HEALTH MANAGEMENT & ECONOMY

HHM-OP-01

SWINE HEALTH SYNDROMIC SURVEILLANCE BASED ON CLINICAL SIGNS AND PRESUMPTIVE DIAGNOSIS DATA REPORTED AT FARM LEVEL

A. Alba Casals¹, E. Allue², E. Novell², J. Balielles³, V. Tarancón², L. Fraile⁴.

¹ *VetEpiMon, Ripoll, Spain;* ² *GSP, Lleida, Spain;* ³ *Interporc, Lleida, Spain;* ⁴ *University of Lleida, Lleida, Spain.*

Introduction

The development of data mining and time series analyses allows extracting information of the health swine population at almost real time from non-specific data. In the North-Eastern Spain, the Grup de Sanejament Porcí (GSP) implemented an open web application to collect, transfer and store data of clinical signs and presumptive diagnosis detected in pig farms by veterinary clinicians. This study assessed the potential of this system for animal health syndromic surveillance using retrospective data.

Material & Methods

The population covered comprised data collected in Aragón, Catalonia and Navarra regions between January 2012 and January 2017. The most relevant clinical signs and presumptive diagnoses were analyzed and modeled in order to assess the spatiotemporal baselines. All analyses were conducted using the “base”, “surveillance” and “sp” packages of the statistical software R.

Results

A total of 8,547 clinical outbreaks were analyzed from 1,337 farms of 33 counties, mostly fattening farms. Respiratory clinical signs were the most reported, followed by digestive and nervous signs. Respiratory outbreaks were associated mainly with porcine respiratory complex diseases such as swine influenza, mycoplasmosis or PRRSV; followed by Pasteurellosis, swine pleuropneumonia and Glässer's disease. Digestive outbreaks were associated mainly with colibacillosis, clostridiosis and swine dysentery. Nervous and locomotor outbreaks were attributed to *Haemophilus parasuis* and *Streptococcus suis* infection and reproductive outbreaks mainly to PRRSV infection.

Discussion & Conclusion

The application of GSP allowed the monitorization of health problems at population level associated with endemic diseases, studying their spatio-temporal evolution and identifying subpopulations of risk. The information provided by the system demonstrates to be useful to identify the increase of incidence of diverse clinical problems in different subpopulations. A more prolonged implementation of this system in all the population would provide robust swine health information at near real time and contribute to improve the decision-making and health management.



HHM-OP-02

DEVELOPING SAMPLING GUIDELINES FOR ORAL FLUID-BASED PRRSV SURVEILLANCE

M. Rotolo¹, L. Giménez-Lirola¹, Y. Sun¹, S. Bade¹, C. Wang¹, D. Baum¹, P. Gauger¹, M. Hoogland², R. Main¹, J. Zimmerman¹.

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Introduction

Oral fluids (OF) are a convenient surveillance sample because they are easily collected and tested for nucleic acids and/or antibodies for PRRSV and a variety of pathogens. However, sampling guidelines for OF are not readily available. The purpose of this research was to develop OF sampling guidelines.

Material & Methods

In 3 wean-to-finish barns on one site, OF samples were collected weekly (9 samplings) from every occupied pen (108 pens; ~25 pigs per pen) for a total of 972 OF samples. OF samples were randomized prior to PRRSV RT-rtPCR testing. The binary results of RT-rtPCR testing were modelled using a piecewise exponential survival model for interval-censored time-to-event data with misclassification. Thereafter, simulation studies were used to study the barn-level probability of PRRSV detection as a function of sample size, sample allocation (simple random sampling vs fixed spatial sampling), assay diagnostic sensitivity and specificity, and pen-level prevalence. Site level probability of detection based on sampling ≥ 2 barns on a site was also evaluated.

Results

Statistical analyses showed that the probability of detection increased with 1) sample size, 2) disease prevalence, and 3) repeated sampling over time. Sample allocation likewise affected the probability of detection. Notably, “fixed” spatial sampling was as good as, or better than, random sampling for the detection of PRRSV. Given the estimated barn-level probability of detection (p), the probability of detection on a site (Ps) was optimized by sampling multiple barns/air spaces (n): (Ps = (1 - (1 - p)ⁿ)).

Discussion & Discussion

This research provided probability of detection estimates for oral fluid samples by sample size, disease prevalence, and test performance at the barn level. Site level probability of detection can be estimated using the approach described above. This research represents initial efforts at developing guidelines for surveillance and monitoring programs using oral fluids.



HERD HEALTH MANAGEMENT & ECONOMY

HHM-OP-03

B-ESECURE: ELECTRONIC SYSTEM TO MEASURE AND IMPROVE BIOSECURITY ON PIG FARMS

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¹MSD-AH Intervet The Netherlands BV, Boxmeer, Netherlands; ²PigChamp Pro Europa, Segovia, Spain; ³MSD-AH International, Madison, United States.

Introduction

Biosecurity procedures impact diseases such as PRRS, but applying and following biosecurity rules is often difficult. B-eSecure is an electronic system that besides external biosecurity, tracks and reports correct and wrong movements of people on farms and visualizes effects of biosecurity improvement on health status and production results. This PigChamp EU program is being piloted by MSD-AH in farms around the world and implementation in 2 Dutch farms is described.

Materials and method

Via installed tracking-devices, movements of people who wear personalized beacons are reported. The PRRSv status of sows, gilts, farrowing-, nursery- and finishing unit was determined and groups with circulating PRRSv defined as red vs groups without as grey. Movements from grey to red were defined as safe and from red to grey and between red as risk respectively unsafe unless a hygiene-lock was used between them (checked by locker devices). The % of correct and risk/unsafe movements per farm and person were reported monthly. Training and reports were implemented to reduce the amount of wrong movements. The effects on PRRSv prevalence and production parameter are monitored via regular diagnostics and management system.

Results

Farm (multiplying) 900 sows: PRRSv+ farrowing, nursery and rearing gilts. Risk/unsafe movements were reduced: September 27% vs October 23%. PRRSv prevalence in the farrowing units decreased by 50% and the amount of detected virus dropped 99% in nursery and farrowing.

Farm (breeding) 700 sows: PRRSv+ rearing gilts unit. Amount of wrong movements remained low at 7% in Oct. Extensive PRRSv monitor will be done every 4 months and 2 groups of mature-gilts tested monthly. No PRRSv was detected in October.

Conclusion

B-eSecure is very helpful for visualization, implementation and improvement of biosecurity procedures. Linking the program with PRRSv prevalence data and production results helps to reach and maintain a high level of biosecurity.



HHM-OP-04

EARLY DETECTION OF CLINICAL RESPIRATORY DISEASE IN GROWING PIGS USING CONTINUOUS SOUND MONITORING AND AN ALGORITHM-BASED RESPIRATORY DISTRESS INDEX

D. Polson¹, S. Playter¹, D. Berckmans², A. Stoffel², B. Quinn³.

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³Boehringer Ingelheim Animal Health, Ingelheim, Germany.

Introduction

Early detection of clinical respiratory disease in growing pigs can improve productivity and profitability by enabling earlier more effective treatment. Clinical disease detection is typically the direct responsibility of farm workers, and is a function of skill, experience and time spent in the farm. However, detection of clinical disease onset by workers across multiple farms and systems can be problematic due to variation in the aforementioned capabilities of personnel. Continuous sound monitoring systems hold the potential to detect the onset of clinical respiratory disease earlier with greater consistency and reliability. The purpose of this project was to evaluate the ability of a continuous sound monitoring system to reliably detect the onset and directionality of clinical respiratory disease of growing pigs under large-scale commercial production conditions.

Materials and Methods

Cough monitors (SOMO+ Respiratory Distress Monitor, SoundTalks NV, Leuven, Belgium) were obtained and installed in three large commercial wean-to-finish facilities designed to house 1200 to 2400 pigs per airspace. Three different farm sites / systems were enrolled in the project. Pigs were placed into facilities per normal practice. An algorithm-based respiratory distress index (RDI) was continuously generated from recorded sound files and uploaded to a cloud database. RDI's were continuously monitored and alerts were automatically sent to pre-determined personnel when a significant rise in RDI was detected by the system. When an RDI alert was generated, diagnostic samples were collected and tested by PCR for PRRS, IAV-S, *Mycoplasma hyopneumoniae*, PCV2 and parainfluenza.

Results

RDI episodes were detected across the three farm sites, including: IAV-S (H1N1), IAV-S (H3N2), and *Mycoplasma hyopneumoniae*. Differences in patterns of cough were observed between IAV-S and *Mycoplasma hyopneumoniae*.

Discussion and Conclusions

The detection of the respiratory disease episodes by the SOMO+ Respiratory Disease Monitor ranged from an estimated 2-5 days earlier than detection by farm personnel.



HERD HEALTH MANAGEMENT & ECONOMY

HHM-OP-05

CONGENITAL TREMOR-ATYPICAL PORCINE PESTIVIRUS (CT-APPV) OUTBREAK IN A MULTIPLYING FARM: ESTIMATION OF THE EFFECT ON PERFORMANCE AND ECONOMICS

V. Geurts¹, A. Cruijsen¹, A. Groof De², A. Klemans³.

¹ MSD-AH Intervet Nederland BV, Boxmeer, Netherlands; ² MSD-AH Intervet International BV, Boxmeer, Netherlands; ³ ABAB Accountants & Adviseurs, Helmond, Netherlands.

Introduction

Congenital-tremors (CT) type A-II outbreaks occur in new born piglets. CT-APPV was identified by next generation sequencing platform VIDISCA and proven as causative agent in an infection trial. This study describes technical and economic impact of a CT-APPV outbreak.

Material and methods

In Q1-2016, CT-APPV was diagnosed as causative agent in a 570 sow farm with a CT outbreak. Prevalence was determined via detailed examination of 120 litters. As number of sold piglets can be influenced by CT outbreaks, production data was analyzed in farrowing/nursery. Technical data of the prior and following 3 quarters of 2016 served as baseline to assess technical impact. Economic impact per sow and farm was estimated by using the average Dutch piglet price in Q1-2016.

Results

CT prevalence at litter level varied from 5% in 4th parity-sows to 55% in 1st/2nd parity-sows. Mortality in CT litters of 2nd parity-sows was 25% and 69% in 1st parity-sow litters.

Total litters (TL), pre-weaning mortality (MF), weaned/litter (WL), post-weaning mortality (MN) and sold/litter (SL) were: Baseline: TL 1,397; MF 14,4%; WL 11.6; MN 2.3%; SL 11.3; Q1-2016: TL 298; MF 25%; WL 10.9; MN 16%; SL 9.1.

Financial impact of losing 2.2 piglets per sow and 6% extra non-sellable piglets was € 74.12 / sow and in total € 22.087.

Conclusion

CT prevalence during an outbreak was up to 55% at litter level and 69% within litters with young parity sows at higher risk, indicating that the virus was already present in the farm. Reduced colostrum and milk intake and a persistent viremia explain the high mortality of CT piglets. During the outbreak, weaned piglets/sow dropped with 0.7 and sold piglets/sow with 2.2 piglets. The financial impact of a CT outbreak can be high. Epidemiology can be studied when CT-APPV antibody and PCR test are available.



HHM-OP-06

BIOLOGICAL MARKERS ASSOCIATED WITH ROBUSTNESS OF PIGLETS AT WEANING

A. Buchet¹, E. Merlot¹, P. Mormede², E. Terenina², B. Lieubeau³, G. Mignot³, J. Herve³, M. Leblanc-Maridor⁴, A. Lacoste⁵, J.N. Sialelli⁶, C. Belloc⁴.

¹INRA PEGASE, Saint Gilles, France; ²INRA GENEPHYSE, Castanet-Tolosan, France; ³INRA IECM, Nantes, France; ⁴INRA BIOEPAR, Nantes, France; ⁵COOPERL, Lamballe, France; ⁶HYOVET, Plestan, France.

Introduction

The robustness of piglets at weaning can be seen as ability to express optimal growth performances without health problems whatever weaning conditions. In this study, we approached piglet robustness at weaning through growth performances after weaning. The aim was to identify biological markers measured around weaning associated with this growth.

Materials and Methods

Piglets (n=288) weaned at 28 days of age were selected from 16 commercial farms with contrasted health statuses (deteriorated: SAN- or good: SAN+). Blood variables (n=62) describing immunity, stress, oxidative status and metabolism were measured at 26 and 33 days of age. The relative ADG (rADG, ADG between 26 and 47 days of age divided by live weight at 26 days) was chosen as the performance indicator. Piglets were then classified according to the median of their farm in classes of low (rADG-) or high (rADG+) rADG.

Results

The health status of the farm was significantly associated with 37 of 67 variables measured (P<0.05). The rADG was associated with 26 variables, and a predictive model of rADG based on linear regression kept (i) the number of monocytes and lymphocytes at 26 days (ii) the blood concentration of vitamin A, non-esterified fatty acids, creatinine and immunoglobulin M and the number of neutrophils at 33 days of age (P<0.05). Thus, piglets reared on SAN- farms exhibited higher activation of the immune system, mobilization of body reserves and oxidative stress after weaning than SAN+ piglets. Independent of the effect of health status, rADG+ piglets exhibited lower mobilization of body reserves and higher antioxidant reserves after weaning than rADG- piglets.

Discussion and conclusion

Finally, based on the weight of a piglet before weaning and on biological variables measured before or 5 days after weaning, it is possible to estimate its weight at 47 days of age ($r^2 = 0.72$).



RESIDENT SESSION

Wednesday, 9 May 2018, 15:30-17:30

RES-OP-01

DIETARY SUPPLEMENTATION WITH TALL OIL FATTY ACID AND RESIN ACID INCREASES SOW COLOSTRUM IGG AND PIGLETS' COLOSTRUM INTAKE IN FREE FARROWING PEN

Shah Hasan (Finland)

RES-OP-02

OCCURRENCE OF DYSENTERY-LIKE DIARRHEA ASSOCIATED WITH *BRACHYSPIRA SUANATINA* INFECTION IN A GERMAN FATTENING FARM

Julia Stadler (Germany)

RES-OP-03

CYTOKINE PROFILES IN PERIPHERAL BLOOD MONONUCLEAR CELLS OF PIGLETS BORN FROM *PORCINE CIRCOVIRUS 2* VACCINATED AND NON-VACCINATED SOWS

Salvador Oliver-Ferrando (Spain)

RES-OP-04

VIRAL AND BACTERIAL INVESTIGATIONS OF RECURRENT PIG NEONATAL DIARRHOEA CASES IN SPAIN

Susana Mesonero Escuredo (Spain)

RES-OP-05

INCREASE IN IRREGULAR RETURN TO ESTRUS RATE IN SOWS AND SEVERE CONJUNCTIVITIS IN FATTENERS CAUSED BY *CHLAMYDIA SUI* - A CASE REPORT

Christine Unterweger (Austria)

RES-OP-06

FIRST STEP TO INCREASE SWINE FARMERS' TRUST IN THEIR VETERINARIANS: DEVELOPMENT OF THE TRUST IN VETERINARIAN SCALE (TIVS)

Mily Leblanc-Maridor (France)



RES-OP-01

DIETARY SUPPLEMENTATION WITH TALL OIL FATTY ACID AND RESIN ACID INCREASES SOW COLOSTRUM IGG AND PIGLETS' COLOSTRUM INTAKE IN FREE FARROWING PEN

 S. Hasan¹, S. Saha², J. Yun¹, O. Peltoniemi¹, C. Oliviero¹.

¹University of Helsinki, Department of Production Animal Medicine, Helsinki, Finland; ²University of Helsinki, Department of Agricultural Sciences, Helsinki, Finland.

Colostrum is essential for piglet survival and growth, providing the piglets with a source for immunoglobulin and energy. This study examined whether tail oil fatty acid and resin acid (PRO) added to a late pregnancy diet affect colostrum composition, yield (CY, g) and intake of colostrum (g) within 24 h after the birth of the first piglet in free farrowing. One week before farrowing, 60 sows were assigned to a 2×2 factorial [housing (CRATE, PEN), diet (PRO, CON)] experiment. Diet was supplemented daily with 5 ml/sow of PRO or control basic sow diet (CON) during the last week of pregnancy. At the beginning of farrowing, 2 ml colostrum were collected to analyze IgG content (mg/ml, ELISA). Piglets were weighed individually at birth and 24h after the birth of the first piglet to calculate CY. The PEN sows tended to have higher CY than the CRATE sows (4949.3 ± 184.0 vs. 4528.5 ± 162.5, $P=0.06$) and had higher colostrum intake by the piglets (342 ± 6.8 vs. 319 ± 6.9, $P=0.01$). Sows fed with PRO diet had higher colostrum IgG content than CON fed sows (113.8 ± 4.9mg/ml vs. 97.5 ± 5.1mg/ml, $P<0.05$). In both PEN and CRATE, sows with PRO tended to have higher IgG level than CON diet (119.1 ± 6.3 vs. 103.8 ± 7.9 and 108.9 ± 7.3 vs. 92.1 ± 6.6, $P=0.06$, PEN and CRATE respectively) and higher colostrum intake in PEN sows (355 ± 8.9 vs. 325 ± 10.4, $P<0.05$). A linear regression model predicts 300 g of more colostrum when PRO is used, and an additional 300 g is predicted when housing in PEN ($P<0.05$, $R^2=0.4$).

In conclusion, this study confirmed the positive effect of PRO diet on IgG level in colostrum and CY. The effect seems to be stronger in a free farrowing pen.

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RESIDENT SESSION

RES-OP-02

OCCURRENCE OF DYSENTERY-LIKE DIARRHEA ASSOCIATED WITH *BRACHYSPIRA SUANATINA* INFECTION IN A GERMAN FATTENING FARM

J. Stadler¹, J. Rohde², M. Majzoub-Altweck³, A. Falkenau³, W. Hermanns³, M. Ritzmann⁴, E. Burrough⁵.

¹ Clinic for Swine, Centre for Clinical Veterinary Medicine, LMU Munich, Sonnenstrasse 16, 85764 Oberschleissheim, Germany; ² Institute for Microbiology, University of Veterinary Medicine, Foundation, Hannover, Bischofsholer Damm 15, 30173 Hannover, Germany; ³ Institute of Veterinary Pathology, Centre for Clinical Veterinary Medicine, LMU Munich, Germany; ⁴ Clinic for Swine, Centre for Clinical Veterinary Medicine, LMU Munich, Sonnenstr.16, 85764 Oberschleissheim, Germany; ⁵ Iowa State University Veterinary Diagnostic Laboratory, Ames, IA 50011, United States.

Introduction

The anaerobic intestinal spirochaete *Brachyspira (B.) suanatina* was first described in 2007 in Scandinavia and swine dysentery-like disease was attributed to the isolates investigated. However, since then no further isolates have been reported from pigs. Accordingly, when the species was validly published in 2016 the overall occurrence and clinical relevance in pigs were unknown.

Materials and Methods

In a 1400 head fattening farm in Southern Germany mucohaemorrhagic diarrhea was observed in 70-80% pigs mid of fattening. Feed consumption was compromised in affected pigs for up to one week. Within two weeks diarrhea spread to other barns affecting 60 % of the finisher pigs. A diagnostic workup including *Brachyspira* and *Salmonella* culture, *Lawsonia intracellularis*-, *B. hyodysenteriae*- and *B. pilosicoli*-specific multiplex PCR and necropsy of five severely affected pigs was performed.

Results

Tests for *Salmonella* spp., *Lawsonia intracellularis* and *B. hyodysenteriae* were all negative. Gross and microscopic lesions were in agreement with dysentery and spirochaetes could be demonstrated by silver staining in tissue samples of the caecum at the ileal papilla. *B. suanatina* was cultured from faeces or colon of all animals and identified using *nox*-RFLP, partial *nox*-gene-sequencing and MALDI-TOF. Partial *nox*-gene sequencing revealed 99-100% identity with *B. suanatina* type strain AN4859/03. An isolated was tested susceptible to tiamulin and clinical signs resolved due to antibiotic treatment. Interestingly, the *B. suanatina* isolate produced a positive result in a *nox*-gene based PCR allegedly specific for *B. hyodysenteriae*.

Discussion and Conclusion

This is the first report on *B. suanatina* infection in pigs outside Scandinavia. The current case illustrates its potential to cause farm scale outbreaks of diarrhea with clinical signs and pathological lesions indistinguishable from swine dysentery. Furthermore the results of the present study highlight the importance of adequate diagnostic tools that are a prerequisite for monitoring and controlling of *Brachyspira* associated diseases.



RES-OP-03

CYTOKINE PROFILES IN PERIPHERAL BLOOD MONONUCLEAR CELLS OF PIGLETS BORN FROM PORCINE CIRCOVIRUS 2 VACCINATED AND NON-VACCINATED SOWS

S. Oliver-Ferrando¹, J. Segalés², M. Sibila³, I. Díaz³.

¹ CReSA-IRTA and Ceva, Barcelona, Spain; ² CReSA-IRTA and UAB, Bellaterra, Spain; ³ CReSA-IRTA, Bellaterra, Spain.

Introduction

The passive transfer of PCV2-specific cells through colostrum to the offspring has hardly been investigated. In consequence, this study was aimed to evaluate the effect of *Porcine circovirus 2* (PCV2) sow vaccination on humoral and cell-mediated immune responses in sows and their progeny.

Material & Methods

At 7 weeks before farrowing, 15 PCV2 PCR negative pregnant sows with medium-low S/P ELISA values were selected and distributed in two groups. Seven sows were vaccinated with a commercial PCV2 vaccine (Circovac®) and 8 were injected with PBS at 6 and 3 weeks before farrowing. Blood samples were taken from sows at farrowing and their offspring at 48-72 hours of life. Presence of PCV2 DNA and antibodies were tested in sera (n=90; 6 piglets per litter). Cytokine (IFN- α , IFN- γ , IL-12p40, TNF- α , IL-1 β , IL-8, IL-4, IL-6 and IL-10) levels of 2 piglets per litter (n=30) were assessed in supernatant from cultured peripheral blood mononuclear cells using ProcartaPlex Porcine Cytokine & Chemokine Panel 1 (Affymetrix).

Results

All sows and piglets were negative by PCV2 PCR throughout the study. Significantly higher PCV2 antibody levels were detected in vaccinated sows after vaccination and in their offspring after colostrum intake compared to the non-vaccinated counterparts. Vaccinated sows did not show significant differences in cytokine secretion levels at farrowing compared to unvaccinated dams. In contrast, piglets from vaccinated sows had significantly higher levels of PCV2-specific cytokines linked to Th1 memory cells (IFN- γ and TNF- α) in comparison to the ones from non-vaccinated dams.

Discussion & Conclusion

PCV2 sow vaccination pre-farrowing, apart from triggering a humoral immune response in sows and antibody transfer to their progeny, might be associated to an increased transfer of cells linked to Th1 memory responses from the dam to the piglet.

Acknowledgments: supported by Secretaria d'Universitats i Recerca de la Generalitat de Catalunya (2013 DI013).



RESIDENT SESSION

RES-OP-04

VIRAL AND BACTERIAL INVESTIGATIONS OF RECURRENT PIG NEONATAL DIARRHOEA CASES IN SPAIN

S. Mesonero Escuredo¹, K. Strutzberg-Minder², C. Casanovas Granell¹, J. Segalés³.

¹ IDT Biologika, Barcelona, Spain; ² IVD Innovative Veterinary Diagnostics (IVD GmbH), Seelze, Germany; ³ Departament de Sanitat i Anatomia Animals, Universitat Autònoma de Barcelona (UAB), UAB, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Barcelona, Spain.

Introduction

Neonatal diarrhoea represents a major disease problem in the early stages of animal production, increasing significantly pre-weaning mortality and piglets weaned below the target weight. Enteric diseases in new-born piglets are often of endemic presentation, but may also occur as outbreaks with high morbidity and mortality. The objective of this study was to assess the prevalence of different pathogens that can be involved in cases of recurrent neonatal diarrhoea in Spain.

Material and Methods

A total of 327 litters from 109 sow farms located in Spain with recurrent neonatal diarrhoea were sampled to establish a differential diagnosis against the main enteric pathogens in piglets using bacteriological isolation, *Escherichia coli* genotyping, *Clostridium perfringens* immunoblotting and genotyping, and virological analyses.

Results

Globally, 105 out of 109 (96.3%) case submissions were positive to at least one of the examined enteric pathogens (*Escherichia coli*, *Clostridium perfringens* types A and C, *Transmissible gastroenteritis virus* [TGEV], *Porcine epidemic diarrhoea virus* [PEDV] or *Rotavirus type A* [RVA]). Fifty-eight out of 109 (53.2%) submissions were positive for only one of these pathogens, 47 out of 109 (43.1%) were positive for more than one pathogen and, finally, 4 out of 109 (3.7%) were negative for all these agents. *E. coli* strains were isolated from all submissions tested; however, only 11 of them were classified into defined pathotypes. *C. perfringens* type A was detected in 98 submissions (89.9%) and no *C. perfringens* type C was found. Regarding viruses, 47 (43.1%) submissions were positive for RVA, 4 (3.7%) for PEDV and none of them for TGEV.

Discussion and conclusion

The present study shows that RVA, ETEC and *C. perfringens* type A are the main pathogens involved in persistent neonatal diarrhoea in Spain. In almost half of the cases, more than one enteric pathogen was found.



RES-OP-05

INCREASE IN IRREGULAR RETURN TO ESTRUS RATE IN SOWS AND SEVERE CONJUNCTIVITIS IN FATTENERS CAUSED BY *CHLAMYDIA SUIS* - A CASE REPORT

 C. Unterweger¹, L. Schwarz¹, J. Spargser², E. Stein³, A. Inic-Kanada³, A. Ladinig¹.

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Introduction

There are multiple reasons for increase in irregular return to estrus rate in sows, most of them of non-infectious origin. Chlamydia spp. infections are known to lead to infertility, but getting a clear diagnosis of a chlamydiosis is difficult, since pathophysiology is poorly understood.

Material and methods

In an Austrian farrow to finish farm, unsuspecting for PRRS, the irregular return to estrus rate in sows of all parities together with vaginal discharge markedly increased over the last year from 10 to 25%. Concurrently, a noteworthy number of fattening pigs developed severe conjunctivitis. Insemination procedure and time point were critically reviewed, backfat was measured. Serum of sows and fattening pigs was analyzed for PRRSV and *Chlamydia* antibodies. Conjunctival swab samples were taken in fattening pigs showing severe conjunctivitis. For diagnostics of infertility, cervical swab samples were taken as well as the genital tract of an infertile sow at slaughterhouse.

Results

Insemination time and method, as well as semen quality and storage, seemed to be correct. Conjunctival swabs were highly positively tested for *C. suis* using culture and PCR, while the cervical swabs were negative for *Chlamydia* spp. Nevertheless the genital tract was positive for *Chlamydia suis*. Most of sterile sows as well as the fatteners showed high levels of *C. suis* antibodies in *C. suis* specific ELISA. No other relevant agents were detected. Doxycycline therapy was successful.

Discussion and conclusion

This case report highlights the difficulties of diagnosing genital chlamydiosis in alive sows: Chlamydia spp. were not detectable in cervix of sterile alive sows, but at the genital tract after slaughtering. Therefore, negative findings do not necessarily prove the absence of the agent. It seems like *C.suis* is able to cause to different clinical signs in one farm at different age/production groups.



RESIDENT SESSION

RES-OP-06

FIRST STEP TO INCREASE SWINE FARMERS' TRUST IN THEIR VETERINARIANS: DEVELOPMENT OF THE TRUST IN VETERINARIAN SCALE (TiVS)

M. Leblanc-Maridor, J. Le Mat, F. Beaugrand, M. De Joybert, C. Belloc.

Center BIOEPAR, INRA, Oniris, La Chantrerie, 44307, Nantes, France.

Introduction

Alternative, especially preventive measures have to be implemented to reduce the need for antimicrobial treatments. An intervention study showed that farms with higher compliance with intervention plans tended to achieve bigger reduction. Moreover, farmers who followed the vet recommendations often trust the measure.

In human medicine, patients' trust in their physician is considered essential for good quality and effective medical care. Several questionnaires/scales exist in human medicine, but none of them have been developed in veterinary medicine.

The objective of this study was to develop and validate the Trust in Veterinarian Scale (TiVS), which aims to measure swine farmers' trust in their veterinarian.

Material and methods

The scale construction process used a literature review and involved a panel of voluntary professionals through focus groups and open-ended qualitative interviews. A list of items, based on a multidimensional theoretical framework, explored the different dimensions of trust. Dimensionality, internal consistency, test-retest reliability and construct validity were investigated. The scale-development process comprised an explanatory principal component analysis, Cronbach's α -coefficients and structural equation modeling.

Results

The validated scale comprised 25 items, divided in five dimensions (Competence, Integrity, Fidelity, Caring, Global trust) with excellent psychometric properties. Items had good communality within their own dimension and structural equation modeling strongly supported the possibility of calculating a global score.

Discussion/Conclusion

TiVS is the first scale adapted to pig farmers' trust in veterinarian. Many factors have an impact: history, psychology, competence, economical context, production organisation, agricultural advisors... So, trust between farmers and veterinarians is a dynamic concept, changing over time and circumstances. Assessing farmers' trust in their veterinarians is probably an essential step to improve adherence to treatments or recommendations. Thus, this scale could be used to identify the different levels and dimensions of trust. Further studies are needed to confirm our result and validate TiVS in other production.



VIRAL DISEASES

Thursday, 10 May 2018, 10:30-12:30

VVD-OP-01

CHANGES IN THE EXPRESSION OF CD163 IN PORCINE ALVEOLAR MACROPHAGES AND ASSOCIATED LESIONS IN PIGS EXPERIMENTALLY INFECTED WITH PRRSV-1 STRAINS OF DIFFERING VIRULENCE

Irene M Rodríguez-Gómez (Spain)

VVD-OP-02

COMPARISON OF 3 DIFFERENT TYPES OF SAMPLES TO DETECT TYPE 1 PRRS VIRUS ON PRE-WEANING PIGLETS IN AN ENDEMIC POSITIVE HERD AND PRACTICAL IMPLICATIONS

Arnaud Lebret (France)

VVD-OP-03

EVALUATION OF THE SURVIVAL OF VIRAL PATHOGENS IN CONTAMINATED FEED INGREDIENTS USING TRANSBOUNDARY SHIPMENT MODELS

Scott Dee (United States)

VVD-OP-04

SURVEILLANCE OF SWINE INFLUENZA VIRUSES (SIV) IN EUROPE 2015-2017 -AN UPDATE-

Dinah Henritzi (Germany)

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SYRINGES PRRS MLV PCR POSITIVE UP TO 3 WEEKS AFTER USE FOR VACCINATION

Martijn Steenaert (Netherlands)

VVD-OP-06

NEW STRATEGIES FOR SAMPLING PIGLETS

Carles Vilalta Sans (United States)

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VIRAL DISEASES

VVD-OP-01

CHANGES IN THE EXPRESSION OF CD163 IN PORCINE ALVEOLAR MACROPHAGES AND ASSOCIATED LESIONS IN PIGS EXPERIMENTALLY INFECTED WITH PRRSV-1 STRAINS OF DIFFERING VIRULENCE

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Introduction

Highly virulent PRRSV strains causing severe disease have been reported in Europe, Asia and North America, associated with high fever, anorexia, severe lung lesions and high mortality. The aim of this study was to characterise the impact of two PRRSV strains of differing virulence in the lung of piglets.

Material & Methods

Seventy four-week old piglets were randomly distributed in 3 separate pens and inoculated intranasally with 10^5 TCID₅₀ of either the low-moderate 3249 or the highly virulent Lena PRRSV-1 strains, a group was kept as control (mock-inoculated). Clinical signs were recorded daily after challenge and animals were sequentially euthanised from day 1 to day 13 post-inoculation (dpi). Left lung was used to perform bronchoalveolar lavages (BAL) for studying the number of PRRSV-infected pulmonary alveolar macrophages (PAMs) as well as CD163 expression by flow cytometry; whereas, right lung was fixed in 10% formalin for histopathology.

Results

Lena-infected animals showed the highest clinical scores and gross lesions (in most cases accompanied by secondary bronchopneumonia), with the maximum being detected between 6 and 8dpi. In Lena-infected animals, the number of PAMs isolated from BAL dramatically dropped from 6dpi onwards, but at 8 and, particularly, 13dpi this happened in 3249-infected piglets as well. These results coincided with severe gross lesions and a higher number of PRRSV-positive PAMs (more numerous in Lena group). The median fluorescence intensity (MFI) of CD163 was meaningfully decreased in PAMs isolated from infected piglets when compared to control. However, infected PAMs exhibited higher MFI of CD163 than non-infected PAMs from the same infected piglet.

Discussion & Conclusion

The highly virulent PRRSV-1 Lena caused severe clinical signs and lesions associated with earlier and enhanced PRRSV replication when compared with 3249 strain. Moreover, the regulated expression of CD163 tied to severe lesions and increased PRRSV replication may be determined by the virulence of PRRSV.



VVD-OP-02

COMPARISON OF 3 DIFFERENT TYPES OF SAMPLES TO DETECT TYPE 1 PRRS VIRUS ON PRE-WEANING PIGLETS IN AN ENDEMIC POSITIVE HERD AND PRACTICAL IMPLICATIONS

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Selarl Porc. Spective, Noyal Pontivy, France.

Introduction

PRRSv control protocol depends on infection dynamics in swine herds. Assessing stability in breeding herds is a main issue. The aim of this study was to compare the ability of three types of samples to detect PRRSv in pre-weaning piglets.

Material and methods

The trial was performed in one PRRS positive, not vaccinated, farrow-to-finish farm. Four nonconsecutive farrowing batches, with respectively 30, 30, 30 and 20 litters were sampled. In each litter, a serum, an individual oral fluid sample (iOF) and a collective oral fluid sample (cOF) were taken. iOF was taken using a cotton swab put in the mouth of one piglet and cOF with a cotton rope. RT-qPCR (LABOFARM, Loudéac, France) was performed for all samples.

Results

We consider a litter positive if at least one type of sample is positive. Sensitivities of blood sample, iOF and cOF are 67% (95% confidence interval at 41%, 80%), 23% (9%, 44%) and 77% (56%, 91%) respectively. Combining blood sample and cOF allows detecting 96% (95, 100%) of the positive litters. There is a clear statistical tendency of lower Ct values from sera than from cOF (Wilcoxon test, $p=0.06$). The Ct values from cOF are statistically lower when the serum of the piglet of the litter is positive (Wilcoxon test, $p=0.02$) but the opposite is not true (Wilcoxon test, $p=0.58$) suggesting that the positivity of the cOF is related to the number of viraemic piglets in the litter rather than to the high viraemia of one piglet.

Conclusion

Serum and cOF are complementary. Concentration of virus in cOF is lower, lowering analytical sensitivity, but by sampling all piglets instead of only one, cOF increases the probability of sampling positive piglets. A new highly sensitive sampling protocol could be to collect both cOF and serum of 1 piglet per litter.



VIRAL DISEASES

VVD-OP-03

EVALUATION OF THE SURVIVAL OF VIRAL PATHOGENS IN CONTAMINATED FEED INGREDIENTS USING TRANSBOUNDARY SHIPMENT MODELS

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Introduction

This study evaluated survival of important viral pathogens of swine or their surrogates in contaminated feed ingredients during simulated transboundary transportation. Based on global significance, 11 viruses were selected, including Foot and Mouth Disease Virus (FMDV), Classical Swine Fever Virus (CSFV), African Swine Fever Virus (ASFV), Influenza A Virus of Swine (IAV-S), Pseudorabies virus (PRV), Nipah Virus (NiV), Porcine Reproductive and Respiratory Syndrome Virus (PRRSV), Swine Vesicular Disease Virus (SVDV), Vesicular Stomatitis Virus (VSV), Porcine Circovirus type 2 (PCV2) and Vesicular Exanthema of Swine Virus (VESV).

Materials and Methods

To model the survival of FMDV, CSFV, PRV, NiV, SVDV and VESV, surrogate viruses with similar physical properties and stability were used, and those consisted of Seneca Virus A (SVA) for FMDV, Bovine Viral Diarrhea Virus (BVDV) for CSFV, Bovine Herpesvirus Type 1 (BHV-1) for PRV, Canine Distemper Virus (CDV) for NiV, Porcine Sapelovirus (PSV) for SVDV and Feline Calicivirus (FCV) for VESV. Remaining assessments involved the actual pathogen. Controls included complete feed (positive and negative controls) and stock virus positive controls (virus only, no feed matrix). Virus survival was evaluated using either a Trans-Pacific or Trans-Atlantic transboundary model, involving representative feed ingredients, transport times and environmental conditions, with samples tested by PCR, VI and/or swine bioassay.

Results

Select viruses (SVA, FCV, BHV-1, PRRSV, PSV, ASFV and PCV2) maintained infectivity during transport, while others (BVDV, VSV, CDV and IAV-S) did not. Survival was maximized in ingredients including conventional soybean meal, lysine hydrochloride, choline chloride, and vitamin D.

Discussion and Conclusions

These results demonstrate survival of certain viruses in specific feed ingredients (“high-risk combinations”) under conditions simulating transport between countries. This work supports previously published data on the survival of PEDV in feed and provides further evidence indicating that contaminated feed ingredients may serve as risk factors for foreign animal diseases.



VVD-OP-04

SURVEILLANCE OF SWINE INFLUENZA VIRUSES (SIV) IN EUROPE 2015-2017 -AN UPDATE-

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Influenza A virus infections causing economic losses are widely spread among swine populations worldwide. In Europe, over the past decades, four lineages of reassortant viruses between avian and human viruses have formed (H1N1av, H1N2hu, H3N2, H1N1pdm/2009). The emergence of the most recent human pandemic influenza virus (H1N1pdm/2009) from reassortant porcine influenza viruses underlines the importance of swine populations as carriers of influenza lineages with zoonotic and even pandemic potential. However, surprisingly few countries actually embarked on sustained, governmentally driven and publicly controlled monitoring programs. After closure of the EU-financed ESNIP3 program, a passive surveillance program for SIV in selected European countries has been initiated on basis of funding by a veterinary vaccine producer.

The surveillance started in April 2015 and comprised so far up to 18.000 samples. Nasal swab samples or other respiratory tract materials were collected from pigs with apparent respiratory disease. Samples were screened by real time RT-PCR (RT-qPCR) for presence of influenza A viruses (Henritzi et al., 2016). Positive samples were subjected to molecular subtyping, virus isolation, antigenic and phylogenetic characterization.

First results in 2016 confirmed a high incidence of influenza virus infections affecting about one quarter of the examined pigs in a season-independent manner. All four virus lineages and various reassortants between them were detected.

In 2017, increased findings of pandemic H1N1/2009 and co-infections with different H1 subtypes were documented. Prevalences of the different lineages were geographically restricted and incursions of new lineages and/or reassortants were documented for several European countries. In addition, the occurrence of a new spill-over of a recent human seasonal H3-subtype into the swine population was noticed. Furthermore a vast repertoire of at least 32 genotypes, resulting from reassortment between pandemic H1N1 and previous porcine lineages, was uncovered.

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VIRAL DISEASES

VVD-OP-05

SYRINGES PRRS MLV PCR POSITIVE UP TO 3 WEEKS AFTER USE FOR VACCINATION

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Introduction

O In a Dutch endemic PRRSV infected sow herd – 1000 sows and weaners – in periodic PCR monitoring in non PRRS vaccinated piglets PRRSV was shown, ORF5 99% homologous to the vaccine strain used before. Possible infection routes were discussed. A persistent PRRS-MLV contamination of bottle feed syringes - that were repeatedly used for piglet vaccination - could not be excluded. The goal of the study was to find evidence for PRRS-MLV persistency in the materials used for vaccination.

Material and Methods

R Two bottle feed syringes that were previously used in the farm and two new bottle feed syringes were prepared, by using them with freshly reconstituted PRRS-MLV.

A After use all syringes were cleaned externally, rinsed with tap water (10 strokes) and stored at 3-8°C, copying the standard procedures in the farm.

The syringes were sampled: using vaccine (T0-V) and again - by using sterile water - immediately after rinsing (T0-R), at 1 week (T1) and/ or at 3 weeks (T3) of storage.

The samples were individually tested by PRRS PCR and ct values were compared.

Results

L At T0-V all ct values were 18. At T0-R ct values ranged from 32-35. At T1 ct values were 34 and 37. At T3 ct values ranged from 30-34.

Discussion and conclusion

With these results, the farm started using new syringes in every batch. But as PRRS vaccination of the piglets was re-implemented for trading reasons, no evaluation of the changed protocol was possible.

PRRSV can survive for 11 days when in a moist/ wet and cold environment. These conditions were met in the farm. The PRRS PCR positive test results of materials up to 3 weeks after use with PRRS MLV serve as proof of concept for a possible infection route. One may question if this is still viable PRRSV.



VVD-OP-06

NEW STRATEGIES FOR SAMPLING PIGLETS

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Introduction

Several techniques have made diagnostics for PRRSV (porcine reproductive and respiratory syndrome virus) easier and cheaper (e.g. oral fluids, blood swabs or pooling samples). However, there are still opportunities for newer strategies to sample more animals with less effort. Taking advantage of routines at farms such as the collection of tissues at piglet processing (castration or tail docking) or the collection of environmental samples is worth to explore.

The goal of this study was to evaluate the sensitivity of different diagnostic strategies to define the infectious status of a sow farm infected with PRRSV.

Materials and methods

The study started 2 weeks after a PRRSV outbreak was reported in a sow farm and sampling occurred every three weeks for a total of 8 samplings over 24 weeks. At each time period, 10 litters were conveniently selected at processing (~ 3 days of age) before fostering. Processing fluids (PF) (fluids derived from tails and testes at castration) from the whole litter and individual serum samples from all piglets within the litter were collected. Wipes were collected from crate surfaces, udder skin from lactating sows and surfaces containing airborne particles deposited by gravitation.

Results

PF showed a sensitivity (Se) and Specificity (Sp) of 83% and 92% respectively when compared with the serum results used as gold standard. Surface and udder swab results showed a Se of 50% and 42%, and Sp of 92% and 98%, respectively when compared to the individual serum results. PRRSV RNA was detected in environmental and skin sow samples for up to 14 weeks after the outbreak.

Discussion & Conclusion

PF are an effective sample to detect PRRSV in piglets, even after significant time since outbreak (~ 6 months). The environment and the lactation sow may be a source for PRRSV infection in the farrowing environment.

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VETERINARY PUBLIC HEALTH

Thursday, 10 May 2018, 10:30-12:30

VPH-OP-01

CIPARS - 15 YEARS OF ANTIMICROBIAL RESISTANCE AND ANTIMICROBIAL USE SURVEILLANCE IN PIGS ALONG THE FOOD CHAIN

Anne Deckert (Canada)

VPH-OP-02

INFLUENCE OF DIFFERENT VACCINATION STRATEGIES AGAINST *SALMONELLA* TYPHIMURIUM IN PIG FARMS ON EXCRETION AND SEROLOGY AT SLAUGHTER AGE

Linda Peeters (Belgium)

VPH-OP-03

PRESENCE OF HEPATITIS E VIRUS IN SERUM AND MUSCLE OF EXPERIMENTALLY HEV/PRRSV CO-INFECTED PIGS

Nicolas Rose (France)

VPH-OP-04

INFLUENCE OF GNRH-VACCINATION IN COMBINATION WITH PUFA REDUCED FEEDING ON BEHAVIOR, BOAR TAIN AND CARCASS QUALITY

Mathias Ritzmann (Germany)

VPH-OP-05

ULTRAVIOLET-C INACTIVATION OF *PORCINE PARVOVIRUS* (PPV), *SWINE VESICULAR DISEASE VIRUS* (SVDV) AND *SENECAVIRUS A* (SVA) IN LIQUID PLASMA

Elena Blázquez (Spain)

VPH-OP-06

EVALUATION OF THE EFFICACY OF THREE PROBIOTIC FEED ADDITIVES TO REDUCE *SALMONELLA* TYPHIMURIUM INFECTION IN EXPERIMENTALLY CHALLENGED PIGLETS

Linda Peeters (Belgium)



VPH-OP-01

CIPARS - 15 YEARS OF ANTIMICROBIAL RESISTANCE AND ANTIMICROBIAL USE SURVEILLANCE IN PIGS ALONG THE FOOD CHAIN

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Introduction

Antimicrobial use (AMU) and antimicrobial resistance (AMR) in animals have come under scrutiny internationally. The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) is a national program that combines AMR data from humans and the food chain with AMU data from animals, plants, and humans to better understand AMR.

Materials & Methods

For pigs, CIPARS samples pork chops from grocery stores, intestinal contents from healthy pigs at slaughter, and feces from healthy grow-finish pigs on farm. Farm surveillance also collects data on AMU. The development of CIPARS has been a collaborative process since 2002 involving: the swine, poultry, and beef industries, the processing and pharmaceutical industries, as well as government agencies.

Results

CIPARS findings have been useful from both the human and food animal perspective. Highlights from 15 years of surveillance data demonstrate that: 1) Vancomycin resistant enterococcus (VRE), an important pathogen in human health, was not isolated in any samples from along the food chain between 2002 and 2011, when testing was discontinued. This differs from the European situation. 2) Although a relatively small sample size, CIPARS Farm data are representative of the Canadian swine industry. CIPARS Farm AMR data from ~95 farms closely mirror those from CIPARS Abattoir which represents over 80% of pigs slaughtered in Canada. 3) Integration of multiple metrics provides a more complete understanding of CIPARS AMU data. Generally, these analyses indicate a decrease in the total quantity of AMU in pigs between 2015 and 2016. However, some differences were observed between the mg/PCU (mg per kg of animal) and DDD (doses per kg of animal) estimates. Depending on metric, the ranking of the top 3 antimicrobials used in feed differed.

Discussion & Conclusion

The CIPARS program provides data useful for evidence-based decision making in the human and agri-food sectors.



VETERINARY PUBLIC HEALTH

VPH-OP-02

INFLUENCE OF DIFFERENT VACCINATION STRATEGIES AGAINST *SALMONELLA* TYPHIMURIUM IN PIG FARMS ON EXCRETION AND SEROLOGY AT SLAUGHTER AGE

L. Peeters¹, J. Dewulf¹, F. Boyen², C. Brossé³, T. Vandersmissen³, G. Rasschaert⁴, M. Heyndrickx⁴, M. Cargnel⁵, F. Pasmans², D. Maes¹.

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Vaccination against *Salmonella* Typhimurium (ST) might be effective to control *Salmonella* infections at farm level, but may affect the herd's serological status. The present study investigated the effect of different vaccination strategies against ST on the excretion of ST field-strains and on *Salmonella* serology at slaughter age.

Five vaccination strategies were tested on three Belgian pig farms: 1. vaccination of sows; 2. vaccination of sows and piglets; 3. vaccination of sows and fatteners; 4. vaccination of piglets; 5. vaccination of fatteners. A comparison was made with a non-vaccinated control group (group 6). Each vaccination strategy was implemented in each farm, during two consecutive production cycles of the same sows. An attenuated vaccine (Salmoporc®, IDT Biologika) was applied. To monitor excretion, individual fecal samples and shoecover samples were collected and tested for the presence of ST field-strain (isolation using ISO6579:2002, serotyping, distinguishing field/vaccine-strains using IDT *Salmonella* Diagnostikum®). Blood samples of 10 fattening pigs/group/cycle/farm were collected at slaughter. Sera were analyzed by ELISA (IDEXX) and S/P-ratios were assessed. Data were analyzed using a logistic regression model (excretion) or a linear regression model with LSD-procedure for post-hoc-tests (serology).

For the fecal and shoecover samples (n=1193), 6-3-4-8-6-5% were positive for ST field-strain in groups 1-2-3-4-5-6, respectively. No significant differences were detected between farms, cycles and groups. The mean S/P-ratios of groups 1-2-3-4-5-6 were, 0.80-1.50-1.76-1.75-1.88-1.03, respectively. Significant differences between groups were related to farm and cycle. Overall, the S/P-ratios of groups 2-3-4-5 were significantly higher than the S/P-ratios of the control group ($p \leq 0.001$). No significant difference was detected between the S/P-ratios of groups 1 and 6.

When applying vaccination against ST in farms with a relatively low infection pressure, the effect on excretion was not clear. Nevertheless, vaccinated animals clearly developed a serological response, which has implications for serology-based *Salmonella* monitoring programs in slaughter pigs.



VPH-OP-03

PRESENCE OF HEPATITIS E VIRUS IN SERUM AND MUSCLE OF EXPERIMENTALLY HEV/PRRSV CO-INFECTED PIGS

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Introduction

Hepatitis E virus (HEV) is a worrying food-borne zoonotic agent which is highly prevalent in pig farms. Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) is a widespread immunosuppressive virus that is suspected of influencing HEV infection dynamics. The aim of our study was to look for HEV in pig serum and muscles in case of HEV/PRRSV co-infection.

Materials and methods

An experimental HEV/PRRSV co-infection trial of Specific-Pathogen-Free (SPF) pigs was conducted with 18 five-week old piglets housed in three pens. In each group, three pigs were inoculated with both HEV and PRRSV whereas the three others were contact animals. Individual blood and feces samples were regularly taken during 49 days post infection (dpi). At the end of the trial, liver and muscle (femoral biceps, psoas major and diaphragm pillar) samples were taken. HEV RNA quantification was performed on all samples using real-time qRT-PCR.

Results

HEV viremia was detected in all inoculated animals from 35 dpi and in 45% of contact pigs from 42 dpi, with viral loads ranging from $1.1 \cdot 10^3$ to $7.7 \cdot 10^4$ GE/mL. On average, HEV viremia started at 23.4 dpi [95%IC 21.2-25.7] and lasted 28.8 days [95%IC 18.6-44.8]. HEV RNA was detected in the three types of muscles, with viral loads ranging from $2.3 \cdot 10^3$ to $1.1 \cdot 10^6$ GE/g. In inoculated pigs, HEV RNA loads in serum and those in feces at 49 dpi were correlated ($p < 0.01$). In contact pigs, statistical associations were observed between HEV RNA loads in serum at 49 dpi and in liver, between HEV RNA loads in muscle and in liver, and between HEV RNA loads in muscle and in feces ($p < 0.05$).

Discussion & Conclusions

In experimental co-infection conditions, long lasting and high HEV viremia and HEV presence in muscles have been evidenced, which should be considered in a public health perspective.



VETERINARY PUBLIC HEALTH

VPH-OP-04

INFLUENCE OF GnRH-VACCINATION IN COMBINATION WITH PUFA REDUCED FEEDING ON BEHAVIOR, BOAR TAIN AND CARCASS QUALITY

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Introduction

GnRH-vaccination influences production of testicular hormones due to antibody GnRH-binding. The aim of the study was to investigate the impact of this vaccination combined with standard or PUFA (Poly-Unsaturated Fatty Acids) reduced feeding schemes on behavioral traits, skin and tail lesions and penis injuries as well as boar taint and fat quality.

Material and Methods

288 male pigs (PlxGermanHybrid) of 3 consecutive fattening batches were randomly divided into 4 treatment groups (n=24) with (IC-Immuno castrated) or without (EM-Entire males) GnRH-vaccination and standard (S) or PUFA-reduced (P) feeding schemes (IC-S, IC-P, EMS, EM-P). GnRH-Vaccination (Improvac®) of the IC groups was performed twice in the 12th (V1) and 17th (V2) week of life. Skin and tail lesion scoring was performed at V1, V2 and 2 weeks later (NK). Behavioral parameters were recorded at V2 and NK for 60 min. At slaughter (average weight 120 kg) backfat samples (50% of the animals) and fat quality was analyzed. Furthermore, penises from all animals were excised and evaluated.

Results

No side reactions after vaccination could be observed in IC groups. EM groups displayed more mounting attempts (29.8) and mountings (3.0) as well as skin lesions (1.83) than IC groups (3.4, 0.0, 1.23) at NK. More penis injuries (scars and fresh wounds) were detected in EM groups without differing significantly between the two feeding schemes. At slaughter, five EM animals exceeded androstenone (>500 ng/g) and skatole (>250 ng/g) thresholds. All IC animals had androstenone concentrations below the thresholds, skatole concentrations varied between 80 and 100ng/g. No influence of feeding scheme were observed.

Discussion and Conclusion

GnRH vaccination, in contrast to PUFA reduced feeding, influences the occurrence and consequences of typical boar behavior as well as reducing boar tainted pigs in this study. Analysis of fat quality will follow subsequently.



VPH-OP-05

ULTRAVIOLET-C INACTIVATION OF PORCINE PARVOVIRUS (PPV), SWINE VESICULAR DISEASE VIRUS (SVDV) AND SENECAVIRUS A (SVA) IN LIQUID PLASMA

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Introduction

Spray dried plasma (SDP) is a functional protein source included in pig feeds due to its beneficial effects on post-weaning performance and survival. The manufacturing process of SDP involves several safety features, but additional safety steps can be investigated. Ultraviolet at 254 nm wavelength (UV-C) is a non-thermal process that disrupts cellular transcription and replication. The aim of this study was to check the effectiveness of the UV-C irradiation on survival of PPV, SVDV and SVA inoculated in bovine plasma.

Material & Methods

A total of 24 L of bovine plasma were used for each virus. This amount was divided into three different sub-batches of 8 L each. At time zero, 15 mL samples were obtained as negative control before virus inoculation. A positive control sample was collected 5 min after inoculation. Plasma was recirculated under turbulent flow at 4000 L/h in a closed system of a SP1 device (SurePure Operation AG, Zug, Switzerland). Each sub-batch was consecutively irradiated at 750, 1500, 3000, 6000 and 9000 J/L and sequential samples were taken at each UV-C dose. Infectivity was analysed in target cell cultures, using the microtiter assay procedure. All negative samples in the titration assay were subjected to three blind passages. Results: Four-fold viral titer reduction (4D) was reached at 5699 J/L for SVDV, 3108 J/L for SVA, and 2708 J/L for PPV.

Discussion and conclusions

These results point out that the UV-C treatment is useful to reduce the load of non-enveloped viruses in liquid plasma. Therefore, this procedure can be used as an intermediate additional safety feature for the manufacturing process of SDP.



VETERINARY PUBLIC HEALTH

VPH-OP-06

EVALUATION OF THE EFFICACY OF THREE PROBIOTIC FEED ADDITIVES TO REDUCE *SALMONELLA* TYPHIMURIUM INFECTION IN EXPERIMENTALLY CHALLENGED PIGLETS

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Different probiotic feed additives have been proposed to control *Salmonella* Typhimurium (ST) infection at farm level and reduce the risk for human salmonellosis. The present study investigated the efficacy of three probiotic feed additives to reduce ST infection in experimentally challenged piglets.

After weaning (28 days), 45 *Salmonella* negative piglets were randomly divided into 5 groups; 1. Negative control: no feed additive (n=5), 2. Positive control: no feed additive (n=10), 3. Probiotic A: $\pm 2 \times 10^6$ CFU/g feed (n=10), 4. Probiotic B: $\pm 2 \times 10^6$ CFU/g feed (n=10), 5. Probiotic A: $\pm 5 \times 10^5$ CFU/g feed (n=10). Pigs were fed *ad libitum* with the experimental feed from arrival (day-7) until euthanasia (day42). One week after arrival (day0), pigs from group 2, 3, 4 and 5 were orally inoculated with 2×10^8 CFU/mL nalidixic acid resistant ST strain 112910a (1mL/pig). Individual fecal samples, and at necropsy, cecum contents, colon contents and ileocecal lymph nodes were collected to evaluate the presence of *Salmonella* before and after inoculation (based on ISO6579:2002). Blood samples, collected before and after inoculation, were analyzed by ELISA (IDEXX Swine *Salmonella* Ab Test), using the cut-off value: S/P \geq 0.25=positive.

Before inoculation, all fecal samples tested negative for *Salmonella*. In group 2, 3, 4 and 5, respectively, 100-100-100-90% of all pigs tested bacteriologically positive at least once after inoculation. 80-90-89-80% of the pigs in, respectively, group 2, 3, 4 and 5 tested serologically positive at day42. No significant differences were detected between the inoculated groups for: serology (#positive animals and mean S/P-ratio), excretion (#positive animals), lymph nodes (#positive after enrichment, #positive without enrichment and mean CFU-count). The #positive cecum contents samples significantly differed between the inoculated groups (p=0.026); group 3 > group 2 (p=0.033).

Under the present conditions, the probiotic feed additives did not significantly influence the serological response, excretion and colonization of ST after experimental infection.



BACTERIAL DISEASES I

Thursday, 10 May 2018, 15:20-16:20

BBD-OP-01

WHAT HAPPENS WHEN *M.HYOPNEUMONIAE* ENTERS A HERD? LONGITUDINAL ASSESSMENT OF *M.HYOPNEUMONIAE* NATURAL INFECTION IN GILTS

Clayton Johnson (United States)

BBD-OP-02

***STREPTOCOCCUS SUIS* (*S. SUIS*) ANTIMICROBIAL RESISTANCE (AMR) GENOTYPE AND PHENOTYPE CORRELATION, AND GENOMIC SIGNATURES SUGGESTING LINKAGE OF AMR GENES**

Juan Hernández-García (United Kingdom)

BBD-OP-03

PREVALENCE OF ANTIBODIES TO *ACTINOBACILLUS PLEUROPNEUMONIAE* IN MULTIPLYING HERDS IN SWEDEN

Per Wallgren (Sweden)

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BACTERIAL DISEASES I

BBD-OP-01

WHAT HAPPENS WHEN *M. HYOPNEUMONIAE* ENTERS A HERD? LONGITUDINAL ASSESSMENT OF *M. HYOPNEUMONIAE* NATURAL INFECTION IN GILTS

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Introduction

Understanding duration of *M. hyopneumoniae* (Mhp) shedding in swine populations determines the the duration of herd closure for elimination and gilt exosure timing for Mhp acclimation strategies. Although shedding duration in experimentally infected pigs is known, epidemiology of natural Mhp infection remains unknown. This study describes the pattern of natrual Mhp infection and persistence in a gilt population.

Materials & Methods

A closed sow herd with internal GDU had recently experienced a Mhp outbreak after being naive for >5 years. 63 gilts were selected at 21 days of age (DOA), sampled via laryngeal swabbing (LS) for Mhp PCR weekly for 5 weeks and monthly afterwards. Serum samples were collected at 21, 110 and 140 DOA for Mhp serology. Tracheal sample (TS) collection was implemented at 200 DOA. A final TS sampling occurred during farrowing from study sows and 5 of their piglets.

Results

11% of gilts were infected at weaning and the last positive gilt was detected 284 days later. Peak infection was detected at 49 DOA. Mhp detection in LS was 8.8% compared to 42.2% in TS at 200 DOA. TS sensitivity remained superior at 215 DOA. 4 gilts remained PCR negative throughout the study; however, all gilts seroconverted by 140 days. 38% of gilts were serologically negative at 110 DOA, from these, 27% had previously tested PCR positive by LS at 21-49 DOA. At farrowing sows and piglets were PCR negative.

Discussion

Despite the recent Mhp outbreak, prevalence at weaning was low. Intensive LS failed to identify infection in 39% of gilts. TS showed superior sensitivity to LS. Timing of Mhp seroconversion after infection is variable and serology is an extremely lagging indicator. Gilts cleared infection within normal Mhp elimination timelines without intentional exposure. If “seeder” exposure is early, gilts will be successfully acclimated to Mhp.



BBD-OP-02

STREPTOCOCCUS SUIIS (*S. SUIIS*) ANTIMICROBIAL RESISTANCE (AMR) GENOTYPE AND PHENOTYPE CORRELATION, AND GENOMIC SIGNATURES SUGGESTING LINKAGE OF AMR GENES

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Introduction

S. suis is a significant zoonotic pathogen affecting pigs and humans. Quick and correct antimicrobial treatment implementation increases recovery chances. Antimicrobial resistance (AMR) can be predicted by the presence of certain genes conferring resistance.

The dynamics of horizontal gene transfer often mean that AMR genes are found within the same mobile elements such as transposons.

Materials and methods

S. suis isolates (n=628) from clinical and non-clinical pig cases were AMR tested using the minimal inhibitory concentration (MIC) method for 17 antimicrobials including lincomycin, and spectinomycin among others. Epidemiological cut-off values (ECOFF) were set by a mathematical model analysing MIC distribution patterns. Isolates with MIC > ECOFF were classified as non-wild-type (NWT). All isolates were sequenced for AMR genes reported in the literatures and spectinomycin and lincomycin phenotypes versus genotypes are reported here.

Results

The presence of AMR genes showed a close agreement with NWT phenotype. For example, 368 out of 369 isolates with lincomycin AMR genes were classed as NWT for lincomycin, and 43 out of 75 isolates with spectinomycin AMR genes were NWT for spectinomycin.

Additionally, 58 of the 628 isolates were NWT for spectinomycin, and 57 of these 58 were NWT for lincomycin also. Genes conferring resistance for lincomycin (*InuB*) and spectinomycin (*ant_6_1a*, *ant_9_1a*, *aph_3_IIIa*) were identified in conjugative transposons in at least 29 out of these 57 lincomycin + spectinomycin NWT isolates.

Discussion and conclusion

Identifying AMR genes helps to predict *S. suis* AMR phenotype and the identification of potential treatments does not require isolation and *in vitro* AMR testing.

We observed higher prevalence than expected of co-resistance to lincomycin and spectinomycin given the individual antimicrobial resistance prevalence. The presence of mobile genetic elements such as integrated conjugative transposons suggests that some AMR phenotypes will be linked in *S. suis* even in the absence of selection.



BACTERIAL DISEASES I

BBD-OP-03

PREVALENCE OF ANTIBODIES TO *ACTINOBACILLUS PLEUROPNEUMONIAE* IN MULTIPLYING HERDS IN SWEDEN

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Introduction

Actinobacillus pleuropneumoniae (APP) is a common respiratory pathogen, but the incidence is generally unknown. This study aimed to screen the presence of APP in Swedish multiplying herds.

Material & Methods

All 30 multiplying herds in Sweden were screened with indirect ELISA-systems for serum antibodies to APP serotypes 1-12, where serotype 5 included 5a, 5b and 5s (an atypical variant detected in Sweden in 1999 and 2007). Eight blood samples per age category were collected from pigs aged 10, 20 and 30 weeks (n=29). One herd sold gilts below 20 weeks of age.

Results

All herds were seronegative to serotypes 1, 5a, 5b, 9,10, 11 and 12, and to serotype 5s.

Pigs aged 10 weeks were seronegative to all serotypes.

Pigs aged 20 weeks were seronegative to all serotypes in 22 of 29 herds. Antibodies to serotypes 3-6-8 were demonstrated in three herds, and to serotypes 4-7 in four other herds.

Pigs aged 30 weeks were seronegative to all serotypes in 23 of 29 herds. Antibodies to serotype 2 were demonstrated in two herds, to serotypes 3-6-8 in another herd, and to serotypes 4-7 in four other herds.

In four of the herds with seropositive pigs aged 20 weeks, pigs aged 30 weeks were seronegative.

Discussion & Conclusion

The multiplying herds were concluded free from serotypes previously never demonstrated in Sweden (1, 5a, 5b, 9,10, 11 and 12), and to 5s.

Prevalences and levels of antibodies to endemic serotypes (2, 3-6-8 and 4-7) were substantially lower than at the previous screening made in 2005. Terminating introduction of live animals, age segregated rearing and improved biosecurity probably contributed to this result, and may also explain why herds with seropositive pigs aged 20 weeks in another batch could have seronegative pigs aged 30 weeks.



WELFARE & NUTRITION

Thursday, 10 May 2018, 15:20-16:20

AWN-OP-01

EFFECT OF TRACHEOBRONCHIAL-SWABBING AND OTHER DIAGNOSTIC TOOLS ON THE ENDOCRINE STRESS RESPONSE OF PIGS

Christine Weiß (Germany)

AWN-OP-02

EFFECT OF ZINC OXIDE AND CHLORTETRACYCLINE ON ANTIBIOTIC RESISTANCE DEVELOPMENT IN WEANED PIGLET

Rudi Forier (France)

AWN-OP-03

REVEALING THE UNSEEN: SEVERE GASTRIC ULCERATION PROBLEMS SOLVED BY USE OF 24 H CAMERA SURVEILLANCE

Wikke Kuller (Netherlands)

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WELFARE & NUTRITION

AWN-OP-01

EFFECT OF TRACHEOBRONCHIAL-SWABBING AND OTHER DIAGNOSTIC TOOLS ON THE ENDOCRINE STRESS RESPONSE OF PIGS

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O Aware of our responsibility as veterinarians, the increasing importance of animal welfare let us consider the effect of tracheobronchial-swabbing on the welfare of pigs.

R Aim of the present study was to evaluate distress caused by tracheobronchial-swabbing, a new diagnostic technique applied without general anesthesia, in comparison to holding pigs in a snare and nasal-swabbing.

A Therefore we measured cortisol (4x) in blood and saliva and catecholamines (2x) in blood before and after manipulation. Four groups, three study and one control group (C), were formed to assess cortisol (each group n=23) and catecholamines (each group n=31) in two different substudies. Tracheobronchial-swabbing (TBS) was performed during snare fixation. Animals in the nasal-swabbing group (NS) were fixated similarly. Animals of the fourth group got restrained for 60sec in a snare (S) without swabbing.

L Treatment in TBS, NS and S caused a significant increase of cortisol concentrations, with no significant difference between groups at any time. 90 min after manipulation cortisol levels in saliva and serum decreased in all groups. The concentration-time-curves of TBS, NS and S did not differ significantly from each other neither in serum nor in saliva cortisol. Unlike S, norepinephrine levels in TBS and NS rose significantly after manipulation. Mean epinephrine levels did not increase significantly in all groups after manipulation.

Stress induced cortisol levels after tracheobronchial-swabbing are comparable to that after snaring and nasal-swabbing. Furthermore we observed a good overall correlation between saliva and blood results. Concerning catecholamines we showed that short-term stress in tracheobronchial-swabbing is comparable to that in nasal-swabbing. Both manipulations caused more stress than fixation with snare solely. The results indicate for the first time that tracheobronchial-swabbing causes endocrine stress responses comparable to nasal-swabbing. Beyond well-established nasal-swabbing, tracheobronchial-swabbing could gain increasing significance in the future as quick, meaningful and gentle diagnostic tool which does not require anesthesia.



AWN-OP-02

EFFECT OF ZINC OXIDE AND CHLORTETRACYCLINE ON ANTIBIOTIC RESISTANCE DEVELOPMENT IN WEANED PIGLET

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Introduction

Chlortetracycline (CTC) and zinc oxide (ZnO) at pharmacological dosage are commonly supplemented in piglet diets in order to improve growth performance, through adjusting gut health and reducing diarrhea during the post-weaning period. However, there is a risk of bacterial resistance development. In this trial, CTC and ZnO were used to evaluate their effects on antibiotic resistance genes.

Material and methods

The trial was performed with 4 experimental diets: 2400 ppm of Zn from standard ZnO vs. 110 ppm of Zn from a potentiated ZnO source (HiZox®), with or without 300 ppm of CTC. Each treatment consisted of 10 piglets weaned at 25 days. DNA was extracted from faeces (0, 2, 4, 7, 14 d), in order to quantify by qPCR the *Escherichia* group, some antibiotic resistance genes and related genes.

Results

As expected, both groups with high concentrations of ZnO reduced the *Escherichia* group, however low concentrations of the potentiated ZnO and CTC showed the same trend. CTC increased numerically the development of various genes (*tetA*, *bacA*) after 6 days; without CTC, there were numerical (*tetA*) or significant (*bacA*, *zint*) differences between the group fed 2400 ppm of Zn from standard ZnO and the group fed 110 ppm of Zn from potentiated ZnO.

Discussion & conclusion

Both ZnO at high level and CTC increase the development of antibiotic resistance genes, and may have an additive effect on these genes. Despite its antibacterial effect, observed in previous studies, the potentiated ZnO source showed a limited effect on resistance genes, compared to standard ZnO at pharmacological dosage.

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WELFARE & NUTRITION

AWN-OP-03

REVEALING THE UNSEEN: SEVERE GASTRIC ULCERATION PROBLEMS SOLVED BY USE OF 24 H CAMERA SURVEILLANCE

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Introduction

A newly build finishing pig unit experienced problems with high mortality rates of 6% . Finishers were kept in large groups of 450 animals and fed liquid feed with several by-products. Flooring surface and feeding space was according to Dutch legislation. Symptoms: variable feed intake, coughing, pale animals, reduced growth. Pathology showed gastric ulceration. Feed interventions did not gave an improvement. No infectious respiratory disease was found. Climate parameters were not abnormal. The local veterinarian decided to consult a behavioural specialist for 24 h video analysis of animal behaviour.

Material and methods

6 high definition cameras were used for 24 h/ 7 d analysis of animal behaviour.

Results- 24h analysis showed a quiet group and no signs of fighting. Pigs used different areas for feeding, sleeping and defecating and showed normal diurnal patterns. However, too many pigs were lying in sternal or half lateral position and almost no pigs were in relaxed lateral position. Thorough research revealed a software error in the climate system occurring randomly during the day, which resulted in draught at those moments and an unpredictable environment for the finishers.

Discussion and conclusion

Finishers in their comfort zone usually lie in a lateral position. Other postures can be a sign of a chronic stressor: animals are not in their comfort zone and welfare is compromised. Farm visits by veterinarians and advisors on feed or climate are usually short and during daytime. Pigs are often aroused when people enter the unit and thereby valuable information on pig behaviour and health is lost. In more complex cases, video analysis provides valuable information in the field to reveal abnormal behaviour related to health problems and/or compromised welfare. Moreover, using this video material is usually an easy way to convince caretakers, advisors and veterinarians that things need to be changed.



BACTERIAL DISEASES II

Thursday, 10 May 2018, 16:40-18:00

BBD-OP-04

ASSOCIATION BETWEEN MYCOPLASMA HYOPNEUMONIAE DETECTION IN LARYNGEAL SWABS AND LUNG LESIONS UNDER EXPERIMENTAL CONDITIONS

Rocío León Kempis

BBD-OP-05

DEVELOPMENT OF A QPCR-SEROTYPING SYSTEM FOR ACTINOBACILLUS PLEUROPNEUMONIAE

Jose Luis Arnal (Spain)

BBD-OP-06

PASSIVE SURVEILLANCE OF *LEPTOSPIRA* INFECTION IN SWINE IN GERMANY

Katrin Strutzberg-Minder (Germany)

BBD-OP-07

ROLE OF SIALIC ACID IN *BRACHYSPIRA HYODYSENTERIAE* ADHESION TO PORCINE COLONIC MUCUS

Macarena P. Quintana-Hayashi (Sweden)

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BACTERIAL DISEASES II

BBD-OP-04

ASSOCIATION BETWEEN MYCOPLASMA HYOPNEUMONIAE DETECTION IN LARYNGEAL SWABS AND LUNG LESIONS UNDER EXPERIMENTAL CONDITIONS

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Introduction

The use of PCR analysis to detect *Mycoplasma hyopneumoniae* (*Mhp*) in live pigs provides information about the infection dynamics and it may allow the identification of infected pigs before seroconversion, observation of clinical signs and lung lesions. Besides, laryngeal swabs tested by PCR have proved to be a reliable diagnostic sample for *Mhp* detection *in vivo* during early-stage infection. The objective of this study was to investigate the potential association between early detection of *Mhp* in laryngeal swabs and lung lesions in pigs experimentally infected with *Mhp*.

Materials & methods

Twelve 5 week old *Mhp* negative piglets were intranasally inoculated with 15 ml of *Mhp* culture given in 3 consecutive days. Laryngeal swabs and blood samples were obtained weekly to up to 21 or 28 days post-inoculation (dpi), respectively. At necropsy, lung lesions were scored (Ph. Eur., monograph no.04/2013:2448) and lung lavages obtained. Detection of *Mhp* by PCR was performed in laryngeal swabs and lung lavages, whereas a blocking ELISA was used in blood samples to assess seroconversion.

Results

Mhp DNA was detected in laryngeal swabs as early as 7 dpi and the number of positive animals increased progressively towards the end of the study. All the inoculated animals proved to be infected by *Mhp* as all lung lavages were PCR positive and bronchopneumonia was observed in all of them. Remarkably, lung lesions tend to be more severe in those animals where *Mhp* was detected earlier in laryngeal swabs. Furthermore, an early detection of *Mhp* in laryngeal swabs was also linked to an earlier seroconversion.

Discussion & conclusion

Laryngeal swabs were identified as a reliable sample for PCR detection of *Mhp* during the early stages of infection. This sample type might be potentially used as a predictor of the lung lesion outcome in non-vaccinated, experimentally infected pigs.



BBD-OP-05

DEVELOPMENT OF A QPCR-SEROTYPING SYSTEM FOR ACTINOBACILLUS PLEUROPNEUMONIAE

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Introduction

A total of 16 serotypes of *Actinobacillus pleuropneumoniae* (APP) have been reported so far; nevertheless, data indicating which serotypes are more virulent is still lacking for most countries. Thus, updated information related to a particular geographical area might be precious.

Current techniques of APP serotyping present certain methodological limitations; cross reactions when using serological tests and inaccurate identification through *Apx* genes. The aim of this work was to develop a complete set of APP typing qPCR reactions to conduct a preliminary survey regarding the current situation of APP in Spain.

Material & Methods

One real time PCR for detecting APP (all serotypes) and 14 qPCR multiplex assays were designed to unequivocally detect serotypes 1,2,3,4,5,6,7,8,9/11,10,12,14,15 and 16. Due to the lack of available sequence ser13 assay was not developed.

A collection of reference strains containing every single serotype was gently provided by University of Montreal (Canada) to conduct the validation. After that, respective isolations from 40 pleuropneumonia compatible cases collected in Spain from 2015 to date were analyzed.

Results

The proposed qPCR assays detected the required serotype only confirming the specificity of the tests.

Microbiological isolations from clinical cases resulted: ser8(n=4, 10%), ser2(n=5, 12%), ser 9/11(n=5, 12%), ser4(n=11, 28%) and ser13(n=15; 38%). Ser13 strains had to be serotyped by serological techniques after obtaining negative reaction with all herein developed qPCR-typing assays.

Discussion & Conclusion

These results agree partially with a former Spanish report to the extent of high prevalence of ser2, ser4 and ser9/11. However, contrary to what was previously described, we found the ser13 as the most prevalent. Considering the advantages of qPCR technique, further studies are planned to validate the simultaneous detection of every serotype when analyzing directly the biological sample.

We conclude that these sets of qPCR assays are a valuable tool to serotype APP strains.



BACTERIAL DISEASES II

BBD-OP-06

PASSIVE SURVEILLANCE OF *LEPTOSPIRA* INFECTION IN SWINE IN GERMANY

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Introduction

Leptospirosis is presumed to be the most widespread zoonosis worldwide; it is a cause of reproductive loss in swine breeding herds and has been reported in swine from all parts of the world. Unfortunately, current data about the prevalence of leptospiral infection in swine are rare.

Material & Methods

Laboratory data were analysed from diagnostic examinations carried out on samples taken from swine all over Germany between January 2011 and September 2016. A total of 29829 swine sera were tested by microscopic agglutination test (MAT) for antibodies against strains of eleven *Leptospira* serovars.

Results

Overall, 20.2 % (6025) of the total sample collection tested positive for leptospiral infection. Seropositivity ranged between 16.3 % (964) in 2011 and 30.9 % (941) in 2016 (January to September only). The most frequently detected serovar was Bratislava, which was found in 11.6 % (3448) of all samples, followed by the serovars Australis in 7.3 % (2185), Icterohaemorrhagiae in 4.0 % (1191), Copenhageni in 4.0 % (1182), Autumnalis in 3.7 % (1054), Canicola in 2.0 % (585), and Pomona in 1.2 % (368). Modelling shows that both the year and the reason for testing at the laboratory had statistically strong effects on the test results; however, no interactions were determined between those factors. The results support the suggestion that the seropositivities found may be considered to indicate the state of leptospiral infections in the German swine population.

Discussion & Conclusion

Although data from passive surveillance are prone to selection bias, stratified analysis by initial reason for examination and analyses by model approaches may correct for biases. A prevalence of about 20 % for a leptospiral infection is most probable for sows with reproductive problems in Germany, with an increasing trend.



BBD-OP-07

ROLE OF SIALIC ACID IN *BRACHYSPIRA HYODYSENTERIAE* ADHESION TO PORCINE COLONIC MUCUS

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Introduction

Infection with *Brachyspira hyodysenteriae* results in mucoid hemorrhagic diarrhea. This pathogen is associated with the colonic mucus layer, mainly composed of mucins. Infection increases mucin secretion in the colon, increases *B. hyodysenteriae* binding sites on mucins, and regulates mucin glycosylation. Here, we analyzed potential mucin epitopes for *B. hyodysenteriae* adhesion in the colon, as well the effect of mucins on bacterial growth.

Materials & Methods

Bacterial adhesion assays were performed to Sialyl-Lewis x, Lewis b, Lacto-N-tetraose, Core-2 and LacdiNAc glycoconjugates providing a range of epitopes for binding. Associations between mucin glycan data and *B. hyodysenteriae* binding to porcine colon mucins data were determined with Pearson correlation coefficient. The role of sialic acid and galactose in *B. hyodysenteriae* adhesion were analyzed after sialidase A and β -galactosidase treatment of the insoluble mucins. Additionally, the effect of porcine colon mucins on *B. hyodysenteriae* growth was determined in defined media without glucose and growth was measured every 2 h for 24 h.

Results

A high statistical correlation was identified between *B. hyodysenteriae* adhesion to insoluble porcine mucins and the presence of sialylated structures. Furthermore, *B. hyodysenteriae* binding to insoluble mucins decreased after sialidase A treatment compared to the non-treated mucin control, while adhesion to β -galactosidase treated mucins remained unchanged. Binding of *B. hyodysenteriae* to synthetic glycoconjugates was not statistically different from background. *B. hyodysenteriae* growth increased in the presence of mucins from two out of five infected pigs, suggesting utilization of mucins as a carbon source for growth.

Discussion & Conclusion

The results highlight a role of sialic acid as an adhesion epitope for *B. hyodysenteriae* interaction with colonic mucins. Furthermore, the mucin response and glycosylation changes exerted in the colon during *B. hyodysenteriae* infection results in a potentially favorable environment for pathogen growth in the intestinal mucus layer.



MISCELLANEOUS

Thursday, 10 May 2018, 16:40-18:00

MIS-OP-01

GENE MARKERS FOR THE RESISTANCE TO PORCINE PLEUROPNEUMONIA (PLEURORES)

Gerald Reiner (Germany)

MIS-OP-02

MINIMAL *MYCOPLASMA HYOPNEUMONIAE* GENETIC VARIABILITY WITHIN PRODUCTION FLOWS

Alyssa Anderson (United States)

MIS-OP-03

EQUIVALENCE BETWEEN FTA-FIXED AND LIQUID ORAL FLUID OF PIGS FOR THE CONFIRMATION OF INFECTION BY VEROTOXIGENIC *ESCHERICHIA COLI* (EDEMA DISEASE) IN PIGS

Jaime Maldonado (Spain)

MIS-OP-04

THE USEFULNESS OF SPES SCORE TO SCREEN FOR *ACTINOBACILLUS PLEUROPNEUMONIAE* INFECTIONS IN ENDEMICALLY INFECTED PIG HERDS

Rubén del Pozo Sacristán (Belgium)



MIS-OP-01

GENE MARKERS FOR THE RESISTANCE TO PORCINE PLEUROPNEUMONIA (PLEURORES)

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Introduction

Actinobacillus pleuropneumoniae is considered one of the most important pathogens in commercial pig production. It causes high economic losses due to acute or chronic pleuropneumonia resulting in decreased performance and increased mortality. Antimicrobial treatment and vaccination ensure only limited protection against the repercussions of the disease, and the excessive usage of antibiotics is no longer feasible. As other means of prevention are needed, genetic disease resistance of the host holds much promise. Previous studies have discovered multiple QTL through controlled infection experiments in crossbred Hampshire/Landrace pigs that could explain up to 22% of phenotypic variance. Based on these findings, the aim of the present study was to identify genetic markers (QTN) for the resistance to pleuropneumonia in a commercial German Landrace breed by genomic sequencing.

Materials and Methods

165 pigs from a segregating German Landrace line were infected with *A. pleuropneumoniae* Serotype 7 using a standardised aerosol infection protocol. Phenotypes were accurately defined on a clinical, pathological and microbiological basis.

37 pigs of the most extreme phenotypes were genotyped by sequencing (Next Generation Sequencing) in the context of a Genome Wide Association Study (GWAS).

Results

The GWAS identified three functional SNPs on three chromosomes, two of them in the range of the already identified QTL ($p = 10^{-12}$). Each variant explained 20-25% of the phenotypic variance, in combination, up to 60%. The SNPs lead to functional modifications of genes that are involved in the pathomechanisms of pleuropneumonia.

Conclusion

This study confirms the genetic background for the host's resistance against pleuropneumonia. Gene markers have been developed that can be used in genetic selection. Favourable gene variants are segregating in commercial populations. Further work is needed to verify the results in a controlled study and to learn more about the prevalence of favourable and unfavourable gene variants in different breeds and populations.



MISCELLANEOUS

MIS-OP-02

MINIMAL *MYCOPLASMA HYOPNEUMONIAE* GENETIC VARIABILITY WITHIN PRODUCTION FLOWS

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Introduction

Mycoplasma hyopneumoniae (*Mhp*) diagnostic tools, such as Multiple Locus Variable number tandem repeat Analysis (MLVA) and P146 sequencing have been used to characterize this microorganism at the molecular level. Multiple variants have been identified by MLVA; however, the extent of genetic variability within production stages in swine flows has not been evaluated. The objective of this study was to assess the genetic variability of *Mhp* within swine production flows in USA.

Methods

Four *Mhp* positive production flows across various states were selected for this investigation. Within each flow, a maximum of ten laryngeal swabs were obtained from 1-3 farms per production stage (i.e. gilt developer unit, sow farm, nursery, and finisher) for up to three years. Samples were collected from pigs showing clinical signs suggestive of infection or from randomly selected pigs in the case that no clinical signs were observed. All samples were tested by PCR. MLVA typing based on characterizing Variable Number Tandem Repeats (VNTRs) of two adhesion loci, namely p97 and p146, and p146 sequencing were performed using the DNA from 1-5 *Mhp* positive samples per farm.

Results

In one production flow, a single variant (100% p146 sequence similarity and one MLVA type) was identified across all four production stages. In the remaining three flows, 1-4 MLVA types and a 98-100% sequence similarity were identified. Nevertheless, MLVA types varied by 1-2 VNTRs for either locus.

Conclusions

From a geographical standpoint, there appeared to be no relationship between location and variant distribution. Therefore, the genetic variability of *M. hyopneumoniae* within swine production flows was minimal over time and flow specific. From this study, it can be hypothesized that evolutionary pressures associated with farm management practices may not have a significant effect on genetic variability. In addition, variants across all production stages appeared to originate from vertical transmission.



MIS-OP-03

EQUIVALENCE BETWEEN FTA-FIXED AND LIQUID ORAL FLUID OF PIGS FOR THE CONFIRMATION OF INFECTION BY VEROTOXIGENIC *ESCHERICHIA COLI* (EDEMA DISEASE) IN PIGS

L. Valls, A. Sánchez, J. Maldonado.

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Introduction

FTA technology allows safe and practical storage and transportation of biological samples. However, its usefulness must be demonstrated with each new kind of sample. This study aimed to validate the use of FTA cards to detect the *VT2e* gene of verotoxigenic *Escherichia coli* (VTEC) in pig oral fluid by qPCR.

Material and Methods

To compare the qPCR performance in liquid and FTA-fixed samples, a panel of 10-fold serial dilutions of a collection VTEC strain, and 28 *VT2e* qPCR-positive diagnostic OF were used, respectively. FTA Elute were inoculated with 200 µl of either sample, and dried off at room temperature overnight. The remaining liquid samples were kept in refrigeration. The day after, qPCR was performed simultaneously on both samples. In addition, the stability of VTEC DNA in FTA Elute along time was assessed with a selected qPCR-positive diagnostic OF, and a liquid suspension of a collection VTEC strain. Samples were processed as described above at 1, 2, 4 and 8 weeks after inoculation.

Results

The limit of detection of the qPCR, when analyzing both liquid and FTA-fixed OF, was the same (<1.5 ng/µl of DNA). All 28 diagnostic OF were positive regardless their nature (liquid or desiccated). When comparing Ct values, 14/28 OF yielded better results in liquid form than their FTA-fixed counterparts, while the remaining 14 did so for the FTA-fixed form. The mean difference between Ct values was 0.19.

Discussion and Conclusion

This study demonstrates that the FTA Elute card is a good alternative for pig OF storing and transportation. The fact that the VTEC DNA remains stable for a long time without degrading makes this system an excellent alternative to use liquid samples, that are sensitive to degradation and carry biological risk.

Acknowledgements

We thank the UCAM staff for sample collection and processing.



MISCELLANEOUS

MIS-OP-04

THE USEFULNESS OF SPES SCORE TO SCREEN FOR *ACTINOBACILLUS PLEUROPNEUMONIAE* INFECTIONS IN ENDEMICALLY INFECTED PIG HERDS

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Introduction

Actinobacillus pleuropneumoniae (APP) is the causative agent of porcine pleuropneumonia. Diagnosis is often done via serological investigations, with slaughterhouse checks as complementary tool. This study compares pleurisy at slaughter with serological response in herds with and without clinical signs of APP.

Materials & Methods

Seven herds were allocated into clinically affected (by APP; n=4) and non-clinically affected (n=3) herds according to symptomatology and/or recent bacteriological isolation. For each herd, pleurisy prevalence was recorded at slaughter (SPES score) and APP-index calculated. A cross-serological investigation was performed at herd level in 4 groups of 5 animals each [6, 10, 16 and 22 weeks of age (wk)]. APP-toxin (ApxI, ApxII, ApxIII) and Outer Membrane Protein (OMP) antibody response was tested by indirect-ELISA (MSD AH Service Lab, Boxmeer, The Netherlands). ApxIV antibodies were analyzed by IDEXX ApxIV ELISA®.

Results

Average pleuritis prevalence was 52.4%^A [38.4–64.6] and 5.9%^B [3.7–7.0] in affected and non-affected herds, respectively (P<0.05). Average APP-index (±sd) was higher for affected (1.16±0.35) compared with non-affected herds (0.07±0.06) (P<0.05). SPES score distribution for affected and non-affected herds was: SPES0 (48% vs 94%), SPES1 (13% vs 3%), SPES2 (16% vs 1%), SPES3 (9% vs 1%) and SPES4 (14% vs 1%). Mean antibody levels (log₂ scale ±sd) for ApxIII at 6, 10, 16 and 22 wk were 10.8±1.2, 10.1±3.2, 14.0±1.9 and 13.3±2.8 for affected and 7.7±1.0, 7.1±1.1, 7.6±1.0 and 7.6±0.7 for non-affected herds (P<0.05). Similar tendency was described for ApxI, ApxII and OMP. The prevalence of seropositive pigs for ApxIV at 6, 10, 16 and 22 wk was 95%, 100%, 75% and 75% in affected and 87%, 53%, 27% and 0% in non-affected herds.

Discussion & Conclusion

Seroconversion to APP in clinically affected herds coincided with severe and highly prevalent pleurisy at slaughter. Slaughterhouse checks are useful to monitor APP and categorize clinically affected herds.



IMMUNOLOGY & VACCINOLOGY

Friday, 11 May 2018, 10:30-12:30

IMM-OP-01

A RECOMBINATION BETWEEN TWO GENOTYPE 1 PRRSV MODIFIED LIVE VACCINES RESULTS IN A FIELD STRAIN WITH INCREASED VIRULENCE

Olivier Bourry (France)

IMM-OP-02

NOVEL INFLUENZA VACCINE EFFICACY AND SAFETY ESTABLISHED FOR NEWBORN PIGS

Troy Kaiser (United States)

IMM-OP-03

MATERNALLY DERIVED ANTIBODIES REDUCE VACCINE EFFICACY AGAINST PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME

Patricia Renson (France)

IMM-OP-04

MATERNALLY DERIVED IMMUNITY IN PIGS. EXPLORING ITS MANAGEMENT THROUGH THE IMMUNOCRIT ASSAY

Lorenzo Fraile (Spain)

IMM-OP-05

VACCINATION OF 1 DAY-OLD PIGS WITH A PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) MODIFIED LIVE ATTENUATED VACCINE IS ABLE TO OVERCOME MATERNAL IMMUNITY

Monica Balasch (Spain)

IMM-OP-06

EFFICACY OF AN AUTOGENOUS VACCINE AGAINST *BRACHYSPIRA HYODYSENTERIAE*

Willem Neiryndck (Belgium)

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IMMUNOLOGY & VACCINOLOGY

IMM-OP-01

A RECOMBINATION BETWEEN TWO GENOTYPE 1 PRRSV MODIFIED LIVE VACCINES RESULTS IN A FIELD STRAIN WITH INCREASED VIRULENCE

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Anses, Ploufragan, France.

Introduction

In Europe, modified live vaccines of genotype 1 (MLV1) are commonly used to control PRRSV infection in swine herds. In December 2014, following successive implementation of a PRRS vaccination program with VP-046BIS and DV strains in a farm, a recombinant strain from the 2 vaccines was isolated. In order to assess the virulence of the recombinant strain, we set-up an *in vivo* study to compare clinical, virological and transmission parameters with the 2 parental MLV1 strains.

Material & Methods

Three groups of 6 SPF piglets were respectively inoculated with one of the MLV1 or the recombinant strain. Twenty-four hours after inoculation, 6 contact piglets were added to each inoculated groups. All animals were monitored daily. Blood and nasal swabs were collected twice a week after inoculation to monitor the genome virus load. During necropsy, samples were collected for additional quantification of the viral genome in tissues.

Results

The vaccine and the recombinant strains did not induce clinical sign. PRRS viral load in inoculated piglets of recombinant group was higher in serum, nasal swabs and tonsils in comparison with piglets from vaccine groups. The first viremic contact animal was detected as soon as 2 dpi in the recombinant group compared to 10 dpi and 17 dpi for vaccine strain groups. Estimation of transmission parameters by mathematical modeling showed an instantaneous transmission rate (number of infected pigs by an infectious pig per day) of 0.57 for recombinant group against 0.08 and 0.11 for MLV1 groups.

Discussion & Conclusion

Our *in vivo* study showed that the recombinant strain was able to replicate at a higher level with a higher shedding and a faster transmission in comparison to the parental vaccine strains. These results suggest an increase of virulence of this strain resulting from the recombination of 2 attenuated PRRSV vaccine strains.



IMM-OP-02

NOVEL INFLUENZA VACCINE EFFICACY AND SAFETY ESTABLISHED FOR NEWBORN PIGS

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Introduction

Economic losses due to swine influenza (IAV-S) are substantial and a global problem, ranking among the top three major health challenges in the swine industry. Historic control strategies include the use of killed virus (KV) vaccines in breeding females to confer passive immunity to offspring, however effective protection requires KV vaccine and challenge virus to be closely related. Live attenuated influenza virus (LAIV) vaccines present an important platform with advantages to stimulate both cell-mediated and mucosal immunity. Boehringer Ingelheim has licensed a bivalent IAV-S (H1N1 and H3N2) LAIV vaccine (Ingelvac Provenza™).

Materials & Methods

The vaccine strains have been attenuated by NS1 gene modification. When a host cell is infected with wild-type influenza virus, the intact NS1 protein suppresses the host cell interferon response. The vaccine's truncated NS1 gene encodes for a carboxy-truncated proteins which in turn does not diminish the host cell's interferon response. Licensing studies included: 10-times overdose safety (newborn pigs), non-target species safety (ferret, rat, chicken), dissemination/shed (dissemination within the body and shed from vaccinated pigs to sentinels), laboratory efficacy (challenge with heterologous viruses at 3 weeks post-vaccination), and field safety (997 pigs at 3 locations).

Results

The laboratory safety studies in host animals and in non-target species showed no adverse observations during each 14-day trial. The dissemination/shed study detected virus in nasal secretions for up to 7 days post-vaccination with limited transmission to sentinels. Efficacy studies with pigs vaccinated at 1- to 5-days-old demonstrated protection against heterologous H3N2 and H1N2 viruses measured by lung lesions, clinical signs, and nasal virus shedding. Finally, Investigators at field locations rated the product satisfactory after evaluating pigs daily for 14 days post-vaccination.

Discussion & Conclusion

Ingelvac Provenza™ is the first commercial LAIV vaccine to demonstrate cross-protection efficacy and safety in pigs as young as 1 day of age.



IMMUNOLOGY & VACCINOLOGY

IMM-OP-03

MATERNALLY DERIVED ANTIBODIES REDUCE VACCINE EFFICACY AGAINST PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME

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Anses, Ploufragan, France.

Introduction

Modified live vaccines (MLV) are commonly used to reduce the impact of Porcine Reproductive and Respiratory Syndrome (PRRS) but limited efficacy is achieved in field conditions. We recently showed that maternally-derived neutralizing antibodies (MDNA) impair piglet immune response to vaccination. Here, we evaluated the impact of MDNA on vaccine efficacy against PRRS virus (PRRSV) challenge.

Materials and Methods

Piglets with low (A-) or high (A+) level of MDNA were vaccinated (V+) or not (V-) with a genotype 1 MLV at both 3 (v1) and 4 (v2) weeks of age. Four weeks post-v2 (W4 pv2), piglets were either inoculated with a PRRSV field strain to evaluate vaccine protection, or housed with inoculated piglets to estimate transmission parameters. Blood was regularly collected to follow the post-vaccination and post-infection (pi) viral load (RT-PCR) and immune response (IFN γ EliSpot and antibody ELISA).

Results

PRRS vaccine was detected in 69% and 6% of A-V+ and A+V+ piglets respectively at W1 pv2. At W4 pv2, 94% of A-V+ and 44% of A+V+ piglets seroconverted with a significant IFN γ response induction in A-V+ group. After challenge, viremia was 100-fold lower at 10 days pi in A-V+ compared to V- inoculated piglets whereas viremia was not significantly reduced in A+V+ piglets. Similarly, in A-V+ contact piglets, virus load was lower than in other groups and the mean duration of viremia was shortened to 6 days compared with 12 days and 19 days for A+V+ and V- animals respectively. A lower transmission rate was estimated for A-V+ group: 0.15 [0.07-0.29] against 0.44 [0.18-1.76] and 0.32 [0.14-0.68] for A+V+ and V- groups respectively.

Discussion & Conclusion

We showed that MDNA impair vaccine efficacy against PRRS both in inoculated and contact piglets, probably by reducing the vaccine replication. These new data could help to improve vaccine protocols.



IMM-OP-04

MATERNALLY DERIVED IMMUNITY IN PIGS. EXPLORING ITS MANAGEMENT THROUGH THE IMMUNOCRIT ASSAY

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Introduction

Colostrum intake is crucial for piglet survival and a critical point in the health management of swine farms because it is the main known transmission mechanism of maternal derived immunity (MDI). The immunocrit assay has been suggested as a cost effective method to quantitatively evaluate maternal antibodies in piglets after colostrum intake. The objective of this study was to describe the immunocrit values in farms with high health status and good productive performances.

Material & Methods

Spanish farrow-to-weaning pig farms with pre-weaning mortality below the national average (12%), correct management and high health status were considered here having a good MDI status. Ten farms were selected and one piglet per sow was bled after colostrum intake (n=27-36/per farm); in particular, samples were collected 24-30 hours after birth. Immunocrit was performed and calculated as previously described in literature.

Results

Average immunocrit values were ranging 13.2-16.4%. The coefficient of variation within farms was ranging 19.2-32.6% and piglet subpopulations with different immunocrit values were identified. Stratification of results depending on parity showed that litters from 4-5 parities sows had higher immunocrit values than litters from 1-3 and 6-9 parities sows. Finally, farms implementing split nursing were showing higher average immunocrit values.

Discussion & Conclusion

Immunocrit values in Spanish farms with good MDI status were similar to those previously described in piglet with high survivability. Study within farm homogeneity permitted to identify piglet subpopulation with different levels of maternal antibodies; this determination might aid to identify piglets with a higher susceptibility to diseases even in farms with good MDI status. This study supported the reproducibility of the immunocrit as method to evaluate the MDI status in a farm; however, further studies are needed to evaluate the ability of the immunocrit assay as a tool to compare the MDI status of different farms.

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IMMUNOLOGY & VACCINOLOGY

IMM-OP-05

VACCINATION OF 1 DAY-OLD PIGS WITH A PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) MODIFIED LIVE ATTENUATED VACCINE IS ABLE TO OVERCOME MATERNAL IMMUNITY

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Introduction

PRRSV is known to circulate after weaning in unstable pig farms. Having immunity in place when piglets are weaned can protect them from early infections. Due to the effect of maternally derived immunity in newborns, vaccination is usually delayed until immunity vanishes, at 3-4 weeks of age. Since onset of immunity against PRRSV takes at least 4 weeks to develop, animals can have a period of risk for PRRSV infection, in which maternal immunity is no longer acting, and vaccine immunity has not yet developed. Suvaxyn PRRS MLV is the first vaccine licensed in Europe which is able to overcome maternal immunity. The objective of the study was to demonstrate the efficacy of vaccination of 1 day-old PRRSV seropositive piglets against challenge with an European PRRSV strain.

Materials and methods

Thirty-five 1 day-old piglets, born from sows vaccinated with Suvaxyn PRRS MLV, were divided into two groups. One group (18 pigs) was kept as negative control; another group (17 pigs) was vaccinated at 1 day of age with Suvaxyn PRRS MLV. All pigs were challenged when levels of maternal antibodies (SN test) in the control group became undetectable. To demonstrate protection against challenge, viremia, rectal temperatures, shedding, clinical signs and body weight were evaluated. Ten days after challenge pigs were necropsied, and lungs evaluated for macroscopic lesions.

Results

A protective effect of vaccination was shown by significant reduction of viral load in serum compared to the control group (3.5 log reduction); efficacy was supported by significant reduction of nasal and oral shedding (2.0 and 1.0 log reduction), and in rectal temperatures. Differences in mean percentage of lung lesions were close to significance (4.3% versus 1.3%).

Conclusions

Lack of interference of maternal immunity with Suvaxyn PRRS MLV efficacy, when the vaccine is administered to 1 day-old piglets, has been demonstrated.



IMM-OP-06

EFFICACY OF AN AUTOGENOUS VACCINE AGAINST *BRACHYSPIRA HYODYSENTERIAE*

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Introduction

Swine Dysentery (SD) results from infection of the large intestine with *Brachyospira hyodysenteriae* (*B.hyodysenteriae*). A commercial vaccine against SD is not available in Europe, but autogenous vaccines may be used. However, there is little scientific evidence for their efficacy.

Materials and Methods

Two consecutive batches of weaned pigs in a herd clinically infected with *B.hyodysenteriae* were enrolled. Within each batch (n=400), half of the pigs were injected intramuscularly at 6 and 9 weeks of age with either the vaccine (V) or physiological saline (PBS). The vaccine consisted of 3 inactivated *B.hyodysenteriae* strains isolated from the herd and aluminum hydroxide as adjuvant. Vaccinated and control pigs were housed in separated units during the finishing period. Pigs were individually weighed at day 0 (first vaccination), day 28 and before slaughter (batch 1: day 122, batch 2: day 129). Blood samples (n = 10 /batch) were taken on day 0 and 28. Fecal samples (n = 24 / batch) were taken on days 42 and 56. Parameters for comparison: average daily gain (ADG), IgG serum antibodies against *B.hyodysenteriae* (ELISA), fecal excretion of *B.hyodysenteriae* (qPCR) and mortality.

Results

ADG for batch 1 was 887 and 877 g, and for batch 2, 693 and 708 g for vaccinated and controls, respectively. The mean ELISA OD-values rose from 0.24 to 0.50 for vaccinated and from 0.20 to 0.38 for controls. Four animals were seropositive (cut-off 0.55): 3 in the vaccinated and 1 in the control group. Overall, *B.hyodysenteriae* DNA was detected in feces of only one vaccinated animal of batch 2. Mortality was 2.25% and 2.75% for vaccinated and controls, respectively. None of the results was statistically significant.

Discussion and Conclusions

In the given circumstances, vaccination with the autogenous *B.hyodysenteriae* vaccine did not lead to significant improvements.



REPRODUCTION

Friday, 11 May 2018, 10:30-12:30

REP-OP-01

IMPACT OF RUNTING ON COLOSTRUM INTAKE, SURVIVAL CHANCES AND DEVELOPMENT

Jan Jourquin (Belgium)

REP-OP-02

IMPACT OF OESTRUS SUPPRESSION IN CARCASS QUALITY OF GILTS INTENDED FOR TERUEL DRY-CURED HAM PRODUCTION

Leticia Pérez Ciria (Spain)

REP-OP-03

VULVAR DISCHARGE SYNDROME IN SOWS AFTER ARTIFICIAL INSEMINATION

Alexander Grahofer (Switzerland)

REP-OP-04

SEVERE UDDER EDEMA AS A CAUSE OF REDUCED COLOSTRUM QUALITY AND MILK PRODUCTION IN SOWS - A CASE REPORT

Stefan Björkman (Finland)

REP-OP-05

BACTERIURIA IN SOWS IS ASSOCIATED WITH AN INCREASED RISK OF STILLBIRTHS

Lola Tolstrup (Denmark)

REP-OP-06

A COMPARISON OF DIFFERENT FARROWING SYSTEMS WITH REGARD TO THE COLOSTRUM SUPPLY OF PIGLETS

Sandra Schnier (Germany)



REP-OP-01

IMPACT OF RUNTING ON COLOSTRUM INTAKE, SURVIVAL CHANCES AND DEVELOPMENT

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Introduction

Runt pigs are intrauterine growth retarded animals characterized by low birth weights (BW). They have higher mortality rates, reduced daily gain and pork quality and increased feed conversion rate. Colostrum intake (CI) is negatively correlated with BW and litter size. For current breeds, a minimum BW of 1.13 kg is needed for normal survival chances.

The objective of this study was to investigate the relation between low BW, CI, mortality and development.

Material & methods

All piglets from 22 litters were identified at birth and weighed at birth, 24 hours, days 14, 28 and 63. CI was determined (Devillers method). Mortality information (weight, date and reason) was recorded. CI, body weight, average daily gain (ADG) and mortality incidences for low BW piglets (below 1.13 kg) were compared to the others. For statistical analysis, breed and parity were included as block effects and litter size as covariate.

Results

A third of the piglets had a low BW. Their CI was lower per piglet (169 vs 269g), but not per kg (188 vs 194g). Their mortality rate was continuously over 4 times higher. Their pre-weaning mortality was 46%, mainly due to low viability and crushing. CI of piglets that died was lower when compared to the survivors irrespective of BW. Although CI per kg of the surviving low BW piglets was comparable to the other piglets, their ADG was always lower resulting in lower weaning (6.27 vs 7.63 kg) and nursery weights (15.66 vs 19.87 kg).

Discussion & Conclusion

Independent of the underlying cause, failure to consume sufficient colostrum leads to poor survival chances. Low BW clearly predisposes piglets for poor CI. Even when piglets below 1.13 kg consume sufficient colostrum, they still fail to develop like their heavier littermates, indicating that runt pigs are negatively impacted well beyond birth.



REPRODUCTION

REP-OP-02

IMPACT OF OESTRUS SUPPRESSION IN CARCASS QUALITY OF GILTS INTENDED FOR TERUEL DRY-CURED HAM PRODUCTION

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Introduction

Increasing fatness and avoiding puberty are desirable in gilts intended for Teruel dry-cured ham. This study was conducted to assess the impact of Vacsincel® (Zoetis), vaccine indicated for temporary oestrus suppression, on gilt genital organs and carcass fat, relative to time of second dose before slaughter.

Material & Methods

A total of 48 Duroc x (Landrace x Large White) gilts (average 26.5 kg body weight-BW) were enrolled and randomly allocated to 4 treatment groups (n=12) according to time of second dose administration: intact females (controls) or vaccinated with 60, 75 or 90 kg BW. The first dose had been previously administered to the three vaccinated groups when gilts had approximately 30 kg BW, and all study animals were slaughtered with approximately 125 kg BW (study conducted from February to June). Weight and size of each part of the genital tract, number and size (<2, 2-4 or 4-6 mm) of the ovarian follicles and backfat depth (measured at *gluteus medius* muscle level) were evaluated. Data were analysed using the GLM procedure of SAS.

Results

Genital organs were more developed in intact than in vaccinated females; longer uterine horns ($p<0.001$) and heavier ovaries, uterine horns, uterus, cervix, vaginal neck and vagina ($p<0.05$). Intact and females revaccinated with 90 kg had more ovarian follicles than gilts revaccinated younger ($p<0.05$). More medium and big follicles were found in intact than in vaccinated gilts ($p<0.05$), and only small ones were detected in revaccinated with 75 kg. Carcass fat thickness trended to increase in vaccinated gilts, and also with the advance of second dose ($p=0.06$).

Discussion & Conclusion

Vacsincel® prevented the puberty resulting in increased carcass fatness. The administration of second dose around 75 kg BW (8 weeks before slaughter) provided optimal results for high quality dry-cured hams.



REP-OP-03

VULVAR DISCHARGE SYNDROME IN SOWS AFTER ARTIFICIAL INSEMINATION

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Introduction

Vulvar discharge is frequently observed in sows with bacterial infection of the urogenital tract and cause economic losses due to reproductive failure in affected sows. Several risk factors for this condition have been described and, therefore, a good diagnostic workup is mandatory.

Material & Methods

This report describes a case of vulvar discharge syndrome in a 480 sow pool system with seven satellite farrowing farms affecting 10% of the sows immediately after insemination. Before a herd examination was conducted, the reproductive data was systematically analyzed. The non-return rate of sows coming from the different satellite farrowing farms varied between 87 and 93%. The general health of the sows in the farrowing units determined by the prevalence of the post-partum dysgalactia syndrome and lameness was within the regular range. A clinical examination in the breeding unit was conducted, and sows were found in good general health condition. In five sows with purulent vulvar discharge a vaginoscopic examination was conducted and a swab of the cervix was obtained.

Results

In all affected sows a reddening of the cervical area with excessive vaginal content was observed and the bacteriological investigation revealed a high content of beta-hemolytic *Streptococcus spp.* with significant antimicrobial resistance. In addition, an ultrasonographic examination indicated no inflammation of the urine bladder or the uterine horns. Furthermore, the breeding management was analyzed revealing a lack of hygiene and a poor stimulation of the sows. Based on the findings a cervicitis in the sows due to management problems in the breeding unit, was diagnosed.

Discussion & Conclusion

In this case report, the vaginoscopic and ultrasonographic examination was essential to localize the inflammation of the urogenital tract. Furthermore, an investigation of the breeding management was necessary to identify the main cause for the vaginal discharge, which was mainly poor hygiene.



REPRODUCTION

REP-OP-04

SEVERE UDDER EDEMA AS A CAUSE OF REDUCED COLOSTRUM QUALITY AND MILK PRODUCTION IN SOWS - A CASE REPORT

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A piglet-producing herd in Finland suffered from inadequate milk production of sows.

Investigation of the problem revealed that 35% of the sows had low water intake, constipation and excessive swelling of the udder prior and during parturition. The severity of the udder edema was graded (Grade I to III) visually and with ultrasound. The first four pairs of the mammary gland were inspected for markings of the slatted floor, redness, and unclear definition of individual glands. If none of the criteria were present the Grade was I (physiological edema), if one criteria was present the Grade was II (mild edema), and if two or more criteria were present the Grade was III (severe edema). Furthermore, the colostrum production of 34 sows (Parity 2 to 4; housed in crated (n= 19) and free (n= 15) farrowing pens) was evaluated.

Ultrasound examination showed thickened dermal and subdermal tissue, more hyperechoic lobuloalveolar tissue with enlarged blood and lymphatic vessels, and increased shadowing in udders with Grade III (all $P < 0.005$). There was a negative effect on colostrum quality ($P = 0.021$) but no effect on colostrum yield ($P = 0.656$). Furthermore, severe edemas occurred only in crated sows ($P = 0.001$) and mostly in younger sows ($P = 0.004$; Parity 2: 4/4 (n/N), Parity 3: 2/14; Parity 4: 2/16).

As a potential cause for the severe edema, a transition diet high in energy (3.8 kg/ day; 10.1 MJ/KG) and low in fiber (4.3%) was identified. As a treatment, a gradual decrease in the energy level (3.8 to 2.7 kg/day) and increase in fiber content (addition of 200 g sugar beet pulp / day) were recommended. At a control visit to the herd four weeks later, the incidence of severe udder edema was decreased and colostrum quality and milk production was improved.



REP-OP-05

BACTERIURIA IN SOWS IS ASSOCIATED WITH AN INCREASED RISK OF STILLBIRTHS

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Introduction

Previous research showed that urinary tract infections (UTI) in sows are associated with poor reproductive performance. Parameters such as farrow rate, risk of rebreed, and weaned piglets per litter has been associated with the presence of bacteriuria. However, no recent related studies exist and the current prevalence of UTI in Danish sows is unknown. Therefore, this study established the prevalence of bacteriuria in reproductive active and clinically healthy sows in four herds followed by an evaluation of the importance of bacteriuria for the reproductive performance. The hypothesis was: bacteriuria decreases sows' reproductive performance.

Material & Methods

The four included herds were selected based on a history of reproductive problems related to primarily decreased farrow rate and increased rebreed percentage. Urine samples were collected from sows when housed in either the pregnancy unit, the farrow unit, or the service unit. Urine culture was performed on each sample. In the period after urine sampling to the next farrowing, reproductive performance parameters were collected. Statistical analyses were made separately for sows in the pregnancy unit, the farrow unit, and the service unit.

Results

The overall prevalence of bacteriuria was 26.3% among 1,267 sows. An increase in the risk of stillbirths was observed among sows having bacteriuria in the farrow unit pre-farrowing with an odds ratio of 1.27 [1.04;1.54], when calculated by logistic regression. Analyses of the other parameters: farrow rate, risk of rebreed, weaning-to-pregnancy interval, and litter size did not show any significant association with bacteriuria in any of the three farm units.

Conclusion & Discussion

The study illustrates that bacteriuria was widespread in the four herds, similarly in herds of many stillborn piglets it could be valuable to optimize the health of the urinary tract by e.g. securing sufficient and good quality water supply.



REPRODUCTION

REP-OP-06

A COMPARISON OF DIFFERENT FARROWING SYSTEMS WITH REGARD TO THE COLOSTRUM SUPPLY OF PIGLETS

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Introduction

Especially after birth, the colostrum supply of newborn piglets is of particular importance for the survival and further development of the piglets. The aim of this study was to investigate in what way the farrowing system and thus the locomotion influences the colostrum supply of piglets.

Material & Methods

A total of 26 sows assigned randomly to commercial farrowing crates (system I), 24 sows were housed to a crate without fixation (system II) and 27 sows were assigned to a group farrowing pen system with six individual pens without fixation and a joint area (system III). Blood samples of two heavy and light piglets per litter were taken within the first two days after birth and before weaning to determine the immunocrit ratio according to the method first described by VALLET.

Results

The level of the immunocrit ratio of the piglets in system I was post natum (system I: 0.158 ± 0.031 ; system II: 0.156 ± 0.036 ; system III: 0.133 ± 0.039) as well as before weaning (system I: 0.050 ± 0.013 ; system II: 0.047 ± 0.015 ; system III: 0.044 ± 0.016) markedly higher than the immunocrit ratio of the piglets in system II + III. Especially the immunocrit ratio of the light piglets p.n. in system III was obviously lower than in system I + II. In analysed blood samples from piglets that didn't survive the lactation period the immunocrit ratio was significantly lower in system III than in the other systems.

Discussion & Conclusion

The significant lower immunocrit of the light piglets of system III p.n. argues for a problem with the colostrum supply especially in this system. In future it has to be investigated in greater details if there is a problem with the colostrum transfer or the sows have insufficient colostrum production.

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POSTERS



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AWN-001

A CLINICAL APPROACH ON RESOLVING A PROBLEM OF NEW NEONATAL PORCINE DIARRHEA SYNDROME IN A FARROW-TO-FINISH HERD

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Introduction

New neonatal porcine diarrhea syndrome (NNPDS) frequently occurs in pig herds. The exact pathogenesis remains unknown, but the intestinal tract microbiota of neonatal piglets likely plays an important role. Management ways to control NNPDS outbreaks have not been widely described so far.

Materials and methods

On January 2017, a newly established 2000-sow herd reported recurrent outbreaks of NNPDS that occurred already for six months. On average, 70 to 80% of the litters became affected across batches. Overall pre-weaning mortality rates increased from approximately 14 to 20%.

Results

Submission of 12 dead piglets and 20 rectal swabs revealed the presence of *Clostridium perfringens* type A and B, rotavirus group A and C, and non-haemolytic *Escherichia coli* isolates that differed from the classical ETEC isolates. No *E. coli* isolates with genes encoding for factors indicative of ETEC were detected by PCR (e.g. for K88, K99, 987P, F41, LT). Antimicrobial treatments and the immunization of the sows against the aforementioned pathogens did not resolve the outbreaks. Therefore, alternative control measures focused on sow feeding. Firstly, the crude protein content of the gestation sow feed was reduced by 2%. Secondly, the percentage of meal particles with a size of less than 0.3 mm was reduced by 15 to 20%, in both the lactation and gestation sow feeds. After a seven-month implementation period, the percentage of litters with diarrhea dropped to 10%, while overall pre-weaning mortality rates dropped to 11%.

Discussion and conclusions

Sow feed with increased levels of protein as well as increased percentage of fine particles may have disturbed the intestinal microbiota of the sows. As piglets are colonized at birth by microbiota from the maternal genital and intestinal tract, this might have rendered piglets susceptible to NNPDS. In the present farm, sow feed alterations were able to resolve the NNPDS outbreaks.

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WELFARE & NUTRITION

AWN-002

EFFECT OF DIFFERENT IRON SUPPLEMENTATION STRATEGIES ON THE HEMATOLOGICAL PARAMETERS AND GROWTH OF PIGLETS

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Introduction

Among livestock, piglets are considered the most susceptible species to developing iron deficiency (or anemia). This study investigated the effect of four different iron dosing schemes, which combine intramuscular and oral iron supplementation, on preventing anemia in piglets.

Materials and methods

Herds A and B were selected. In each herd, 240 suckling piglets were selected on the third day of age from a group of 40 sows. Those piglets were divided into four different groups. A 2 x 2 factorial design was used with two intramuscular iron dextran injection schemes [37.5; (LI) or 150; (HI) mg/kg] and two oral ferrous sulphate schemes [125; (LF) or 200; (HF) mg/kg, as creep feed]. Piglets were weaned at 21 days of age. Whole blood samples were collected at 20 days of age. All piglets were weighed at 3, 20 and 28 days of age. Statistical linear mixed model results were considered significant when *P* values were <0.05.

Results

At day 20, in each of herds A and B, the hematocrit, hemoglobin and red blood cell counts of groups HI-HF and HI-LF were significantly higher than those of groups LI-HF and LI-LF. Considering both herds, the average hemoglobin concentrations for groups HI-HF, HI-LF, LI-HF and LI-LF at day 20 were 11.12, 11.37, 7.67 and 7.59 g/dL, respectively. Accounting for the weights at day 3, in herd A, groups HI-HF and HI-LF had a significantly higher average daily weight gain between days 3 and 28 when compared to LI-HF and LI-LF (177.63 and 183.47 *versus* 146.22 and 156.98 g/day, respectively). In herd B, no significant growth differences were detected in the same period.

Conclusions

Schemes with a high dose intramuscular iron injection were more efficient than those with the low dose of intramuscular iron injection in preventing subclinical anemia and improving growth in piglets.



AWN-003

EFFECT OF DIETARY NUCLEOTIDE SUPPLEMENTATION IN SOWS DURING LACTATION: DEVELOPMENT OF PIGLETS AT WEANING PERIOD

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Introduction

The porcine placenta is epitheliochorial, which is impermeable to different substances such as immunoglobulins or nucleotides. Nursing pigs receive nucleotides from the diet via colostrum and milk. The milk of the sow is the only direct source of nucleotides for piglets. This is the reason whereby the amount of nutrients, such as nucleotides, that are transferred during lactation they are critical to protect newborns from future intestinal disorders and immune function. Therefore, piglets could benefit from nucleotide supplementation in sows. The objective of this study was to evaluate the effects of supplementing sows with nucleotides during lactation on performance and mortality rate of piglets during weaning and post weaning period.

Material & Methods

1 week before farrowing and during lactation period, sows received a diet supplemented with 500 ppm of a nucleotide formulation specifically designed for pigs. At weaning and post weaning, several parameters were evaluated in 420 piglets from 32 multiparous sows distributed into 2 treatments; piglets from sows that had received nucleotides (experimental diet) and sows that were fed a commercial diet without nucleotides, used as control group. The Statistical Analysis System (SAS) was used for the statistical analyses and alpha significance level was set at 0.05.

Results

When groups were compared, piglets from sows that had received nucleotides showed significant increases in weaned period ($p < 0.05$) in average daily gain (296.59 vs 257.90 g/d); in on consumption (320.92 vs 290.08 g/d). At the end of weaned period; a significant but not statistically ($p = 0.09$) increase in average daily gain and average weight ($p = 0.07$) were observed.

Discussion & Conclusion

These results suggest that dietary nucleotide supplementation in sows 1 week before farrowing and during lactation results in transmission of nucleotides to their piglets, allowing a significantly improvement in performance of weaned pigs.

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WELFARE & NUTRITION

AWN-004

STUDY OF THE USE OF A BACTERIAL XYLANASE TO MODULATE THE MICROBIOTA AND THE GUT HOMEOSTASIS ON PIGLETS SUSCEPTIBLE TO ETEC

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Introduction

Exogenous enzymes favour the release of shorter polymers of the dietary fibre and could promote the development of a beneficial digestive microflora. The bacterial xylanase in weaning pig diet was tested for the impact on the intestinal microbiota and digestive homeostasis. Pigs genetically susceptible to enteropathogen *Escherichia coli* K88ac(ETEC) were used to not preclude the possibility of highlighting the response to xylanase on post-weaning diarrhoea and dis-microbiosis.

Material & Methods

32 ETEC-susceptible pigs, weaned at 25±1 days, were assigned to **CO** (corn/barley/wheat mash standard diet) or **XY** (CO plus 100 g/t xylanase Belfeed). Blood samples and faeces were taken after 14 and 28 days of treatment. At day 28 pigs were euthanized and sampled for jejunum tissue. Pigs were individually evaluated for a five-point faecal score every 7 days. Faecal bacteria 16S rRNA gene was sequenced using MiSeq Kit on a MiSeq-Illumina platform.

Results

Pigs had diffused diarrhoea. In each treatment group, 4 subjects died or were suppressed. The treatment did not change growth, faecal score and reactive oxygen metabolites in blood at the two time points. XY increased villus length in the jejunal mucosa (+ 15 %, p=0.066). The OTUs distribution was fairly homogeneous and Shannon and InvSimpson indices were not changed by treatment and time. Time clusterized for the Beta diversity (p=0.003). Per phylum abundances were quite homogenous among diets and time point and dominated by Bacteroidetes (52%) followed by Firmicutes (43%). At species taxonomic level, *Lactobacillus reuteri* remained longer after weaning in XY (p<0.05).

Discussion & Conclusion

The xylanase supplementation favoured the persistence of xylose-fermenting *L.reuteri*, considered beneficial. This may explain the mild increase of the villus length. The supplementation with xylanase did not improve growth and robustness against pathogenic *E. coli*, but the effect on some beneficial bacteria species is worth further studies.



AWN-005

SKIN LESIONS ON HEAVY PIGS (SLAUGHTERED AT 170 KG) AND THEIR ASSOCIATION WITH THE PREVALENCE OF HAM DEFECTS

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Introduction

Skin lesions due to fighting before slaughter are a welfare problem with economic losses for producers and abattoirs. The Aim of this study was to assess the prevalence of skin lesions at a slaughterhouse over one year in relation to slaughter season and overnight lairage, determining if they could have an impact on ham defects.

Materials & Methods

In one year 648 pig batches were scored during slaughter procedures for skin lesions and classified for ham defects according to IPQ (Italian Parma Quality) standards. The anterior and posterior parts of the carcass were separately scored according to a 3-point scale adapted from the Welfare Quality Protocol.

Results

An annual median of 64,0% of carcasses per batch with severe anterior scratches and a mean of 46,4% for posterior scratches were found. Autumn was the worst season for both skin lesions and ham defects ($P < 0,001$). Overnight lairage resulted in higher prevalence of severe cranial scratches (70,2% vs 58,0%, $P = 0,02$) and veining defect (1,96% vs 1,46%, $P = 0,002$), while it had a preventive effect for petechial haemorrhaging (0,41% vs 0,84%, $P < 0,001$). A correlation ($r = 0,27$, $P < 0,001$) was found between prevalence per batch of severe posterior scratches and IPQ hematomas.

Discussion & Conclusion

Although both skin lesions and IPQ hematomas showed a maximum during autumn, only a low positive correlation between them was found. This poor correlation can be partly explained by an inappropriate observer position on the slaughter line, indicated also by a 0 median for carcass external hematomas. The contradiction between our seasonal trends and those of previous studies reveal that other factors over-riding environmental conditions should be considered. In conclusion the present study confirms that skin lesions represent a problem also for heavy pigs and that overnight lairage and slaughtering season can affect their prevalence.

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WELFARE & NUTRITION

AWN-006

HERBAL VITAMIN D METABOLITE FACILITATES PARTURITION IN SOWS

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Introduction

Modern pig farming is associated with high piglet mortality. The duration of farrowing is critical and has an impact on survival and subsequent thriving of the piglets. Since tedious labour caused by weak muscle tonus is linked to blood calcium level, it was thought that increasing Ca in the sows' diet might improve the reproductive performance. However, previous experiments showed that neither Ca-supplementation nor a supplementation with Vitamin D or 25-hydroxyvitamin-D had any effect.

Solanum glaucophyllum, a South American plant, contains the metabolic active form of Vitamin-D in form of 1,25-dihydroxyvitamin-D₃-glycosides. Since a water-soluble extract of this plant (SGE) was effective in preventing hypocalcaemia in calving cows, a possible effect of this extract on serum Ca, 1,25-dihydroxyvitamin-D₃ and, as a consequence, on farrowing time in sows was examined.

Materials & Methods

In an organic piglet producing farm five sows (German Large White x German Land race) were mated with a Pietrain boar. One day before the calculated parturition date the animals were moved into individual farrowing pens with installed video cameras, allowing continuous monitoring. SGE was given daily, starting 7 days before the expected farrowing. The sows were randomly assigned to control or treatment. In a second, third and fourth round (6, 12 and 18 months later) a crossover was performed. So, over four consecutive parturitions, each animal acted twice as control and as treated, respectively.

Results

SGE treatment showed higher serum Ca and 1,25(OH)₂D₃ than control and parturition time was significantly reduced from 370 minutes to 256 minutes. Regarding farrowing time of each sow in the four consecutive rounds, the crossover from control to SGE was always associated with reduction of the farrowing time and vice versa.

Discussion & Conclusion

An extract of *Solanum glaucophyllum*, containing 1,25-dihydroxyvitamin-D₃-glycosides was able to reduce farrowing time significantly by 24%.



AWN-007

ENZYME STRATEGY TO IMPROVE HEALTH AND GROWING CONDITIONS OF FATTENING PIGS

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The use of dietetic fiber in pig diets can reduce animal aggressiveness and improve gut health maintaining performance. However, pig's enzymatic capacity is limited to breakdown fibre. Moreover, NSP was found to change gene expression patterns and microbiotica composition in the hind gut, reflecting reduced gut health and its productivity. The objective of study was to evaluate the effects of Endofeed DC (multienzyme complex) on health and growing conditions of fattening pigs.

A total of 360 pigs were used (19.2 ± 3.09 kg BW) and allotted to 36 pens (10 pigs/pen) to evaluate the effect of Endofeed DC (125 ppm) on performance of pigs for fattening, based on nutrition and good health. Treatments were: T1-negative control, T2-Endofeed. Productive performance was recorded at 60, 74, 95, 116, 130, 144, and 165 days of age. Culls/mortality and animals requiring injectable antibiotics were registered every day. Statistical analysis of data was performed by GLM of SAS. Body weight was included in the model as covariate.

Pigs fed Endofeed DC improved FCR 7% (2.13 vs 2.28; $P=0.01$), and tended to reduce feed intake (1.46 vs 1.53 kg/d; $P=0.06$) compared with control. Endofeed DC pigs at 144 days showed higher BW 3% (72.7 vs 70.7 Kg; $P=0.02$), although this difference was not statistically significant at 165 days (91.2 vs 89.6 kg; $P=0.12$).

Supplementation of Endofeed DC improve the gut health status which was reflected in their consumption. Improvement 7% in FCR is a direct consequence of enzyme activity which improved NSP digestion, reduced nutrient losses and improve intestinal health and animal welfare (prebiotic response). Final body weight and BWG were also improved by Endofeed DC supplementation.

In conclusion, supplementation of Endofeed DC plays an important role in improve the nutrient digestibility of high viscosity ingredients in swine diets, improving gut health and performance.

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WELFARE & NUTRITION

AWN-008

IMPROVING WELFARE AND NUTRITION OF WEANED PIGLET BY AMYLOFEED

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Introduction

High intestinal viscosity induced by dietary cereals (wheat/Barley) can increase pathogen flora in the distal GIT associated with enteric diseases. These stressors can alter immune systems reducing health and growing conditions. The objective of the study was to evaluate the effects of Amylofeed (multienzyme complex) on the animal nutrition and welfare of weaned piglets.

Material and methods

A total of 320 weaned piglets (7.1 ± 0.50 Kg BW) weaned at 28 days of age were used during 42 days. Treatments were: Control: Basal diet versus basal diet + 0.5 Kg/MT Amylofeed. The Barley/wheat meal basal diets were isonutritives, and met or exceeded the nutrient requirements for piglets (NRC, 1994). Prestarter diets were offered from 1-21 days, and starter diets from 22-42 days. Live weight (**LW**), feed intakes, BWG, FCR, mortality were recorded or calculated at 0, 7, 21, and 42 days of age. Veterinarian inspections were made continuously for any signs of wet droppings/diarrhea. Data were analyzed by GLM of SAS (SAS, 1990). Statistical significance was declared at $P < 0.05$.

Results

Although feed intake was unaffected by the treatments ($P > 0.10$), piglets fed Amylofeed® (D1-D42) improved ($P < 0.05$) BWG (+5.6%; $P = 0.031$) and FCR (-4%; $P = 0.031$) and showed a numerically better feces score compared with the control group. Mortality was unaffected by the treatments.

Discussion and Conclusion

The possible health effect of Amylofeed® in piglets seems to focus on the degradation of NSP of Barley/wheat, reducing its high viscosity and stimulating the growth and activity of beneficial bacteria in the GIT. Amylofeed® added at 0.5 kg/ton to Barley/wheat basal improved welfare and nutrition of weaned piglets.



AWN-009

EFFECT OF HIGH LEVELS OF FIBER SOURCES (ALFALFA AND SUNFLOWER MEAL) IN PIGS' DIET (60-100 KG) ON THE COEFFICIENTS OF NUTRIENT APPARENT ABSORPTION AND GUT HEALTH

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Fibre-high feed ingredients can decrease the cost of pigs diets because of their lower costs compared to the conventional raw materials. The experimental trial was conducted on 9 pigs divided in 3 groups (C, E1, E2) for a period of 8 weeks. The pigs were housed in individual digestibility cages which allowed the daily recording of the feed intake and of the excreta. Diet C was based on corn, wheat and soybean meal had: 17.50 crude protein, 3.50% crude fibre and 3232 kcal/kg ME. The experimental diets differed from group C by their fibre content: 6.5% (E1) and 7.5% (E2). The higher fibre level was obtained with alfalfa meal (4% in E1 diet; 6% in E2 diet) and sunflower meal (12.36% in E1 diet; 18.38% in E2 diet). There were two balance periods of 5 days each (weeks 4 and 8); the average feed intake and excreta (dry matter basis) were recorded and samples were collected, which were analysed for: dry matter, protein, fat, fibre, ash and gross energy. During the first balance period the coefficients of apparent fibre absorption were significantly ($P < 0.05$) higher in both experimental groups (62.64% -E1 and 63.59% - E2), compared to the control group (48.52%). No significant ($P < 0.05$) difference was noticed, however, during the second balance between groups regarding the coefficients of apparent fibre absorption. The total number of bacterial germs in faeces registered significant differences ($P < 0.05$) only between E1 (8.312 ± 0.01 col/g) and E2 (8.342 ± 0.013 col/g) groups for the first balance period. Regarding the total fungal count, significant differences ($P < 0.05$) were recorded only between group C (3.915 ± 0.121 col/g) and group E2 (3.017 ± 0.408 col/g), during the second balance period. In conclusion, the use of high-fibre diet formulations (6.5 and 7.5%) for fattening pigs (60-100kg), didn't have adverse effects on pig health and performance.

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WELFARE & NUTRITION

AWN-010

IMPACT OF SUNFLOWER OIL SUPPLEMENTED DIET ON BEHAVIOR AND HEMATOLOGICAL STRESS INDICATORS OF GROWING-FINISHING PIGS EXPOSED TO HOT ENVIRONMENT

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The objective of this study was evaluated the replacement of 5% starch per 5% sunflower oil (SO), in growing and finishing pigs diet, on behavior and animal welfare. Seventy-two crossbred males (51± 6,29 kg body weight-BW) were housed according to the initial BW, in climate-controlled rooms (collective pens), and exposed to heat stress conditions (30-32°C). The experiment lasted 90 days and the treatments studied were: 1) control diet (5% starch x 0% SO) with *ad libitum* feed intake (FI); 2) SO diet (replacement of 5% of starch per 5% SO) with *ad libitum* FI; 3) control diet with restriction FI or 4) SO diet with restriction FI. Hematological parameters were evaluated on all animals at the beginning of the environmental treatment, on the transition of feed and in the final of experiment. The general activity and position of the animals was evaluated by means of a scan sampling three times per day, during all the experiment. When animals reached BW of 130-140 kg, they were slaughtered by carbon dioxide stunning. To hematological parameters, the hematocrit levels were higher at the end than at the beginning of the experiment. In addition, leucocytes count, although decreased from the beginning to the end of the study, was by far higher than the normal range for this species during all the study. To the behavior parameters, it was found that the pigs lied laterally mainly at noon when the temperature was increased to 30°C, and sternly most frequently during the afternoon and morning when the temperature was maintained at 25°C. In addition, it was shown that pigs fed *ad-libitum* were sleeping more laterally than those fed restricted. Experimental treatments were not able to reduce the hematological stress indicators. In addition, pigs fed restricted were less sensible to the heat stress than pigs fed *ad-libitum*.



AWN-011

INDUCED ABORTIONS IN SOWS AT THE END OF GESTATION, WHAT ABOUT THE SURVIVAL OF PIGLETS?

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Some medical conditions as PED or accidents may necessitate to rapidly induced sow parturition before full term. That's what happened following a major fire completely destroying the farrowing facility of an 800 sows breeding herd (two weeks farrowing batches). Sending some sows to slaughterhouse was impossible since recent administration of a vaccine with a 21 days withdrawal period was done. Significant efforts were made to accommodate sows and piglets on another pig site without any result. Thus, the recommendation was to induce parturition of the next 2 batches of sows (n=159) before full term. Two doses (175 and 131.25 µg respectively) of prostaglandins (Planate[®], Merck Animal health) were administrated by intra-vulvar injection 7 hours apart. This was followed by an intra-vulvar injection of oxytocin (20 IU) 24 hours later. Six sows over 159 (4%) did not abort. Within batch A (79 sows), median time to farrowing=9 days, parturitions began at a median time of 35 hours following second dose of prostaglandin and resulted in many live piglets (62% of total births). Within batch B (74 sows), median time to farrowing=23 days, parturitions began at a median time of 32 hours following second dose of prostaglandin and resulted in lesser live piglets (10% of total births). Once induced, parturitions lasted for more than 10 hours compared to 3 hours in natural time. Two full-time employees were required over 48 hours to ensure follow-up and interventions. A total of 779 live piglets had to be euthanized at birth using a pneumatic powered captive bolt (Zephyr EXL). It could result in a serious welfare concern if people are not sensitized and well prepared to face this kind of intervention. Maybe another protocol would be used to decrease the duration of the abortion because it seems to be difficult for the sows.

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WELFARE & NUTRITION

AWN-012

EFFECT OF FUSARIUM MYCOTOXIN CONTAMINATION IN PIGLET FEED ON PERFORMANCE, ORGAN HEALTH AND IMMUNE STATUS: REVIEW ON FIELD STUDIES

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The susceptibility of pigs to Fusarium mycotoxins is a widely discussed topic. Feed quality control and feed safety regulations may lead to the conclusion that mycotoxins are under control and not of concern for pig health, but the interactive and subclinical effects, even at low mycotoxin contaminations, are underestimated.

This paper provides a summary of four field trials with weaning piglets to show the negative impact of low to moderate mycotoxin contaminations.

Trial 1 was performed with 24 female grower pigs and a mycotoxin contamination of 2 ppm ZEN. Performance and reproductive organs were evaluated in a three-week trial period. Trial 2 included 720 mixed sexed weaning piglets with a DON contamination below 0.9 ppm for the whole trial period of 42 days. Performance and impact on ear necrosis and diarrhea incidences were evaluated. Trial 3 evaluated blood and immunoglobulin status of piglets receiving 2 ppm DON over a period of 56 days. In trial 4, with a co-contamination of 3.8 ppm DON, 0.2 ppm ZEN and 2.5 ppm FUM, performance and the effects on intestinal histology were evaluated. In all four trials one group was supplied with a mycotoxin counteracting feed additive.

All parameters investigated revealed a significant negative impact of mycotoxins on the animals. Besides reduced performance, weight and size of the reproductive organs (uterus, vulva) were increased and blood parameters, such as hematocrit, hemoglobin as well as IgA, were negatively influenced. Villus length and crypt depth were impaired by mycotoxins, ear necrosis incidences as well as the number of diarrhea days were increased. By the addition of the feed additive the negative impacts were reduced.

Mycotoxin contamination even at low levels is a risk factor in swine production. A proper mycotoxin risk management is crucial to reduce subclinical mycotoxicosis in piglets and a resulting loss in performance.



AWN-013

IMPACT OF FUMONISINS AND A FUMONISIN-DEGRADING FEED ADDITIVE (FUMZYME®) ON PERFORMANCE AND BIOMARKERS OF EFFECT AND EXPOSURE IN SWINE

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Introduction

Fumonisin (FUM) are a group of mycotoxins often found in *Fusarium* contaminated maize. As swine is the species most sensitive to FUM, these mycotoxins represent a serious threat to swine production. FUM can cause immune-modulation and organ specific alterations depending on dose and duration of exposure. FUM disrupt the sphingolipid metabolism by blocking ceramide synthase leading to accumulation of free sphinganine (Sa). Consequently, the production of complex sphingolipids, necessary components of nerves, muscles and membranes, is interrupted. In the present study, the efficacy of a feed additive containing a fumonisin esterase (FumD; commercial name FUMzyme®) for detoxification of FUM was investigated, using the sphinganine to sphingosine ratio (Sa/So) in serum as biomarker of effect.

Material & Methods

We performed two trials with identical setup. For each trial, pigs (n=32) were allocated to 8 experimental groups and individually penned during the whole trial period of 42 days. Groups of pigs (n=4) received feed naturally contaminated with fumonisin B1 (FB1) at different concentrations (0.5 - 31 mg/kg) either with or without FumD (10 U/kg). Feces samples were taken at day 14, 28 and 42 to evaluate the enzymatic degradation of FB1 to hydrolyzed FB1 (HFB1). HFB1 shows a reduced toxicity compared to FB1.

Results

In the course of the study a negative impact of FB1 on weight, weight gain and FCR of the animals was observed. For all dietary FB1 concentrations tested, the Sa/So ratio in serum was significantly lower in the groups fed FumD-containing diets. It was almost reduced to control level. Furthermore, for most tested dietary FB1 concentrations, the enzyme caused a significant decrease of the fecal FB1 concentration and a concomitant significant increase of the fecal HFB1 concentration.

Conclusion

We conclude that FUMzyme® is effective in preventing a toxic effect of fumonisins in pigs.

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WELFARE & NUTRITION

AWN-014

EFFECTS OF TWO DIFFERENT CIRCOVIRUS TYPE 2 AND *MYCOPLASMA HYOPNEUMONIAE* VACCINE COMBINATIONS ON ACUTE PHASE PROTEINS IN PIGLET

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Introduction

Acute phase proteins (APPs) have been proposed as biomarkers to monitor welfare, and inflammatory response. C-reactive protein (CRP) has recently been postulated as a potential biomarker use for vaccine safety studies and the haptoglobin (Hp) may be an indicator of average daily weight gain (ADWG) in pig farms. The aim of this study was to evaluate the response of piglets to vaccination with two different PCV2 and Mhyo vaccine combinations based on Hp, CRP and rectal temperature.

Materials and Methods

Two groups of 22 piglets (11 males +11 females) were vaccinated, at 21 days old, with CircoFLEX® (1 mL) and MycoFLEX® (1 mL) in a single injection of (A) 2 mL (FLEXcombo®; Boehringer Ingelheim, Spain, SA) or with a single injection (2 mL) of (B) Suvaxyn CIRCO+MH RTU® (Zoetis). The rectal temperature was recorded before and 8h after immunization. Serum Hp and CRP concentrations were determined at 0, 24 and 48 h after vaccination using an automatic biochemical analyzer (Olympus 2700, Germany). A two-ways ANOVA test was performed and a value of $P < 0.05$ was used to indicate significance.

Results

In relation to baseline, HP serum concentrations increased significantly ($P < 0.001$) in both groups A and B at 24h Post-V. Regarding CRP concentrations this increase was observed at 24h and 48h. In contrast, in group B both Hp and CRP concentrations were significantly higher than group A. 8h Post-V, rectal temperatures were significantly higher in the group B (39.18°C) compared to group A (38.40°C).

Conclusion

The results showed that the production of APPs has been higher and more persistent in animals of group B. In addition, this group had higher rectal temperature. Both observations indicate that these animals showed a greater inflammatory response upon vaccination and, therefore, a worse adaptation to weaning. This difference has been observed also in Iberian piglets.



AWN-015

COMPARISON OF ISOTONIC PROTEIN SOLUTION AND MILK REPLACER EFFECTS IN SUCKLING PIGS

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Introduction

The purpose of this study was to investigate the effects of an isotonic protein drink (Tonistry Px™) on productivity in suckling pigs, when compared to milk replacer.

Materials and Methods

The study was conducted at Swine Innovation Centre Sterksel. 80 litters of York/Dutch Landrace were assigned to treatment groups, randomized by parity and expected farrowing date. Treatment groups were (C) negative control group; (PX) litters receiving 3% Px™ solution 500 mL/litter/day; (PX+M) Px + Milk replacer group; (M) positive control group receiving only milk replacer. All treatment groups received their respective treatments from day 2 -8 after birth. The volume of milk replacer was increased daily from 100 to 1200 mL in this time. Groups PX and PX+M also received a combination of Px solution and gruel for 3 days before weaning.

Piglets were individually weighed at birth, day 9, and weaning. The amount of Px™ or milk replacer consumed by each litter was measured daily. All groups received creep feed after day 9. Dry feed intake, mortality, culls, diarrhea scores and medications were also recorded. Weights were analyzed using a GLM using litter as the experimental unit.

Results

Pigs were weaned at 26 days. PX pigs weighed 7.76 kg at weaning, which was significantly greater than other treatment groups (PX+M 7.22 kg, M 7.20 kg, and C 7.13 kg, P<.05).

Discussion and Conclusion

Litters given Px from day 2-8 of age weighed an extra 0.5 kg at weaning compared to litters given milk replacer, a combination of milk replacer and Px, or normal suckling. This represents a 7% increase in weaning weight and suggests that early enterotrophic nutritional support increases productivity weight at weaning.

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WELFARE & NUTRITION

AWN-016

EFFECT OF ZINC OXIDE SOURCES AND DOSES ON WEANED PIGLETS

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Introduction

Zinc oxide (ZnO) is commonly added in piglets diets, at nutritional dosage (110 mg/kg Zn) to fulfil animal requirements or at pharmacological dosage (2400 mg/kg Zn) to improve growth performance. When ZnO is supplied at high dosage, Zn level in animal wastes may be high and lead to environmental concerns. In this study, a potentiated ZnO source (HiZox[®], Animine), a coated ZnO and the standard ZnO were compared at different doses.

Material and methods

A total of 108 piglets, weaned at 21 days, were allocated to 18 pens (6 piglets/pen) and fed with 6 experimental corn-soybean based diets during 14 days: standard ZnO (110, NC; or 2400 mg/kg Zn, PC), coated ZnO (110 or 220 mg/kg Zn) or potentiated ZnO source (110 or 220 mg/kg Zn). Piglets were weighed individually at d0 and d14 and feed intake was recorded. At the end of the experiment, 3 piglets per pen were selected and sacrificed. Contents from proximal and distal small intestine were collected. Numbers of bacteria (*E. coli*, coliform bacteria) were assessed using selective media.

Results

There was no significant difference between the treatments for the growth performance. NC showed the lowest weight gain (1.2 kg) and PC the highest (1.6 kg). In the proximal small intestine, numbers of *E. coli* were significantly ($P < 0.05$) higher for NC and for the coated ZnO, compared to PC; the potentiated ZnO obtained intermediary results. In the distal small intestine, similarly, *E. coli* and coliform bacteria populations were significantly ($P < 0.05$) higher for the coated ZnO compared to PC.

Discussion & conclusion

ZnO at pharmacological dosage showed reduction in *E. coli* and coliform counts compared to NC, whereas the coated ZnO showed no reductions and the potentiated ZnO showed consistent, but only numerical reductions. Complementary analyses are in progress.



AWN-017

CARDIAC LESIONS AND HEART WEIGHTS OF MARKET PIGS AS RISK FACTORS FOR IN-TRANSIT LOSSES

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Introduction

Individual pig factors are likely more of a significant cause of in-transit losses than commonly considered risk factors such as elevated temperatures, over-crowding, inappropriate handling, or long transport times. The objective of this study was to determine if pre-existing cardiac pathology predisposes market pigs to death during transit.

Materials and Methods

Hearts were collected from one of the two largest swine abattoirs in Ontario, Canada between June 2012 and April 2015. Hearts collected from the processing line (N=388, non-ITL /control hearts) were examined and compared to ITL hearts (N=70, from hogs found dead on the truck). Hearts were examined grossly and histologically for the presence or absence of lesions. Comparison of the weights and weight ratios of the intact heart (THW), the left ventricle and septum (LV+S), the right ventricle (RV) and the body (BW) weights were performed.

Results

The hearts of ITL pigs had significantly greater THW/BW, LV+S/BW and RV/BW than non-ITL pigs ($p \leq 0.0001$). ITL hearts had a greater frequency of dilation of the aorta and pulmonary artery (59% vs 1.5%), dilated atria (67% vs 0.5%), dilated RV chamber (100% vs 5%), thickened LV walls (97% vs 64%) and thickened atrioventricular valves (50% vs 3.6%) over non-ITL hearts ($p \leq 0.0001$). Medial hyperplasia of the coronary arteries, nuclear rowing, and irregular bundles of hypertrophic myocardial fibres were present with variable severity in both ITL and non-ITL hearts.

Discussion and Conclusions

ITL hogs have cardiac lesions which predispose them to acute heart failure during transport. Commonly described transport-risk factors for ITL pigs (handling, ramp inclines, stocking density and temperature) increase the cardiac workload of pigs resulting in insufficient cardiac output in pigs with cardiac pathology. This study indicates the importance of examining the hearts of ITL hogs for specific gross pathologies when investigating in-transit losses of market hogs.

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WELFARE & NUTRITION

AWN-018

PREVALENCE OF STOMACH LESIONS IN FINISHER PIGS AND SOWS AT SLAUGHTER IN THE NETHERLANDS (2017 COMPARED TO 1990 AND 2010)

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Introduction

Mucosal lesions of the stomach are quite common in pigs. The squamous epithelium of the pars oesophagea has no mucus-secreting glands, which makes this part more sensible to the damaging effects of acid and pepsin and hence more predisposed to ulceration. Risk factors described most frequently are finely ground feed and stress. Severity of the lesions can range from slight parakeratosis with little or no clinical relevance, to a fatal bleeding ulcer. At recovery of the lesions, scar tissue can cause stenosis of the stomach entrance, which hinders feed intake. In 1990 and 2010, GD Animal Health (NL) studied the prevalence of stomach lesions in sows and finishers at slaughter. To gain insight in possible trends, in 2017 a similar new study was done.

Material & Method

After slaughter, stomachs of pigs were opened, washed and scored from 0 to 5 according to the following protocol: intact mucosa (0), some parakeratosis (1), extensive parakeratosis (2), parakeratosis with some small erosions (3), parakeratosis with extensive erosions (4), severe lesions / ulceration / stenosis of the stomach entrance (5). Samples were examined from at least 30 finisher farms and from at least 30 sow herds.

Results

At slaughter stomachs were assessed of 682 finishers and 184 sows. The prevalences of the respective stomach scores in finishers were: 7.2% (0), 35.6% (1), 33.9% (2), 18.0% (3), 4.3% (4) and 1.0% (5).

In sows it was 10.3% (0), 33.2% (1), 24.5% (2), 24.5% (3), 7.1% (4) and 0.5% (5).

Conclusion

Compared to investigations done in 1990 and 2010, results of the latest study were fairly similar. No distinct trend was observed since 1990. The number of pigs with an intact stomach mucosa (code 0) is quite low, but so is the number of pigs with severe lesions (code 5).



AWN-019

XYLANASE AND LIVE YEAST IN PIGLET DIETS INFLUENCE INTESTINAL BACTERIAL POPULATIONS AND ANIMAL PERFORMANCE

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The objective of this study was to evaluate the effect of xylanase supplementation and the addition of live yeast (*Saccharomyces cerevisiae*) on the performance and intestinal microbiota in piglets. One hundred eighty commercial crossbred PIC piglets (23-days-old) were sorted by initial body weight and allocated to one of three treatments: CTR (control diet), XYL (CTR diet supplemented with 16,000 BXU/kg xylanase [Econase[®] XT]) and X+Y (XYL diet supplemented with 1 kg/t of live yeast, 2×10^{10} CFU/g [Vistacell[®]]). Each treatment had ten replicates, with 6 animals each. Two feeding phases, based on sorghum and soy-bean meal, and water were available *ad libitum* for the 42-days of the study. Average daily gain (ADG) and daily feed intake (ADFI) were measured from 0 to 42 days (23 to 65-days-old) and feed efficiency calculated (FCR). At the end of the study, bacterial identification through 16S rRNA (V3-V4) sequencing of the ileal and caecal digesta from one piglet per replicate was performed. No treatment effects were observed on ADFI. Pigs offered the live yeast in addition to the xylanase had increased ADG (CTR = 402 vs X+Y= 422 g/pig/d; $P = 0.043$) compared with those pigs supplemented with xylanase alone (CTR = 402 vs XYL = 406 g/pig/d; $P = 0.655$). Feed efficiency was improved with XYL (1.74) and X+Y (1.70) compared with CTR (1.82; $P = 0.018$). XYL and X+Y tended to increase the relative presence of Lactobacillaceae in the ileum ($P = 0.089$) and caeca ($P = 0.086$). Clostridiaceae counts were reduced by 10% in the ileum with XYL and 14% with X+Y compared to control ($P = 0.081$). Live yeast supplementation combined with xylanase during the nursery phase in piglets improved performance and led to an improved microbial balance.

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WELFARE & NUTRITION

AWN-020

INFLUENCE OF DIFFERENT FARROWING AND WEANING SYSTEMS ON THE WELFARE AND HEALTH OF WEANER PIGS

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Introduction

In modern pig husbandry, animal welfare is an important factor for raising healthy animals. In this study effects of early socialization in farrowing units and effects of mixing pigs at different ages on their welfare and health were examined.

Material /Methods

Piglets were raised either in single-litter-systems with conventional farrowing crates (FC) or free-movement-pens (FMP) or a multi-litter system with group-housing (GH).

There were additionally three different postweaning systems: a standard system with mixing and regrouping at weaning (control group CG), a system where the weaners were left in their farrowing system (weaning-in-farrowing unit WiFu) and a wean-to-finish (WetoFi) system (more space).

Eight consecutive batches were performed, where piglets were tail-docked or undocked batchwise.

Scorings for claw health, skin lesions, lameness, diarrhea and coughing were performed every two weeks during the weaning period (T1, T3, T5), tail lesions were scored weekly (T1 – T5).

Results

At T1 GH-piglets had less skin lesions than the FC- or FMP-piglets. From T1 to T5, skin lesions decreased in the CG and the WetoFi-group in contrast to the WiFu-group.

In the WetoFi-group significantly more claw lesions developed at T1 than in the other groups. From T1 to T5, claw lesions decreased again and were less severe in all groups.

Tail lesions increased from T1 to T5 and got worse in all weaning-systems, especially in undocked CG-pigs. At T5, GH-piglets showed more severe tail lesions than FC- or FMP-piglets.

Discussion/Conclusion

Less skin lesions in GH-piglets indicate a positive benefit of early socialization. Development of claw lesions shortly after weaning depended on floor conditions. Leaving the piglets in their farrowing crate seems to be the least stressful kind of weaning. More frequent and severe tail lesions at the end of weaning may be a result of less space availability and insufficient enrichment in the pens.



AWN-021

RELATIONSHIP BETWEEN VITALITY SCORE, COLOSTRUM INTAKE AND MORTALITY OF PIGLETS IN DIFFERENT FARROWING ENVIRONMENTS

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This study investigated relationships between vitality score (VS), colostrum intake (CI), and mortality of piglets during 24 h postpartum in different farrowing environments. A total of 334 piglets [Duroc × (Danish Yorkshire × Danish Landrace)] from 26 sows were used for this experiment. The sows were kept in (1) CRATE (N=13): a farrowing crate (crate size: 220 × 80 × 80, pen size: 250 × 170), or (2) OPEN (N=13): an open farrowing crate (crate size: 220 × 80 × 180, pen size: 250 × 240). At birth, VS and body weight of each piglet were recorded. The VS was observed for the first 15 seconds of life and divided into low (LVS; with no movement; N = 153) or high (HVS; with movement; N = 181) group. At 24 h after the first piglet, all piglets were weighed again for estimation of CI. The farrowing environment did not affect CI or VS. However, there was higher mortality in OPEN pen compared to CRATE pen (17.1 ± 2.1 vs. 1.3 ± 2.3 %; $P < 0.001$). The mortality rates between LVS and HVS were not differed in both farrowing environments. In CRATE pen, HVS had higher CI than LVS (287.9 ± 26.3 vs. 217.3 ± 26.3 g; $P < 0.01$), whereas in OPEN pen, CI was not differed between LVS and HVS. In conclusion, this experiment indicate that piglet vitality at birth was associated with colostrum intake in the farrowing crate, but not in the open farrowing crate. Further study will be needed to demonstrate the causal relationship between colostrum intake and farrowing environments.

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AWN-022

TARGETED METABOLOMICS: EXPLORATIVE STUDY ON THE METABOLOMIC RESPONSE OF SEVERAL ALGAE IN WEANED PIGLETS CHALLENGED WITH *ESCHERICHIA COLI* K88

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Andres Pintaluba, S.A., Reus, Spain.

Introduction

The beneficial effects of algae on nutrition, physiology, health promotion and welfare for animals and humans are well documented. A novel approach is necessary to explain positive effect of algae on growth promotion, antioxidant and antimicrobial effect, immune system modulation and gastrointestinal tract protection through measuring the metabolic profile changes in weaned piglets fed with algae. The aim of this study is to profile the biological samples of weaned piglets challenged with *Escherichia coli* K88 using metabolomic analysis to elucidate mechanism of action of algae supplementation on weaned piglets.

Material & Methods

The study lasted 14 days, had a randomized complete block design, using 56 weaned piglets in 4 treatments (Basal Diet -BD-, BD plus algae APSA108005 or APSA103017 or APSA102026 at 0.2%). Oral challenge with 5×10^8 CFU *E. coli* K88 was performed on day 4. On day 14, plasma, serum, muscle and liver were collected from one piglet per pen to determine the profile variation of biochemical parameters by detection kits, malondialdehyde by spectrophotometry, fatty acids and amino acids by GC-MS and HPLC-DAD respectively.

Results

26 metabolites were up-regulated and 23 down-regulated significantly ($p < 0.05$) in weaned piglets supplemented with algae compared with control ones. These metabolites demonstrate the antioxidant effect of algae (Malondialdehyde, HDL, C16:1n7, methionine), on growth promotion-source of energy (leucine, lipids, glucose, cholesterol, phospholipids, triglycerids, NEFAS-liver, total protein, C18:2n6, aspartic acid, serine, histidine, leucine), antimicrobial effect (valine) and immune system modulation (alanine, methionine, lysine).

Discussion & Conclusion

The metabolome of algae supplemented weaned piglets was different from the control ones. Significantly differences were observed in metabolites related with antioxidant effect, protein and energy metabolism, the response of the animal against infections and immune system modulation. 14 first days algae supplementation in weaned piglets diets have potential to improve animal performance and welfare.



AWN-023

WEANED PIGLETS: 14-DAYS ALGAE TREATMENT IMPROVES HEALTH AND PERFORMANCE OF ANIMAL DURING THE POSTWEANING PERIOD

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Introduction

In pigs, digestive disorders associated with weaning lead to antibiotic use to maintain intestinal health. Algae have been studied for their beneficial effects on health, specifically on GIT. The aim was to assess the effects of algae on performance and health status in pigs during the postweaning period at a pilot experimental farm.

Materials and methods

A total of 288 weaned piglets (7.2 ± 0.41 kg BW) were housed in 24 pens of 6 animals (males and females) in a replicated complete randomized design. Each pen was randomly allocated to 1 to 3 dietary treatments during first 2 weeks after weaning. Treatments were: nonmedicated (NM), feed medicated with 0.69% antibiotics (AB), and feed with 0.2% algae (MA). All diets were isonutritive. Trial duration was 42 days of postweaning. Health status was registered daily; feed intake and BW were recorded at days 0, 14 and 42 of postweaning period.

Results

No differences ($P > 0.10$) among treatments were observed on health status (mortality and proportion of applied veterinarian treatments). Pigs fed MA tended ($P = 0.05$) to exhibited a greater FCR compared with NM and AB (0.72 vs 0.68 ± 0.015 kg/d) after postweaning period. However, no differences ($P > 0.10$) among treatments were observed in daily feed intake, ADG, and final BW after 42-d postweaning period (0.48 ± 0.013 kg/d, 0.33 ± 0.010 kg/d, and 21.4 ± 0.43 kg, respectively).

Discussion and Conclusions

Benefits of microalgae were observed on health status and performance compared with antibiotics encouraging the use of algae as an alternative to manage early postweaning disorders. In conclusion, supplementation of algae plays an important role in improving gut health and maintaining performance when antibiotic use will be severely reduced across most of European countries.

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WELFARE & NUTRITION

AWN-024

COMPARISON OF SKIN INJURIES IN PIGLETS DURING CASTRATION IN THE FIRST WEEK OF LIFE

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Introduction

Surgical castration is still widely executed to avoid boar taint, although alternative methods already exist. While information about suffered pain is available, skin wound dimensions and healing are neglected in many studies. The impact of surgeon and anaesthesia onto dimensions of skin incisions was evaluated in two farms.

Material & Methods

Skin incisions were measured immediately after castration in 178 male piglets. In farm A, two farm-employees castrated piglets on days 6-7 of life without anaesthesia (n=59), while in farm B two surgeons castrated piglets on 1-4 days of age under isoflurane inhalation anaesthesia (n=119). A potential injury caused by double Improvac[®] vaccination was assessed by taking the dimensions of the recommended needles into account.

Results

The mean length of the sum of incisions in one individual was 34.9±8.6 mm in farm A and 35.2±8.1 mm in farm B with significantly higher values in anaesthetized animals. Surgeons differed in their experience and skin incision technique (two parallel cuts or one horizontal cut), thus mean length difference between surgeons was highly significant (p<0.0001). There was no correlation between the piglets' age and the length of incisions.

Discussion and Conclusion

Longer incisions in anaesthetized animals in this study might be due to better skilled surgeons castrating without anaesthesia. As alternatives for surgical castration are available, it must be assessed, if non-surgical alternatives as immunocastration can be implemented in the future. The depth of penetration of needles provided with the safety system of Simcro[™] Sekurus[™] for application of Improvac[®] is 9 or 15 mm, resulting in sting-lengths of 18 or 30 mm after double injections, which is less than the incisions length caused by surgical castration. As margins of wounds were not completely adapted after surgery, the 1.6 mm diameter of the needle was not taken into account for injury comparison.



AWN-025

BREEDING FOR BETTER HEALTH BY USE OF COMPUTED TOMOGRAPHY AND EXPERIENCES WITH USE OF AZAPERONE AS A SEDATIVE AGENT FOR BOARS BEFORE COMPUTED TOMOGRAPHY

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Introduction

When breeding for increased growth rate, a correlated negative effect is increased prevalence of osteochondrosis. At Norsvin boar test station, the boars are sedated with azaperone at 120 kg live weight before undergoing computed tomography (CT). For Norsvin Landrace (L) and Norsvin Duroc (D) boars CT has been used in the breeding programme since March 2008 to assess osteochondrosis based on the images to counteract such a negative development.

Materials and methods

From 2014 to 2017, a total of 10,560 boars were sedated with azaperone (Stresnil® - Janssen), 8 mg per kilo live weight before scanning. All the boars were given an osteochondrosis-score based on a subjective evaluation of CT-pictures in 3 dimensions of each elbow and knee joint. In addition, individually daily growth and feed consumption was registered. Data from this period was analysed to evaluate complications after sedation and to estimate genetic trends for growth rate and osteochondrosis.

Results

We have seen an increase in early growth (0-40 kg), -0.8 days (L) and -3 days (D) and a decrease in osteochondrosis-score of -0.9 (L) and -0.25 (D). Following sedation of 10,560 boars, side effects were seen in only 170 (1.61%) of the boars. A total of 64 boars (0.61%) died, 17 (0.16%) were euthanized due to penis prolapse and 89 (0.84 %) were euthanized due to muscular trauma in the hind legs.

Conclusion

Use of computed tomography has made it possible to avoid increased prevalence of osteochondrosis when breeding for increased early growth. The percentage of boars lost due to complications related to sedation is minimal (1.61%).

During the presentation, a video showing CT-scanning of boars and assessment of osteochondrosis will be shown.

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AWN-026

EFFECTS OF A PHYTOGENIC FEED ADDITIVE ON INFLAMMATION, OXIDATIVE STRESS, GUT PERMEABILITY AND GUT MORPHOLOGY IN NURSERY PIGS

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The effects of a phytogenic feed additive (PFA) on inflammation, oxidative stress, gut permeability, and gut morphology in nursery pigs were determined. Dietary treatments were basal diet [CON] and basal + 0.015 % PFA (Digestaron[®], Biomin Holding GmbH).

Pigs (n=11/trt, BW=7.50 ± 1.04 kg) were penned individually and fed the two dietary treatments. On d 26, blood samples were collected from each pig, then pigs were orally gavaged with a solution of lactulose and mannitol, urine samples were collected for a period of 12 h after gavage. On d 28, pigs were euthanized and samples from the liver and ileum were collected.

Supplementation of PFA increased serum IGF-1 (124.91 vs. 144.90 ng/mL, $P=0.002$) and tended to reduce serum interferon (IFN)- α (1.12 vs. 0.62 pg/mL, $P=0.084$); no significant effects ($P\geq 0.194$) were observed on serum haptoglobin, IFN- γ , interleukin (IL)-6, IL-1 β , IL-10, IL-8, and tumor necrosis factor- α . Supplementation of PFA did not significantly affect ($P\geq 0.434$) markers of oxidative stress in the liver and ileum (malondialdehyde, protein carbonyls, glutathione peroxidase activity, and superoxide dismutase activity) and in-vivo gut permeability (lactulose:mannitol ratio). Supplementation of PFA significantly increased ($P<0.001$) villi height (263 vs. 302 μm) and crypt depth (180 vs. 206 μm), but did not affect villi:crypt ratio (1.38 vs. 1.40, $P=0.758$). Supplementation of PFA significantly increased goblet cell number/villi (13.6 vs. 16.4, $P=0.023$).

Overall, supplementation of PFA increased growth factors, reduced pro-inflammatory cytokine expression, improved gut morphology, and increased goblet cell count.



AWN-027

BODY CONDITION SCORING - A RELIABLE METHOD TO ESTIMATE WEIGHT LOSS IN LACTATING SOWS?

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Introduction

In the lactation period, sows' body reserves need to be mobilized, if the energy need is not covered by food intake. A high weight loss negatively affects animal health, wellbeing and biological performance. Therefore, monitoring the sow's body condition is important to be able to adjust the quality and quantity of feed. In practice the most common method is the Body Condition Score (BCS). The aim of this study was to investigate the accuracy of this subjective scoring method regarding the actual weight losses.

Materials & Methods

The study was carried out at a basic breeding operation of the BHZIP GmbH with landrace db.01 sows, kept in single housing free-movement pens. The data of n=714 litters was collected in 18 batches from October 2016 until November 2017. Sows' bodyweight (kg) and BCS (1-5) were documented when the sows entered the farrowing system, subsequently 12-36 hours after farrowing, and when the sows left the farrowing unit.

Results

When the sows entered the farrowing system, their body weight was on average 273.66kg and their body condition score was 3.35. After farrowing they weighed 254.13kg with a BCS of 3.03, and when they left the system it was 229.92kg and 2.58. The correlations between bodyweight and BCS at all three time points were positive but low ($r_1=0.26$, $r_2=0.17$, $r_3=0.42$), and for all three points significant ($p<0.0001$). The loss in bodyweight and BCS was calculated for three different time periods. Correlations between these losses in weight and BCS were also positive (r range from 0.20-0.37).

Discussion & Conclusion

The correlations between bodyweight and BCS are on low level, but highly significant and point in the same direction. Even though the assessment of BCS is not as accurate as the bodyweight, it is still a valid method and much easier to implement on farm.

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WELFARE & NUTRITION

AWN-028

EVALUATION OF AIR HYGIENIC PARAMETERS IN FARROWING PENS WITH AND WITHOUT FIXATION OF THE SOW

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Introduction

The hygienic status, characterized by different parameters, of the husbandry system is of essential importance for porcine health. Parameters such as noxious gases or microbial load can vary within and between batches, regular monitoring offers useful information. As alternative farrowing systems gain importance, the aim of this study was to compare hygienic parameters, with the main emphasis on air quality, in pens without any fixation of the sow during lactation -single loose housing pens (LH) and a group-housing system for six lactating sows (GH) - with a conventional farrowing crate (FC) system.

Materials & Methods

The study was performed in nine batches with averagely six sows in the respective compartments with LH, GH and FC systems. Sampling took place at the beginning (day 6), mid (day 19) and end (day 31) of the farrowing/suckling period. At each sampling date, the air quality was assessed by the parameters ammonia and microbial load (total bacteria count per m³). Moreover, temperature was recorded, and the fecal contamination of the pens was evaluated via a contamination score from 1 to 4. All data was analysed statistically (SAS Enterprise Guide 7.1).

Results

Regarding the total bacteria count, it increased over the farrowing/suckling period, but no significant differences between the systems were observed. Variations in ammonia concentrations showed a seasonal effect and correlated with outside temperatures, but significant differences between the systems were assessed neither. The contamination score was highest in GH systems.

Discussion & Conclusion

On base of the hitherto analyzed data, no significant differences in the hygienic status of the different farrowing systems were documented. The only exception is the grade of fecal contamination, which was increased in the GH pens. The contamination was higher due to different housing equipment elements and “dead” corners; and therefore, practical improvements can be realized.



AWN-029

EFFECTS OF DIETARY PEAS MIXED WITH LINSEED (3:1) ON MINERAL AND ENZYMATIC PLASMA PROFILE IN WEANED PIGLETS

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Modifying dietary fatty acid composition of piglets, especially at weaning as the most critical period of their live, by using sources of long chain polyunsaturated fatty acids such as linseed and peas can contribute on anti-inflammatory function increasing piglet's health status and welfare. The study was conducted to evaluate the effects of dietary peas: linseed mixture (3:1) on certain plasma metabolites (minerals and enzymes) in weaned piglets. A total of 20 weaning piglets Topigs, 28 ± 3 days of age, 6.96 ± 0.94 kg weight were divided into 2 groups: control diet (C diet) with a classical corn-soybean meal diet and peas: linseed diet (E diet, 3:1). The plasma mineral profile (Ca, P, Mg, Fe) and the enzymes concentration of the alanine aminotransferase (ALAT), aspartate aminotransferase (ASAT), alkaline phosphatase (AP), gamma-glutamyl transferase (GGT), lactate dehydrogenase (LDH) and creatine kinase (CK) were determined by BS-130 Chemistry analyser (Bio-Medical Electronics Co., LTD, China). The dietary addition of peas: linseed mixture decreased significantly the plasma concentration of Ca (-5.2 , $P=0.05$) whereas the plasma concentration of Mg was significantly higher ($+23.5$). Additionally, the Ca and Mg were correlated with α -linolenic fatty acid whiles Ca ($r=0.53$, $P=0.03$) is negatively correlated the Mg ($r=0.81$, $P<0.0001$) reflected a positive correlation. The concentration of plasma P and Fe was not affected by the dietary addition of peas: linseed mixture. There was no significant difference for the enzymes concentration of ASAT, GGT, LDH, CK in plasma of piglets fed E diet, except for the ALAT where was noticed a tendency of decrease (by 6.8%, $P=0.06$) compared with control diet. The results suggest that dietary peas: linseed mixtures (3:1) improve significantly plasma Mg concentration and by decreased plasma concentration of ALAT, a marker of liver injury, could contribute to improved health state of piglets in a stressfully period.

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AWN-030

THE EFFECT OF DIETARY HEMPSEED (*CANNABIS SATIVA*) ON PLASMA IMMUNOLOGICAL PARAMETERS ON LACTATING MULTIPAROUS TOPIGS SOWS

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The hemp is a vegetable source rich in n-3 fatty acids (FA). The objective of this paper was to evaluate the changes of plasma immunoglobulin (IgA, IgG, IgM) on lactating sows due to dietary addition of hempseed. The biological trial was conducted with 10 multiparous sows assigned randomly for 21D to two groups: control (CL), which received the classical diets, and experimental (HSL), treated with 5% hempseed. Blood samples were aseptically collected in the first day (1thD), 7D and 21stD after farrowing and at 101D of gestation considering as references value. The concentration of immunoglobulin was measured by Elisa after plasma dilution. The IgG concentration decreased ($P>0.05$) compared to 101D of gestation (19.34 mg/mL in CL group and 16.95 mg/mL in HSL group vs. 28.34 mg/mL at pregnant sows). The same tendency was noticed for IgM synthesis (6.58 mg/mL in CL group and 6.86 mg/mL in HSL group vs. 8.07 mg/mL at pregnant sows). However, the diet did not change significantly the synthesis of these parameters. Whatever the diet the IgA, known as an anti-inflammatory antibody, increased in lactating sows ($>23.15\%$ than references value). After farrowing we registered a decline whatever the type of immunoglobulin and starting 7D the concentration increased except IgG. At 21D AF the concentration of IgA was significantly increased compared to 1thD. With regard IgM tend to increase in time while the IgG reach similar value as 1thD ($P>0.05$). The 5% dietary hempseed given to HSL sows increased 1.61 times α -linolenic FA concentration in the diet, 1.01 times linoleic FA concentration. A higher dietary concentration of n-3 FA could be responsible for the immune response noticed in experimental diet. We can conclude that hempseed is a valuable resource which did not affect significantly the level of immunoglobulin while in time the immune response was different.



AWN-031

THE EFFECTS OF DIETARY FATTY ACIDS ON PASSIVE IMMUNITY AND PERFORMANCE PARAMETERS IN WEANING PIGLETS

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Weaning is one of the most stressful events in a pig's life; during which they encounter a multitude of intestinal, immunological and social challenges which interfere with gut development and growth performance, previously controlled using growth-promoting antibiotics. However; an EU-wide ban prohibiting their use began in 2006, directing research towards developing safe alternatives. Studies indicate that fatty acids are efficient immunomodulators and exert a positive effect on animal performance. This research aims to investigate the strategic use of fatty acids as a natural alternative to antibiotics, in order to create a sustainable feed product with advantages to animal welfare as well as industry.

80 pregnant sows were fed either a standard diet + *fatty acids* or standard diet only. Colostrum samples were used to measure immunoglobulin profile whilst piglet sera samples were analysed for IgG to test if enhanced immunity was transferred during nursing. The second part of this study identified whether any positive changes were reflected in piglet performance.

IgA and IgM colostrum concentrations were significantly higher ($P < 0.05$) in sows fed supplemented diets whilst IgG, although not significant, was also higher. Sera IgG was significantly higher in piglets born to sows on the supplemented diet. In regards to performance, piglets born to treated sows showed significantly improved feed conversion ratios and weight gain.

These results suggest that colostrum produced by fatty acid supplemented sows was of a higher nutritional value and provided a greater level of immune protection to piglets. This resulted in improved piglet performance, indicating that the enhanced composition of the colostrum is both nutritional and beneficial to piglets. It is thought that the pathway for improving milk quality involves promoting a healthier gut through controlling the balance of microflora. This then allows the animal to maximise feed efficiency, thus improving immune status and body condition.

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AWN-032

INFLUENCE OF CALCIUM AND BICARBONATE LEVELS IN DRINKING WATER ON THE PERFORMANCE OF NEWLY WEANED PIGLETS (4-9 WEEKS OF AGE)

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In Flanders, certain pig farmers use deep drainage water (depth 4-8m) as drinking water. This water contains high levels of calcium and bicarbonates. It is unclear to which extent these levels affect newly weaned piglets. Therefore, 2 experiments were carried out on the effect of either high bicarbonate or high calcium levels on performance, water consumption and fecal consistency, in newly weaned piglets. In both experiments, 8 pens of 6 piglets (3 gilts and 3 barrows) received tap water, 8 pens received tap water with extra CaCl_2 (0.5 g/l) in exp. 1 or NaHCO_3 (1 g/l) in exp. 2 and 8 pens had the choice between tap water and the same treatment water. Increasing the hardness in exp. 1 (56.3 °F vs 22.7 °F) did not significantly affect performance, water consumption and fecal consistency. Similarly, increasing the bicarbonate level (845 vs 160 mg/l) in the second experiment did not affect fecal consistency scores or piglets' performance. However, pigs that had the choice between tap water and water with high bicarbonate levels performed significantly worse: daily feed intake decreased with 24g/day, daily weight gain decreased with 58 g/day and feed conversion ratio increased with 0.13 g/g. The reason for this is unclear. An interaction between water type and time point on water usage was observed ($P < 0.001$): While no difference in water use was observed at start of the nursery period, over time more water was used in the pens receiving tap water in comparison to pens receiving water with high bicarbonate levels. In contrast to the perception in practice with deep drainage water, no detrimental effect of water calcium or bicarbonate level on piglet's performance could be identified in the experiments. Further research is necessary on the effect of combinations of parameters and in different (more challenging) conditions.



AWN-033

EVALUATION OF SOWS' AND PIGLETS' PERFORMANCE IN FARROWING PENS WITHOUT FIXATION

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Introduction

Conventional pens with farrowing crates (FC) restrict lactating sows in various behavior patterns, and its acceptance declines in society. Therefore, alternative systems without any fixation of the sow during lactation -single loose housing pens (LH) and a group-housing system for six lactating sows (GH) - were compared to the FC system with regard to performance data of sows and piglets. Moreover the proportion of cross suckling in the GH system was assessed.

Materials & Methods

From 156 sows and 2,338 piglets in nine batches, weaning weights of the piglets, average losses and causes of piglet losses were analyzed.

Cross suckling was analyzed via direct observation on three sampling periods per batch in four batches. Following parameters were assessed: number of cross suckling piglets, location, synchronization and success/failure of each suckling bout.

Results

The highest losses were observed in the LH with 25.7%, followed by the GH with 19.9% and the FC with 12.3%. The main reason for the increased losses was a higher proportion of crushed piglets. LH piglets reached the highest mean weaning weight (8.2 kg), followed by the FC piglets (7.5 kg) and the GH piglets (6.9 kg).

In total, 393 suckling bouts were observed in the LH system. About 90% (n=354) of the suckling bouts were successful. Cross suckling occurred in 35% of all successful suckling bouts. The average number of cross suckling piglets per successful nursing was 0.56. Initially, for nursing, the pens were preferred, whereas in the following two examinations more suckling bouts took place in the communal area. The grade of nursing synchronization was high with two thirds of all suckling bouts in groups of four to six sows.

Discussion & Conclusion

Further research is necessary to develop the two tested alternative farrowing systems into a marketable commodity.

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AWN-034

PRE-WEANING GROUP HOUSING AFFECTS FIGHTING ACTIVITY AND DAILY WEIGHT GAIN OF PIGLETS WHEN MIXED WITH UNFAMILIAR CONSPECIFICS AFTER WEANING

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Introduction

Pre-weaning group housing for sows and their litters becomes increasingly important in order to enhance sow welfare. However, there is still a lack of knowledge concerning potential benefits for piglets during the post-weaning period.

Material & Methods

In the present study, weaner pigs were mixed in groups of 10, using littermates (LM) originating from pre-weaning group housing (Gr) and from farrowing pens with crates (Co). The following variations were studied in three replicates: Gr/Gr (5 LM from Gr + 5 LM from Gr; litters familiar), Gr/Co (5 LM from Gr + 5 LM from Co; litters unfamiliar), Co/Co (5 LM from Co + 5 LM from Co; litters unfamiliar).

Results

During 24 hours after mixing, piglets in Co/Co fought more than piglets in Gr/Co and Gr/Gr (32 vs 24.5 vs 1 fights/piglet; $p < 0.05$), showing also more aggression against their own LM (6 vs 2 vs 0 fights/piglet). Within Gr/Co, piglets originating from Co fought more against their LM than piglets from Gr (7 vs 1 fights/piglet). Four days after mixing, piglets in Gr/Gr had lower mean lesion scores than piglets in Gr/Co, those in turn were less injured than piglets in Co/Co (7.6 vs 11.6 vs 17.6; $p < 0.05$). Within four days after weaning, piglets in Co/Co had lower daily weight gains than in Gr/Co and Gr/Gr (197.3 g vs 274.4 g and 325.6 g; $p < 0.05$). Until the end of rearing, no significant difference was found (573.0 g vs 522.6 g vs 531.8 g).

Discussion & Conclusion

In mixed groups Gr/Co, piglets fought less, were less injured and gained more weight immediately after weaning than piglets in Co/Co. We conclude that positive effects of pre-weaning socialization can also be expected when piglets meet unfamiliar conspecifics after weaning. This can be particularly important when weaner pigs from different farms are mixed.



AWN-035

GENETIC EFFECTS ON INFLAMMATION AND NECROSIS OF TAILS, EARS, CORONARY BANDS, SOLES AND HEELS (SINS)

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Introduction

Field observations indicate that tail lesions in pigs can occur without any interactions with other pigs and that they are often found in combination with inflammation and necrosis of the ears, coronary bands, soles and heels. Based on this findings, we have introduced swine inflammation and necrosis syndrome as a new syndrome in swine at the ECPHM congress in Dublin in 2016. Because we suppose a common endogenic trigger, the aim of the present study was to provide evidence for genetic variation of the syndrome.

Material & Methods

Twentyseven sows were inseminated with mixed semen of two boars from two distinct Pietrain-lines whose offspring were suspected to differ significantly in the outcome of SINS in the field. This approach was chosen to exclude environmental effects between boar lines, because piglets from each line were born in the same litter. The piglets were individually marked by ear tags. All aspects of SINS were individually scored in the piglets at the third and 39th day of life. Paternity was detected by microsatellite analysis from genetic material of the piglets' docked tails.

Results

The study revealed significant differences between boar lines and boars regarding inflammation and necrosis of tails, ears, coronary bands, soles and heels in suckling pigs and weaners. Genetics explained about one third of phenotypic variance of SINS. One third of genetic variance was explained by the line, two thirds by individual boars within line.

Discussion & Conclusion

Our results provide evidence for a genetic component of inflammation and necrosis syndrome in swine. Thus, endeavours to combat the syndrome should engage genetic selection, besides environmental improvement. For a sustainable improvement of SINS, future studies elaborating candidate genes and pathways that promote the syndrome are needed.

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AWN-036

IMPROVEMENT IN QUALITY OF SOWS AND ENVIRONMENT CAN REDUCE PREVALENCE OF INFLAMMATION AND NECROSIS OF TAIL, EAR, CORONARY BANDS, SOLES, HEELS AND CLAWS IN PIGLETS, WEANERS AND FATTENERS

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Introduction

Tail lesions in pigs can occur without any interactions with other pigs and in combination with inflammation and necrosis of the ears, coronary bands, soles, heels and claws. Based on this findings, we have introduced swine inflammation and necrosis syndrome as a new syndrome in swine at the ECPHM congress in Dublin in 2016. Low feed fiber content and inadequate water supply are among the most important triggering factors. We hypothesize that improving the quality of the sow and the housing system can improve the degree of SINS in piglets, weaners and fatteners.

Material & Methods

From a cohort of 120 hybrid sows, twenty sows with best and twenty with worst condition, respectively, were selected based on detailed scores from coronary bands, soles, heels, claws and teats. Half of the sows of each group (and their offspring) were kept under conventional conditions, while the environment of the second half was improved with drinking bowls, water disinfection and additional feeding of hay and straw. 115 suckling piglets, 113 weaners and 103 fatteners were scored for the degree of inflammation and necrosis of tails, ears, coronary bands, soles, heels and claws.

Results

Environmental enhancement reduced inflammation and necrosis in tails, ears, coronary bands, soles, heels and claws of piglets by 50, 47, 9, 54, 2 and 33%, respectively. Corresponding values in weaners were 65, 29, 93, 21, 26 and 77%, respectively and for fatteners 100, 9, 100, 88, 41 and 100%, respectively. Significant effects of the sow's condition were only detectable under conventional environmental conditions, but disappeared with the improved environment.

Discussion & Conclusions

The present study shows that inflammation and necrosis in pigs involves different body parts (syndrome). The problem starts early (with the sow). Improving the sow's and the environmental conditions can improve the problem.



AWN-037

LIVER INFLAMMATORY PATHWAYS ARE ASSOCIATED WITH SWINE INFLAMMATION AND NECROSIS SYNDROME (SINS) IN PIGLETS

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Introduction

Swine Inflammation and Necrosis Syndrome (SINS) has been hypothesized as a systemic process of inflammation, originating from the gut and liver and involving peripheral organs like tails, ears, coronary bands, soles, heels and claws with inflammation and necrosis. The syndrome can be seen as early as in suckling piglets, even directly after birth. Aim of the present study was to provide associations between inflammation of peripheral organs (SINS) and the pro-inflammatory and inflammatory metabolism of the liver.

Material and Methods

Fifty-three three days old suckling piglets and 47 39 days old weaners were scored for the degree of inflammation and necrosis of tails, ears, coronary bands, soles, heels and claws. Liver samples were taken directly after euthanasia, snap-frozen in liquid nitrogen and stored at -80°C until RNA extraction. The samples were examined with quantitative real-time PCR (qPCR) for expression of genes encoding for fibroblast growth factor-21 (FGF-21), haptoglobin (HP), intercellular adhesion molecule-1 (ICAM-1), interleukin-6 (IL6), superoxide dismutase-1 (SOD-1), tumor necrosis factor (TNF) and interleukin-8. Six piglets with least and 6 with most severe SINS symptomatic were selected for genome-wide transcriptomics, respectively.

Results

Inflammation and necrosis of the different body parts were significantly associated with each other and with key regulators of liver inflammation and metabolism. High correlations were detected e.g. between tail and ear inflammation/necrosis and liver haptoglobin expression in weaners ($r=0.5$; $p<0.001$). Numerous further associations were found in suckling pigs and weaners.

Discussion & Conclusions

Our results show a clear association between inflammation and necrosis of tail, ears, teats and claws (SINS) and liver metabolism. The link lies in significant changes of the expression of hepatic key regulators of inflammation and metabolism. Thus, the ongoing study provides a deep insight into the pathogenesis of the syndrome.

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AWN-038

PIGGY TALK: PIGS TALK ABOUT THEIR CONDITION

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Introduction

Future evaluation and support of welfare in livestock needs non-invasive methods that provide a direct and accurate information on the animals' condition. Vocal communication among pigs could be one such indicator to determine the status of well-being in individuals and herds. Specific studies are missing, although vocalisation has extensively been used to indicate stress. Aim of the present study was to detect changes in vocalisation among pigs exposed to a slightly uncomfortable situation that would not really reduce their well-being.

Material & Methods

For this pilot study, three miniature pigs were observed daily at three consecutive time intervals of one week, each. The pigs used to be housed together in a spacious pen on straw beddings with hay and water ad libitum. Pigs were proffered about 50 g of a commercial pelleted food for fatteners, sometime in the morning and in the afternoon. During the first and third week of the trial, pellets were given exactly at 8 o'clock in the morning, and at 10 o'clock during the second week. The pigs were video recorded, behaviour and vocalisation were quantified. Vocalisation was dissected with the program Praat®.

Results

During the week with delayed feeding, laying periods were reduced, slightly aggressive interaction and rooting were increased. Concurrently, grunts were prolonged with an increase in frequency and volume. Some vocalisation parameters as detected by Praat® were specifically changed. At the same time, frequency and intensity of squeaking was reduced by delayed feeding.

Discussion & Conclusion

The results of the current study indicate that vocalization can provide sensible parameters to evaluate the condition of pigs, even before well-being is affected. Dissecting vocalisation by measures like Praat® can open a new field of studies aiming towards a more dispassionate understanding of the condition and even feeling of pigs in the future.



AWN-039

S-KETAMINE AND INTRANASAL APPLICATION: ALTERNATIVES FOR THE CASTRATION OF MALE SUCKLING PIGLETS?

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Introduction

Intramuscular injection of anaesthetics ketamine and azaperone has been proposed as an alternative for surgical castration of male suckling piglets. However, in conflict with a good surgical tolerance is hypothermia, tachycardia, a prolong castration period, and a long recover phase with disadvantages for piglets and sow. Aims of the present study were to test, whether the application of the ketamine S-enantiomer and intranasal application instead of intramuscular could reduce agitation, defensive movements, stress and the length of recovery in comparison to the usually applied RS-racemate.

Material & Methods

The experiment was conducted on a commercial farm in Germany. Seventy-eight healthy, five dayold male piglets were matched by litter and weight to six treatment groups in a randomized and blinded experimental study. The setup compared the RS-racemate with the S-enantiomer of ketamine and the intramuscular with the intranasal route. Effects were estimated based on movements and vocalisation under castration, cortisol levels, clinical parameters and the duration of the recovery phase.

Results

The exchange of the RS-racemate of ketamine by the pure S-enantiomer significantly reduced movement scores and tachycardia during castration of male piglets. Cortisol levels 120 minutes after castration, breathing rates and recovery time were significantly increased. Hypothermia reached the same level with S-ketamine as with the RS-racemate. Intra nasal application of S-ketamine further decreased accuracy and efficiency of ketamine anaesthesia in piglets. Significant parts of the drug were spilled during application in a non-systematic way. Effects on cortisol levels 120 minutes after castration and tachycardia seemed to be just an effect of total lower ketamine uptake by the i.n. route. I.n. application had no positive effect on the length of the recovery period.

Discussion & Conclusion

We conclude that neither the application of S-ketamine nor the intranasal route are alternatives for future anaesthesia in suckling piglet castration.

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AWN-040

SWINE INFLAMMATION AND NECROSIS SYNDROME (SINS)

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Introduction

Tail lesions in pigs can occur in the field without any interactions with other pigs and in combination with inflammation and necrosis of the ears, coronary bands, soles, heels and claws. This joint occurrence of symptoms has led to the introduction of swine inflammation and necrosis syndrome (SINS) as a new syndrome in swine, at the ECPHM congress in Dublin in 2016. Two years later, we report about details of the syndrome which have been compiled in eight studies including around 25,000 pigs of different ages and from different herds.

Material & Methods

We developed a system to clinically score degrees of inflammation and necrosis at the tail base, tail tip, ears, teats, heels, coronary bands, soles and claws. These findings were completed by histopathological and transcriptomic results including tail, ear, claw, liver and gut samples. Genetic effects were also included.

Results

Inflammation and necrosis were significantly correlated between the investigated body parts, although their degree of involvement was modified by environmental conditions, e.g. ears were more involved in cases with heat stress. SINS was found in piglets directly after birth. Aberrations of the different body parts were associated with inflammation and metabolism of gut and liver. Significant effects of genetics, sow's condition and environment were determined. They could be part of a successful solution of the problem.

Discussion & Conclusion

The onset of symptoms within the first days of life, their combined appearance (tail vs. feet) and progress, their shared improvement during the second week of life, a common genetic basis and associations with inflammation and metabolism of gut and liver argue for common intrinsic effects that can be influenced but not exclusively triggered by tail biting, floor condition and technopathies. Consideration of SINS will play a crucial role on the way to improve animal welfare in pigs.



AWN-041

HEAT STRESS INDUCED CHANGES ON INTESTINAL PERMEABILITY, ENDOTOXIN TRANSLOCATION, AND INFLAMMATORY PARAMETERS IN GROWING PIGS

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Heat stress antagonizes livestock production due to increasing temperatures and frequencies of extreme climatic events. During heat stress, the gastrointestinal tract is one of the first organs affected. One of the major concerns is increased intestinal barrier dysfunction and the disruption of gut barrier function, which allows pathogens and immunogenic compounds such as endotoxins to enter the body and blood stream. In order to evaluate the effects of heat stress on gut permeability, endotoxin translocation and inflammatory biomarkers, three trials were performed.

In the first trial, animals were either kept at thermoneutral conditions (28°C) or under diurnal heat stress conditions (6 hours at 38°C; 18 hours at 32°C /day for 3 days). Pigs were euthanized and ileal permeability was assessed *ex vivo* with modified Ussing chambers. In addition, serum endotoxin concentrations were measured. In the second trial, same conditions were used to evaluate the concentrations of acute phase proteins as well as liver parameters. In the third trial, a milder heat stress was applied (6 hours at 35°C; 18 hours at 32°C /day for 3 days) and gut permeability was assessed with a non-invasive dual sugar assay.

Respiratory rate and rectal body temperature were significantly increased in pigs under heat stress conditions in all trials. Furthermore, modified Ussing chamber assays as well as the non-invasive sugar assay showed that the gut barrier was significantly impaired due to the heat stress conditions. A significant increase of endotoxin activity in the blood was observed in the first trial. In addition, there was a significant effect of heat stress on acute phase protein levels in the blood.

Results confirm that heat stress leads to increased intestinal permeability and dysfunction in young pigs. Due to this heat stress-induced disruption endotoxins were able to enter the blood flow, which further affected the immune response.

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WELFARE & NUTRITION

AWN-042

SUPPLEMENTATION OF A CLAY-MINERAL BASED PRODUCT MODULATES THE EFFECTS OF HEAT STRESS ON BODY TEMPERATURE, RESPIRATORY RATE, AND ILEAL ENDOTOXIN PERMEABILITY IN GROWING PIGS

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Pigs are quite sensitive to high temperatures and heat stress which can attenuate performance and wellbeing. The gastrointestinal tract is one of the major organs affected by heat stress. The objective of this study was to evaluate effects of a short-term heat stress on health parameters and ileal endotoxin permeability, and to assess the ability of a dietary clay-mineral based product to reduce the severity of heat stress challenge.

Thirty-two piglets (~21 kg) were either kept under thermoneutral conditions (24 hours at 28°C for 3 days), or under heat stress conditions (6 hours at 38°C; 18 hours at 32°C /day for 3 days). In addition, animals received either a diet without any supplement (control) or a diet with a clay-mineral based product (CM). Respiratory rate and body temperature were measured daily at 0, 2, 4 and 6 hours. Ileum endotoxin permeability was assessed via Ussing chamber assay using FITC-labeled lipopolysaccharides.

Average rectal temperature and respiratory rate significantly increased during heat stress ($P < 0.01$) compared to animals kept under thermoneutral conditions. Addition of CM significantly reduced respiratory rate (140.2 vs 134 bpm; $P < 0.001$) as well as rectal temperature (41.2°C vs 41°C; $P < 0.05$) during heat stress. In heat stressed animals, endotoxin permeability was significantly increased in the ileum (7.6 vs 31.9 AU; $P < 0.01$) compared to animals kept under thermoneutral conditions. CM showed a trend to decrease ileum endotoxin permeability in heat stressed animals (14.1 vs 31.9 AU; $P = 0.087$).

As expected, heat stress did have a negative effect on general health parameters as well as endotoxin permeability. In addition, the results indicate that supplementation of CM could counteract the negative effects of heat stress on selected parameters. However, mode of action of CM should also be assessed during long-term heat stress.



AWN-043

CLINICAL EXAMINATIONS OF LACTATING SOWS AND THEIR PIGLETS IN THREE DIFFERENT HOUSING SYSTEMS

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Introduction

This study deals with the influence of housing systems on the health of lactating sows and their piglets. Therefore, three different farrowing systems were compared: A. conventional farrowing crates (CON) B. free movement pens (FMP) and C. a group-housing system (GRP).

Materials & Methods

Examinations of the sows occurred at the day of introduction (t1), one week after parturition (t2) and at the last day of lactation period (t3).

General condition, vital signs, skin abnormalities and udder health were studied at each point of time, whereas claw lesions were examined at t1 and t3.

The examinations of the piglets were carried out on t2 and t3 regarding skin injuries, carpal and tarsal abrasions, sole bruising and coronet injuries. Additionally, typical piglet diseases, birth- and weaning weights as well as losses and their causes were recorded.

Results

Skin injuries differed significantly between housing systems at t2 and t3, with GRP sows having the highest rates, also concerning the udder. From t1 to t3 there was a significant decrease of claw lesions in GRP sows.

Piglets exhibited differences in skin injuries between the housing systems especially at t3, with highest rates in GRP. FMP piglets showed highest weight gains followed by CON and GRP piglets ($p < 0.05$). Losses, especially due to piglet crushing, were highest in FMP (25,8%), followed by GRP (19,8%) and CON (12,2%).

Discussion & Conclusion

High rates of skin lesions can be explained by aggressive interaction between GRP sows as well as by cross suckling. Free movement in the GRP system had a positive influence on claw health of sows. Highest mortality rates due to crushing were seen in the first days of life (GRP, FMP) implementing that fixation of sows for the first days after farrowing in these systems would ameliorate survival rates of piglets.

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WELFARE & NUTRITION

AWN-044

SPECIFIC COMPOUND FEED INCREASES INTESTINAL HEALTH AND GROWTH IN WEANING PIGLETS *IN VITRO* AND *IN VIVO*

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Introduction

In this study we analyzed whether a compound feed, primarily based on specific fats and to a lesser extent on protein and cholesterol, could be of advantage for weaning piglets as compared to no treatment, nutritional control or creep feed control.

Materials & Methods

Trans well cell culture analysis comprising Caco-2 cells was used to study effects of an *in vitro* digested compound feed on trans epithelial electrical resistance (TEER) and interleukin-8 (IL8) secretion after challenge with mycotoxin deoxynivalenol (DON). After that, effects on health and growth were analyzed in a controlled *in vivo* trial involving 74 piglets and a controlled field trial including 238 piglets.

Results

The compound feed counteracted *in vitro* the reduction of TEER and the increase of IL8 excretion in Caco-2 cultures challenged with DON. *In vivo*, the compound feed, when administered by oral gavage five days prior to weaning, lead to increased average daily weight gain (ADWG) as compared to water control and nutritional control. Alkaline phosphatase activity and IL8 concentration in plasma and villi length at mid jejunum were improved in the experimental group as compared to the controls. For the field trial, compound feed was mixed with a semolina of puffed wheat and this was offered to piglets in excess for voluntarily intake from day 4 of life up until 5 days after weaning (day of life 32). Feed uptake before weaning was increased by more than 50% in the experimental group as compared to the control group and body weight at day of life 61 was significantly 10% higher in the experimental group.

Discussion & Conclusion

These results are promising for the compound feed for preparation of piglets for challenging periods.



AWN-045

PRO- AND PREBIOTIC COMBINATION IN BIMULAC® PRE REDUCES DIARRHEA IN SUCKLING PIGLETS

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Introduction

Early contact with diarrhea-causing pathogens leads to an imbalance of the intestinal microbiota. Thus, newborn piglets are faced with great challenges. As a preventive measure, the use of microbiota and immune-modulatory feed additives is reported to support the vitality of piglets. The objective of the present study was to investigate the effect of a pre- and probiotic combination on diarrhea incidence and growth performance in suckling piglets (21 days lactation period).

Material and Methods

40 DanBred sows and their litters were used in a feeding trial conducted on a commercial farm in Germany. All animals were located in one stable section and were randomly divided in a control and a trial group with 20 sows each (comparable parity number). Each piglet of trial group was drenched with 2 ml of Bimulac® Pre at day 2 and 4 after farrowing. The control animals received electrolytes and a complex of B vitamins in case of diarrhea infection. Number of infected litters with diarrhea and average daily weight gains were recorded. Bacterial pathogens in piglets showing diarrhea were determined by swap sampling method.

Results

Bimulac® Pre reduced the percentage of litters affected by diarrhea (10% vs 40%). The swap sampling indicated an *E.coli* infection in both groups. The average weight gain tended to be improved in the Bimulac Pre® group compared to control (180 vs. 160 g per head/d; $p < 0.10$). A significant difference in weight gain was detected in sows with parity > 1 (185 vs. 161 g per head/day; $p < 0.05$) higher weight gain in the trial group.

Discussion and Conclusion

The use of a complementary feeding stuff containing a pre- and probiotics combination seems to be an effective tool to prevent *E.coli*-related diarrhea in suckling piglets. Less diarrhea allows a better growth performance of piglets.

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WELFARE & NUTRITION

AWN-046

RELATIONSHIPS BETWEEN COLOSTRUM SUPPLY OF SUCKLING PIGLETS AND *SALMONELLA* PREVALENCE IN PIGLET REARING

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Salmonella are still a problem in pork production. Increasing litter sizes observed in recent years with lower average birth weights at the same time makes an adequate colostrum supply of newborn piglets more difficult. This study tested the hypothesis, that modern piglet producing farms with a high farrowing rate and an increased *Salmonella* prevalence in piglet rearing show a more unfavorable colostrum supply in suckling piglets.

Methods

An association of 250 northern German piglet producing farms has been organizing a voluntary biannual health-status-monitoring on piglets (25 kg BW) for years. The monitoring includes an ELISA for *Salmonella* antibodies. On basis of these data 12 *Salmonella*-conspicuous and 12 *Salmonella*-inconspicuous farms were selected. Each farm was visited once 24-48 hours after the main farrowing day. On each farm 4 litters were sampled and 2 light-weight, 2 medium-weight and 2 heavy-weight piglets per litter were weighed and a blood sample was taken. The blood samples were tested for the colostrum supply by means of the Ig-Immunocrit-method.

Results

In this field study, there was a significant difference in Immunocrit values between the *Salmonella*-inconspicuous farms and *Salmonella*-conspicuous farms for the low weight piglets. There was no significant difference between the *Salmonella*-conspicuous and *Salmonella*-inconspicuous for the factor body weight, litter size and parity.

Conclusion

This study provides preliminary evidence that when comparing *Salmonella*-conspicuous farms and *Salmonella*-inconspicuous farms, colostrum supply could be a critical factor to be considered. The fact that there is no difference in the body weight of the two groups suggests that there may be differences in colostrum management. Further studies have to investigate the impact on the *Salmonella* seroprevalence at the time of slaughter.

This study was supported by EIP-Agri (Agriculture & Innovation), European Agricultural Fund for Rural Development (Project 276 03 454 035 0521).



AWN-047

DIETS FOR PREGNANT SOWS BASED ON ROUGHAGE - APPARENT DIGESTIBILITY AND NUTRITIVE VALUE OF WHOLE PLANT SILAGES OF WHEAT AND MAIZE

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Introduction

In modern piggeries roughages have lost their relevance. Recently, advanced liquid feeding systems facilitate to use whole plant silage (WPS) as the basis for pregnant sows. Thus the question was whether the digestibility rate of these silages can be predicted by using the equation based on crude fibre content.

Materials & Methods

Four non-pregnant sows were fed diets on maintenance level, calculated on the metabolic body weight. A basis ration was fed; in the following trials a share of basis ration was substituted by whole plant maize silage (WPMS) resp. whole plant wheat silage (WPWS). After adaptation (14 days) to the silage rations followed the collecting of all residues (7 days). The apparent digestibility (aD) was calculated using the difference method.

Results

The aD of the two WPS was strongly correlated to the XF content. The calculated values of aD of the organic matter (WPWS 52.7%/ WPMS 64.5%) confirmed the expected values (WPWS 52.7%/ WPMS 64.6%), predicted with the regression formula. The other determined nutrients were digestible as follows (WPMS/ WPWS, %): XP (58.5/ 51.0), XL (81.0/ 64.8), XF (24.9/ 27.7), NfE (73.9/ 62.4). The WPMS contained 11.0 MJ ME/ kg DM and the WPWS 8.28 MJ ME/ kg DM.

Discussion & Conclusions

In the ration of WPMS were 57% and of WPWS 40% of total dry matter intake contributed by the WPS. Considering that the feed intake of WPS had to be higher for equal energy intake; diets with high crude fibre contents prolong the feed intake, gut fill and feeling of satiety and therefore might improve the well-being.

The project is supported by funds of the Federal Ministry of Food and Agriculture (BMEL) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office for Agriculture and Food (BLE).

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WELFARE & NUTRITION

AWN-048

PORCINE FOREBRAIN VACUOLIZATION: A NOVEL CONDITION OF SWINE ASSOCIATED WITH WASTING?

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Introduction

The term wasting does not imply a diagnosis by itself but is a clinical name to describe a physical condition characterized by growth retardation, usually of multifactorial origin. This report describes an apparently new condition of pigs clinically characterized by wasting and vacuolization of the brain neuropil.

Materials and methods

Since November 2016, an increasing number of farms in Spain have experienced growth retardation in nursery pigs. Animals are weaned in good body condition, and after 1-2 weeks, they start losing weight. Prevalence may vary between 7-25%. Most of these animals do not die and have to be euthanized for humanitarian reasons. At necropsy, no significant lesions were reported, but occasional gastric ulceration. To investigate potential causes of this condition, 6 affected farms were investigated (including 5 sick and 5 healthy pigs from each herd).

Results

Pigs from 5/6 farms displayed significant difference in body condition and weight between affected and healthy pigs; healthy pigs from the sixth farm submitted had a very similar weight to that of sick animals. Besides the poor body condition, few gross lesions were observed in examined pigs, being erosion/ulcer of stomach the most frequent one. Histopathologically, the most consistent lesion was neuropil vacuolization of the prosencephalon, mainly located in the thalamic nuclei and in the transition between white and grey matter of the neocortex (24/30 in sick and 6/30 in healthy pigs). Interestingly, 4/6 healthy pigs that also showed this lesion were from the sixth farm. *Porcine circovirus 2* (PCV2) and *Porcine reproductive and respiratory syndrome virus* (PRRSV) infections were ruled out.

Discussion and conclusions

Clinical and pathological investigations of these wasting cases in nursery pigs were associated with spongiosis of the forebrain. Literature suggests this lesion linked to congenital, metabolic (toxic/deficiency) scenarios, but the precise cause of these cases is still unknown.



AWN-049

INVESTIGATIONS ON THE OPTIMAL VALINE:LYSINE RATIO IN WEANED PIGLETS

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Introduction

In practical piglet diets the branched-chain amino acid L-Valine (Val) is regarded as 5th limiting amino acid, but inconsistent information is available about the optimal Val:Lys ratio for piglets. Aim of this study was to investigate the optimal Val:Lys ratio through performance parameters.

Material & Methods

A total of 200 weaned piglets (8.7 ± 1.1 kg bodyweight) were randomly allocated to 5 dietary treatments containing different Val:Lys ratios on a SID base (0.59, 0.63, 0.67, 0.71, 0.75 during pre-starter phase and 0.57, 0.62, 0.66, 0.70, 0.75 during starter phase). The total trial duration was 43 days, divided in a pre-starter phase (0 – 13 d) and a starter phase (13 – 43 d). The diets consisted of corn, wheat and soybean meal (CP pre-starter: 18.05 %; Lysine pre-starter: 1.25 % SID; CP starter: 16.72 %; Lysine starter: 1.15 % SID). GLM procedure was used to compare treatment means, whereas orthogonal contrasts were applied to determine the linear and quadratic response to increasing doses of Val.

Results

The gradual addition of Val leads to a significant improvement in weight gain and feed intake over the total period and indicates a gradual increase in the Val requirement with the age period. Numerically the highest body weight gain (661 g) as well as lowest FCR (1.53) were observed in the 2nd half of the starter period (29 – 43 d) for a Val:Lys ratio of 0.70:1.00.

Discussion & Conclusion

The supplementation of Val to a basal diet improves the performance parameters of piglets. Especially in the 2nd half of the starter period a clear response to the Val supplementation was observed. Based on the results of the present study a Val:Lys ratio of 0.70:1.00 can be suggested for optimal performance results in piglets within a bodyweight range of 20 – 30 kg.

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AWN-050

THE IMPACT OF CASTRATION METHOD ON TREATMENT RATES IN NURSING PIGS

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Introduction

Surgical castration of male piglets is routinely performed to avoid boar taint in pork. However, for welfare reasons, all EU countries has agreed on a declaration that surgical castration is to be phased out by 2018. Replacing surgical castrations with vaccinations against boar taint has the potential to reduce treatments of secondary bacterial infections originating from castration wounds. The aim of this study was to compare treatment rates of nursing piglets before and after surgical castrations were replaced with vaccinations with Improvac (Zoetis Inc.), a vaccine efficient in reducing boar taint.

Material & Methods

The study was performed in a closed 120-sow farrow-to-finish herd. Treatment records for seven batches of nursing pigs where male piglets were surgically castrated (CAS) were compared to 12 batches where male piglets were not surgically castrated (NON) but later vaccinated with Improvac. Only antibiotic treatments were compared. Arthritis and overall treatment rates for CAS-batches and NON-batches were compared with an independent-samples t-test.

Results

All treatments were parenteral treatments applied to individual piglets. No group treatments were administered. The mean treatment rates for arthritis were 3.3% (range: 2.0 – 5.0%) for CAS-batches and 2.3% (range: 0.5 – 4.6%) for NON-batches. Overall treatment rates were 6.9% (5.5 – 9.2%) for CAS-batches and 3.9% (1.3 – 6.6%) for NON-batches. Overall treatment rates were significantly higher for CAS-batches ($p=0.004$).

Discussion & Conclusion

The overall treatment rate of nursing pigs was low in this herd indicating that surgical castrations were performed under hygienic conditions. However, the number of treatments were even further reduced after surgical castrations were replaced with Improvac vaccinations. This shows that there is potential for reducing antibiotic use by minimizing practices such as surgical castration and tail docking where the physical barrier of the skin is damaged and bacteria can enter and spread in the body.



AWN-051

EXPERIENCES WITH THREE INJECTION COCKTAILS OF GENERAL ANESTHESIA USED FOR PIGLETS PRIOR TO CASTRATION

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Introduction

To improve the animal welfare in the pig production, Denmark made a national agreement to stop castration without anesthesia by the end of 2018. Since the knowledge about general anesthesia of piglets is limited, the aim of this pilot study was to obtain experiences of general anesthesia of piglets prior to castration in conventional production facilities.

Material&Methods

A total of 25 male piglets, aged 4 days, were anesthetized with one of three different anesthesia cocktails(AC) and castrated in a conventional Danish pig production herd. All AC's contained ketamine as the anesthetizing agent and were injected intramuscularly in the piglets' necks. The compounds of the three AC's and doses are listed below:

- AC-1, n = 10: 15 mg/kg ketamine, 5 mg/kg azaperone, 0.2 mg/kg butorphanol
- AC-2, n = 10: 13 mg/kg ketamine, 2 mg xylazine
- AC-3, n = 5: 4 mg/kg ketamine, 0.08 mg/kg medetomidine, 0.22 mg/kg butorphanol

The piglets were castrated during unconsciousness, which is defined as the loss of all three reflexes; palpebral reflex, jaw tone, and muscle tone, or no later than 20 minutes post injection. Movements or/and vocalizations during the castration as well as the recovery period for each cocktail were observed. The piglets were euthanized after having suckled once after the anesthesia or if the recovery time exceeded 3 hours.

Results

The recovery time for each AC:

- AC-1: 130-186 minutes (10*/9**/5***)
- AC-2: 65-182 minutes (10*/10**/9***)
- AC-3: 169-183 minutes (5*/4**/2***)

Numbers in parenthesis are the total number of anesthetized piglets*/number of piglets able to stand within 3 hours**/number of piglets which suckled within 3 hours***. Only AC-1 provided a sufficient pain relief as none of the piglets anesthetized made any pain behavior during castration.

Conclusion

Considering the long recovery time and insufficiency to relieve pain, none of the AC's are considered ideal to use for piglets.

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AWN-052

USE OF SELECTED HIGHLY DIGESTIBLE ANIMAL PROTEIN SOURCES IN WEANLING DIETS IMPROVES PIGLET PERFORMANCE AND INTESTINAL HEALTH FOR THE PRE-STARTER PERIOD

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Introduction

High inclusion of vegetable protein in the diet can lead to protein fermentation and predispose for diarrhea in piglets. Therefore, the inclusion of highly digestible protein sources from animal origin is strongly recommended to overcome the inflammatory response of the intestinal mucosa. We hypothesized that a combination of hydrolyzed peptides of porcine intestinal mucosa (PDP) and animal plasma (AP) can exert a synergic effect in terms of performance and intestinal health.

Material & Methods

A total of 264 [(LDxLW)xPt] piglets were fed four different pre-starter diets (20.5%CP, 0-14d post-weaning) based on partial replacement of extruded soybeans in the diet by AP or a combination of AP and PDP. The same starter diet was offered from 14-35d post-weaning. No antimicrobials or therapeutic ZnO were used in feed. Animals were individually weighted at weaning and on d7, 14 and 35 post-weaning. The health status and mortality rate was daily assessed. Blood samples were collected on d7 post-weaning for TNF-alpha determination.

Results

Higher BW, ADG and better FCR was observed for the groups fed diets containing AP and AP+PDP at d7 and d14 and for the entire pre-starter phase (0-14d post-weaning). Moreover, TNF-alpha was lower for AP+PDP (88.6 pg/mL) than the Control group (112 pg/mL). Mortality was also lower for AP (0%) and AP+PDP (1.3%) than Control (4.5%).

Discussion & Conclusion

It is concluded that partial substitution of extruded soybeans by animal plasma or their combination with hydrolyzed peptides of porcine intestinal mucosa clearly improve early weaning-starter period on weanling performance and intestinal health.



AWN-053

IMPLEMENTATION OF WELFARE QUALITY® PROTOCOL IN SLOVENIAN PIG FARMS

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Introduction

The aim of this study was to test the protocol (welfare measures) as a non-invasive way to assess the welfare of pigs, and establish critical limits of pigs' welfare, including health care, with emphasis on an individual animal.

Material and Methods

Welfare Quality® Protocol for pigs was used for the purposes of this study. The protocol describes the procedures and requirements for the assessment of pig welfare (sows, piglets, growing-finishing pigs). We used animal-based, management-based, or resource-based measures to achieve a representative assessment of pig welfare of each farm.

Ten conventional and ten alternative Slovenian pig farms were included. In this study, an alternative farm provided outdoor area for pigs, roughage and frequent possibility to forage.

Results

A total of 4.336 sows and 18.118 growing-finishing pigs in conventional housing system and a total of 185 sows and 622 growing-finishing pigs in alternative housing system were assessed. We were able to collect all measures only from 6 farms. Those farms raised 72 to 1600 breeding animals (all were conventional farms).

Conclusions

This was the first detailed insight into the state of welfare on the commercial pig farms in Slovenia. It was not possible to use all the assessment measures (stereotypies, clinical and health measures for pregnant and lactating sows), mostly because of a small number of animals on the farms (sample size was lower as required in the protocol). The protocol is not adapted to small farms. In Slovenia 93, 3 % of farms are small farms with 1 to 20 breeding animals and only 0,048 % of farms are large with more than 1000 breeding animals. Therefore, we believe that the current version of the protocol should be adapted to enable the implementation of this welfare assessment tool also in small-sized and alternative pig housing systems.

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WELFARE & NUTRITION

AWN-054

MYCOTOXIN SURVEY 2017 - WHAT'S GOING ON IN EUROPE?

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Pigs are particularly sensitive to mycotoxins, therefore it is of high importance to know where, and at what level, mycotoxins occur. BIOMIN has been conducting an annual mycotoxin survey for more than ten years, monitoring the incidences of different mycotoxins in finished feed and agriculture commodities used in animal feed.

O In the first three quarters of 2017, 13,153 samples sourced worldwide were analysed for major mycotoxins, aflatoxins (Afla), zearalenone (ZEN), deoxynivalenol (DON), T-2 toxin (T-2), fumonisins (FUM) and ochratoxin A (OTA). Of these samples, 2,592 originated from Europe. Samples were analyzed using liquid chromatography coupled to tandem mass spectrometry, high performance liquid chromatography and enzyme-linked immunosorbent assay.

S In total, 91% of all samples in Europe contained at least one of the six main mycotoxins (based on samples for which at least three mycotoxins were analyzed. DON was the most common mycotoxin and was detected in 72% of all samples at a mean concentration of 448 ppb for positive samples. In order of prevalence for the other *Fusarium* mycotoxins, ZEN was in 52% (mean of 54 ppb), FUM was in 50% (mean of 582 ppb) and T-2 was in 35% (mean of 37 ppb). Aflatoxin (from *Aspergillus* species) and ochratoxin A (from *Penicillium* and *Aspergillus* spp.) occurrence are often related to storage conditions but also grain damage in the field; Afla was present in 18% of all samples (mean of 4 ppb) and OTA was in 27% (mean of 9 ppb). Mycotoxin co-occurrences were identified in 74% of samples, this presence of two or more mycotoxins can result in synergistic or additive toxic effects on animals consuming the affected material.

T The survey results indicate that mycotoxins remain a serious concern in agricultural production. An effective mycotoxin risk management program should be applied to protect animals from negative effects of mycotoxins.

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AWN-055

LET'S TALK ABOUT... ON FARM EUTHANASIA

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Introduction

On-farm euthanasia is an emotional topic amongst farmers, veterinarians and stakeholders. Re (EC) 1099/2009 requires farms to have protocols in place that transparently describe the process and facilitate timely euthanasia. To successfully integrate a decision tool on farm the tool must be informative and practical. Therefore, we developed and tested an on-farm euthanasia protocol (decision tool).

Material and Methods

Firstly, practical criteria for the decision tool were defined by expert opinion. Secondly a concept decision tool was created and indicators for euthanasia were validated by a literature study. Thirdly, in the proof-of-concept-phase we performed a qualitative field study on four farms to evaluate farmers' interpretation and use of the decision tool, especially on the observation and decision on piglets with inconclusive indicators (birth weight, milk intake and behaviour) from literature.

Results

Based on literature euthanasia is justified in case of congenital disorders and traumas that render a piglet non-viable, untreatable diseases and inadequate response to treatment. However, literature remains ambiguous about "doubt-piglets" (it is doubtful for various reasons that it should be euthanized). Birth-weight alone cannot be used as a single indicator for euthanasia. However, combinations of birth weight, milk intake and behaviour seemed well definable indicators that are practical in use for farmers to justify euthanasia of non-viable pigs.

Discussion & Conclusion

Although the decision tool proved to be practical in use on farms and was able to standardize the decision process of euthanizing of "doubt-piglets" sufficient commitment by the farmer is needed to obtain full added value of such a protocol. Therefore the use of the decision tool should be embedded in the relation between farmer and herd veterinarian. In addition, the reasons for euthanasia can be regularly analysed which contributes to animal welfare and has the potential to enhance the overall performance of the farm.

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AWN-056

ABSTRACT WITHDRAWN

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AWN-057

ANIMAL-BASED MEASURES ON ITALIAN HEAVY PIGS AT SLAUGHTERHOUSE AND RELATIONS WITH ANIMAL WELFARE ON FARM

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Introduction

Animal-based measures (ABMs) can be used effectively in the evaluation of animal welfare (AW) on farm. Some ABMs might be also efficiently used during slaughterhouse inspections. The aim of this work was to investigate the possibility of exploiting ABMs, collected at slaughterhouse on Italian heavy pigs (165Kg), to obtain information about AW on farm.

Material & Methods

Twenty-eight ABMs were tested at slaughterhouse on 62 batches of finishing pigs belonging to 54 different pig farms of Northern Italy. The observations were carried out during ante-mortem (n=10,085 pigs) and post-mortem inspections (n=7,952 pigs). Fifteen selected ABMs were evaluated both at slaughterhouse (118.5±45 pigs per farm) and on farm (26.3±4.8 pigs per farm) for 16 different farms chosen randomly.

Results

Four ABMs were not observed at slaughterhouse (tail biting, scouring, rectal prolapse and twisted snouts). The two ABMs with a higher prevalence at slaughterhouse were manure on the body grade 1 (28.36%) and dermatitis (28.03%). The prevalence of ABMs showing AW problems was higher at slaughter compared to farm. In particular, significant differences between ABMs were founded for non-uniformity of size, 3.0±0.6 and 1.8±0.9 ($P<0.05$), and dermatitis, 34.3±4.8 and 1.8±0.7 ($P<0.001$) for slaughterhouse and on farm observations respectively.

Discussion & Conclusion

The comparison between ABMs observed at slaughterhouse and at farm-level showed a good correlation and slaughterhouse proved to be a better detection site for some indicators. Besides, observations at slaughterhouse are easier to perform compared to observations on farm and allow to monitor and record constantly AW in batches all year round. According to the results of this study, slaughterhouse seems an excellent and feasible detection point to evaluate ABMs in pigs and it could be used as a tool to complete the evaluation of AW at farm-level.

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WELFARE & NUTRITION

AWN-058

ELECTRICAL CURRENT FLOW AS AN ALTERNATIVE EUTHANASIA METHOD TO MANUALLY APPLIED BLUNT HEAD TRAUMA FOR UNVIABLE PIGLETS

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Introduction

Euthanasia has to induce rapid loss of consciousness followed by quick death. In line with the legislation, unviable suckling piglets are killed by exsanguination after a blunt head trauma in German farms. But the method is displeasing for the personnel, which may result in inconsistent effectiveness.

The aim of the study was to find electrical parameters for appropriate electrocution of piglets after electrical stunning to provide another euthanasia method for unviable piglets.

Material & Methods

The current flow was simulated using a computer piglet-model, where electricity distribution in brain and heart were visualized. Afterwards different current settings were tested for suitability in piglets.

Consciousness was confirmed by the lack of reflexes. Confirmation of death was examined with electrocardiography and electroencephalography. Excitations, vocalisation and skin-irritations were recorded.

Results

Shown by computer simulation, electrodes (size: 2cm²) placed in the temporal region provide optimum pass through the brain. And both, the placement of the electrodes behind the forelimbs or between the shoulders and the sternum indicate high current density in the heart.

Starting the investigation on electrocution in azaperone and ketamine anaesthetized piglets, the procedure succeeded after seventeen different combinations of current settings using 0.75A; 400Hz, duration and direction of the current flow: 5sec laterolateral through the thorax – 20-30sec break – 5sec dorsoventral through the thorax.

Electrical stunning succeeded using 1.3A, 50Hz, electrode position: laterolateral in the temporal region, duration of the current flow: 20sec.

The evaluated setting for electrical stunning and electrocution were investigated in another group of twenty-five piglets, which were stunned and killed successfully.

Discussion & Conclusion

Electrical head stunning followed by electrocution is considered suitable for the euthanasia of suckling piglets, although in literature electrocution of piglets with ≤ 5 kg BW is referred to as inappropriate because sources suggest that ventricular fibrillation cannot be induced securely.



AWN-059

EFFECTS OF SUPPLEMENTING PREPARTUM SOW DIET WITH ORGANIC ACIDS ON NEONATAL PIGLET MORTALITY

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The primary goal of the present study was to examine the effect of supplemental organic acids to the late gestation diet on neonatal piglet mortality. An additional goal was to study the effect of the loose-housed farrowing system on neonatal piglet mortality. A total of 60 sows were moved to farrowing units 7 days before the expected parturition date. The sows and their offspring were allocated to a factorial design with two factors, diet [CON (normal sow diet) vs. ORG (normal sow diet supplementing tall oil fatty and resin acids)] and housing [CRATE (crate size: 225 × 65 × 65, pen size: 325 × 250) vs. FREE (crate size: 225 × 159 × 191, pen size: 325 × 250)]. The live-born piglet mortality rate was remarkably higher in FREE than in CRATE (11.8 % ± 1.9 vs. 3.3 % ± 1.8, $P < 0.01$). This was due to the higher rate of crushed piglets seen in FREE compared to CRATE (11.5 % ± 1.8 vs. 2.4 ± 1.8, $P < 0.001$). In FREE, the sows with ORG diet had a lower rate of crushed piglets (5.6 % ± 2.5 vs. 17.5 % ± 2.6, $P < 0.01$), and thus the lower live-born piglet mortality rate (6.0 % ± 2.5 vs. 17.5 % ± 2.7, $P < 0.05$) than the sows with CON diet, whereas among sows in CRATE, the live-born piglet mortality rate was not affected by different diets (1.3 % ± 2.6 for CON vs. 5.3 % ± 2.6 for ORG). Consequently, these data indicate that supplemental tall oil fatty and resin acids to the diet of the prepartum sow could reduce mortality rates of neonatal piglets in loosed-housed system within 24 h postpartum.

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WELFARE & NUTRITION

AWN-060

INFLUENCE OF DAY-TIME ON FEEDING BEHAVIOUR OF GROW-FINISH PIGS FED VIA A LIQUID FEEDING SYSTEM AND WITH A PIG-TO-FEEDER RATIO \geq 2:1

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Introduction

Liquid feeding is commonly used on German pig farms but little is known about behaviour of pigs at feed-uptake using type of feeding. In practice pigs receive liquid feed in various feeding blocks throughout the day. This study investigated the influence of day-time, group-size and pig-to-feeder ratio on feed-uptake.

Material & Methods

In a grow-finishing unit applying liquid feed via sensor feeding in 5 blocks/day (2x30 min each), following a short acclimation period after placement, behaviour of pigs at feeding was recorded with the software VideoSyncPro during all feeding times and over a 3-day period. Before start of the observation period pigs were individually weighed and marked with a color code. In total 97 pigs in 4 pens were investigated: Group A: 13, B: 19, C: 26, D: 39 pigs; group A and C: pig-to-feeder ratio 2:1, group B and D: 3:1. Software Mangold INTERACT Version 17 was used to analyse how often and how long the individual pigs were standing at the trough.

Results

In all 4 groups independent of group size or pig-to-feeder ratio it was observed that each pig was taking up feed at least once in each of the feedings blocks. The observations revealed that in all 4 groups pigs on average were more often standing at the trough and stayed for a longer time during the 4th block than in any of the other 4 feeding blocks.

Discussion & Conclusions

This study demonstrated that all piglets took up feed in each feeding block. It was observed in all groups that pigs showed highest activity in feed uptake during afternoon hours. This is in line with the biphasic biorhythm of swine, with a more active behaviour during the afternoon. Further studies on other farms are ongoing to confirm that observations are not farm-related.



AWN-061

INFLAMMATORY RESPONSE OF JEJUNAL EXPLANTS FROM PIGLETS EXPOSED TO LPS, DEOXYNIVALENOL, AND LPS + DEOXYNIVALENOL

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The resident gut microbiome is one of the most abundant sources of bacterial lipopolysaccharides (LPS) in animals, which are potent inflammatory inducers and may negatively affect. Deoxynivalenol (DON) is a trichothecene mycotoxin that selectively target tissue with a high mitotic index such as intestinal tissue, inducing inflammatory signaling. DON naturally occur in cereals used in swine production. Once the gastrointestinal tract represents the first barrier met by compounds such as DON and LPS, we investigated the effect of DON, LPS, and DON+LPS on COX-2 and TNF- α immunohistochemistry staining in jejunal explants from piglets. The jejunum of three piglets was segmented into four parts (2 cm²), washed with PBS and antibiotics, and randomly assigned to one of the treatments. The jejunal explants were maintained in Dulbecco's Modified Eagle Medium (DMEM) and exposed according to the following four treatments; T1 - control; T2 - 2 μ g/mL *E. coli* LPS; T3 - 46 μ M DON; T4 - T2 + T3. After 1 h of explants exposure, the segments were washed with PBS, fixed in 10% neutral buffered formalin solution, serially exposed to graded alcohol concentration, and embedded in paraffin. The tissue microarray technique (TMA) was applied on the paraffin blocked tissue and sections were examined for immunohistochemical staining of COX-2 and TNF- α . Comparisons were assessed using the Student t -test with unequal variance ($P < 0.05$). COX-2 immunohistochemistry staining shown greater ($P < 0.05$) percentage of marked area promoted by DON (3.85 \pm 1.33), LPS (1.68 \pm 0.23), and DON+LPS (7.34 \pm 4.36) exposure compared to control (0.88 \pm 0.52). DON (17.75 \pm 4.89), LPS (9.57 \pm 1.37), and DON + LPS (14.02 \pm 2.22) exposure compared to control (3.29 \pm 1.93) also increased TNF- α percentage. LPS+DON combination potentiated ($P < 0.05$) the % COX-2 (7.34 \pm 4.36 vs. 1.68 \pm 0.23 LPS) and % TNF- α (14.02 \pm 2.22 vs. 9.57 \pm 1.37 LPS) compared to LPS. DON, and LPS are potent inflammatory inducers and its co-exposure can amplify inflammatory response.

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WELFARE & NUTRITION

AWN-062

UROLITHIASIS IN FINISHING PIGS IS ASSOCIATED WITH COMPOSITION OF FEED AND DRINKING WATER

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Introduction

A previous study investigated crystalluria and urinary calculi in fattening pigs on fifty farms in Belgium. Microscopic examination revealed struvite as the most common crystal component (30% of the urine samples). Macroscopically stones and grit were detected in 7% of the samples. The composition of the stones was frequently mixed but always with involvement of calciumoxalatedihydrate (COD). The present study identified risk factors for developing urolithiasis with the overall aim to gain insight in the pathogenesis of the condition.

Material and methods

On the selected farms, feed and water samples were collected and subjected to chemical analysis. Also, information about management, nutrition and feeding schemes, drinking water quality and supply was collected using a questionnaire. For microscopic struvite and COD stones, a separate multivariable grouped logistic regression model was built in a stepwise forward manner to model the probability of the microscopic detection of struvite or COD.

Results

The presence of COD was negatively associated with the flow rate of the nipple drinker and the copper content in the feed, while a positive association was noticed with the chloride and phosphorus content of the feed, the manganese content of the drinking water and the presence of enterococci in the drinking water.

Struvite crystals tended to be more frequently detected in winter than in spring. A negative association was found with the potassium, calcium and fluoride content of drinking water and a positive association was observed with the iron content in the feed.

Discussion and conclusion

Several risk factors for crystalluria and urinary calculi were identified. It was shown that sufficient water intake by means of a good flow rate of the nipple drinkers is primordial for a high urine volume with a decreased tendency for crystalloid precipitation.



BBD-001

ANTIMICROBIAL CONSUMPTION AND EXTENDED-SPECTRUM β -LACTAMASE (ESBL)-PRODUCING *ESCHERICHIA COLI* IN ITALIAN FATTENING UNITS

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Introduction

Extended-spectrum β -lactamase (ESBL)-producing *Escherichia coli* represents a risk for both human and pig health. Furthermore, antimicrobials misuses may increase ESBL spread.

The aim of this study was to investigate, in latter stages of production, relationships between presence of ESBL-producing *E. coli* and antimicrobial consumption.

Materials and Methods

A convenience sample of forty-eight heavy pig fattening units was selected in Lombardy region of Italy. Ten samples of faeces were collect for each farm, five on farm and five at slaughterhouse, and ESBL presence was screened using a phenotypic diagnosis. Farms were classified as ESBL-positive if, at least, one sample collected on farm and one at slaughterhouse were positive.

Antimicrobial consumption was estimated, as days of treatments per bred pig, using defined daily dose animal for Italy (DDDAit) and an average weight at treatment of 100 kg. Data were collected retrospectively on 2016.

Differences between ESBL-positive and ESBL-negative farms were investigated using Mann-Whitney *U* test.

Results

Twenty out of forty-eight farms were found ESBL-positive. Number of bred pigs per year did not differ significantly ($P = 0.3061$) between the two groups of farms. Medians of antimicrobials consumptions were 7.65 days/pig in ESBL-positive farms (range; 0.84-31.10) and 19.54 days/pig (range; 0.11-43.97) in ESBL-negative ones. Antimicrobials consumption were not significantly different ($P = 0.1212$) between the two groups.

Discussion & Conclusion

The presence ESBL-producing *E. coli* is a source of relevant concern for public health. Lack of differences in antimicrobials consumption, between ESBL-positive and ESBL-negative farms, may be due to a limited sampling and difference in usage patterns of specific active ingredients (i.e. β -lactams). Moreover, identification ESBL-producing *E. coli* could be improved using molecular techniques. Further clarifications are required regarding ESBL, antimicrobials consumptions and active ingredients patterns during all production phases of Italian heavy pigs.

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BACTERIAL DISEASES

BBD-002

IGG IMMUNE RESPONSE TO *TREPONEMA PEDIS* T A4 IN FIELD CASES OF EAR NECROSIS

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Introduction

Ear necrosis is a syndrome affecting pigs shortly after weaning and is regarded as an animal welfare issue. The etiology is unknown but *Treponema* spp., predominantly *Treponema pedis*, are commonly detected in the lesions. Oral treponemes have been suggested as source of infection, transferred by biting and licking behavior. The aim of this study was to investigate the IgG response in field samples towards a whole cell lysate of *T. pedis* and a putative virulence protein, TPE0673.

Materials and Methods

In eight Swedish pig herds experiencing outbreaks of ear necrosis, serum was sampled from pigs (n=56, 8-14 weeks of age) showing different stages of ear necrosis. *Treponema* spp. had previously been detected in samples from these pigs. The serological response was analyzed by in-house ELISAs for IgG antibodies towards *T. pedis* T A4 lysate and to *T. pedis* protein TPE0673. Serum from three 13 weeks old healthy pigs were used as controls. The significance of difference between mean absorbance values in field cases and in the control group was assessed by two-sample t-test and between different herds by one-way ANOVA.

Results

For both ELISAs, mean absorbance values from all field cases of ear necrosis was significantly higher than that of the control group. There was no significant difference in mean absorbance values between the different herds, which indicates a cross-reactivity between different strains of *T. pedis* and possibly even between other *Treponema* spp.

Discussion and conclusion

Our previous studies have shown a broad diversity of *Treponema* phylotypes in ear necrosis, but with a predominance of *T. pedis*, suggesting that this species is of specific importance. The results presented here indicate that either *T. pedis* is involved in more or less of all these cases of ear necrosis or that antigenic variation is small between the *Treponema* phylotypes involved.



BBD-003

ANTIMICROBIAL SUSCEPTIBILITY OF FINNISH ENTEROTOXIGENIC *E. COLI* IN PIGS IN YEARS 2013-2016

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Introduction

Enterotoxigenic *Escherichia coli* can cause porcine neonatal and post weaning diarrhea, and potentiated sulfa drugs and aminopenicillins are recommended to be used for treatment of *E. coli* diarrhea. Due to quite commonly occurring antimicrobial resistance (AMR), diagnostic samples are sent to the laboratory to find out resistance profiles of enterotoxigenic *E. coli* on pig farms. As a part of the AMR-monitoring program, antimicrobial resistance is also tested for drugs that are not in clinical use for pigs in Finland.

Material and methods

Escherichia coli isolates from pig enteritis cases were obtained from faecal or post-mortem samples submitted to the laboratory. The enterotoxigenic *E. coli* were tested for antimicrobial susceptibility and isolates defined as resistant or non-wild type based on CLSI clinical breakpoints or epidemiological cutoff values (ECOFF), respectively. Isolates with decreased susceptibility to third generation cephalosporins were tested for AmpC and ESBL production. Only one isolate per herd was included.

Results

Decreased susceptibility to tetracycline, trimethoprim-sulfamethoxazole, ampicillin, streptomycin and quinolones were frequently observed. Also multiresistant isolates and one or a few AmpC producers were detected each year. Non-wild type isolates to colistin, gentamicin or florfenicol were not found.

Discussion and conclusion

The true AMR situation related to drugs in clinical use in Finnish pig herds might be better than these results indicate since the farms that frequently use antimicrobials and where the antimicrobial treatments are ineffective, are more likely to send samples. Also, the number of isolates tested each year was relatively low. However, decreased susceptibility is common and in case of recurrent antimicrobial use for diarrhea in pigs, the choice of the drug should be based on laboratory diagnostics and resistance profiles of enterotoxigenic *E. coli* on the farm.

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BACTERIAL DISEASES

BBD-004

USE OF FREE-RANGE PIGS AS SENTINELS FOR ANIMAL TUBERCULOSIS IN SPAIN

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Introduction

Tuberculosis continues being one of the main threats of outdoor rearing systems. It has been proposed that pigs may represent a useful sentinel for *Mycobacterium tuberculosis complex* (MTC) infection in both wildlife and cattle. The objective of this study was to evaluate the use of free-range pigs as sentinels of animal tuberculosis in bovine farms from Spain.

Material & Methods

Pigs ranged outdoors from 20 farms with MTC positive cattle in the last four years were evaluated for the presence of tuberculosis-like lesions (TBL) at slaughterhouse. TBL were submitted to bacteriological and qPCR analysis. A total of 582 serum samples were sampled at slaughterhouse to evaluate the presence of antibodies against MTC by using ELISA. Bacteriology results from bovine lesions evaluated in the last four years from two farms were also available and compared.

Results

A herd prevalence of 20%, a within-herd seroprevalence ranging from 6.67% to 43% (considering only seropositive farms) and an individual seroprevalence of 3.26% was detected in pigs by both bacteriological analysis and serology. In one farm (ID29) the *M. bovis* spoligotype SB1869 detected in cattle from 2015 to 2017 was also isolated from pigs. In a second farm (ID33) the same (SB0295 – isolated in 2014 from bovine lesions) and new (SB1869) *M. bovis* spoligotypes were detected from pigs as well as from bovine samples, showing that *M. bovis* spoligotypes associated with previous bovine MTC outbreaks were still present in pigs.

Discussion & Conclusion

Results of this study show the suitability of both serology and meat inspection surveillance of free-range pigs to monitor MTC infection or to detect exposure to this pathogen within a positive area. In addition, these results point out the role of pigs as potential carriers of new strains of *M. bovis* highlighting the necessity of implementing appropriate biosecurity measures.



BBD-005

EFFECTIVE USE OF AN AUTOGENOUS VACCINE FOR PREVENTING AND CONTROLLING EXUDATIVE EPIDERMITIS ASSOCIATED MORTALITY - A CASE STUDY

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Exudative epidermitis (EE) is a pseudo-contagious skin infection most frequently seen in newborn piglets up to about eight weeks of age. Virulent strains of exfoliating toxin-producing *Staphylococcus hyicus* are generally considered the causal agents, although other staphylococci may be implied. EE can be of economic significance as a cause of mortality and poor growth rate.

This clinical case occurred in a 400 sow farrow to finish farm located in Portugal.

A few days after weaning, piglets started showing skin lesions ranging from localized lesions to a generalized exudative condition covering the body. Severely affected piglets experienced rapid weight loss, dehydration and death often occurred within a few days. Antimicrobial therapy with injectable gentamicin was performed with low success in individual pigs, along with skin disinfection with chlorhexidine of the weaned batch.

Prior outbreak post-weaning average mortality was normally around 1,8% (January to July 2016) and increased up to 6,6% in the peak (December 2016); almost all of the increase was attributable to EE.

Staphylococcus hyicus was identified in swabs of clinically affected piglets. Antimicrobial susceptibility tests indicated resistance to penicillin and moderate sensitivity to gentamicin; the strain was sensitive to cefquinom, marbofloxacin and enrofloxacin.

All gestating sows were then vaccinated with an autogenous vaccine containing the isolated strain of *S. hyicus* at 11 and 13 weeks of gestation with very satisfactory results - an improvement was seen when pigs born from immunized sows reached the nursery (3,2% mortality). The average nursery mortality in the following six months (February to July 2017) was 1,7%. Herd immunity proved to effectively control and prevent disease extension and frequency.

Altogether, vaccination of sows, strategic use of antibiotics and an increase in management input translated in lower average nursery mortality and a better nursery performance than before the disease outbreak, with no new cases recorded.

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BACTERIAL DISEASES

BBD-006

EFFICACY OF VETMULIN® FOR THE CONTROL OF *MYCOPLASMA SUI*S INFECTIONS

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Introduction

Mycoplasma suis attaches and penetrates the erythrocytes and therefore leads to haemolytic anemia and reduced technical performances. A high health farrow-to-finish herd was suffering from pale suckling piglets despite an intramuscular iron injection. Simultaneously, impaired fertility and hypogalactia was noted. *Mycoplasma suis* was diagnosed by multiple positive PCR results of blood analyses and extreme low haemoglobin values in suckling piglets. As well in the farrowing units as in the nurseries, pigs showed a lower growth and more secondary infections like diarrhoea and *Streptococcus suis* infections.

Materials and methods

All sows and gilts were orally treated with tiamulin (Vetmulin®-Huvepharma®) at 10 mg/ kg bodyweight/ day for 14 consecutive days. Next to a close follow up of the haemoglobin values of the piglets, *Mycoplasma suis* PCR blood analyses were performed to evaluate the efficacy of the treatment. As purchased gilts showed positive PCR analyses at delivery, gilts were treated during 14 days upon arrival in quarantine. Technical data from the post-treatment period were compared to the pre-treatment period.

Results

After treatment, a recovery of haemoglobin values (from 4.84 to 11.97 mmol/ l) of 16 days old piglets was noted. Mean weight of the piglets at weaning and preweaned piglets was respectively 5 and 4.62 kg versus 4.8 and 3.46 kg before the programme. A 50 % reduction of positives PCR samples in sows and gilts and no positive blood tests of piglets at weaning were noted. The general health status of all pigs and the milk production and fertility of the sows improved significantly.

Discussion & conclusion

Mycoplasma suis infections may have an enormous impact on rendability due to impaired oxygen transport capacity in pigs. This haemotrophic disease can perfectly be controlled by a strategic administration of Vetmulin®.



BACTERIAL DISEASES

BBD-007

REDUCED ANTIMICROBIAL RESISTANCE IN WEANER PIGS TREATED WITH DETACH® FOLLOWING NATURAL CHALLENGE WITH F4 *E.COLI*

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Aminoglycosides and zinc oxide (ZnO) can prevent post-weaning diarrhoea (PWD) caused by Enterotoxigenic *E.coli* (ETEC), but their use can lead to antimicrobial resistance (AMR). Bromelain also protects pigs from PWD, but is not bactericidal. It inactivates host receptors, thereby preventing ETEC colonisation, and inhibits fluid secretion by toxins. This study tested the hypothesis that bromelain (formulated as Detach® 125mg/4mL) could control PWD without increasing AMR in *E.coli*.

Seventy-two pigs were selected from 9 high-health gilt litters and randomly allocated into four groups at weaning (Day 0; two piglets from each litter, n=18 per group); Detach® (oral on D-1 and D6), ZnO (2,500 ppm in feed, D7 to D19), neomycin sulphate (NS; 8mg/kg bw in feed, D7 to D19) or Controls (unmedicated). Four faecal *E.coli* isolates from each pig on Day 6, Day 19 and Day 39 were tested for AMR to 7 commonly used antibiotics. Differences in proportions of resistant *E.coli* between groups were analysed by logistic regression. Numbers of F4 ETEC were also quantified. Weight gains were recorded weekly.

A median of 280 F4 ETEC were detected on D6 across all pigs, with a significantly higher proportion in Controls relative to NS pigs (P=0.042). At Day 6, *E.coli* AMR was not significantly different between groups, but by D19 *E.coli* from bromelain and ZO pigs had reduced AMR to tetracycline, sulphamethoxazole/trimethoprim (TMS) and lincospectin relative to neomycin and Control pigs (P<0.001). Neomycin resistance was also higher in NS pigs (P=0.001), and two NS-treated pigs died. At Day 39, pigs previously treated with ZnO had significantly increased resistance to lincomycin (P=0.022) and tetracycline relative to all other groups (P<0.001). Bromelain did not increase growth (D7-D39; NS, 23.13^a kg; ZnO, 22.02^c kg; Detach, 21.07^b kg and Control, 22.77^c kg (P<0.05), but bromelain was effective in diarrhoea control without inducing AMR in *E.coli*.

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BACTERIAL DISEASES

BBD-008

A CLINICAL TRIAL TO ASSESS SEROLOGICAL RESPONSE AND EFFICACY OF PORCILIS® ILEITIS IN PIGS WITH SUBCLINICAL ILEITIS RAISED WITHOUT FEED ANTIBIOTICS DURING THE GROWER - FINISHER PERIOD (GF)

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Introduction

Subclinical ileitis caused by *Lawsonia intracellularis* is a common grow-finish enteric disease that results in transient reduction of feed conversion and weight gain, often without clinical signs. Subclinical infections are often controlled with antimicrobials that treat concurrent respiratory problems. For farms not using medicated feed, outbreaks are difficult to predict and morbidity usually ranges from 5 - 20% in affected herds. Preventive medicine will be the best option to reduce the amount of antimicrobials used during the growing period.

Material and methods

In a 300 sow herd with conventional diseases, *Lawsonia* prevalence pre-vaccination was 50%, diagnosed by fecal PCR, without clinical signs of Ileitis. Weekly productions of piglets were randomly assigned to control or treatment. Pigs (265 pigs/treatment) were randomly selected at weaning by weight. Control pigs were vaccinated with Circumvent® PCV M G2 as per label at 3 and 6 weeks of age. Treatment pigs, in addition, were vaccinated with Porcilis® Ileitis, an inactivated *Lawsonia* vaccine, at weaning. Both treatments were housed together; weights were collected individually at the end of the hot nursery and daily at the GF barn by an electronic scale. Serology samples were collected from 30 pigs in each treatment for IFA titers and fecal samples for PCR were taken at trial start and end.

Results

Based on 35,000 weight points in GF over a 70 day average per pig, vaccinated pigs averaged 1 kg more than controls at 20 weeks of age. Subclinical ileitis prevalence reduced from 50% to 23%. Pre-vaccination, all tested pigs were serologically negative for *Lawsonia*. Vaccinated pigs had a detectable IFA response, while no titers were found in control pigs.

Discussion

Porcilis Ileitis effectively reduced *Lawsonia* shedding and prevalence, induced an immune response and increased the weight at 20 weeks of age compared to controls.



BBD-009

ASSESSMENT OF LUNG LESIONS IN SLAUGHTER PIGS IN BELGIUM IN 2016-2017, SCORED WITH THE CEVA LUNG PROGRAM

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Introduction

Lung scoring at the slaughterhouse is a valuable tool for the assessment of the respiratory health status of pigs. The aim of the study was to investigate the prevalence and the extension of lung lesions suggestive for *Mycoplasma hyopneumoniae* (M.hyo) and *Actinobacillus pleuropneumoniae* (A.p.) infections observed in slaughter pigs in Belgium.

Materials & methods

Between January 2016 and November 2017 a total of 181 batches which included 26.528 lungs from different Belgian farms were scored at the slaughterhouse, using the Ceva Lung Program (CLP) scoring methodology. In the Ceva Lung Program, bronchopneumonia which is suggestive for enzootic pneumonia (EP) caused by M.hyo, including scarring and cranial pleurisy is quantified. Dorso-caudal pleurisy which is suggestive for previous A.p. infections is scored and APP index is calculated.

Results

The median % of bronchopneumonic lungs was 19,70% with the Q1=8,86% and Q3=33,45%. The median % of affected surface of the bronchopneumonic lungs was 5,94%, with the Q1=3,63% and Q3=7,83%. The median % of scarring was 2,55%, with the Q1= 0,77% and Q3=6,85%. The median % of cranial pleurisy is 1,20%, with the Q1=0,00% and Q3=3,14%. The median % of lungs with dorso-caudal pleurisy is 15,00%, with Q1=5,18% and Q3=28,99%. The median APP index is 0,43, with Q1=0,16 and Q3=0,81.

Disussion & Conclusion

The results of lung scoring at the slaughterhouse from 181 batches in Belgium indicate a high rate of EP-like and A.p.-like lesions which is consistent with earlier published data from Belgium. The control of M.hyo and A.p. remains a challenge and farm-specific control programs should be evaluated regularly. The CLP methodology is a valuable tool to evaluate the success of current and future control measures.

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BACTERIAL DISEASES

BBD-010

EVALUATION OF A.P. IMMUNE STATUS OF SOWS AND GILTS IN 10 BELGIAN SOW HERDS

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Introduction

Porcine pleuropneumonia, caused by *Actinobacillus pleuropneumoniae* (A.p.), is often induced by a trigger in already colonized pigs. Early transmission of A.p. from infected sows to their offspring was confirmed from the tenth day of life onwards. To prevent this, it is important to control A.p. infections in the sow herd. Incoming gilts should have the same immune status as the sow herd. Since most sows carry A.p., the introduction of negative gilts can cause gilts to suffer A.p. infection, higher A.p. shedding and an increased risk to colonize suckling piglets. The objective of this study was to compare the A.p. immune status of incoming gilts and the sow population.

Material & Methods

10 sow farms were randomly selected. On each farm, peripubertal gilts and sows were blood sampled. In total 49 gilts and 58 sows were sampled. Farms A to F purchase gilts from 3 different genetics and farms G-J produce their own gilts. ApxIV antibodies were tested by an indirect ELISA test (IDEXX). ApxIV antibody titers were compared between gilts and sows within each farm and overall.

Results

The median ApxIV titer in the gilt group is 8,7 and in the sow group is 162,4. The minimum titer in the gilt group is -2,6 and the maximum titer is 184,9. 34/49 of the sampled gilts are seronegative, 3/49 doubtful and 12/49 seropositive. In all farms except farm G, seronegative gilts were present. The minimum titer in the sow group is 51,2 and the maximum titer is 261,2. This means that all sampled sows are ApxIV seropositive.

Discussion & Conclusion

In these farms, the immune status of gilts and sows was different and this can contribute to an uncontrolled A.p infection in the farm. Therefore, it is recommended to vaccinate gilts against A.p. before introduction into the sow herd.



BBD-011

AN OUTBREAK OF CLOSTRIDIOSIS DUE TO CLOSTRIDIUM DIFFICILE IN NEONATAL PIGLETS IN NORTHERN ITALY: A CASE REPORT

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Introduction

An outbreak of pre-weaning diarrhea happened in a farrow to wean herd (900 sows) of Northern Italy. Morbidity and lethality recorded were 15% and 90% respectively. Eight 3 day old piglets were submitted to the laboratory of Reggio Emilia (IZSLER) with a history of diarrhea and sudden death.

Materials and methods

Necropsies were performed following standardized procedures. Bacteriology was performed on kidney, spleen, small intestine and colon collected from the piglets using different bacterial media in aerobic and anaerobic conditions. Colon specimens were frozen at -20° C to investigate for C. difficile toxins (TcdA and TcdB) by a commercial ELISA test. Tissue specimens collected for histological analysis were fixed in 10% formalin and 5 µm sections obtained were stained with haematoxylin and eosin.

Results

The piglets were dehydrated and anemic. Mesocolonic edema and pasty colonic content were observed. Differential diagnosis included pre-weaning enteritis caused by Clostridium difficile, Clostridium perfringens type A, enterotoxigenic E.coli, Salmonella spp, Isospora suis, Rotavirus and porcine epidemic diarrhea virus (PEDV). C.difficile was isolated in a pure culture from all samples of colon collected and the TcdA and TcdB toxins were demonstrated. Histopathology showed focal fibrino-purulent colitis. The piglets showing clinical signs have been treated with tylosin 10 mg/kg BW for three days by injection and this has successfully controlled the disease. The strain of C.difficile isolated was used to produce an inactivated autogenous vaccine for parenteral use in sows and farrowing crate hygienic measures have been implemented.

Discussion & Conclusion

The use of vaccination was implemented in order to minimize the antibiotic usage, based on macrolides. The hygiene implementation contributed to decrease the exposure-dose to neonatal piglets and minimized the risk of disease. After the implementation of the measures reported no other cases of clostridiosis have been described in the herd.

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BBD-012

ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *HELICOBACTER SUIS* ISOLATES FROM PIGS AND MACAQUES

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Helicobacter suis is a fastidious, Gram-negative bacterium that has been associated with gastritis, reduced daily weight gain and ulceration of the non-glandular part of the stomach in pigs, as well as with gastric disease in humans. The agent also colonizes the stomach of non-human primates, which probably represent the original hosts of this pathogen. Since *H. suis* only grows in a biphasic medium with an acidic pH, standard assays cannot be used to determine antimicrobial susceptibility and so far, only one study has investigated the antimicrobial susceptibility pattern of 9 *H. suis* strains isolated from pigs. Here, we determined the antimicrobial susceptibility of a larger collection of *H. suis* isolates.

A combined agar and broth dilution method was used to analyze the activity of 16 antimicrobial agents against 20 and 15 *H. suis* isolates obtained from pigs and macaques, respectively. After 48h microaerobic incubation, minimal inhibitory concentrations (MICs) were determined by software-assisted calculation of bacterial growth as determined by quantitative real-time PCR.

A monomodal distribution of MICs was seen for beta-lactam antibiotics, macrolides, aminoglycosides, doxycycline, metronidazole and rifampicin. A bimodal distribution was detected for fluoroquinolones, lincomycin and tetracycline, indicating acquired resistance in 2, 1 and 1 of the 20 porcine isolates, respectively. Acquired resistance against lincomycin and spectinomycin was detected in 1 and 2 of the 15 primate isolates, respectively. Remarkably, MICs of ampicillin and tetracyclines were higher for porcine *H. suis* isolates than for isolates obtained from macaques. Currently, whole genome analysis is being performed, which should shed more light on resistance mechanisms.

This study indicates that acquired resistance occasionally occurs in *H. suis* isolates and confirms the feasibility of the combined agar and broth dilution method to determine the antimicrobial susceptibility of *H. suis* isolates.



BBD-013

ROLE OF *HELICOBACTER SUIS* AND *FUSOBACTERIUM GASTROSUIS* IN THE PATHOGENESIS OF GASTRIC ULCERATION IN PIGS

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Helicobacter suis is a zoonotic, Gram-negative bacterium, that has been shown to cause gastritis and a reduction in daily weight gain in naturally and experimentally infected pigs. Several studies also attribute a role to this pathogen in the development of hyperkeratosis and ulceration of the non-glandular stratified squamous epithelium of the *Pars oesophagea* of the porcine stomach, although *H. suis* does not colonize this region. It is not completely clear how exactly *H. suis* influences ulcer development, but our recent studies indicate that alterations in gastric acid secretion may be involved. This may affect the composition of the *Pars oesophageal* microbiota. Compared to non-infected, 6-8 months old pigs with no obvious lesions, higher numbers of a recently described *Fusobacterium* species, designated *F. gastrosuis*, were detected in the *Pars oesophagea* of *H. suis*-infected pigs of the same age group with hyperkeratosis and erosions of the *Pars oesophagea* and downregulated markers for gastric acid secretion. The genome of *F. gastrosuis* showed presence of genes encoding proteins similar to proteins that play a role in the pathogenesis of infections with other *Fusobacterium* spp. and *F. gastrosuis* lysate induced necrosis in gastric cell lines. In *H. suis*-infected adult sows, severe lesions were highly present in the *Pars oesophagea* and markers for acid secretion were upregulated.

We hypothesize that a decreased gastric acid secretion during the more acute phase of a *H. suis* infection (6-8 months old pigs) may allow higher numbers of *F. gastrosuis*, which may affect development of lesions. Increased production of gastric acid during the chronic phase of infection (adult sows) might then further aggravate severity of lesions.

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BBD-014

ASSESSMENT OF THE CURRENT SITUATION OF THE PORCINE ENZOOTIC PNEUMONIA AND PORCINE PLEUROPNEUMONIA IN SPAIN USING SLAUGHTERHOUSE LUNG EVALUATION

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Introduction

Enzootic pneumonia (EP) and Porcine pleuropneumonia (PP) are still two of the main causes of economic losses in the swine production. Lung evaluation at the slaughterhouse is a helpful tool to assess the evolution of both diseases. The aim of this study was to describe the current situation of EP-like lesions and Ap-like lesions in Spain.

Material and methods

The survey was performed from July the 1st of 2015 up to 30th June of 2017. A total of 1145 batches of pigs from 5 different Spanish regions were evaluated. All the records were classified in the 4 trimesters according to slaughter dates. Lungs from each batch were scored at the slaughterhouse for EP-like and A.p.-like lesions using Ceva Lung Program methodology.

Results

The percentage of lungs with EP-like lesions was 47,30%, with an average percent of affected surface of lung parenchyma out of all lungs and of pneumonic lungs of 3,52% and 6,15 % respectively. The region with less affected lungs was the South-East of Spain, both for prevalence (35,53%) ($p < 0,05$) and for affected surface (2,43%) ($p < 0,01$). Months from July up to September showed to be the trimester with worst results for indicators of EP-like lesions ($p < 0,05$). A.p.-like lesion scoring showed 13,07% of dorsocaudal pleurisy and APPI index of 0,36. South-Eastern region had also better results, 11,04% and 0,30 respectively ($p < 0,05$). No differences for A.p.-like lesions between trimesters were observed.

Discussion and Conclusion

EP and PP are still largely present in Spain, although significant differences between regions and seasons have been described. Further studies should be defined to investigate how the control measures and which factors are influencing these differences.



BBD-015

PHARMACOKINETIC BEHAVIOR OF PAROFOR® 70 MG/G WSP POST ORAL ADMINISTRATION

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Introduction

The objective of this study was to measure the concentrations of paromomycin (PRM) (the active ingredient of Parofofor® 70mg/g WSP) in the gastrointestinal tract, during and after ending oral treatment.

Materials and Methods

Sixty pigs (Danube white) of both sexes (7.74-11.4 kg), 4-5 weeks of age, were used. On day 0 of the trial, the pigs were treated via drinking water with 25 mg PRM /kg/bodyweight (bw) as Parofofor® 70 mg/g WSP for 5 consecutive days. The evolution of concentrations of PRM was assessed applying HPLC determination in plasma and intestinal contents of pigs.

Results

The concentrations of PRM in the contents of small and large intestine on day 5 of the treatment, 24 hours and 48 hours after the end of the treatment were respectively 760.3 and 640.5 µg/g; 16.7 and 71 µg/g; 0.8 and 7.2 µg/g. The concentrations of PRM in the contents of small and large intestines on 72 hour after the end of the treatment were <LOQ (0,25 µg/g). The PRM concentrations in plasma during the treatment, 24 and 48 hours after the end of the treatment were <LOQ (50 ng/mL).

Conclusions and Discussion

The results from the study show that after oral administration of Parofofor® 70 mg/g WSP at 25 mg/kg/bw, PRM concentrates in small and large intestines, giving therapeutic concentrations for at least 48 hours after end of treatment.

These data help for better interpretation of *in vitro* susceptibility testing and in designing of efficient medication strategies.

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BBD-016

UREAPLASMA DIVERSUM IN LUNGS AND LARYNGEAL SWABS FROM PIGS WITH AND WITHOUT PNEUMONIA

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Introduction

Ureaplasmas sp. are commensals or opportunistic pathogens of vertebrate hosts. *Ureaplasma diversum* colonizes the urogenital tract of cattle and has been associated with genital disorders in these mammals. Recently, *U. diversum* was detected in pneumonic lungs of swine (Burgher et al., 2014). However, little is known about its role in porcine respiratory disease complex (PRDC).

Material & Methods

The lungs of 78 pigs (from two different herds) were inspected at abattoir, looking for proliferative pneumonias. From each inspected lung, specimens for histopathological analysis and broncho-alveolar lavages (BAL) for PCR were collected. DNA from BAL specimens was extracted and a specie-specific PCR for *U. diversum* was performed (Vasconcellos Cardoso et al., 2000).

Results

U. diversum was detected in 10/78 (12.8%) of BAL specimens, 3/40 (7.5%) in pigs from one herd and 7/38 (18.4%) from the other one. Out of 10 positive ones, three showed no lesions; one showed interstitial pneumonia, and the remaining six showed different degrees of perivascular and peribronchiolar lymphoplasmacytic hyperplasia. Additionally, 20 laryngeal swabs taken at 22 weeks of age, were processed by PCR giving a positive result of 2 out of 20 (10%).

Discussion & Conclusion

Although *U. diversum* is considered a bovine ureaplasma, earlier defined as a non-pathogenic species but currently a pathogenic one, its crossing from bovine to swine has been suggested (Burgher et al., 2014). There are few antecedents in the literature about its presence in swine. Its identification has been reported in pneumonic lungs from Cuban pigs (Burgher et al., 2014), but there are no antecedents in the literature about its presence in larynx. In spite of the fact that pathogenic potential and circulation of the agent among pig populations remain unknown, this finding constitutes an important antecedent for further studies about *U. diversum* participation and role in PRDC.



BBD-017

COMPARISON OF THE IMPACT OF THREE ONE-SHOT VACCINES AGAINST *MYCOPLASMA HYOPNEUMONIAE* ON PRODUCTIVE PARAMETERS IN A FIELD TRIAL

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Introduction

Vaccination against *Mycoplasma hyopneumoniae* has become an efficient tool to control and reduce economic losses associated with Enzootic Pneumonia (EP). The aim of this field trial was to compare the effect on productive parameters of three commercial one-shot vaccines against *M. hyopneumoniae*(Mh).

Material and methods

The field trial was performed in 2016 in a 5.000 sows farm and 55.600 animals of 27 batches were included. Productive parameters and lung lesion scores were collected from 14 batches vaccinated with Hyogen® Ceva, 9 batches vaccinated with Vaccine B(Mh) and 4 batches with Vaccine C(PCV2+Mh RTU). The economic balance in the 3 groups was calculated using Respinomics®app.

Results

The performance was as follows: batches vaccinated with Hyogen® had FCR 2,293 points and ADG 668 gr.; batches vaccinated with vaccine B had FCR 2,406 and ADG 631 gr.; and batches vaccinated with vaccine C had FCR 2,367 and ADG 627 gr. The differences between the Hyogen® group and groups B and C were statistically different both for FCR and for ADG (p<0,05).

Hyogen® group showed the percentage of lungs with Ep-like lesions of 45,21%, and the average affected lung surface of 3,01%. The percentage of lungs with EP-like lesions in group B was 48,55%, and the affected surface 4,21%. In group C the% of lungs with EP-like lesions was 53,21% and the affected surface 5,67%.

The economic analysis of the three groups showed a higher net profit in the Hyogen® group of 1,65€ and 2,48 €/animal compared with Vaccine B and Vaccine C groups respectively.

Conclusion

In this field trial, Hyogen® demonstrated to be the best option to improve FCR and ADG, and consequently to increase the profit compared to two mostly used Mhyo vaccines. Thus, vaccination with Hyogen® could contribute better than those vaccines to reduce the economic impact of enzootic pneumonia.

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BBD-018

MULTIDRUG RESISTANT *SALMONELLA* ISOLATED FROM CONVENTIONAL PIG FARMS THAT USE ANTIMICROBIAL AGENTS IN THEIR PREVENTIVE MEDICINE PROGRAMMES

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Introduction

Antimicrobials are commonly prescribed during the pig rearing period in Spain. This study aimed to assess the effects of ceftiofur and tulathromycin treatment in the emergence of cephalosporin resistant (CR) *Salmonella* during the lactation period.

Materials and methods

In four conventional pig farms, a group of 7-day-old piglets were treated with an intramuscular injection of ceftiofur ($n = 40$ per farm), whereas in another four farms piglets were treated with tulathromycin ($n = 40$ per farm). A control group of animals ($n = 30$ per farm) was left untreated in all farms. Moreover, these animals also received amoxicillin, pleuromutilins and tetracyclines throughout the rearing period. Faecal swabs were taken prior to treatment, 2 and 7 days post-treatment and at time of slaughter for culture of *Salmonella* spp. Minimal inhibitory concentration (MIC) determination to 14 antimicrobials, pulsed-field gel electrophoresis (PFGE) and detection of resistance genes comprising five different families of antimicrobial agents were performed in all isolates. Plasmids harbouring CR genes were characterised.

Results

Sixty-six *Salmonella* isolates were recovered from five of eight farms. Forty-nine of them were multiresistant and four contained bla_{CTX-M} genes harboured in conjugative plasmids of the IncI1 family. These four isolates were recovered before treatment with ceftiofur. *tet(A)* (77%), *sul1* (27%), and *tet(B)* (23%) genes were the most prevalent, and 10 isolates also presented *qnrB* genes.

Discussion and conclusions

A direct relation between the use of ceftiofur and the occurrence of CR *Salmonella* was not established. However, multidrug resistant was common, especially for ampicillin, streptomycin, sulphonamides and tetracycline. These antimicrobial agents are used in veterinary medicine and their prescription should be revised in a case-by-case situation.



BBD-019

OPTIMIZATION OF ANTIMICROBIAL TREATMENTS USING PHARMACODYNAMIC PARAMETERS UNDER FIELD CONDITIONS

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Introduction

Antimicrobials (AB) are essential tools to control clinical outbreaks involving bacteria as primary or secondary pathogens. The selective pressure exerted by these compounds could contribute to the emergence of antimicrobial resistant (AR) bacteria. The selection of the most suitable AB is critical to decrease the appearance and spread of AR. There are many guidelines about AB for swine practitioners, but a more practical approach is urgently needed to put these recommendations into practice. The aim of this research work is to describe a method based on pharmacodynamic determination to select the most suitable AB in a case by case situation.

Material & Methods

Samples coming from clinical cases compatible with the most common pig bacterial diseases were cultured on suitable medium cultures. After 2-3 days of culture, colonies were selected and cultured again for identification and further analysis using VITEK 2 COMPACT system. Antimicrobial susceptibility tests for MIC determination were performed, using the agar dilution method, according to CLSI guideline M31-A3 with modifications to automate the procedure (Thermofisher scientific proposal). A different battery of twelve AB was used for digestive and respiratory and systemic pathogens, respectively.

Results

It was possible to determine the MIC value for pig respiratory and digestive pathogens. This MIC value was used to select the most suitable antimicrobial taking into account pharmacokinetic (available in the public domain), pharmacodynamic information and recommendations published by the European Union about the different antimicrobial categories. This prediction was checked with clinical information from the field after applying the treatments.

Discussion & Conclusion

These results highlight the relevance of determining pharmacodynamic parameters (MIC) to optimize antimicrobial treatments in pig medicine. The generated information can justify an antimicrobial treatment for the present and future clinical cases if this epidemiological information is linked with the sow origin.

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BACTERIAL DISEASES

BBD-020

ERADICATION OF *MYCOPLASMA HYOPNEUMONIAE* IN AN OUTDOOR HERD USING AIVLOSIN®

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Introduction

The objective of this project was to eradicate *Mycoplasma hyopneumoniae* (*Mh*) from a 400 outdoor sow farm, using antibiotic treatment in the breeding animals and offspring and with a partial depopulation. Tylvalosin was selected as the preferred antibiotic to perform this *Mh* eradication program, as it shows mycoplasmacidal activity and has been proven effective in other *Mh* eradication protocols.

Material and Methods

Eradication was set up in a commercial outdoor herd. Piglets are weaned at 28 days of age and sent at 70 days to external sites. Free *Mh* pregnant gilts are introduced 6 weeks before farrowing in the herd. The farm was *Mh* positive but the situation was stable (in 2014, PCR assay results from trachea-bronchial swabs were negative at 28 and 70 days of age). Sows were vaccinated against *Mh* 3 weeks before farrowing but not piglets. The protocol consisted in emptying the nursery and medicating all gilts, sows and boars with 2.125 mg tylvalosin (Aivlosin® 42.5 mg/g medicated premix for pigs) per kg of body weight (bw) per day during 28 days. Suckling piglets received from the first day of the protocol and every 10 days thereafter an intramuscular injection of 2.5 mg tulathromycin per kg bw. *Mh* vaccination was stopped right after the end of the treatment. Replacement gilts were reintroduced in quarantine 7 days after the end of the protocol. Serological monitoring has been performed on these sentinel gilts 12 and 33 weeks after their arrival, and on old finishers born after the end of the protocol.

Results

20 months after the eradication protocol, all tested samples have been negative.

Conclusion

The farm is now considered as *Mh* free. This protocol with a treatment with Aivlosin® and a partial depopulation has been proven to be effective in the eradication of *Mh* from this unit.



BBD-021

EFFECT OF DIFFERENT GILT VACCINATION SCHEDULES ON COLONIZATION BY *MYCOPLASMA HYOPNEUMONIAE* DURING THE GILT ACCLIMATION PERIOD

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Introduction

Gilts are considered key in *Mycoplasma hyopneumoniae* (*Mhyo*) transmission. Vaccination during gilt acclimation may decrease shedding at farrowing, piglet colonization and, together with piglet vaccination, to diminish the impact of respiratory problems in fatteners. The aim of this study was to assess the effect of different gilt vaccination protocols during acclimation on the *Mhyo* colonization.

Material and Methods

An external batch of 180 *Mhyo* seronegative and PCR negative gilts were selected at 1 week post-entry (wpe) in the acclimation unit of a *Mhyo* positive farm. Gilts were divided into 3 groups (A, B and C). Group A was vaccinated intramuscularly with 2 ml of a commercial *Mhyo* vaccine (Hyogen®) at 2, 4, 6 and 8 wpe. Group B gilts received 2 ml of vaccine at 2 and 6 wpe and 2 ml of PBS at 4 and 8 wpe. Group C received 2 ml of PBS at every studied wpe. Laryngeal swabs (LS) and blood samples were taken at 14 wpe and were tested by rt-PCR and ELISA, respectively. Number of shedding and seropositive gilts by group were compared by Fisher's exact test.

Results

Number of shedding gilts in vaccinated groups A (1/60, 1.7%) and B (2/60, 3.3%) was significantly lower ($p < 0.05$) compared to the non-vaccinated group C (27/60, 45.0%). Nevertheless, no statistical differences were found among the vaccinated groups with different number of doses. All gilts were seropositive (180/180, 100%) and no differences were detected.

Discussion and conclusion

Gilt vaccination reduces significantly the *Mhyo* gilt colonization and may represent an effective tool for decreasing the *Mhyo* infectious pressure in farms. Apparently, no differences were observed when using 2 or 4 vaccine doses in terms of *Mhyo* colonization at 14 wpe.

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BBD-022

MYCOPLASMA HYOPNEUMONIAE GENOTYPE COMPARISON OF FIELD STRAINS DETECTED IN VACCINATED ANIMALS AT SLAUGHTERHOUSES AND THE STRAIN OF THE VACCINE USED

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Introduction

Mycoplasma hyopneumoniae (*Mhyo*) strains circulate in most vaccinated farms. Nevertheless, there is few information regarding the similarity among field and vaccine strains. The purpose of this study was to compare the *Mhyo* genotype of the strains detected in slaughtered animals from vaccinated farms with the strain of the vaccines used.

Material and Methods

Lungs showing *Mhyo*-like lesions from 3 animals from 10 vaccinated farms were collected at Spanish slaughterhouses. To confirm *Mhyo* as the cause of the lesions, these samples were tested by qPCR. Within each farm, those qPCR positive samples with Ct value lower than 30 were genotyped by sequencing different loci (p97, p146, H1 and H5). Characterization was based on counting the variable number of tandem repeats (VNTR) for each locus. Five commercial vaccines against *Mhyo* used (A, B, C, D and Hyogen®) and two reference strains (ATCC 25095 and ATCC 25934) were also genotyped. Sequences of nucleotides and VNTR were aligned with MUSCLE v3.8.31 to compare the similarity among *Mhyo* field and vaccine strains.

Results

From the 30 analyzed samples, 21 were qPCR positive whereas samples from three farms (two vaccinated with Hyogen® and another with vaccine B) were negative. Among these positive samples, 12 *Mhyo* typing profiles were found according to the VNTR for each locus. Each vaccine strain and reference strains displayed different genotypes. *Mhyo* typing profile detected on each farm was different from the vaccine profiles.

Discussion and conclusion

Mhyo was detected in all vaccinated farms, but those that received Hyogen® and vaccine B. In positive cases, field strains were different from the strain of the corresponding vaccine applied. Further analyses are needed to elucidate the influence of vaccination on *Mhyo* circulating strains.

Acknowledgments: Secretaria d'Universitats i Recerca del Dept. d'Economia i Coneixement de la Generalitat de Catalunya (2015DI078) and CEVA Santé Animal.



BBD-023

VACCINATION WITH COLIPROTEC® F4/F18 BEFORE WEANING IN A FRENCH FARM DEALING WITH POST-WEANING DIARRHEA: A CASE REPORT

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Post-weaning diarrhea (PWD) remains a major cause of economic losses for the pig industry. A number of preventive measures have been recommended to control PWD. Coliprotec® F4/F18 is a live non-pathogenic *E. coli* vaccine for active immunization of pigs against F4-EPEC and F18-EPEC. This case report describes the implementation of Coliprotec® F4/F18 one week before weaning to control PWD due to F4-EPEC in a French farm.

This study reports on a 220-sow farrow-to-finish farm with history of PWD. After weaning at 28 days of age, complete batches of piglets are transferred to a nursery for 50 days. Before implementation of Coliprotec® F4/F18, PWD control strategy consisted of an antibiotic-free specific diet supplemented with a therapeutic dose of zinc oxide (3000 ppm) and water medication with colistin (100 000 IU/kg/day for 3 days). In order to optimize the control of PWD, it was decided to vaccinate piglets with Coliprotec® F4/F18 at 21 days of age. A new feed with a feed additive dose of zinc oxide (131 ppm) and less digestive security was implemented for the vaccinated pigs. Mortality, average daily gain (ADG) and antibiotic treatments were recorded for five batches before (1587 piglets) and seven batches after (2099 piglets) the implementation of Coliprotec® F4/F18.

Following vaccination with Coliprotec® F4/F18, PWD clinical signs decreased and PWD specific antibiotic treatments were not required. Mortality of the nursery phase was decreased from 3.72% for the non-vaccinated groups to 1.86% for the vaccinated groups. Nursery ADG was 546.44 and 528.61 g/day for the non-vaccinated and the vaccinated groups, respectively.

In this farm, implementation of Coliprotec® F4/F18 one week before weaning improved clinical signs of PWD and reduced the mortality rate by nearly 2% in the nursery, while PWD antibiotic treatments and therapeutic levels of zinc oxide in the feed were not needed.

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BACTERIAL DISEASES

BBD-024

COMPARISON OF THE GROWTH PERFORMANCE OF HEAVY PIGS VACCINATED WITH HYOGEN® OR ANOTHER SINGLE SHOT VACCINE AGAINST *M.HYOPNEUMONIAE* IN ITALY

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Introduction

Enzootic pneumonia remains one of the major respiratory diseases of pigs affecting significantly the growth performance of fatteners. In some production systems the vaccination is used for practical reasons even before weaning in suckling piglets. The aim of this trial was to compare the effect of single shot of Hyogen® with another single shot vaccine in the farm condition.

Material and methods

A commercial farrow-to-finish farm with 350 sows was selected for the trial. In total 337 pigs of 4 batches were vaccinated with Hyogen® at 1 WOA upon the request of the producer (group G1) and were compared with 271 pigs from 3 batches vaccinated with the Vaccine A also at 1 WOA (group G2). The growth performance was monitored in the fattening units. Lung lesions were scored at the slaughterhouse according to the Ceva Lung Program. The economic balance was calculated using Respinomics™.

Results

No side effects were observed in piglets after any of the two vaccines. The ADG in fattening was 0.871kg in pigs of G1 compared to 0.827kg in G2 ($p > 0.05$). The prevalence of lungs with fresh EP-like lesions, the % of affected lung parenchyma out of sick lungs and the % of lungs displaying scars due to old lesions were in the G1 28%, 2% and 1% respectively and in the G2 27%, 2.5% and 3% respectively. The overall economic benefit due to higher ADG was calculated 2.2€ per pig in favour of G1.

Conclusion

The single dose of Hyogen® vaccination resulted in higher daily weight gain in the fattening period in comparison with another on-shot Mhyo vaccine. Due to the improvements in the weight gain, Hyogen® vaccination was more profitable in the heavy pig producing farm in Italy.



BBD-025

SCREENING OF SEVERAL ALGAE IN WEANED PIGLETS' FEED TO COUNTERACT THE EXPERIMENTAL *ESCHERICHIA COLI* K88 INFECTION AND POST-WEANING DIARRHEA

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Introduction

Colibacillosis is a major cause of illness and death in weaned pigs. Antibiotics and antimicrobials (Zn or Cu) in piglets starter diets control this incidence. The ban of AGP offers an opportunity for new strategies of prevention. The study determined the efficacy of several algae against the challenge with *Escherichia coli* K88 in weaned piglets.

Material & Methods

The study lasted 14 days, had a randomized complete block design, using 56 weaned piglets in 4 treatments (Basal Diet -BD-, BD plus algae APSA108005 or APSA103017 or APSA102026 at 0.2%). Oral challenge with 5×10^8 CFU *E. coli* K88 was performed on day 4. Performance and diarrhea were assessed daily. Fresh feces were collected to determine presence of K88. On day 14, caecal, ileal contents and ileal mucosa scrapes were collected from one piglet per pen for microbiota and gene expression of immunological markers (qRT-PCR).

Results

APSA108005 and APSA103017 numerically outperformed Control group. *E. coli* K88 counts in feces and the number of positive samples were lower in APSA108005 (29% vs 86% for BD on day 5 after challenge); from ileal and cecal contents APSA103017 and APSA102026 supplementation reduced K88 counts (0.5 log units). The expression degree of cytokines and cell-surface-proteins were higher in algae groups compared to BD (between 0.1 to 0.6 relative units). The OTUS profiles from ileal content samples, showed an increase of *Lactobacillus* spp. in APSA108005 group. Significant differences in the global microbiota profile were observed in APSA108005 or APSA102026.

Discussion & Conclusion

The algae supplementation during the 14 first days weaning may have a prebiotic effect controlling *Escherichia coli* K88 diarrheas, stimulating the immune system associated to intestinal mucosa and inducing changes on digestive microbiota. 14 first days algae supplementation in weaned piglets diets could be an alternative to antibiotics and have potential to improve animal performance.

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BACTERIAL DISEASES

BBD-026

SEROTYPING OF 705 *STREPTOCOCCUS SUIIS* STRAINS BY PCR

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Introduction

Streptococcus (S.) suis is a major swine pathogen which causes considerable losses in the swine industry. *S.suis* possesses a coat of capsular polysaccharides that confers protection against the immune system. This capsule helped to classify *S. suis* strains into 35 serotypes (1 to 34 and 1/2). Recent studies demonstrated that serotypes 32 and 34 belong to the *S.oriratti* species and for serotypes 20, 22, and 26 a new species called *S.parasuis* was suggested. Hence, *S.suis* species can be divided into 29 serotypes.

Material & Methods

Between January 2016 and October 2017 705 *S.suis* isolates were gained from 8 different countries (Germany, UK, Belgium, The Netherlands, Poland, Russia, Croatia, Switzerland). Swabs were spread out on blood agar and incubated for 24h at 37°C. Species confirmation was performed by MALDI-TOF mass spectrometry and serotyping by PCR. PCR-based methods for serotyping are not able to differentiate between serotypes 1 and 14 and 2 and 1/2, respectively.

Results

212 of the 705 isolates (30%) were found to be serotype 2 or 1/2, followed by serotype 9 (n=158), serotype 7 (n=82) and serotype 1 or 14 (n=70). The remaining serotypes were found in the following descending order: 4, 8, 3, 5, 18, 16, 21, 29, 12, 28, 31, 17, 23, 10, 11, 15, 19, 25 and 30. 20 isolates were not typeable. Serotypes 6, 13, 27, 33 and 35 could not be detected.

Discussion & Conclusion

This study confirms that *S.suis* serotype 2 is still the most frequent serotype found, followed by serotype 9 and 7. Although new approaches were used for serotyping, 20 isolates could not be typed. As this method of serological typing is based on antigenic composition of the bacterial capsule, it might be difficult to identify strains without any capsule genes or with deviations in the capsule gene sequences.



BBD-027

USE OF *ACTINOBACILUS PLEUROPNEUMONIAE* (APP) DETECTION AND SEROTYPING MOLECULAR TOOLS TO SUPPORT DIAGNOSIS ON APP CLINICAL CASES

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Introduction

App causes important losses to the pig industry through respiratory disease and >30% mortality in growing pigs if left untreated. App infection does not always produce disease and asymptomatic carriage in the tonsil may be difficult to detect. Recent refinements to published PCR tools now allow detection and molecular serotyping of App without requiring isolation.

Materials & Methods

We followed a farrow to finish farm with severe App clinical problems in 12-to-18 week old pigs. Serum samples were collected from 4-to-20 weeks-old pigs to measure App (anti-ApxIV) antibodies. Group level oral fluids were collected at 8, 10 & 12 weeks of age for PCR. Bacteriology culture were done on lung tissue from affected animals.

Results

Anti-ApxIV antibodies declined around 8 - 10 weeks of age with S/P ratios <40 (negative) between the 12 - 14 week of age (most severe clinical sings occurred in this age) to become >50 (positive) in older ages. App was isolated on lung samples from fatalities. Samples of oral fluid were positive for App by PCR in all the groups tested, including in 8 and 10 week-old pigs without any respiratory signs. Oral fluid samples and lung isolates presented similar molecular signatures, when typed by PCR, as serotype 8.

Discussion & Conclusion

Oral fluids are easy to collect and they can be useful to detect the involvement of pathogens in respiratory problems on pigs. Here, App was detected and typed by PCR in infected pigs before clinical signs, prior to an outbreak, and during the outbreak as well. Although reliance on oral fluid testing alone is not sufficient for diagnosis of App disease, we highlight the value of optimised PCR techniques on this medium as a potentially valuable surveillance and supplementary pre-purchase testing tool.

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BACTERIAL DISEASES

BBD-028

MUCOSAL INFECTION WITH CLINICAL *STREPTOCOCCUS SUIIS* SEROTYPE 9 STRAIN ISOLATE CAN INDUCE SEVERE DISEASE

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Introduction

Streptococcus suis is associated with disease and mortality in young piglets from weaning to 10 weeks old. To study interventions appropriate animal models need to be available. Therefore, an infection experiment with a pathogenic clinical *Streptococcus suis* serotype 9 strain isolate was conducted using a mucosal infection.

Materials & methods

Twenty piglets, six weeks old, from an SPF herd with known carrier ship of *S. suis*, but without a history of disease were used. Four treatment groups were formed. Two groups were infected intranasal and oral with 10⁹ CFU of a pathogenic *S. suis* strain. Two groups served as controls and received a sham inoculation. One of the infected groups and one of the control groups were pretreated with acetic acid 30 minutes before inoculation. Samples were taken during life from tonsil, saliva and feces and after necropsy from gut, joints, brain, lung, lymph nodes, spleen and serosa.

Results

Of the infected animals, 70% showed typical illness and 50% had to be removed due to severe clinical symptoms. No effect was seen from acetic acid pretreatment. After inoculation *S. suis* serotype 9 was present in tonsil samples from all piglets, in saliva samples of 80% of piglets and in feces of 20% of piglets. 80% of infected piglets showed an increased leucocyte count. At necropsy, 30% of the infected animals were *S. suis* positive in joints, 10% in brain, 10% in lungs, 20% in lymph nodes, 10% in spleen and 20% in serosa.

Conclusion

With this results, we showed that it is possible to induce clinical illness in SPF piglets with inoculation of a pathogenic *S. suis* type 9 strain by mucosal infection. These results are a basis for further optimizing of an animal model to study intervention methods against *S. suis* type 9 infections.



BBD-029

NEONATAL PIGLET DIARRHEA IN FRANCE: WHICH PATHOGENS ARE INVOLVED?

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Introduction

Neonatal diarrhea is common in pig farms and induces economic losses because of poor technical performances and increased mortality of the affected piglets, as well as increased frequency of antimicrobial use. The aim of this study was to establish the prevalence of potential pathogens in affected French farms and the frequency of histological lesions that could be attributed to these pathogens.

Material and Methods

From 2015 to mid-2017, 283 analyses were performed on feces samples from diarrheic piglets. All samples were subjected to bacterial culture and genotyping of pathogenic isolates combined with viral analyses by PCR (Polymerase Chain Reaction). In addition, in 84 of these analyses, histological examination was carried out on samples of gut walls.

Results

No *Clostridium perfringens* type C or TGE (Transmissible Gastro Enteritis) or PED (Porcine Epidemic diarrhea) coronaviruses were found. The prevalence of pathogens in investigated herds was as follows (in parentheses: isolation prevalence and histological lesion frequency, respectively): *Clostridium perfringens* type A (84% and 33%), *Enterococcus hirae* (63% and 49%), *Clostridium difficile* (48% and 12%), rotavirus type A (26% and 26%) and enterotoxigenic *Escherichia coli* (18% and 20%). Histological results seemed influenced by the age of the sampled piglets. For 28% of the 84 diagnosis with histological examination, it was impossible to identify an etiological cause of disease because there were contradictions between the bacterial and/or viral findings and the observed histological lesions. For the other 72%, bacteria belonging to normal gut microbiota were commonly involved (alone or jointly): *Enterococcus hirae* (47%) and *Clostridium perfringens* type A (29%).

Discussion and Conclusion

Understanding under what conditions commensal bacteria become pathogenic would help to solve many neonatal diarrhea cases.

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BACTERIAL DISEASES

BBD-030

PK/PD AND CLINICAL RELATIONSHIPS OF VALNEMULIN (ECONOR®) ADMINISTERED TO PIGS FOR THE TREATMENT OF ILEITIS CAUSED BY *LAWSONIA INTRACELLULARIS*

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Introduction

Econor® is a pleuromutilin antibiotic registered for treatment of enteric and respiratory diseases associated with *Brachyspira* spp, *Lawsonia intracellularis* and *Mycoplasma hyopneumoniae*. The objective of the work was to compare the pharmacokinetics (PK) of the valnemulin (Econor®-Elanco AH) ileum contents concentration (ICC), to relate this to intracellular MICs (iMICs) against *Lawsonia intracellularis* (*LI*) derived from laboratory studies (pharmacodynamics - PD) and evaluate the clinical efficacy of the drug when administered in an artificial infection study.

Material & Methods

Pharmacokinetics: The valnemulin (VAL) ICC concentration was estimated using a PK model based on the valnemulin colon contents concentration published following the administration of valnemulin via feed at 75ppm and 200ppm.

Pharmacodynamics: The iMICs were derived from a study in which 10 EU and US isolates of *LI* grown in McCoy murine fibroblast-like cell cultures were tested.

Challenge study: An artificial infection study was carried out (*LI* challenge strain LR189/5/83) in which VAL was given at 25, 37.5, 50ppm from 2 days before challenge until termination 21 days after infection. In this study VAL was also given at 75 and 125ppm 7 days after infection for 14 days until termination.

Results

Pharmacokinetics: The valnemulin ICC was recorded at 0.49 µg/g (75 ppm) and at 1.51 µg/g (200 ppm).

Pharmacodynamics: The MIC90 of valnemulin against *LI* was 0.125µg/ml.

Challenge study: In the artificial infection study some mild gross and histological lesions were found in groups with lower dose levels (25-50ppm). At dosages from 75-125ppm no gross and histological lesions were found with a histological lesion score of 0%. Improved performance data confirm the pronounced clinical effect at higher dosages.

Discussion & Conclusion

Effective valnemulin concentrations are achieved in the ileum contents. These are sufficient to inhibit the development of gross lesions (50 ppm) and to treat and eliminate ileitis infection at 75 ppm (3-4 mg/kg bw) and above.



BBD-031

PK/PD AND CLINICAL RELATIONSHIPS OF VALNEMULIN (ECONOR®) ADMINISTERED TO PIGS FOR THE TREATMENT OF SWINE DYSENTERY CAUSED BY *BRACHYSPIRA HYODYSENTERIAE*

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Introduction

Econor® is a pleuromutilin antibiotic registered for treatment of enteric and respiratory diseases associated with *Brachyspira* spp, *Lawsonia intracellularis* and *Mycoplasma hyopneumoniae*. The objective of the work was to compare the pharmacokinetics (PK) of the valnemulin (Econor®-Elanco AH) colon contents concentration (CCC), to relate this to MICs against *Brachyspira hyodysenteriae* (*B.hyo*) and to evaluate the clinical efficacy of the drug when administered in an artificial infection study.

Materials&Methods

Pharmacokinetics: The valnemulin CCC concentration was determined based on a pharmacokinetic study following the administration of valnemulin via feed at 75 ppm and 200 ppm.

Pharmacodynamics: The MICs were derived from several studies (pharmacodynamics - PD) using the broth microdilution test.

Challenge study: An artificial infection study was carried out and, when clinical signs of disease were evident, groups of pigs were treated for 10 days with Econor from 50-150 ppm. Un-medicated food was provided for further 14 days. Clinical disease was assessed daily, clinical scores were assigned and rectal swabs taken twice weekly. Post-mortem examination was carried out 24 days after challenge.

Results

Pharmacokinetics: The valnemulin CCC was recorded at 1.68 µg/g (75ppm) and at 5.2µg/g (200ppm).

Pharmacodynamics: The MIC90 of valnemulin against *B.hyo* was 0.063µg/ml.

Challenge study: In the artificial infection study, the clinical signs of disease rapidly resolved at all treatment levels and clinical disease was not seen by day 5 in the treated pigs. Shedding of *B.hyo* was prevented in all treatment groups after withdrawal of medicated feed. No swine dysentery lesions were found at dosages of 75 to 150ppm post mortem.

Discussion & Conclusion

Using the CCC and MICs of valnemulin give a good correlation for the prediction of the efficacy for the treatment of swine dysentery, when administered in the feed at 75ppm and higher dosages. This anticipated efficacy was confirmed in an artificial challenge study.

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BACTERIAL DISEASES

BBD-032

A FIELD TRIAL COMPARING THE EFFICACY OF TWO VACCINES AGAINST MYCOPLASMA HYOPNEUMONIAE IN TERMS OF LUNG LESIONS AND GROWTH PERFORMANCE

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Introduction

Mycoplasma hyopneumoniae is the primary pathogen of Enzootic Pneumonia and can predispose to the porcine respiratory disease complex. Vaccination is commonly used to reduce coughing, lung lesions and performance losses due to Mycoplasma hyopneumoniae infection. In the present study, the effect of a novel vaccine against swine Enzootic Pneumonia on lung lesions and pigs' carcass weight was investigated in comparison with another commercial vaccine, in a Greek swine farm.

Materials and Methods

The study took place in a Greek farrow to finish herd with 1000 sows. The study began in June 2016, when 500 piglets were vaccinated with Hyogen[®] (group 1) and 500 piglets with Vaccine A (group 2). Per request of the farmer in both groups one shot of the vaccines was administered in 7th and 21st day of life, with 1 and 2ml per injection for groups 1 and 2, respectively. Pig' lungs were examined at slaughter for EP-like lesions by using a Ceva Lung Program methodology and their carcasses were weighed separately.

Results

In total 670 lungs and carcasses were evaluated and weighed, respectively (group 1: 306 and group 2: 364). Lungs from animals belonging to group 1 were 0.66 times less likely (P=0.024) to have any EP-like lesions compared to lungs from animals belonging to group 2. Also, the percentage of affected lung parenchyma was on average 1.98 less (P <0.001) for animals vaccinated with Hyogen[®] compared to Vaccine A. Regarding carcass weight, animals from group 1 weighed on average 810 gr more compared to animals from group 2, however, this difference was not statistically significant (P=0.37). All results were adjusted for slaughter age-effect.

Conclusions

Under the conditions of the present study, animals vaccinated with Hyogen[®] had lower frequency and severity of EP-like lesions and better growth performance compared to animals vaccinated with Vaccine A.



BBD-033

ELIMINATION OF MYCOPLASMA HYOPNEUMONIAE BY VETMULIN® IN A DANISH MULTIPLIER HERD

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Introduction

A modified elimination protocol of Mycoplasma hyopneumoniae (M. hyo) compared to the method described by Zimmermann, W. 1989 is reported.

Material and Methods

900 Danbred sows and 350 Danbred gilts were planned eliminated for M. hyo. The herd is located at site 1 (Sows), site 2 (7-30 kg weaners), site 3 (gilt rearing). Barrows are sold. The sanitary status was red SPF (but positive for M. hyo). Clinical inspection and serological monitoring according to the SPF Scheme is performed monthly. Herd flow is site 1>site2>site3. 200 gilts for restocking were treated separately at site 3. Sows and gilts were medicated with Vetmulin® 10% oral granules in the feed at 6 mg/kg bodyweight for 14 days without piglet free interval. Ill sows and non-eaters were injected with Vetmulin 162 mg/ml or euthanized. Piglets born during the medication period were injected every Tuesday for 5 weeks with tulathromycin 25 mg/ml. Small and unthrifty piglets euthanized to minimize cross fostering. All piglets born before or during the medication period were weaned off site. A contamination barrier was made between sectionized farrowing rooms. Site 2 and site 3 was emptied, cleaned and disinfected before receiving piglets born after the elimination.

Results

M. hyo was surveyed by 20 samples from gilts, minimum 16 weeks of age, born after the elimination for 6 months at site 1 and site 3. In total 240 blood samples. The herd was declared free of M. hyo.

Discussion and conclusion

M. hyo is surveyed monthly by 20 samples both at site 1 and site 3. 480 seronegative samples have been obtained since the elimination start. The herd is still free of M. hyo.

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BACTERIAL DISEASES

BBD-034

PREVALENCE OF BACTERIAL PATHOGENS ISOLATED FROM URINARY SAMPLES OF SOWS IN BRITTANY IN 2017 AND ANTIMICROBIAL SUSCEPTIBILITY TO DIFFERENT ANTIBIOTICS OF *ESCHERICHIA COLI* ISOLATED IN THESE SAMPLES

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Introduction

In France, urinary tract infections (UTI) in sows can affect the breeding performances, particularly fertility, and sometimes lead to mortality of sows. Such infections are often under or late diagnosed. Subsequent economic losses raise awareness of farmers to detect these diseases. The aim of this study was to describe bacteria encountered in UTI in France and to measure their prevalence.

Material and Methods

93 samples were collected in 17 farms in Brittany from sows with cloudy or nitrite positive urine. Every sample was submitted to standard bacteriological culture (isolation, numeration and identification by MALDI-TOF). Antimicrobial susceptibility testing by a disk-diffusion method according to the CA-SFM French guideline was performed on strains considered as relevant pathogens.

Results

The data showed that for 87% of samples a single bacteria was isolated. For 73% of samples, *Escherichia coli* was isolated while Gram positive bacteria were isolated from remaining samples. 11% of them were *Staphylococcus spp.* The same proportions were nearly found when including relevant bacterias isolated from polymicrobial samples. In such polymicrobial samples, combinations of bacteria were mainly *Escherichia coli* of morphologically-different strains, or *Escherichia coli* with *Enterococcus spp.* or *Streptococcus spp.* Antibigrams were performed on the strains of *Escherichia coli*, highlighting higher sensitivity (100%) of these strains to colistin, apramycin and 3rd and 4th generation cephalosporins as well as lower sensitivity to amoxicillin (40%), tetracyclines (31%) and trimethoprim-sulfonamides (65%), antibiotics largely used in collective and metaphylactic treatment in sows.

Discussion and Conclusions

These results were correlated with the data found in the literature. The main difference was the highest prevalence of *Enterococcus spp.* found in relation to a lower isolation rate of *Streptococcus spp.* It seems therefore important to set up early detection of UTI in order to use targeted curative treatments and limit resistance to antibiotics.



BBD-035

ENTEROCOCCUS HIRAE- COMMENSAL OR PATHOGEN?

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Enterococcus (E.) hirae has been described as a potentially emerging cause of neonatal porcine diarrhoea (NPD). The bacterium is however also found in the intestinal flora of healthy piglets. The aim of this study was to investigate if strains associated with NPD are genetically different from strains found in healthy piglets.

E. hirae isolates associated with NPD were obtained from frozen intestinal samples from 18 piglets from six herds. All 18 animals displayed intestinal colonization with *E. hirae* on histopathology. *E. hirae* isolates from healthy animals were obtained from rectal samples from 35 healthy piglets from six different herds with no history of NPD. All animals were <1 week old. Swabs were cultured for enterococci on Slanetz/Bartley-agar. Up to ten pink colonies from each sample were analysed by MALDI-TOF for species identification. *E. hirae* isolates were subtyped by *cpn60* gene sequencing. Whole genome sequencing (WGS) was performed using Oxford Nanopore's MinION on six isolates from diarrhoeic and healthy piglets, respectively.

E. hirae could be cultured from all 18 diarrhoeic piglets and from 18 out of the 35 healthy piglets. A total of 160 isolates were recovered from the diarrhoeic piglets and 35 from the healthy. *Cpn60*-sequences were determined for 158 isolates from diarrhoeic piglets and 23 isolates from healthy piglets (12 isolates remain to be sequenced). Alignment of the ~500 bp sequences (CLC main workbench 7.9.1) revealed that the *cpn60*-sequence in 157 out of the 158 isolates from diarrhoeic animals were identical and differed from the isolates from healthy animals. Bioinformatics analyses of WGS data are on-going.

Preliminary data support a genetic difference between *E. hirae* associated with NPD and strains found in healthy animals. Comparative genomics of WGS data is however needed to confirm this and to characterise genetic features that are specific for *E. hirae* associated with NPD.

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BACTERIAL DISEASES

BBD-036

EFFICACY OF HYOGEN® IN COMPARISON TO OTHER ONE SHOT *MYCOPLASMA HYOPNEUMONIAE* VACCINES UNDER FIELD CONDITIONS

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Introduction

Vaccination against *Mycoplasma hyopneumoniae* (Mh) is a common tool used for the prevention and control of Enzootic pneumonia (EP). Evaluation of lungs at the slaughterhouse is a common method to assess the efficacy of vaccination. The aim of this study was to compare the efficacy of Hyogen® with other four one-shot Mh vaccines.

Material and methods

Between October 2016 and November 2017 a total of 548 batches within 81.507 lungs from different farms located in Spain were scored at the slaughterhouse for Enzootic pneumonia (EP)-like lesions using Ceva Lung Program (CLP) scoring methodology described previously. Prevalence and extensions of dorsocaudal pleurisy (*Actinobacillus pleuropneumoniae*-like lesions) were also recorded.

For each batch the indicators of EP-like lesions and APPI index were calculated, using CLP app.

Results

Lungs from unvaccinated pigs showed statistically more lung lesions than lungs from vaccinated pigs. The % of affected lung with EP-like lesions was 59,04% vs 43,48% ($p < 0,001$), percent of affected surface out of all lungs was 5,11% vs 2,98% ($p < 0,001$), and APPI index 0,33 vs 0,37 ($p < 0,001$) in non-vaccinated vs vaccinated batches respectively.

Lungs from farms vaccinated with Hyogen® showed statistically lower percentage of affected lungs with EP-like lesions than the rest of vaccines, 37,96% vs 52,92% ($p < 0,001$), and less percentage of affected surface out of all lungs 2,08% vs 4,53% than in the other groups ($p < 0,001$). The APPI index was also statistically different 0,32 in Hyogen® group vs 0,35 in the rest ($p < 0,05$).

Discussion & Conclusions

Vaccination of piglets against *Mh* reduced the prevalence and severity of EP-like lesions. Lungs from farms vaccinated with Hyogen® showed less EP-like lesions, pleurisy and APPI index than lungs from farms vaccinated with any other vaccine or no vaccinated farms. This result also indicates that efficient control of *Mh* infections can help to control the problems with *Actinobacillus pleuropneumoniae*.



BBD-037

THE IMPACT OF VACCINATION AGAINST *LAWSONIA INTRACELLULARIS* ON SHEDDING OF *SALMONELLA ENTERICA* SEROVAR TYPHIMURIUM AND THE GUT MICROBIOME

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Introduction

Lawsonia intracellularis (*Li*) is among the most common intestinal pathogens of swine, and has been found as a risk factor for increased *Salmonella enterica* shedding in pigs. *Salmonella enterica* serovar Typhimurium (*ST*) continues to be a major cause of foodborne illness worldwide and pork can serve as a source of infection. The objective of this study was to investigate if oral live vaccination against *L. intracellularis* could lead to decreased *S. Typhimurium* shedding in a co-infection model.

Materials & Methods

To test this hypothesis, pigs were challenged with either *ST* or *ST* and *Li*, with and without *Li* vaccination (n = 9/group). A non-challenged group served as negative control. Fecal samples were collected on the day of challenge with *ST* and weekly thereafter until 49 days post infection. *ST* was quantified in feces using a most probable number enrichment method and the microbiome was investigated using the V1-V3 region of the 16S rRNA gene.

Results

Li vaccination decreased the shedding of *ST* in co-infected animals by 2.12 log₁₀ organisms/gram of feces at 7 d.p.i. (p<0.05). Analysis of the microbiome showed that vaccination led to a significant (p<0.05) increase in the abundance of *Clostridium* species, including *Clostridium butyricum* in co-infected animals.

Discussion & Conclusion

This study demonstrated that oral live vaccination against *L. intracellularis* can significantly reduce the shedding of *S. Typhimurium* in co-infected animals. The increase of *C. butyricum* mediated by vaccination could have contributed to decreased shedding of *S. Typhimurium*. This is because *C. butyricum* is known to produce large amounts of butyrate, which can inhibit *S. Typhimurium* invasion of the intestine. These results indicate that vaccination against *L. intracellularis* in co-infected herds may provide a new tool to increase food safety and animal health by decreasing *S. enterica* shedding and transmission without the need for antibiotics.

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BACTERIAL DISEASES

BBD-038

ASSESSMENT OF ATROPHIC TURBINATE LESIONS IN ITALIAN FARMS

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Introduction

Atrophic Rhinitis (AR) is a disease impacting the upper part of the respiratory tract characterized by hypoplasia of nasal turbinates associated with decreased performance and increased respiratory problems. Routine diagnosis is uncommon in Italy. This absence of regular diagnosis can lead to underestimate the prevalence and the impact of the disease. The aim of the present study was to evaluate the presence of AR lesions in Italian pig farms at risk.

Material & Methods

Veterinarians from Northern Italy were asked to select for this survey farms with no to low AR vaccination plan (e.g. gilt vaccination only, recent vaccination plan discontinuation). On these farms, cross sections of the snout of the 3 -5 dead pigs considered at risk and weighing 20-180 kg were scored (0-22 scale). Pictures of turbinates were taken and were submitted to a blinded expert for scoring and procedure controls. Vets answered to a questionnaire about farm practices as well.

Results

Seventeen vets have submitted pictures and questionnaires from 25 farms. In total 97 noses were scored. From nasal pictures, 70% of the sections were correctly performed. Among these, complete absence of lesions was found in only 15%; 53% showed low score (1-7), 24% medium score (8-14) and 9% high score (15-22). At the farm level, 19/25 farms provided correct sections for scoring, among which 11 farms provided sections showing moderate to severe lesions.

Discussion & Conclusion

This study possibly revealed that the impact of AR in Italian farms could be underestimated since 35% of interpretable snout sections collected in farms with limited prevention program showed non negligible medium to severe AR lesions. Nevertheless no bacteriological exam was performed to confirm the etiology of these cases. This observation advocates reinforcement of disease surveillance routines on farm by encouraging regular diagnosis and according to best practices.



BBD-039

USE OF BRONCHO-ALVEOLAR LAVAGES FOR THE DIAGNOSIS OF SRD AND ANTIBIOTIC CHOICE

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Introduction

Bacteria collection methods play a major role in the prudent use of antibiotics by helping in the identification of pathogens and in the choice of appropriate antibiotic treatment. This study aimed at assessing the performance of bronchoalveolar lavages (BAL) for Swine Respiratory Disease (SRD) diagnosis and at assessing how diagnostic correlates with the outcome of gamithromycin therapy.

Material & Methods

On ten Italian farms experiencing SRD episodes, 20 sick pigs weighing 12-15kg (2 farms) or 40-50kg (8) were selected. BAL were performed in each pig for bacterial culture. The pigs were allocated to two groups according to a clinical score based on rectal temperature, depression and respiratory signs. One group was treated with gamithromycin (ZACTRAN). The second group was left untreated while respecting animal welfare considerations. Clinical scoring was performed again one (one farm:two) day(s) following treatment.

Results

Following gamithromycin treatment, clinical signs decreased in 7 farms as compared to untreated pigs ($p < 0.001$ to 0.02 for 6 farms): as early as one day post-treatment, only 6% treated pigs vs 55% controls still showed moderate clinical signs. On these farms, 26% BAL fluids were positive, predominantly evidencing *Pasteurella multocida* (57%), *Streptococcus suis* (38%). On 2 farms, either self-recovery in controls or absence of early recovery in treated animals could be linked to an absent or irrelevant bacterial burden. On the last farm, the low therapeutic effect could be associated to a high bacteria load (40% positives) of mixed origins.

Discussion & Conclusion

This study shows that BAL is an effective method for bacterial isolation in SRD cases. In addition, the nature and prevalence of bacteria species well correlated with the clinical outcome following therapy. The contribution of *Streptococcus suis* could be debated and it could not be excluded a variable susceptibility to gamithromycin could have contributed to differentiated therapeutic outcomes.

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BACTERIAL DISEASES

BBD-040

ASSESSMENT OF *STREPTOCOCCUS SUIIS* SEROTYPES IN 148 GERMAN PIG FARMS DURING THE PERIOD OF 2015 TO 2017

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Introduction

Streptococcus suis (*S. suis*) infections have a strong impact on health status and growth performance, especially in suckling piglets and nursery. The aim of the present study was to assess different serotypes involved in clinical cases in Germany. The samples came mainly from meningitis, arthritis and polyserositis cases, but also from respiratory disease.

Material & Methods

A total of 430 isolates originating from 148 farms were analysed between 2015 and 2017. Submitted isolates were cultured from different locations (serosa, pulmonary tract, central nervous system (CNS), joints) during necropsy from animals with clinical signs associated with *Streptococcus suis* infection. The strains were characterized by multiplex PCR targeting capsular genes to identify the serotype (*cps* typ) 1,2,7 and 9. It should be noted that serotype 1 and serotype 2 are not distinguished from serotypes 14 and 1/2, respectively, with this PCR.

Results

The percentages of the isolates (n=430) for *cps* types 1,2,7,9 and untypable strains were 4%, 32%, 13%, 26% and 25%, respectively. For 182 isolates the location of isolation was specified. It could be seen, that the serotypes varied with the localization sampled. Types 2,7,9 were most commonly found in the CNS (39%, 9%, 40%), whereas in the joints also *cps*1 was detected quite frequently (9%). In the serosa (57%) and pulmonary tract (42%) untypable strains were predominant, followed by *cps*2 and *cps*7.

Discussion & Conclusion

These findings show that mainly *cps* 1,2,7,9 *S.suis* strains were detected in joints and central nervous system of pigs in Germany. Regarding the isolates of the serosa and pulmonary tract almost half of these strains were not typable with the used PCR and therefore their significance for the clinical signs on these farms could not be assessed. Further examination of virulence-associated factors of the isolated strains could give more information about their clinical relevance.



BBD-041

COMPARISON OF VIRULENCE-ASSOCIATED GENE PROFILES OF 408 *STREPTOCOCCUS SUIIS* STRAINS FOUND IN 138 GERMAN PIG FARMS IN 2015-2017

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Introduction

In order to reduce antimicrobial usage in the suckling period or in the nursery, autogenous vaccines against *Streptococcus suis* (*S.suis*) play an increasing role in prophylaxis. To produce a vaccine out of the relevant agents, isolation of strains out of altered regions/organs is the first step to success. The assessment of virulence-associated genes can also help to decide which strains to choose.

Material & Methods

The 408 *S.suis* strains were analysed by multiplex PCR to identify the serotype (*cps* type) 1,2,7 and 9, as well as to identify four genes of virulence-associated factors: sortase (*srtD*), muramidase released protein (*mrp*), suilysin (*sly*) and extracellulare protein (*epf*). The used PCR can't distinguish serotype 1 from serotype 14 and serotype 2 from serotype 1/2.

Results

All of the *cps*1,2 and 9 strains contained at least one virulence factor gene. Only *cps*1 (29%) and *cps*2 (29%) strains where *mrp*+, *sly*+, *epf*+, *srtD*+. Only 95% of the *cps* 7 strains were *mrp*+. 40% of the non typable strains showed no virulence-associated gene. For 182 isolates the location of detection was declared. In the CNS and the joints most isolates contained more than one virulence factor, whereas in the pulmonary tract and serosa a high percentage (14% and 22%) of the isolates had no virulence-associated genes.

Discussion & Conclusion

The results show, that it is very important to have a deeper look at the virulence potential of strains being chosen for the production of autogenous vaccines. If the isolates were isolated from CNS or joints, they most likely harbour at least one virulence-associated factor. Isolates from the respiratory tract and serosa however often have different virulence profiles than the aforementioned isolates. Therefore, one cannot simply equate the isolate from one location with an isolate from a different location for use in an autogenous vaccine.

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BACTERIAL DISEASES

BBD-042

HEMORRAGIC FIBRINO-NECROTIC PLEUROPNEUMONIA IN SUCKLING PIGLETS

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Introduction

In May 2017 two 14-day-old suckling piglets belonging to an Italian farrow to wean farm (987 sows), with a clinical history of sudden death without clinical signs, were sent to the Laboratory of Reggio Emilia (IZSLER) for diagnostic investigations. They belonged to a litter of 16 piglets born from a first parity sow in a unstable PRRS farm. After the first case other 5 litters, belonging to 5 first parity sows were affected. The total morbidity and lethality was 76.2% and 45.8% respectively.

Material and methods

Necropsies were performed following standardized procedures as well as bacteriology (including biochemical confirmatory tests) and histological examinations, that were performed on lungs, kidneys and spleen collected during the anatomopathological evaluation. Sensitivity to antibiotics was determined using the disc diffusion method (Kirby-Bauer).

Results

Anatomopathological examination showed a diffuse monolateral hemorrhagic fibrinonecrotic pleuropneumonia. *Actinobacillus pleuropneumoniae* (APP) biotype 1 and serotype 9 was isolated from lungs. Microscopic examination confirmed the presence of fibrinous pleuropneumonia with bacterial aggregates in the alveoli and a depletion of the splenic lymphoid follicles in both piglets. In agreement with the results of the antibiogram the piglets were treated twice by injection with florfenicol (15 mg/kg BW). The antibiotic treatment was effective to tackle the problem.

Discussion and conclusion

This is a rare case of pleuropneumonia in 14-day-old suckling piglets as most of the outbreaks are described in fattening pigs. The early onset of pleuropneumonia described could be due to the introduction of a new APP strain; to the lack of vaccination and immunity for APP in gilts; to the lack of passive immunity to protect piglets belonging to first parity sows and to the presence of PRRSV-viremic and immunodepressed piglets. No other outbreaks of pleuropneumonia have been described in the herd in the following months.



BBD-043

ANTIBACTERIAL ACTIVITY OF RHODOMYRTONE AGAINST *STREPTOCOCCUS SUIIS*

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The major pig pathogen *Streptococcus suis* is considered a zoonotic agent that causes severe infections in humans. Currently, higher level of resistance to different antimicrobials has been detected and natural products could be an alternative to the control of this pathogen. Rhodomyrtone, a natural compound extracted from *Rhodomyrtus tomentosa*, displays potent antimicrobial activity against a wide range of Gram-positive bacteria. The objective of this work was to analyze its antimicrobial activity against *S. suis* strains obtained from pigs and humans.

Material & Methods

The broth microdilution method, according to CLSI, was performed to determine the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of Rhodomyrtone (0.03125-64 µg/mL) against 60 *S. suis* strains, obtained from diseased and healthy pigs (n=54) and diseased humans (n=6). MIC_{50,90} and MBC_{50,90} were determined and the bactericidal power (rate MBC₅₀ and MBC₉₀ / MIC₅₀ and MIC₉₀) was calculated (bactericide effect was considered with rate <4). All the assays were carried out in triplicate.

Results

The MIC and MBC values of Rhodomyrtone against pigs isolates were similar (MIC, 1-16 µg/mL, MBC 4-64 µg/mL) than human strains (MIC values of 4 to 16 µg/mL and MBC 32 to 64 µg/mL). The values of MIC₅₀ (8 µg/mL), MBC₅₀ (16 µg/mL), MIC₉₀ (16 µg/mL), MBC₉₀ (32 µg/mL) and the bactericidal power (rate_{50 and 90} =2) showed a good activity against *S. suis*.

Discussion & Conclusion

The MIC and MBC values obtained against *S. suis* were higher than those obtained for other Gram positive pathogens, but not exceed the toxicity limits of this product. Rhodomyrtone has shown a good antimicrobial activity, and may be a promising alternative for the control of diseases caused by *S. suis* in human and veterinary medicine.



BACTERIAL DISEASES

BBD-044

COMBINED EFFECT OF GENTAMICIN AND OXYTETRACYCLINE WITH ESSENTIAL OILS AND THEIR MAIN COMPONENTS AGAINST RESISTANCE *STREPTOCOCCUS SUIIS* STRAINS

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Introduction

Streptococcus suis is an important pig pathogen with zoonotic potential. The control of the diseases caused by this microorganism is based on antimicrobial therapy. Actually, an important pressure to reduce the use of antimicrobials in pig farms exists, one of the strategies proposed is the combination of antimicrobials (AMB) with Essential Oils (EOs). The evaluation of the effectiveness of the combination of Gentamicin (GEN) and Oxytetracycline (OXI) with cinnamon, oregano, common thyme and red thyme EOs and their main components (cinnamaldehyde, carvacrol and thymol) against resistant strains of *S. suis* is the main objective of this work.

Material & Methods

Five resistant *S. suis* strains to GEN or OXI drugs were used, by the Checkerboard method. From the best combination that inhibited the bacterial growth, fractional inhibitory concentration index (FIC_{index}) was determined. A synergistic effect was considered when FIC_{index} ≤0.5; Additive >0.5-1; Indifferent >1 <2; and antagonist when FIC_{index} ≥2.

Results

No antagonistic effect was detected to any of the *S. suis* strain. The best combinations were detected between Gentamicin and each of the four EOs analysed with synergistic (FIC_{index} 0.375-0.5) and additive effects (FIC_{index} 0.563-1.0). For oxytetracycline, the best results were obtained with cinnamon, with synergistic effect in 2/5 assays and additive in the remaining (3/5). A decrease in the MIC of both products, up to 2-16 for AMB and 2-8-fold for EO was observed.

Discussion & Conclusion

In general, better results were obtained when combining the conventional AMB with EO than with its main component. These differences could be explained by the variety of mechanisms of action attributable to the Essential Oil compounds and the possible synergism between them. Our results could be of interest for future options of combined treatment of this antibiotic with essential oils against diseases produced by *Streptococcus* species.



BBD-045

IMPROVING EDEMA DISEASE DIAGNOSIS IN PIGS BY DETECTING THE VT2E TOXIN GEN IN ORAL FLUID BY QPCR

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Introduction

The current confirmatory diagnosis of the edema disease caused by verotoxigenic strains of *Escherichia coli* (VTEC), is based on bacterial culture of rectal swabs or intestinal contents. This method is time consuming, invasive, and requires additional work to ensure that the isolate has the potential to produce the toxin. The aim of this study is to validate an alternative to bacteriology, and improve in terms of sampling and representativeness.

Material and Methods

A qPCR assay targeting the verocytotoxin variant 2e (VT2e gene) was standardized. A panel of 35 swine bacterial and viral pathogens, and several 10-fold dilution series of a VTEC reference strain were used to determine the analytical performance of the assay. Then, the method was adapted to pig oral fluid (OF) as clinical sample to run two studies: The first one was aimed to detect VTEC in 99 diagnostic OF, received in Diagnos for screening of respiratory disease. Samples came from 18 commercial farms located in 7 European countries. The second study focused on a selected VTEC-affected fattening unit. Sixteen pens were sampled; environmental samples, individual rectal swabs, and pen OF were collected, and the detectability of VT2e in the different samples was compared.

Results

The qPCR detected VTEC exclusively, with a limit of detection <1.5 ng of target DNA/ μ l, and 93.3% efficiency. VT2e was present in 17.2% of the diagnostic OF, distributed in 44.5% of the farms. When analyzing environmental, individual rectal swabs and OF samples in pens of a VTEC-affected farm, 7/16 (43.5%), 12/16 (75%) and 16/16 (100%) were positive to VT2e, respectively.

Discussion and Conclusions

Results from this study demonstrate that oral fluid can be a useful tool for monitoring VTEC in pig herds, reducing labor, increasing the amount of animals sampled, and reducing the waiting time to get results.

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BACTERIAL DISEASES

BBD-046

IMPORTANCE OF CO-INFECTING SEROVARS OF LEPTOSPIRA IN SPAIN

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Introduction

Leptospira is distributed worldwide, affects a wide range of species and is also a zoonosis. Leptospira in swine production result in severe economic losses due to its negative effect on reproductive parameters (abortions, increased stillbirths, mummified piglets, infertility) and high antibiotic use for treatment. The aim of this study was to establish the prevalence of several serovars of Leptospira in co-infected animals in farms reporting reproductive problems.

Material & Methods

Between January 2016 and October 2017, all analytical results sent to two different Spanish laboratories for the diagnosis of reproductive problems were collected. Only those samples from confirmed reproductive problems were considered. The samples were analyzed by the MAT technique obtaining as results: Negative (no agglutination) or Positive (titres between 1/30, 1/50, 1/100, 1/300, \geq 1/800). A total of 835 serum samples were analyzed for Bratislava serovar (B) and Pomona (P), and 789 for Icterohaemorrhagiae (Ic), Canicola (C) and Gryppotyphosa (G). B and P are considered swine population adapted while Ic are in rodents, C in dogs and probably G also dogs and wild animals.

Results

Analysis of serum samples individually confirmed the following results: 16.6% positive against serovar B + Ic, 11.3% B + P, 0.8% B + G, 0.3% B + C, and 0.5% P + Ic. In addition 5.2% was positive against B + P + Ic at the same time. Thus, co-infections affecting the same animal are present in 34.7% of all serum analyzed.

Discussion & Conclusion

Coinfections of at least two serovars in the same animal are common. The non- adapted serovar Ic is more common in co-infection than adapted serovar P. We need to be aware of contact between swine and other species to control infections with non-adapted serovars of Leptospira. A multivalent Leptospira vaccine will be needed to control disease.



BBD-047

LEPTOSPIROSIS PREVALENCE STUDY IN PIG FARMS REPORTING REPRODUCTIVE PROBLEMS IN SPAIN

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Introduction

Leptospira is distributed worldwide, affects a wide range of species and is also a zoonosis. Leptospira in swine production results in severe economic losses due to its negative effect on reproductive parameters (abortions, increased stillbirths, mummified piglets, infertility), and high antibiotic use for treatment. Acute disease has also been described. The objective of this study was to establish the prevalence of Leptospira in farms reporting reproductive problems.

Material & Methods

Between January 2016 and October 2017, all analytical results sent to two different Spanish laboratories for the diagnosis of reproductive problems were collected. Only those samples from confirmed reproductive problems were considered. The samples were analyzed by the MAT technique obtaining as results: Negative or Positive with titres between 1/30, 1/50, 1/100, 1/300, \geq 1/800. Some studies state that titres \geq 1/100 are an active infection while less than 1/100 is chronic-subclinical disease. A total of 1,341 serum samples were analyzed for Bratislava serovar (B), 835 for Pomona (P), and 789 for Icterohaemorrhagiae (Ic), Canicola (C) and Gryppotyphosa (G).

Results

Analysis confirmed the following results: 48.6% positive against serovar B, 15.8% P, 16.6% Ic, 0.8% G, 0.3% C. Titres \geq 1/100, related with active infection, were reported in 17.4% B, 8% P and 2.8% Ic. At farm level, 111 farms were sampled for B, 70 for P, and 48 for Ic, G, and C. Sample analysis per farm confirmed seropositivity of 85.5% B, 32.8% P, 37.5% Ic, 4.7% G, and 1.6% C, with titres \geq 1/100 in 44.1% B, 17.1% P and 7.8% Ic.

Discussion & Conclusion

Serovar Bratislava is highly distributed between farms with reproductive problems in Spain. Serovars Pomona and Icterohaemorrhagiae are present as well with relative importance. Subclinical-chronic disease is more prevalent. These findings support that Leptospira presence might be a risk factor for reproductive problems in Spanish pig farms.

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BACTERIAL DISEASES

BBD-048

EFFICACY OF A SINGLE INJECTION OF ZACTRAN® FOR SWINE AGAINST *BORDETELLA BRONCHISEPTICA* RESPIRATORY DISEASE IN EXPERIMENTALLY INFECTED PIGLETS

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Introduction

Bordetella bronchiseptica (Bb) is one of the major pathogens involved in Swine Respiratory Disease (SRD). The efficacy of ZACTRAN® for Swine (gamithromycin) against Bb was tested in an experimental pneumonia model.

Material & Methods

Forty 5-week-old SPF piglets were inoculated with 9.3 log₁₀ CFU of a virulent Bb by nasal route on D0. Sensitivity of the Bb isolate to gamithromycin was representative of current field pig isolates. On D3, animals were randomly allocated to two groups according to SRD clinical signs. They were administered either a single dose of ZACTRAN (1mL/25kg IM, n=20), or saline (n=20). Rectal temperature, behavioural observations and respiratory signs were recorded and scored daily from D0 to D13. Ten days post-treatment, all animals were necropsied. Lungs were examined macroscopically for lesions. Lung and trachea were sampled for histology.

Results

The Bb inoculation successfully induced coughing in 50% and sneezing in 45% of animals before treatment. From D3, clinical signs rapidly decreased in treated animals whereas they increased until on D6 in controls before initiation of a self-resolution phase. Global Clinical Scores (GCS) in the treated group were consistently lower than in the control group from D4 onwards (p<0.03 for D5-to-D9 period). Average number of post-treatment diseased days (GCS≥1) was reduced by 74% (1.1 vs 4.3 days, p<0.0001).

Gross lung lesions were characterized by dark, red consolidated areas with well demarcated borders. Severity and frequency of gross lesions were lower in the treated group (p=0.033). The overall lesion score was reduced by 39% in treated animals. Histological results also evidenced minimal to marked bronchio-alveolar and/or pyogranulomatous pneumonia and/or minimal to mild tracheitis of less severity and/or frequency in treated animals.

Conclusion

This study demonstrated efficacy of ZACTRAN for Swine at label dose for the treatment of SRD due to *Bordetella bronchiseptica*, based on lung lesions and clinical signs.



BBD-049

DETECTION OF LACTOFERRIN IN SWINE FAECES FROM AN EXPERIMENTAL INFECTION OF *B. HYODYSENTERIAE*

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Introduction

Lactoferrin is an iron-binding glycoprotein present in various tissues and secretions of animals and humans. It is associated with inflammatory processes participating in several physiological functions as immune response or protection against microbials.

The aim was the detection and quantification of lactoferrin in the faeces of *B. hyodysenteriae* infected pigs.

Material & Methods

Faeces were collected from 45 *B. hyodysenteriae* experimentally infected weaned pigs. A sandwich ELISA using rabbit polyclonal antibody for the coating of the plates and peroxidase-labelled anti-lactoferrin monoclonal antibody as conjugate was used for the quantification of lactoferrin in faecal samples. Moreover, *B. hyodysenteriae* was detected in faecal samples through culture and identification by PCR.

Results

All samples were negative to *Brachyspira* and the level of lactoferrin was low in the first three samplings, before clinical signs of swine dysentery. However, 58.3 % of samples were positive by culture-PCR and 35.5 % of samples had high levels of lactoferrin during clinical disease. Although 61 % of *Brachyspira* positive samples had high levels of lactoferrin, there were also positive samples with low levels of lactoferrin. On the other hand, 2 % of the samples with high levels of lactoferrin were negative by culture-PCR.

Discussion & Conclusion

Clinical signs of swine dysentery and *B. hyodysenteriae* shedding were associated with high levels of lactoferrin in swine faeces. However, there were differences between lactoferrin concentration and *Brachyspira* detection at the start and at the end of the follow-up period, probably when the inflammation associated with the infection was lower.

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BACTERIAL DISEASES

BBD-050

COMPARATIVE FIELD STUDY ON THE EFFICACY OF AIVLOSIN® WATER SOLUBLE GRANULES VERSUS DOXYCYCLINE WATER MEDICATION FOR MYCOPLASMAL PNEUMONIA CONTROL IN A FINISHING UNIT IN ROMANIA

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A field study comparing the efficacy of Tylvalosin (Aivlosin® Water Soluble Granules (WSG), ECO Animal Health Ltd.) with doxycycline was carried out in a large finishing site in Romania for the control of mycoplasmal pneumonia.

Material and methods

There were 8,000 places in 4 buildings, each with a capacity of 2,000 places. 4,000 finishers (2 buildings) were treated on entry with Aivlosin® WSG daily for 5 days at 5 mg tylvalosin /kg bodyweight/day for the control of *Mycoplasma hyopneumoniae* infection. The following week, 4,000 finishers (2 other buildings) were treated on entry with Doxycycline Water Soluble Granules for 5 days at 10 mg doxycycline/kg bodyweight/day. All animals came from the same nursery unit. The lungs of a sub-sample of 600 pigs from the Aivlosin® group and 300 from the Doxycycline group were checked at the slaughterhouse for enzootic pneumonia lesions. Pneumonic lesions were scored 1 to 5 (1 point for any lobe with lesions, regardless of the extent).

Results

The pigs from the Aivlosin® group had 40% lower average lung score than the control group. The pigs in the Aivlosin® group grew faster (+27 g/day), had better feed conversion (- 0.180 kgs feed/kg weight gain) and reached market weight earlier (4 days).

All low-quality pigs from the nursery had been allocated to the Aivlosin® group, resulting in the higher mortality (+0,41%) compared to the control group.

Discussion and conclusion

Despite being lower quality, pigs treated with Aivlosin® WSG at the start of finishing had better lung scores at slaughter and better performance than the pigs in the Doxycycline group. This demonstrated a clear advantage in using Aivlosin® to control mycoplasmal pneumonia at the early stages of production and reduced the amount of antimicrobial used per pig.



BBD-051

EVALUATION OF AIVLOSIN® WATER SOLUBLE GRANULES AND DENAGARD® LC IN THE CONTROL OF *LAWSONIA INTRACELLULARIS* IN A FINISHING UNIT IN DENMARK

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Introduction

This paper describes a comparative field trial on a commercial unit in Denmark. The pigs were born on a 1,200 farrow-to-nursery unit which supplied 750 weaners per week and had an associate finisher unit of around 3,000 places. All units had been M hyo, PRRS and APP positive.

The system was already using Denagard LC at 5 weeks and 8 weeks after weaning to control *Lawsonia intracellularis* (L.i.).

Material and Methods

At weaning, pigs were double ear tagged, individually weighed and allocated at random for weight and sex to one of two groups, each containing 300 pigs. The control group received Denagard at 8.8 mg tiamulin/kg bodyweight daily for 5 consecutive days while the treatment group received Aivlosin at a dose rate of 5.0 mg tylvalosin/kg bodyweight daily for five consecutive days. Both groups were medicated via drinking water at 5 and 8 weeks after weaning. The medicated water was made up fresh on a daily basis for both products.

Results

Production parameters were measured during the finishing stage.

Both treatments achieved satisfactory control of ileitis caused by L.i. Mortality was the same for both groups at 4%. However, an increase in average daily gain (20g/pig/day) and an improvement in feed efficiency for the Aivlosin-treated group relative to the Denagard-treated group (2.19 and 2.30, respectively) was recorded. None of the differences were statistically significant.

Discussion and conclusion

Aivlosin medicated pigs achieved a similar resolution of clinical signs of L.i, while using 43% less antibiotic (on a mg/kg basis), when compared to Denagard. In addition, the Aivlosin medicated pigs had better growth and feed conversion rates.

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BACTERIAL DISEASES

BBD-052

MYCOPLASMA HYOPNEUMONIAE ELIMINATION IN A FARROW TO FINISH UNIT IN BRITTANY USING AIVLOSIN® WATER SOLUBLE GRANULES (WSG)

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Introduction

A *Mycoplasma hyopneumoniae* (Mhyo) elimination project was initiated in a unit that broke down when production began. The unit was located in a high-density area in Brittany and was equipped with a HEPA filtration system. The unit started filling up with breeding stock in September 2016. The first signs of pneumonia on the site were detected in the first sows at weaning one month later. Mhyo was later confirmed by serology of their piglets.

Initial Program

Partial depopulation was undertaken with all weaned animals moved off-site, leaving only breeding inventory on-farm. Two weeks later, sows were medicated with Avlosin® WSG at 8 mg tylvalosin/kg/day for 28 days via liquid feed. They were also injected with Draxxin® (100 mg/ml) at 1ml/40 kg IM at farrowing. Piglets were injected IM with Draxxin® (25mg/ml) 0.3 ml/piglet at birth and at 15-18 days of age at 1ml/10 kg.

A strict biosecurity program was implemented. Mhyo negative replacement gilts were introduced monthly.

Additional measures taken

Following a review, introduction of replacement gilts was halted for the duration of the medication programme. The Aivlosin® WSG dose was reduced to 5 mg tylvalosin/kg/day but treatment duration was extended by 21 additional days. Sow treatment with Draxxin® was delayed until the final day of the Aivlosin® medication.

Quarantined gilts, later used as sentinels, received the same medication program as the sows. Piglets weaned March 2017 were the first to remain on site.

Results

After completing the program in March 2017, sentinel gilts were introduced into the herd and tested regularly for Mhyo via PCR (orolaryngeal swabs) and ELISA (serology).

All samples collected over the following nine months were negative.

Discussion and conclusion

This experience demonstrates that it is possible to achieve Mhyo elimination using Aivlosin® without interrupting the introduction of negative replacements until the final stage.



BBD-053

REPORT OF A *MYCOPLASMA HYOPNEUMONIAE* ELIMINATION PROJECT IN AN OUTDOOR UNIT IN OXFORDSHIRE USING AIVLOSIN® 42.5 MG/G PREMIX

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Introduction

A *Mycoplasma hyopneumoniae* (Mhyo) elimination program is described in one 800-sow, 3-week batch outdoor unit which had been introducing Mhyo negative replacement stock.

The unit was considered Mhyo negative; however, during slaughterhouse inspections (summer 2016), lung scores in pigs supplied from the farm were incompatible with this status. Serology confirmed the positive status of the sow herd.

Material and methods

Replacement was interrupted in April 2016 to stabilise the herd, ensuring that no breeding animals younger than 9 months of age were present. The last 2 batches of gilts delivered received Draxxin® (1ml/40kg IM) and MycoFLEX® (1ml IM) 14 days before beginning the medication programme.

Starting on August 29th, 2016 (155 days after the last gilt introduction), all sows were medicated for 6 weeks in-feed with Aivlosin 4.25% premix (ECO Animal Health Ltd.) at an inclusion rate of 212 ppm tylvalosin. Treatment began one week before farrowing and finished one week post-weaning for each batch.

Sucking pigs were not treated and back-fostering was prohibited. Sows 'off-feed' were identified and, if inappetence persisted, they were administered an injectable macrolide (Draxxin®, Zoetis, Inc.) once. The number of sows treated in this way was minimal.

Results

Upon completion, the replacement program was restarted and first gilts used as sentinels, being tested every quarter until a year after the program was finished. The sample size aimed to ensure a 90% certainty of detecting Mhyo prevalence of ≥10%. The IDEXX® ELISA test was used; a blocking ELISA (OXOID Ltd UK) confirmed any positives.

Discussion and conclusion

All samples were negative, suggesting successful elimination which was further supported by frequent slaughter inspections of finishers.

This report demonstrates that it is possible to eliminate Mhyo using Aivlosin, even when Mhyo negative replacements have been supplied, given adequate planning, including a relatively short period of herd closure.

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BACTERIAL DISEASES

BBD-054

ERADICATION OF *ACTINOBACILLUS PLEUROPNEUMONIAE* BY PARTIAL DEPOPULATION AND TILMOVET® TREATMENT

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Introduction

App infections are sometimes not fully controlled by vaccination, medication or biosecurity. Partial depopulation, combined with strategic treatment with tilmicosin (Tilmovet®, Huvepharma®) was initiated to eradicate *App*, restore performance and reduce antibiotic dependence.

Materials and methods

Grower and finisher pigs in a 500 sow closed farrow- to- finish herd in a pig dense area suffered from *App* for 3 years resulting in acute outbreaks every few months. *M. hyopneumoniae*, PRRS and PCV2 were well controlled using commercial vaccines. *App* vaccination, in-water and in-feed medication, injections and off-site finishing did not improve results. Older and poor performing sows and all progeny below 10 months of age were removed. Piglets were sold at weaning and growers were finished elsewhere. The sow herd was then medicated with Tilmovet® at 16 mg/ kg bodyweight for 4 weeks. Piglets born during this time were injected weekly with tulathromycin and sold at weaning. All sows were injected twice with marbofloxacin at the end of the programme and 48 hours later. Inappetent sows were injected with marbofloxacin.

Results

Once the programme finished, group medication was not applied and individual treatments were exceptional, resulting in a reduction of antibiotic use from 1006 mg/ kg PCU to 6.2 mg/ kg PCU. Days to bacon were reduced from 177 to 172 days. ELISA blood tests showed negative results for *App* APX IV. 190 Pigs examined at slaughter showed no *App* or *M. hyopneumoniae* lesions. The mortality rate before the programme was 11.85 % but 3.2 % afterwards.

Discussion and conclusion

Partial depopulation combined with strategic medication with Tilmovet® resulted in a successful eradication of *Actinobacillus pleuropneumoniae* with less cash flow disruption than a full depopulation and the maintenance of the herd's parity profile. Together with an improved performance, a significant reduction of mortality and antibiotic use was noted.



BBD-055

VACCINATION AGAINST *MYCOPLASMA HYOPNEUMONIAE* WITH HYOGEN®: PREVALENCE AND SEVERITY OF LUNG LESIONS

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Introduction

Vaccines have demonstrated their effectiveness against *Mycoplasma hyopneumoniae* in reducing clinical signs and lung lesions and improving productivity parameters.

Material and methods

In total 3622 pigs were divided in three groups. Group A was treated with Vaccine A, a combined PCV2+M.hyo RTU vaccine (n=1008), Group B with Hyogen®, Ceva (n= 1607) and Group C remained as non-vaccinated control (n= 1007). Altogether 612 lungs from Group A, 606 from Group B and 445 from Group C were examined at the slaughterhouse for the prevalence of EP-lesions according to Ceva Lung Program. Lungs from the same groups were examined in three different batches according to the order of being sent to the slaughterhouse (start, middle or final). Samples of lungs were obtained at the slaughterhouse and examined by qPCR for Mh DNA.

Results

There were significant differences ($p < 0.001$) for total average score between Group A (0.46 ± 0.024) and B (0.13 ± 0.011), and between B and C (0.49 ± 0.027). Significant differences were not found between groups A and C. The average score of each batch (start, middle or final of the group) was 0.53 ± 0.043 , 0.56 ± 0.038 and 0.30 ± 0.038 , respectively, for Group A, 0.037 ± 0.006 , 0.037 ± 0.006 and 0.33 ± 0.026 for Group B, and 0.31 ± 0.038 , 0.59 ± 0.04 and 0.70 ± 0.038 for Group C. The means of Mh DNA showed significant differences between both vaccinated groups and control group ($1 \cdot 10^6$ in group A, $3.75 \cdot 10^5$ in group B, and $8 \cdot 10^8$ in control group; $p = 0.007$).

Conclusions

Pigs vaccinated with Hyogen® presented lower frequency and average score of lung lesions than the group treated with the other vaccine and control group. Also the amount of Mh bacterial DNA in slaughter pigs was different between both vaccines and the control group. This study demonstrated that Hyogen® protected the pigs better against the Mh infection than the PCV2+Mhyo combined RTU vaccine.



BACTERIAL DISEASES

BBD-056

LABORATORY TRIAL FOR TO EVALUATE THE VECTOR COMPETENCE OF ORIENTAL COCKROACH (*BLATTA ORIENTALIS*) FOR ETEC, *SALMONELLA TYPHIMURIUM* AND *BRACHYSPIRA HYODYSENTERIAE*

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The Oriental Cockroaches (*Blatta orientalis*) are important pest in swine production in recent years, have long been investigated to assess the carry capacity for different swine pathogenic bacteria. They are known to carry about 57 species of pathogenic bacteria. Though various studies indicated that cockroaches play an important role as mechanical as well as biological vectors for foodborne bacterial pathogens, but cockroaches individual contribution lack. The objective of this study was to evaluate the vector competence of Oriental cockroach for three important porcine pathogens isolated from Italian swine farms: ETEC (F18 STa, STb), *Salmonella typhimurium*, and *Brachyspira hyodysenteriae*.

About one hundred adult cockroaches were reared under controlled conditions (RH 60%, photoperiod 14:10 h (L:D) and temperature 28°C). For each pathogen tested, 16 adult cockroaches were randomly picked, divided into 2 groups of 8 and transferred individually in sterile plastic containers. The first group was infected by contaminated food (potatoes) supplied for 5 days, which was then removed and replaced to sterile one. Individual faeces were collected daily and the presence of each pathogen was verified (ETEC only numbered). The second group was maintained as negative control. The oral infection was carried out with bacterial quantity of 10⁸-10⁹ CFU/g. Cockroach faeces started to be positive for *S. typhimurium* (8/8) the day after contamination and for ETEC (6/8) two days after contamination. No positivity was observed for *B. hyodysenteriae*. Faeces remained positive until contaminated food was removed: 4 days after removal no more positivity was observed for both *S. typhimurium* and ETEC (0/8). Faeces of the control group remained negative for each pathogen. In this study the vector competence of cockroaches for swine bacterial pathogens was confirmed for ETEC and *S. typhimurium*, but only as mechanical vector (not infected). The possible role in the diffusion of *B. hyodysenteriae* was not evidenced.



BBD-057

TISSUE SELECTION FROM DIFFERENT PARTS OF THE LUNG IS CRITICAL FOR DETECTION OF *MYCOPLASMA HYOPNEUMONIAE*

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Introduction

Mycoplasma hyopneumoniae (*M.hyo*) detection in a lung tissue sample is part of respiratory disease diagnostics. Different authors have quantified *M.hyo* in order to connect *M.hyo* load with lung lesion severity. Quantification was performed on small pieces of lung tissue and, as expected, concentration of pathogens varies depending on the location of the sample. This study compared *M. hyo* load of various samples from one side of the lung.

Material & Methods

At a German abattoir, 20 lungs of unknown origin with typical macroscopic *M.hyo*-like lesions were selected. Lung lesions scores (LLS) of the right lungs were evaluated and four samples were taken from each of the right lungs:

- tissue sample from the tip of the right medium lobe (ML)
- tissue sample from the border between healthy tissue and lesion (GB)
- two samples from a homogenate of the complete right lung (Stom1 and Stom2)

Homogenization was done in the Stomacher® (Seward Ltd.; GB-Worthing, West-Sussex). Samples were examined by rPCR (Strait et al. 2006) at the IVD GmbH in Seelze-Letter, Germany.

Results

Cycle threshold (Ct-) values of the four samples were compared with each other and with the LLS. All Stom 1- and Stom 2 samples tested positive, 4 ML and 2 GB-samples tested negative. All Ct-values were in the same range. No correlation was found between Ct-values and LLS.

Discussion and Conclusion

A more realistic estimation of *M.hyo* load in a lung can be expected by testing a completely homogenized lung instead of small tissue samples; resulting in a reduced chance of false negative test results. Further investigations are necessary for a better understanding of correlations between LLS, *M.hyo* load, timepoints of infection and sampling, presence of other pathogens and different tissue samples.

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BACTERIAL DISEASES

BBD-058

INVESTIGATION OF PRODUCTION PARAMETERS IN A COMMERCIAL PIG FARMS IN SPAIN WITH POST-WEANING DIARRHOEA BEFORE AND AFTER THE IMPLEMENTATION OF A LIVE NON-PATHOGENIC *ESCHERICHIA COLI* VACCINE (COLIPROTEC® F4/F18)

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Introduction

Post-weaning diarrhoea (PWD) remains a major cause of economic losses for the pig industry due to mortality, morbidity, decreased growth rate and cost of medication. PWD typically causes mild to severe diarrhoea after weaning, which can be associated with marked dehydration, loss of performance, and mortality.

PWD is mostly caused by enterotoxigenic *Escherichia coli* (ETEC), a pathotype characterized by the production of fimbriae that elicit colonization and enterotoxins that disrupt fluid homeostasis in the small intestine. F4 and F18 fimbriae are the types that are most frequently detected in ETEC isolates from cases of PWD.

Antimicrobials are frequently used on farms to treat PWD.

Coliprotec® F4/F18 is a live non-pathogenic *Escherichia coli* vaccine indicated for active immunisation of pigs against enterotoxigenic F4 and/ or F18 positive *Escherichia coli*.

Material and methods

Trial was conducted in a commercial pig farm with 450 reproductive sows, located in the North-West of Spain. This farm suffered in 2016 important enteric problems in nursery due to Rotavirus, Salmonella and enterotoxigenic *Escherichia coli* (ETEC). In December 2016, control measures were implemented to control enteric diseases and to reduce the use of colistin in feed.

PWD remained in nursery and new protocols were adopted, Coliprotec® F4/F18 vaccination was implemented by drenching, a single oral dose in 18 days old piglets.

Ten previous and no vaccinated batches (1794 piglets) were compared with nine vaccinated batches (1721 piglets).

Results

Mortality and ADWG had a statistical improvement, mortality decreased from 3,16% to 1,28%, daily gain increased from 382,10 to 449,67 g.

The Weight at the end of nursery was more than 2 kg per piglet.

Clinical observations showed less diarrhoea outbreaks incidence and less water medications.

ROI 2,75:1.

Conclusion

Coliprotec® F4/F18 obtained an active mucosal immunity in piglets (IgM+IgA), getting a definitive control of the enterotoxigenic *Escherichia coli* (ETEC).



BBD-059

ASSOCIATION OF SEQUENCE WITH SEROTYPE, VIRULENCE, AND ANTIMICROBIAL RESISTANCE IN *ACTINOBACILLUS PLEUROPNEUMONIAE*

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Introduction

Actinobacillus pleuropneumoniae (App) is responsible for significant economic losses in worldwide pig production. Peracute cases of sudden deaths, severe hemorrhagic and necrotizing or fibrinous pleuropneumonia and decreased performance during subclinical infections are typical manifestations. Strains are highly variable regarding serotype, virulence and antibiotic resistance, leading to massive problems in diagnostics, therapy and vaccination. The aim of the present, ongoing study is to identify molecular markers of App in association with well characterized strains from the field.

Material & Methods

21 genome sequences, publicly accessible on the NCBI genome database, were compared using ANI (average nucleotide index) software. A 1000 nucleotides frame of the core region was compared among the strains on the nucleotide and amino acid level. About 100 strains resembling different features of App were sampled on commercial herds, phenotypic characterized and sequenced on a genome-wide level.

Results

As a result of the ANI analysis, the compared strains, although mostly representing individual serotypes, showed only low genetic difference (max 2.09%). Genetic variability between strains of the same serotype only differed by 0.02 to 0.09%. Strains of the same serotype and the same serotype group (e.g. 1/9/11) were clustered within the same branch of a phylogenetic tree, underlining their high degree of genetic homology.

Discussion & Conclusion

The in silico analysis of App genome sequences proved a high degree of homology, although the strains differed obviously in their phenotypes. Based on the results of the first part of the study, the second and ongoing part aims to identify specific sequence motives and SNPs, associated with virulence, serotype and antibiotic resistance. The results will help to improve diagnostic, therapeutic and prophylactic measures in the future.

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BACTERIAL DISEASES

BBD-060

MOLECULAR CHARACTERIZATION OF VIRULENCE IN *HAEMOPHILUS PARASUIS*

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Introduction

Haemophilus (H.) parasuis can be a commensal in the upper respiratory tract or a facultative infectious agent. Typical pathological findings are characterized by fibrinous inflammation. Glässer's disease, has to be distinguished from solitary bronchopneumonia, and strains are highly variable regarding serotype, virulence and antibiotic resistance. This causes massive problems in diagnostics, therapy and vaccination. The aim of the present study was to characterize molecular markers of *H. parasuis* in association with virulence of field isolates.

Material & Methods

138 strains of *H. parasuis* were collected from herds in Germany (Lower Saxony and Hesse). *H. parasuis* was cultured, serotyped and screened by PCR regarding 10 potential virulence genes. Samples were obtained from individual pigs during necropsy. According to the overall disease status of the pigs (clinic, pathology, microbiology), they were classified into four degrees: from 0 (without any symptoms) to 3 (high-grade of *H. parasuis*-specific findings) led to an assessment of the virulence of the examined strains. Associations between serotypes, resistance, virulence factors, evidence in the organs, category of the age of the pigs and category of illness were examined via Pearson's χ^2 test.

Results

The severity of disease levels within herds varied from definite cases of commensalism to cases with specific, high degree clinical and pathological symptoms. Five of the ten virulence factors were significantly associated with the pathological outcome, the degree of participation of *H. parasuis* in the disease and the age of the pigs. However, associations with serotypes and resistance to antibiotics could not be detected.

Discussion & Conclusion

Inclusion of virulence factors into *H. parasuis* diagnostics can significantly improve the diagnostical output. This additional information can help to decide, whether *H. parasuis* has to be classified as the causative agent or just a commensal in a current case.



BBD-061

M. HYOPNEUMONIAE, M. HYORHINIS AND M. FLOCCULARE, ALONE OR IN ASSOCIATION, IN ENZOOTIC PNEUMONIA-LIKE LESIONS: EXPLORATORY INVESTIGATION IN 666 PIG LUNGS FROM 47 HERDS

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Introduction

Enzootic pneumonia (EP), primarily caused by *Mycoplasma hyopneumoniae* (Mhp), is costly to the pig industry. In EP-like lesions, *M. hyorhinae* (Mhr) and *M. flocculare* (Mfloc) are also identified. The aims of this study were to assess (i) the frequency of associations and the amounts of Mhp, Mhr and Mfloc in lungs with EP-like lesions and (ii) the relationships with the severity of EP-like lesions.

Materials and Methods

The investigation involved 666 lungs collected at slaughterhouses (47 pig batches, Brittany). Lungs were scored for EP-like lesions and classified in three categories: no or mild, moderate, or extensive lesions. Lungs were analyzed by a multiplex qPCR to quantify Mhp, Mhr and Mfloc. The relationships between the extent of lesions and the laboratory results were determined by a multiple correspondence analysis, followed by a hierarchical clustering. The associations between *Mycoplasma* species and EP-like lesions were quantified by a logistic-regression analysis.

Results

Mhp, Mhr and Mfloc were found in 42.9%, 0.6% and 19.3% of lungs, with on average, 3.1×10^7 , 9.7×10^6 and 5.7×10^6 genome equivalents mL⁻¹, respectively. Mhp was associated with Mhr alone or with Mfloc alone in 1.9% or in 14.6% of lungs respectively. Three clusters of associations were found (i) no or mild EP-like lesions with PCR-negative lungs for all *Mycoplasma* species or PCR-positive lungs for Mfloc (ii) moderate to extensive lesions with PCR-positive lungs for Mhp, and (iii) extensive lesions with PCR-positive lungs for at least two *Mycoplasma* species. Mhp and Mhr detection significantly increased the odds for a lung to have extensive lesions. No relationship was found between the extent of lesions and the mycoplasma genome load.

Conclusion

Mhp and Mhr appeared to be the two species involved in the severity of EP-like lesions. These findings also underline the importance of the detection of *Mycoplasma* associations to better control EP.

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BACTERIAL DISEASES

BBD-062

PREVALENCE OF VT2E IN PIGS: SYSTEMATIC LITERATURE REVIEW

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Introduction

Reliable data on the worldwide presence of verotoxigenic strains of *Escherichia coli* (VTEC) producing verotoxin-2e (*Vt2e*) could explain the overall prevalence of swine oedema which causes a deleterious economic impact in the swine industry. Therefore, a systematic literature review on the prevalence of *Vt2e* was considered appropriate.

Material & Methods

Thirty-eight studies published between 1995 and 2016 assessing the prevalence of VTEC and the *VT2e* gene in the swine industry, obtained from databases and reference lists, were analysed.

Results

The data analysed came from experimental protocols and clinical evaluations using samples taken from healthy and diarrheic pigs in farms and from pig slaughterhouses in Europe, America, Africa and Asia. The prevalence of *Vt2e* gene was assessed in 28 papers. One described that 31% (rectal swabs) and 23.7% (faecal samples) of healthy pigs were positive for *Vt2e* gene in Belgian farms and slaughterhouses, respectively. The remaining 27 manuscripts described the prevalence of *Vt2e* in VTEC isolates from healthy animals, which was 30% and 72% in Asia and South America, respectively, but exceeded 72% in Europe and North America. This review also showed that the prevalence of *Vt2e* was lower in diarrheic animals.

Discussion & Conclusion

Only one study specifically assessing the prevalence of the *Vt2e* gene in pig farms was found in this literature review. Thus, the prevalence of *Vt2e* was determined based on the high percentage of *Vt2e* gene in VTEC isolates from healthy pigs in Europe and North America. Additionally, differences in study designs and laboratory tests complicated this comparison both within and between countries. Based on these results, studies on the prevalence and role of this bacterium in pig population worldwide are required.

Acknowledgment

The authors express their gratitude to L. Calpe for her support in this literature review.



BBD-063

THE *BACILLUS CEREUS* TOXIN CEREULIDE CAUSES SEVERE NEUROLOGIC SYMPTOMS IN THE PIG

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Introduction

The *Bacillus cereus* cyclic depsipeptide cereulide is known to evoke emesis a short time after ingestion in humans, but besides this generally mild course of the disease, also severe clinical cases leading to death associated with liver failure and encephalopathy within a few hours following exposition have been described. These cases were mostly associated with ingestion of contaminated rice or pasta dishes. Here we established a porcine cereulide intoxication model.

Material and Methods

16 pigs (10-15 kg BW) were fed cereulide at concentrations of 10, 30, or 150 $\mu\text{g}/\text{kg}$ BW and observed for either 2 or 7 days (acute vs chronic toxicity). At specific time points venous blood was drawn for hematologic analyses. At the end of the study, pigs were euthanized and select organs including liver and brain sampled for pathology.

Results

All pigs suffered from a transient depression and recurrent seizures in lateral recumbency for appr. 4-7 hours starting one hour after toxin intake. Then the pigs gradually recovered. To analyze chronic toxicity, 10 $\mu\text{g}/\text{kg}$ cereulide were administered daily for 7 days. Similar to acute toxicosis, pigs developed a transient depression and seizures after 2-6 hours. Clinical signs again disappeared every day. Histological as well as hematological and blood chemical examinations did not reveal any notable pathological changes. Only creatine kinase was upregulated 8 hours post intoxication for up to 48 hours.

Discussion and Conclusion

Due to its lipophilic and ionophoretic character cereulide might be able to cross the blood-brain-barrier by transmembrane diffusion and further lead to an alteration of the potassium content of the cerebrospinal fluid, which is known to cause seizures. In summary, the pig seems to be a valuable model for studying cereulide intoxication.

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BACTERIAL DISEASES

BBD-064

ANTIBIOTIC SUSCEPTIBILITY IN *STAPHYLOCOCCUS HYICUS* FROM HEALTHY PIGS

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Introduction

Staphylococcus hyicus occurs on the skin on healthy pigs, but may also be involved in infections like exudative epidermitis. Information on antibiotic susceptibility in *S. hyicus* from Swedish pigs is scarce. In this study, susceptibility of *S. hyicus* from the skin of healthy sows was investigated.

Materials & Methods

Sampling was done by rubbing the skin behind the ears with a sterile cotton-tipped swab on up to three sows per herd in 36 herds. Culture was done on selective agar modified from Devriese. Typical colonies with a turbid zone were selected and subcultured on bovine blood agar. Species identification was done by MALDI-TOF MS. Minimum inhibitory concentrations (MIC) of selected antibiotics were determined by microdilution in accordance with CLSI using VetMIC panels. Evaluation of MICs was done by epidemiological cut-off values (ECOFF) for *S. aureus* issued by EUCAST, except for enrofloxacin where no EUCAST ECOFF is available. Values above ECOFFs were considered non-wild type.

Results

In total, 65 isolates of *S. hyicus* from 30 herds were isolated and susceptibility tested. Forty-five isolates (69%) had non-wild type phenotypes for penicillin, 20 isolates (31%) for trimethoprim-sulphamethoxazole, 5 isolates (8%) for clindamycin, 2 isolates (3%) for enrofloxacin and 1 isolate (2%) for gentamicin. Isolates with non-wild type for penicillin produced beta-lactamase. All isolates had wild type phenotypes for cephalotin, ceftiofur, chloramphenicol, erythromycin, fucidic acid, oxacillin and tetracycline.

Discussion & Conclusion

Although sampling was done on healthy pigs, the results from this study may be an indication of the antibiotic susceptibility situation in *S. hyicus* that cause infection. In general, the isolates were highly susceptible, with penicillin and trimethoprim-sulphamethoxazole as exceptions. That 69% of the isolates produced beta lactamase indicate doubtful clinical response to penicillin treatment. This is worrisome since penicillin is often used for skin infections in pigs in Sweden.



BBD-065

COMPARATIVE ASSESSMENT OF VARIOUS VACCINES AGAINST MYCOPLASMA HYOPNEUMONIAE IN COMMERCIAL PIG FARM

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Introduction

Enzootic pneumonia (EP) caused by *Mycoplasma hyopneumoniae* (M.hyo) remains one of the most important respiratory infections in current swine production with significant economical impact. High M. hyo prevalence was reported recently in Russia based on lung scoring and PCR examination. Vaccination belongs to the most efficient and profitable strategy to control EP. The aim of the study was to evaluate the efficiency of 5 different commercial M.hyo vaccines in comparison with Hyogen® (Ceva).

Material and Methods

A farrow-to-finish farm of 6700 sows located in Leningrad region with the history of EP was selected for the trial. 5124 piglets were randomly assigned into the 6 groups and vaccinated either at 21-24 days of age (Groups G1-G5 by Hyogen® or vaccines A, B, C, D, E) or on D7 and D21 of life (G6 by vaccine F). All pigs were kept under the same conditions. The efficiency of vaccination was evaluated according to zootechnical parameters (ADG, FCR), mortality and lung scoring using the CLP methodology (Ceva). For each parameter a specific scale was used with the scale from 1 - best performance to 6 - worst performance to rank the vaccines.

Results

The best performing group of pigs was the G2 (vaccinated with Hyogen®) with the overall score 13. The other evaluated groups were scored as follows: G1-31, G3-22, G4-26, G5-19 and the G6-26.

Discussion and Conclusion

The combination of performance indicators and lung score check is considered as a relevant way to assess the efficacy of M.hyo vaccines in the field condition. In this large scale study Hyogen® vaccinated pigs achieved the best performance compared to pigs vaccinated with any of the available one or two shot vaccines.

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BACTERIAL DISEASES

BBD-066

COMPARISON OF EFFICIENCY OF AMMINOSIDINE AND ENROFLOXACIN TREATMENT PROGRAMS FOR CONTROL OF NEONATAL DIARRHOEA

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Introduction

Antibiotics are still an important tool for treatment of certain acute bacterial diseases in swine and early effective approach is necessary in order to minimize economical losses and mortality. Aim of the presented study was to compare the effect of amminosidine in comparison with enrofloxacin to control neonatal diarrhea on enzootically affected farm.

Material and Method

The study was performed on one farm with a total capacity of 4.000 sows in Italy, involved 40 randomly selected litters from different parity sows, showing clinical signs of diarrhea 48 hours after farrowing. Sensitivity to both selected antibiotics were confirmed by examination of strains of *E. coli* isolated from previous cases. Two groups were established as group A (enrofloxacin) and group B (amminosidine), both consisted from 20 litters. All piglets were individually injected according to manufacture recommendation. Weight at birth and at weaning were collected, as well as number of piglets requiring additional treatment. A fecal score was evaluated in all litters (0=traces of diarrhea; 1=mild; 2=evident).

Results

All variables did not differ between the groups in following order- A and B, respectively. Weight at birth: 1.47 vs. 1.38 (P=0.370), weight at weaning 5.64 vs. 5.23 (P=0.247), number of weaned piglets per litter 9.7 vs. 9.8 (P=0.846), fecal scores 0.9 vs. 1.05 (P=0.418) and number of relapses 6/20 vs. 4/20 (P=0.832). Considering costs of the treatment of each litter (12 piglets/litter and 2.5 kg/piglet) was similar for both groups (0,89 vs. 0,9 €).

Discussion and Conclusion

Both treatments were effective for control of neonatal diarrhea. Taken into consideration of limited treatment options available, voluntary ban of use of fluoroquinolones in many important swine producing countries due to the highest priority status for human medicine, aminoglycosides (amminosidine) seems to be appropriate alternative for therapy of acute cases beside vaccination.



BBD-067

PREVALENCE OF *MYCOPLASMA SUIS* IN FARROWING SOWS AND PRE-SUCKLING TRANSMISSION TO THEIR PIGLETS

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Transmission of *Mycoplasma (M.) suis*, the causative agent of infectious anemia in pigs mainly occurs via iatrogenic or zotechnical manipulations or due to ranking fights within animal groups. Moreover, other transmission routes including ingestion of secretes/ excretes, blood-sucking arthropods and intra uterine transmission have thought to play an epidemiological role without being experimentally proven.

To investigate *M. suis* prevalence in sows immediately after birth and a potential transplacental transmission of *M. suis* under field conditions 21 piglet producing farms in Bavaria were selected. On each farm EDTA-anticoagulated blood samples from 9 or 10 sows from each farm (n=208) and from three piglets of each sow (n=622) before colostrum uptake were collected. Samples were tested for *M. suis* by qPCR.

In total, 31.3% of the collected serum samples from sows were positive for *M. suis*. At farm level 76.2% of the investigated farms had at least one *M. suis* positive sample. Overall, *M. suis* was identified by PCR in 14.4% of 474 investigated pre-suckling sera from the 16 *M. suis* positive farms. Among those 68 *M. suis* positive piglets 73.5% piglets were born from *M. suis* positive sows, whereas 26.5% piglets derived from *M. suis* negative sows. Piglets born from a *M. suis* positive dam were significantly more often positive than piglets born from a *M. suis* negative dam (p<0.001, OR: 5.2). Mean *M. suis* blood loads of sows was 2.07×10^6 *M. suis*/mL blood and 4.88×10^7 *M. suis*/mL blood of piglets, respectively. Bacterial blood loads of sows were positively correlated with bacterial blood loads of piglets (p<0.001, rs=0.537).

The present study provides further insides into *M. suis* infection dynamics as it is the first description of *M. suis* in piglets immediately after birth prior to colostrum intake and the first large scale investigation on *M. suis* prevalence in sows.

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BACTERIAL DISEASES

BBD-068

COMPARING POST-WEANING MORTALITY IN PIGS BORN FROM SOWS VACCINATED WITH TWO DIFFERENT COLI-CLOSTRIDIA COMBINATION VACCINES

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Introduction

Among the most common causes for mortality and antibiotics used post-weaning are E.coli-associated diseases like post-weaning diarrhea (PWD) and edema disease. Recently a novel Coli-Clostridia combination vaccine containing F4 and F18 E. coli fimbrial antigen, is registered in the EU. The objective of this field observation was to evaluate the efficacy of two commercial Coli-Clostridia sow vaccines in reducing PWD-associated mortality in their offspring.

Material & Methods

On a commercial 425 head sow farm, piglets suffered from E.coli F4 PWD (weaning age 26 days). Control piglets (CP; n=1908) were born from sows vaccinated with a commercial Coli-Clostridium vaccine previously used on the farm and weaned between February and April 2017 (13 batches). Piglets born out from the novel Coli-Clostridia combination -vaccinated sows (EP; n=2220) were weaned between May and June 2017 (12 batches). Date and presumed cause of mortality (by judgement of the animal caretaker) from weaning to 45 days post-weaning were recorded per batch.

Results

Total mortality after weaning was lower for EP compared to CP (1,7% vs 2,2%). PWD-associated mortality was reduced significantly from 16 (0,8%) in CP to 3 (0,1%) in EP (OR 0,16; p<0,005). The average age of mortality due to PWD increased from 9 days (CP) to 29 days post-weaning (EP).

Discussion & Conclusion

In this field observation, mortality due to diarrhea after weaning was significantly reduced using the novel Coli-Clostridia combination vaccine, compared to the previous farm protocol. Mortality was postponed to a later age in EP pigs, which might be explained by a longer lasting maternal immunity. With the expected ban on using high concentrations of zinc oxide in diets of weaned piglet in the EU, alternative methods to prevent PWD have increasing relevance. Coli-Clostridia sow vaccines can play an important role in this, especially vaccines that provide longer lasting protection.



BBD-069

EXAMINATION OF ILEA COLLECTED AT SLAUGHTER FOR DIAGNOSING PORCINE PROLIFERATIVE ENTERITIS (PPE) IN AN EARLY INFECTED FINISHER HERD

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Introduction

PPE is caused by *Lawsonia intracellularis* (Li). Often the disease progresses sub-clinically, which makes the role of Li infection as cause for poor pig performance hard to proof. Producers are hesitant to sacrifice pigs without severe clinical signs for diagnostic purposes. The objective of this study was to investigate if ilea collected at slaughter, could be a useful specimen to support PPE diagnostics.

Material & Methods

A herd suffering from PPE in the first weeks of finishing (12-16 weeks of age) was selected. From a batch of 240 slaughter pigs, 100 blood samples were taken for serology at exsanguination and 60 ilea were collected after evisceration. Ilea, stored individually on ice, were examined for macroscopy, weighing (10 cm of the mid-section), histology, IHC and Li-qPCR.

Results

Of the blood samples 97% were Li-antibody positive (ELISA). Histological findings indicated presence of ileitis in 50% of the ilea, of which 95% were IHC-positive. From the histological negative samples, only 1 sample (3%) was IHC-positive. Li genome equivalents (GE) were found by qPCR in 97% of the tissue samples. The IHC-positive samples had higher average amounts of Li present compared to IHC-negative samples: 10.7 log GE/ml vs 7.3 log GE/ml (P<0.001). There was no correlation between ileal weights and histological findings. Macroscopy had a poor sensitivity and specificity (58% and 64% respectively) when compared to IHC.

Discussion & Conclusion

Investigation of ilea collected at slaughter can be useful to diagnose PPE without sacrificing pigs, but not if only examined macroscopically. Typical histological lesions were detected and IHC testing was positive in a significant number of samples from a herd infected with Li in the first weeks of finishing. QPCR tissue levels correlated well with histology/IHC. Further studies are necessary to judge the full potential of qPCR.

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BACTERIAL DISEASES

BBD-070

RISK FACTOR ANALYSIS FOR PROLIFERATIVE HEMORRHAGIC ENTEROPATHY (PHE) ON DUTCH FINISHING PIG FARMS

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Introduction

PHE can be a frustrating problem for a finishing pig farmer and knowledge on PHE risk factors is limited. To have more knowledge, a survey was conducted across 30 different finishing pig farms in The Netherlands.

Material & Methods

A questionnaire was developed containing possible risk factors related to PHE, based on empirical and previously published findings. The survey covered aspects of management, technical performance, biosecurity, climate control, feed and water management. In total 30 farms were selected based on PHE history: severe (sPHE, n=10) mild-to-moderate (mPHE, n=9) and control farms without PHE (C, n=11). The farms were visited and interviewed by the same person.

Results

For the analysis of PHE-related risk factors, sPHE and mPHE farms were combined in the data set. Significant ($p < 0.05$) odd's ratio's (OR) for PHE could be attributed to: specialized finishing pigs farms compared to farrow to finish sites (OR 5.77); less floor surface per finisher pig (0.8 m² vs 1.0 m²; OR 9.33); deworming more than once (OR 9.9).

Tendencies ($0.1 < p > 0.05$) could be attributed to: having more than one piglet supplier (OR 1.92), less cleaning and disinfection of boots (OR 4.86).

Pigs on PHE farms had a higher average daily gain (833 vs 822 gram/day) and fed larger amounts of starter and grower feed compared to control farms. Antibiotics use was higher in sPHE compared to mPHE and C (DDDy 11.5 vs 3.2 and 5.1 respectively).

Discussion & Conclusions

PHE seems to occur more on farms with higher growth and better biosecurity. Deworming more often and higher antibiotic use could be related to the fact that PHE-affected farms implement counter measures to control the disease. Further data gathering is needed to confirm the results of this survey since only a limited number of farms were involved.



BBD-071

ANALYSIS OF THE SUBMISSION FOR DIAGNOSTIC INVESTIGATION OF DIARRHOEA SAMPLES FROM SUCKLING PIGLETS IN THE NETHERLANDS IN THE PERIOD FROM SEPTEMBER 2015 TO NOVEMBER 2017

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Here we present the analysis of samples of diarrhoea from new borne piglets (max. 4 days old) gathered by veterinarians and analysed at IVD laboratory in Hannover, Germany. Sampling kits were provided by IDT Biologika, containing 3 swabs and the sample tubes, and analysis was paid for by IDT Biologika as part of the service around Clostriporc A.

Analysis was done for Rotavirus type A, PED, TGE, pathogenic *E. coli*, *Clostridium perfringens* type A (CpA) and C, *Clostridium difficile* and alpha-hemolytic Streptococci, differentiated by PCR to *Enterococcus durans* and *E. hirae*. Viruses were detected by PCR. Attachment factors and toxins of *E. coli* were detected by PCR, as were the toxin genes of *Clostridium*. Production of toxins of *C. perfringens* was detected by immunoblot.

396 samples in a total of 70 submissions came from piglets aged 0 to 4 days old. No PED, nor TGE was found. Rotavirus was found in 9 submissions of which 4 had also pathogenic *E. coli*. 7 out of 70 submissions had no CpA in them. 5 of these had pathogenic *E. coli* and 2 also high counts of *E. hirae*. In 1 submission only *C. perfr.* type C was found. Of the 60 submissions without Rotavirus or CpC, 55 showed moderate to large amounts of CpA. In 16 out of 60 CpA produced alpha- and beta2-toxin in the immunoblot. 20 out of these 60 submissions were tested for *E. hirae*, 11 submissions had samples with large amounts of *E. hirae*. In 30 out of these 60 pathogenic *E. coli* was found (ETEC, UPEC or NTEC). In many submissions multiple pathogens were found.

Analysis of diarrhoea samples from neonatal piglets is complex and in many cases multiple pathogens are found. In many herds the simultaneous application of multiple vaccines against these various pathogens is necessary.

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BACTERIAL DISEASES

BBD-072

POSITIVE ECONOMIC EFFECTS OF LIVE *E. COLI* F4 VACCINATION FOR THE PREVENTION OF F4-ETEC POST-WEANING DIARRHEA IN PIGLETS AND FATTENING PIGS

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Introduction

Post-weaning *Escherichia coli* diarrhea (PWD) remains a major cause of economic losses for the pig industry. PWD, caused by enterotoxigenic *E. coli* (ETEC), typically provokes mild to severe watery diarrhea (5-10 days post-weaning). Most common adhesins on ETEC from PWD are the fimbriae F4 (previously called K88) and F18. An oral live bivalent *E. coli* F4/F18 vaccine (Coliprotec® F4/F18; Prevetec Microbia) is available, which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC. The objective was to compare technical results of *E. coli* F4/F18 vaccination with previous standard therapeutic approach under field conditions.

Materials & methods

A 600-sow farm with diagnosed problems of PWD due to F4-ETEC was selected. Piglets were vaccinated at 18 days with the oral live bivalent *E. coli* F4/ F18 vaccine. At weaning, no standard group medication (antibiotics) was applied for prevention of PWD. Several performance parameters were collected before (n=17000 pigs) and after implementation of the vaccination (n=16500 pigs): ADG, feed cost, days in nursery, FCR and mortality for the nursery phase; ADG, mortality and value reduction at slaughter (€/pig) for the fattening phase.

Results

Oral *E. coli* F4/F18 vaccination significantly reduced the mortality rate (P<0.05) for both the nursery (3.5% to 2.6%) and fattening phase (4.7% to 3.3%) in combination with a decrease in number of days in nursery (-3 days; P<0.05). Production parameters were identical before and after the vaccination. Results induced a positive ROI (+2.69).

Discussions & Conclusions

The results show that live *E. coli* F4/F18 vaccination against PWD has led to similar technical performance parameters, in combination with a significant reduction in mortality rate (nursery and fattening) and a positive ROI. In conclusion, control of PWD through vaccination is a good option to prevent piglets from the negative clinical outcomes of post-weaning F4-ETEC infection.



BBD-073

VACCINATION WITH A LIVE BIVALENT *E. COLI* F4/F18 VACCINE FOR THE PREVENTION OF F18-ETEC POST-WEANING DIARRHEA

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Introduction

Post-weaning *Escherichia coli* diarrhea (PWD) remains a major cause of economic losses for the pig industry. PWD, caused by enterotoxigenic *E. coli* (ETEC), typically provokes mild to severe watery diarrhea between 5 and 10 days after weaning. Most common adhesins on ETEC from PWD are the fimbriae F4 (previously called K88) and F18. Therapy to combat PWD typically consists of antibiotic treatment in combination with high doses of ZnO (3000 ppm). Recently, an oral live bivalent *E. coli* F4/F18 vaccine (Coliprotec® F4/F18; Prevetec Microbia) is available on the European market, which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC. The objective was to compare technical results of *E. coli* F4/F18 vaccination with previous standard therapeutic approach under field conditions.

Materials & methods

A 600-sow farm (weaning at 21 days) with diagnosed problems of PWD due to F18-ETEC was selected. Piglets were vaccinated at 18 days with the oral live bivalent *E. coli* F4/ F18 vaccine. At weaning, no standard group medication (ZnO and antibiotics) was applied for prevention of PWD. Piglets were fed a farm-prepared mixed liquid feed formula. Several performance parameters were collected: weight at d0-50, time in nursery, FCR, feed cost, mortality, ADG and medication use (TI₁₀₀).

Results

Oral *E. coli* F4/F18 vaccination significantly reduced the mortality rate (6.0% to 3.0%; P<0.05) and the TI₁₀₀ by 75% (P<0.05). Production parameters remained identical.

Discussion & Conclusions

The results show that live *E. coli* F4/F18 vaccination against PWD has led to similar technical performance parameters, in combination with a significant reduction in the mortality and medication use. In conclusion, control of PWD through vaccination is a good option in order to prevent piglets from the negative clinical outcomes of F18-ETEC infection during the post-weaning period.



BACTERIAL DISEASES

BBD-074

VACCINATION WITH A LIVE BIVALENT *E. COLI* F4/F18 VACCINE FOR THE PREVENTION OF F18-ETEC POST-WEANING DIARRHEA - REDUCTION OF MORTALITY AND ANTIBIOTIC USE

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Introduction

Post-weaning *Escherichia coli* diarrhea (PWD) remains a major cause of economic losses for the pig industry. PWD, caused by enterotoxigenic *E. coli* (ETEC), provokes mild to severe watery diarrhea (5-10 days post-weaning). Most common adhesins on ETEC from PWD are the fimbriae F4 (previously called K88) and F18. An oral live bivalent *E. coli* F4/F18 vaccine (Coliprotec® F4/F18; Prevet Microbia) is available, which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC. The objective was to compare technical results of *E. coli* F4/F18 vaccination with previous standard therapeutic approach.

Materials & methods

An 800-sow farm with diagnosed problems of PWD due to F18-ETEC was selected. Piglets were vaccinated at 18 days with the oral live bivalent *E. coli* F4/ F18 vaccine. At weaning, no standard group medication (antibiotics) was applied for prevention of PWD. Several performance parameters were collected before (n = 3 groups) and after implementation of the vaccination (n = 5 groups): time in nursery, mortality and medication use (TI₁₀₀) in the nursery phase and days to slaughter in the fattening phase.

Results

Oral *E. coli* F4/F18 vaccination significantly reduced the mortality (4.3% to 1.9%; P<0.05) and the TI₁₀₀ by 80% in the nursery. Finisher vaccinated pigs were slaughtered 7 days earlier at the same end body weight. Production parameters were identical before and after the vaccination.

Discussion and conclusions

The live *E. coli* F4/F18 vaccination against PWD has led to similar technical performance parameters, in combination with a significant reduction in mortality and medication use in the nursery phase and reduction of number of days in the fattening. In conclusion, control of PWD through vaccination is a good option to prevent piglets from the negative clinical outcomes of post-weaning F18-ETEC infection with additional effect on finisher pig performances.



BBD-075

VACCINATION WITH A LIVE BIVALENT *E. COLI* F4/F18 VACCINE PREVENTS F4-ETEC POST-WEANING DIARRHEA AND REDUCES ANTIBIOTIC USE

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Introduction

Post-weaning *Escherichia coli* diarrhea (PWD) remains a major cause of economic losses for the pig industry. PWD, caused by enterotoxigenic *E. coli* (ETEC), typically provokes mild to severe watery diarrhea between 5 and 10 days after weaning. Most common adhesins on ETEC from PWD are the fimbriae F4 (previously called K88) and F18. An oral live bivalent *E. coli* F4/F18 vaccine (Coliprotec® F4/F18; Prevetec Microbia) is available, which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC. The objective was to compare technical results of *E. coli* F4/F18 vaccination with previous standard therapeutic approach.

Materials & methods

A 250- sow farm (weaning at 25 days) with diagnosed problems of PWD due to F4-ETEC was selected. Piglets were vaccinated at 20 days with the oral live bivalent *E. coli* F4/ F18 vaccine. At weaning, no standard group medication (ZnO and/or colistin) was applied for prevention of PWD. Piglets were fed a farm-prepared mixed liquid feed formula. Several performance parameters were collected before and after implementation of the vaccination: pen weight at days 0 and 42, mortality, ADG and use of colistin (TI₁₀₀).

Results

Oral *E. coli* F4/F18 vaccination significantly decreased TI₁₀₀ colistine from 16.7 to 0.0 (P<0.05) for all monitored groups after vaccination. Furthermore, contrary to batches before the implementation of the vaccination, no ZnO was used during the post-weaning period. Production parameters were comparable before and after the switch to the oral *E. coli* F4/F18 vaccination.

Discussion & Conclusions

The results show that live *E. coli* F4/F18 vaccination against PWD has led to similar technical performance parameters, in combination with a significant reduction in the medication use. In conclusion, control of PWD through vaccination under field conditions is a good option to prevent piglets from the negative clinical outcomes of post-weaning F4-ETEC infection.

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BACTERIAL DISEASES

BBD-076

VACCINATION WITH A LIVE BIVALENT *E. COLI* F4/F18 VACCINE RESULTS IN ANTIBIOTIC REDUCTION WITH IMPROVED GROWTH AND FEED CONVERSION RATE

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Introduction

Post-weaning *Escherichia coli* diarrhea (PWD) remains a major cause of economic losses for the pig industry. PWD, caused by enterotoxigenic *E. coli* (ETEC), typically provokes mild to severe watery diarrhea and mortality (5-10 days post-weaning). Most common adhesins on ETEC from PWD are the fimbriae F4 and F18. Therapy to control PWD typically consists of antibiotic treatment in combination with high doses of ZnO (3000 ppm). Recently, an oral live bivalent *E. coli* F4/F18 vaccine (Coliprotec® F4/F18; Prevtect Microbia) is available on the European market, which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC. The objective was to compare technical results of *E. coli* F4/F18 vaccination with previous standard therapeutic approach under field conditions.

Materials & methods

A 700-sow farm (weaning at 21 days) with diagnosed problems of PWD due to F18-ETEC was selected. Piglets (n=3039) from 3 consecutive weaning batches were vaccinated at weaning with the oral live bivalent *E. coli* F4/F18 vaccine and compared to controls (n=4341) from 4 consecutive weaning batches. In the vaccinated groups, no standard group medication (3000 ppm ZnO or colistin) was applied. Several performance parameters were collected: weight at d0-50, FCR, mortality, ADG and medication use (TI₁₀₀).

Results

Oral *E. coli* F4/F18 vaccination significantly reduced the mortality rate (3.15% to 1.65%) and the TI₁₀₀ by 90% (P<0.05). Production parameters significantly improved (P<0.05), with +22 g/d in ADG and -0.06 in FCR between control and live *E. coli* F4/F18 vaccinated piglets.

Discussion & Conclusions

Vaccination against PWD has led to better technical performance parameters, in combination with a reduction in the mortality and a significant reduction in medication use. In conclusion, control of PWD through vaccination is a good option in order to prevent piglets from the negative clinical outcomes of F18-ETEC infection during the post-weaning period.



BBD-077

VACCINATION WITH A LIVE BIVALENT *E. COLI* F4/F18 VACCINE SIGNIFICANTLY IMPACTS ANTIBIOTIC USE DURING THE NURSERY PERIOD

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Introduction

Post-weaning *Escherichia coli* diarrhea (PWD) remains a major cause of economic losses for the pig industry. PWD, caused by enterotoxigenic *E. coli* (ETEC), typically provokes mild to severe watery diarrhea (5-10 days post-weaning). Most common adhesins on ETEC from PWD are the fimbriae F4 (previously called K88) and F18. Therapy to combat PWD typically consists of antibiotic treatment in combination with high doses of ZnO (3000 ppm). An oral live bivalent *E. coli* F4/F18 vaccine (Coliprotec® F4/F18; Prevtect Microbia) is available on the European market, which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC. The objective was to compare technical results of *E. coli* F4/F18 vaccination with previous standard therapeutic approach under field conditions.

Materials & methods

A 250-sow farm (weaning at 25 days) with diagnosed problems of PWD due to F18-ETEC was selected. Piglets were vaccinated at 20 days with the oral live bivalent *E. coli* F4/F18 vaccine. At weaning, no standard group (colistin) medication was applied for prevention of PWD. Several performance parameters were collected before (n = 900 piglets) and after implementation of the vaccination (n = 1200): time in nursery, mortality and medication use (TI₁₀₀) in piglets.

Results

Oral *E. coli* F4/F18 vaccination decreased TI₁₀₀ by 95% for comparable number of days in nursery. Production parameters were identical before and after the switch to the oral *E. coli* F4/F18 vaccination. Mortality rate was also similar but was low (1%) both before and after vaccination.

Conclusions

The results show that live *E. coli* F4/F18 vaccination against PWD has led to similar technical performance parameters, in combination with a significant reduction in medication use. In conclusion, control of PWD through vaccination under field conditions is a good option to prevent piglets from the negative clinical outcomes of post-weaning F18-ETEC infection.

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BACTERIAL DISEASES

BBD-078

A STUDY ON THE TRANSMISSION OF *MYCOPLASMA HYORHINIS* IN SUCKLING PIGLETS IN TWO FARM IN NORTHERN ITALY

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Introduction

For a long time regarded as a commensal, *Mycoplasma hyorhinis* is now suspected to play an important role in PRDC, arthritis and polyserositis.

The aim of the present study was to evaluate the way of diffusion of *M. hyorhinis* among suckling piglets in two farrow-to-finish farms in Northern Italy.

Materials & Methods

From each farm three sows each month for three months were selected. Nasal swabs were collected from each sow two days before farrowing. Swabs were tested for *M. hyorhinis* and *M. hyopneumoniae* using a real time Taq man probe PCR with internal control.

After farrowing three piglets from each sow were selected and the same analysis were performed on sows and piglets on days 2, 8 and 18 after birth. An additional sampling was performed on piglets after weaning, at day 30.

Results

11/72 nasal swabs from 9/18 sows tested positive for *M. hyorhinis*. Only two sows tested positive more than once.

Among piglets 1/54 swabs tested positive at day 2 (1.85%; 95% confidence interval (95% CI): 0.05-9.89%), 11/53 at day 8 (20.75%; 95%CI: 10.84-34.11%), 35/51 at day 18 (68.63%; 95%CI: 54.11-80.89%), 37/41 at day 30 (37/41=90.24%; 95%CI: 76.87-97.28%).

Only three piglets tested negative after a positive sampling.

Discussion & Conclusion

The trend of positivity for *M. hyorhinis* suggest a discontinuous excretion by sows while piglets, once infected, tend to maintain *M. hyorhinis* positivity at the level of nasal cavity.

Although the presence of *M. hyorhinis* from nasal cavities of sows appeared discontinuous, the diffusion of the pathogen among the litter seems to be quick, reaching at a prevalence around 90% by day 30 of life. The first piglets infected may play a role in the diffusion of the bacteria; the possibility of another route of shedding from sows (vaginal discharge, milk) is under evaluation.



BBD-079

A SUDDEN MORTAL DISEASE OUTBREAK IN ORGANIC SPF PIGS

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Introduction

Contact with new microbes may be dangerous for pigs of high health status. This manuscript describes a disease outbreak following allocation of SPF pigs.

Material & Methods

At the weight of 43 kg, 152 SPF pigs born by parity 1-sows were transferred 190 km to a new organic herd rearing fatteners out-doors. The transport vehicle was cleaned and without other animals. At arrival, all pigs were kept on deep straw with access to pasture.

Four days after arrival, lameness was observed in two pigs. Two days later, five pigs were found dead and another 7 depressed (poor balance and/or lame). Affected pigs were treated with benzylpenicillin and/or Vitamin E/Selenium. The following day, more pigs expressed severe depression, dog sitting and paralysis.

Autopsy revealed purulent meningitis with presence of *Streptococcus suis* in the brain in one pig, and early signs of serositis in the abdomen of another pig. All pigs were individually treated with benzylpenicillin procaine for 3 days.

Six weeks after arrival, blood samples were collected from 10 pigs and analysed for presence of antibodies to *Haemophilus parasuis* and *Streptococcus suis* with indirect ELISA-systems.

Results

In total, 11 pigs died and 2 pigs were culled. The remaining 139 pigs regained health and a high DWG.

Six weeks after arrival, all pigs were seropositive to *Haemophilus parasuis* ($A_{450} > 0.5$), and seven pigs had high levels of antibodies ($A_{450} > 1.1$). Two pigs had low levels of antibodies to *Streptococcus suis* (0.54 and 0.68).

Discussion & Conclusion

Infections with *Streptococcus suis* may be lethal. However, the low levels of antibodies only indicated presence of but not a major influence of that bacteria. Instead, the high levels of antibodies to *Haemophilus parasuis* indicated a major influence of that bacteria. It cannot be excluded that the pigs were exposed to *Haemophilus parasuis* during the transport.

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BACTERIAL DISEASES

BBD-080

APPLICATION OF QUANTITATIVE PCR FOR STREPTOCOCCUS SUIS SEROTYPES 2 AND 9 ON TONSIL AND SALIVA SAMPLES IN PIGS UNDER FIELD CONDITIONS

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Introduction

Streptococcus suis infections are important indications for antimicrobial treatment in pigs. To control *S. suis* infections, it will be helpful to develop a practical test to assign a *S. suis*-status to farms. In this research we addressed the following questions:

- Can qPCR be used for detection of *S. suis* serotype 9 infection in live pigs in the field?
- What is the sensitivity of a convenient sampling method (saliva-swabs) compared to tonsil-brushing under field conditions?
- What is the effect of enrichment in the culture procedure prior to qPCR on sensitivity?

Material & Methods

On two farms 60 piglets (Farm A: 15x6 weeks, 45x9 weeks; Farm B: 60x9 weeks old) were sampled. Farm B reported episodes of clinical *S. suis* infections, Farm A did not. Per piglet 4 samples were taken:

- Tonsil-brush.
- Tonsil-brush, enriched in Todd-Hewitt-medium (eTH).
- Saliva-swab.
- Saliva-swab, eTH.

All samples were tested by a previously validated qPCR for serotypes 2 and 9.

Results

Whereas the estimated serotype 2 prevalence was 0% in both farms, serotype 9 was found in both; in Farm A 98% (95%CI:95-100%) and in Farm B 32% (95%CI:20-43%) of the animals tested positive. Serotype 9 positive test results were observed in tonsil-samples of 74 and in saliva-samples of 63 piglets. Tonsil- and saliva-samples test results showed substantial correlation, especially for enriched samples (Kappa=0.71). Enrichment resulted in a 5-fold (saliva) or 10-fold (tonsil) increase in number of positives.

Discussion & Conclusion

Although Farm A never reported clinical signs due to *S. suis* serotype 9, the estimated prevalence was significantly higher than on Farm B. Current ongoing research suggests that this may be explained by differences in pathogenicity between serotype 9 strains. Saliva-swabs (eTH) could be an effective sampling method for assessing *S. suis* serotype 9 farm status.



BBD-081

DETECTION OF *BRACHYSPIRA HYODYSENTERIAE* IN A CARRION CROW (*CORVUS CORONE*)

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Background & Objectives

The role of corvid birds in the epidemiology of *Brachyspira (B.) hyodysenteriae* causing swine dysentery in pigs has been questioned. Therefore, we examined crows living close to *B. hyodysenteriae* positive pigs for the presence of *B. hyodysenteriae* and analysed isolates with molecular methods.

Material & Methods

Intestinal swabs of four young crows (*Corvus corone*) and faecal swabs from pigs living in two neighbouring *B. hyodysenteriae* positive free-ranging pig herds (herd A and B; 10 swabs/ herd) were sampled. The 24 samples were analysed by *Brachyspira* specific culture, and the isolates were identified by *nox*- polymerase chain reaction specific for *Brachyspira* spp. followed by restriction fragment length polymorphism. *B. hyodysenteriae* isolates were typed using multi-locus sequence typing (MLST).

Results

Eight samples from herd A and six from herd B as well as one crow sample were positive for *B. hyodysenteriae*. The eight isolates from herd A and one isolate from herd B belonged to sequence type (ST) ST196. The remaining five porcine isolates from herd B as well as the corvid isolate were grouped into ST66.

Discussion & Conclusion

This is the first description of *B. hyodysenteriae* in crows and its molecular relationship to *B. hyodysenteriae* from pigs from the same area. This emphasizes that crows should be considered as a potential vector spreading *B. hyodysenteriae* into pig herds. Further studies are now necessary to elucidate the actual role and impact of crows in the epidemiology of *B. hyodysenteriae*.

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BACTERIAL DISEASES

BBD-082

LOW DIVERSITY AMONG *BRACHYSPIRA HYODYSENTERIAE* ISOLATES IN SWITZERLAND

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Introduction

Brachyspira (*B.*) *hyodysenteriae* infection can cause swine dysentery (SD), increased use of antimicrobials and economic losses. Control and eradication of SD rely on a better understanding of sources, transmission and spread. We analysed *B. hyodysenteriae* isolates from different Swiss pig herds using molecular typing methods and epidemiological data.

Material & Methods

B. hyodysenteriae isolates were obtained from a laboratory collection (SD cases, monitoring) and research projects and were analysed by multi-locus sequence typing. Epidemiological data (place & date of sampling) were recorded.

Results

Forty-seven isolates (1 to 8/ herd) originating from 24 herds (eastern Switzerland: 16, middle-western part: 8) were collected between 2010 and 2017. Isolates belonged to sequence type (ST) ST6 (n=3), ST66 (n=12), and the new STs ST196 (n=30) and ST197 (n=2). The herds located in eastern Switzerland harboured all four identified STs. In one of these herds, two STs (ST66 and ST196) were present. In herds from the middle and western parts, only ST196 (n=7) and ST66 (n=1) were present.

Discussion & Conclusion

Sequence typing of *B. hyodysenteriae* revealed a low genetic diversity and the presence of the same ST in different regions in Switzerland. This indicates that the *B. hyodysenteriae* strains very likely originate from a few common sources which contribute to the spread of the pathogen. In case of numerous sources, more STs would have been expected to be present. However, further analyses of more herds and samples including their epidemiological background are needed to confirm this hypothesis and to identify sources.



BBD-083

***ERYSIPELOTHRIX* STRAINS ISOLATED FROM TONSILS OF FATTENING PIGS IN SWEDEN**

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Introduction

Erysipelothrix rhusiopathiae (ER) causes erysipelas and the tonsils are recognized as a common site for ER in pigs. The aim of this study was to estimate the incidence of ER in the tonsils of pigs in Sweden.

Material & Methods

Tonsils were collected from 200 apparently healthy pigs at slaughter in 2017, 100 in spring and 100 in autumn, from 10 abattoirs slaughtering 88% of the pigs in Sweden. The sample size per abattoir was based on the number of pigs slaughtered. Only one pig per herd was sampled.

Tonsil tissue (about 1 x 1 cm) was inoculated in 5 ml broth with 0.2 mg/ml sodium azide and 5 µg/ml crystal violet at 37°C for 48 h. Approximately 10 µl of the broth was spread on horse blood agar plates containing 400 µg/ml kanamycin and 50 µg/ml neomycin and incubated at 37°C for 48 h. Growth of ER was confirmed by colony morphology and MALDI-TOF MS.

Results

ER was isolated from six of the 200 tonsils (3%); None from 7 abattoirs (n=108), 3/60 in I (5%), 2/12 in II (17%) and 1/20 in III (5%). All ER-isolates were from southern Sweden with a mean distance to the abattoir of 235±99 km (range 111-377 km).

Discussion & Conclusion

Approximately 50% of all healthy pigs have been reported to be subclinical carriers of ER, corresponding to preliminary results from a survey in Swedish wild boars. In contrast, the results indicated a low risk (3%) for fatteners to be carrier of ER, ranging from 5-17% of the herds in affected areas.

The results obtained indicate that indoor rearing of fatteners combined with vaccination of sows, hygiene and limited access to straw prevent colonization of ER, which is further supported by the fact that erysipelas rarely is diagnosed in such herds.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-001

A COMPARISON OF MALE PIGS DESTINED FOR THE PRODUCTION OF HIGH-QUALITY CURED PRODUCTS USING EITHER PHYSICAL CASTRATION OR IMMUNOCASTRATION: META-ANALYSIS OF RELEVANT CARCASS DAT

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Introduction

High intramuscular (IM) fat content and backfat depth are important requirements for pigs destined for high-quality cured products (HQCP). Those pigs are commonly slaughtered at heavy live-weights; therefore need to be castrated to avoid boar taint and unacceptable male behaviour. Immunocastration with Improvac® (Zoetis) (IC) is a growing an effective and animal-friendly alternative to physical castration (PC), which is voluntarily abandoned by 2018 in Europe. The aim of this study was to compare the impact of these two approaches on ham yield, IM fat and backfat by applying meta-analyses techniques.

Materials and Methods

Pigs of different breeds, destined for the production of HQCP, were included. For subgroup analyses, hot carcass weight was used to categorize studies into heavy-weight pig production (>97.7kg) and medium-weight pig production (90.9kg-97.7kg). For all analyses including >3 comparisons, a random-effect model was used; when ≤3 comparisons, the more suitable fixed-effect model was applied.

Results

Five experiments comparing 250 IC pigs with 243 PC pigs, published in four peer-reviewed articles were identified. Over all pigs, absolute weights of hams were similar. Considering heavy pigs only, IC pigs yielded 300g more ham than PC pigs ($P<0.05$). % IM fat was numerically smaller in IC compared with PC pigs, although not statistically significant. Backfat was approximately 3mm lower in IC pigs ($p<0.0001$). Nevertheless, IC pigs met the minimum requirements defined for HQCP: in average all pigs had >2.5% IM fat and >20mm backfat, and Iberian pigs had an average backfat of >50mm.

Discussion and Conclusion

Meta-analyses of studies comparing IC and PC pigs raised for the production of HQCP showed that Improvac is a suitable alternative to PC, as IC pigs also exceeded the required thresholds for IM fat and backfat defined for HQCP. Moreover, heavy-weight IC pigs yielded higher weights of ham compared to heavy-weight PC pigs.



HHM-002

HEMOGLOBIN CONCENTRATIONS IN RELATION TO REPRODUCTIVE STAGE AND PARITY IN SOWS

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Introduction

The iron demands of sows and hemoglobin (Hb) concentrations typically are ignored in pork production. Therefore, this study evaluated Hb concentrations in different parities of sows at various stages of reproduction.

Materials & Methods

The cross-sectional study included 2685 sows from 11 different farms (2400-4000 sows/farm) in two states (North Carolina and Indiana) in the USA. Approximately 250 blood samples were collected from 10 sows/parity/stage on each farm. Stages were defined as early, mid, and late gestation, and early and late lactation. Parity groups were 0, 1, 2, 3, and > 4. The Hb concentrations were measured on the farm using a HemoCue Hb 201+™. Blood samples were taken from the ear veins of sows. Data was analyzed using analysis of variance with state, farm, parity, and stage as the independent variables. Means were compared with Tukey's HSD test.

Results

The Hb concentrations differed ($P < .05$) between North Carolina ($9.7 \pm .03$ g/dL) and Indiana ($10.5 \pm .05$ g/dL). Also, Hb concentrations differed among reproductive stages with mid-gestation having the highest ($P < .05$) concentrations ($10.7 \pm .06$ g/dL), early lactation with the lowest concentrations ($9.1 \pm .05$ g/dL), and concentrations rising over late lactation ($9.4 \pm .06$ g/dL) and early gestation ($10.6 \pm .06$ g/dL). This trend was consistent among parities and farms. There also was an effect of parity, with Hb concentrations decreasing with increasing parity.

Discussion

This method of Hb assessment provided a simple and inexpensive method of Hb evaluation on commercial farms. The difference between states was surprising; however, it was suspected that sow diets were a significant factor. If 10.5 g/dL is as an indicator of anemia, then a large proportion of sows were anemic, thereby revealing potential issues with anemia in sows, particularly in lactation. Additional studies are necessary to evaluate the influence of Hb status on reproductive performance.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-003

PRODUCTIVITY IMPROVEMENTS FOLLOWING PORCILIS® PCV M HYO VACCINATION

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Introduction

Although the efficacy of a new vaccine is thoroughly proven prior to being marketed, follow-up on efficacy after large-scale use in the field is important. The aim of this Danish historical study was to evaluate the effect of Porcilis® PCV M Hyo during the weaning period.

Material & Methods

Retrospectively, production data like mortality, feed conversion rate (FCR) and average daily gain (ADG) were collected from Danish weaning herds vaccinated with Porcilis® PCV M Hyo. Data from one year prior to initiation of vaccination was compared to data from one year after fully-implemented vaccination. The intermediate period (six months), where the herds contained both vaccinated and non-vaccinated pigs, was omitted from the dataset. Also, herds that experienced severe disease outbreaks with other pathogens or disease clearances (mainly with PRRS) during the study period (2½ years) were excluded.

Results

Twenty Danish herds totally producing 650,000 pigs per year were included in the data set. On average, mortality and FCR decreased by 0.4% ($p=0.01$) and 0.06 feeding units/kg ($p=0.07$), respectively, and ADG increased by 5 g ($p=0.83$). This improved productivity has a value of €0.5. Of the 20 herds, 12 herds previously used another PCV2 vaccine, whereas 8 herds did not previously vaccinate against PCV2. For these two sub-groups, the improvements in productivity corresponded to €0.3 and €1, respectively.

Discussion & Conclusion

The historical study design does not allow for distinguishing the effect of vaccination from the effect of time. Opposed to most parallel studies, however, a historical design allows for the inclusion of a large number of observations, adding power to the study at a different level. The improved productivity following vaccination, coinciding with an unchanged productivity during the same period at a national level, supports an economical benefit of Porcilis® PCV M Hyo already in the weaning period.



HHM-004

BIOFILM IN WATER PIPES: EVALUATION METHOD OF ELIMINATION DURING SANITATION PROCEDURE IN POST-WEANING UNIT

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Background and Objectives

Pickling of water pipes during sanitation to eliminate biofilm is not common in pig production, whereas it is systematic in poultry breeding. FT22, FT37 and ATP are good indicators of biofilm in water pipes.

This field study aims to show the interest of:

- Applying peroxide stabilized by silver nitrate (HYDROCARE®) to eliminate biofilm of water pipes.
- Using on ATP-metry method to estimate efficiency of the cleaning.

Material and Methods

This comparative study is conducted on 8 French farms, between April and May 2017.

Water is sampled at the beginning and at the end of the pipe before cleaning during sanitation in post-weaning unit before cleaning.

Then, a disinfecting solution of HYDROCARE® diluted to 3% is incorporated into water pipes for remaining during 12 hours.

After draining and rinsing, water is sampled once again at the end of pipes.

On all samples, total flora contents at 22°C (FT22) and 37°C (FT37) are measured at the laboratory. ATP is measured on-farm, with an NG Luminometer Clean-Trace® 3M.

Results

On 7 farms out 8 FT22 and FT37 were higher than 100CFU/ml before cleaning. ATP measures ranged from 172 to 4436RLU.

After cleaning, FT22 and FT37 were absent in 6 tested farms. On the 2 others, FT22 and FT37 were lower than 30UFC/ml. ATP measures ranged from 11 to 690RLU.

Discussion and Conclusion

According to this study, application of HYDROCARE® allowed a decrease of markers of biofilm in water pipes, estimated either by counting the total flora or ATP.

It confirms the interest of cleaning with HYDROCARE® at each sanitation to eliminate the biofilm.

ATPmetry seems to be an interesting evaluation method because it is simple, quick and can be tested on-farm.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-005

EAR NECROSIS IN GROWERS RELATED TO STRAY VOLTAGE? A CASE REPORT

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Objective

Ear necrosis is a common issue on French farms. Effects on pig performance are usually moderate, still the pathology is stressful for farmers and may raise welfare concerns. Moreover, in some cases large numbers of pigs are affected, with extensive lesions, leading to dramatic consequences. Little is known about etiology and risk factors. This case aims to show the possible implication of stray voltage.

Materials and methods

The case takes place in a 160-sow farrow-to-finish farm, in May 2017. Piglets are weaned at 28 days of age (doa) and are sent in growing units where they stay up to 70 doa. Ear necrosis usually appears around 40 doa and can affect up to 75% of piglets in a batch. Housing conditions were investigated and are good regarding animal welfare.

Stray voltage was measured with a multimeter in 3 pens at several points: stainless feeders and drinkers, concrete ground, fans. No significant voltage could be measured in feeders, ground, and fans ($U < 40\text{mV}$), but measures ranged from 150 to 350mV in drinkers.

Daily weight gain from weaning to 70 doa (DWG 28-70), losses in growing units, and incidence rate of ear necrosis were monitored on 8 batches before and after earthing of drinkers (4 and 4 batches respectively).

Results

Earthing of drinkers was done in August 2017. Losses in growing units dropped from [2.1% - 7% - 6.5% - 5.6%] before earthing to [1.4% - 2.9% - 4.1% - 2.8%] after. No impact on DWG 28-70 could be evidenced. After earthing, no case of ear necrosis were noticed on the 1st, 2nd, and 4th batch. On the 3rd one, incidence was around 5%.

Conclusion

This case report suggests the possible implication of stray voltage on ear necrosis prevalence and severity. Further investigations are needed to explore this suspected risk factor.



HHM-006

ANALYSIS OF THE ECONOMIC IMPACT OF LUNG LESIONS THANKS TO THE CEVA LUNG PROGRAM (CLP) AFTER SETTING UP A NEW VACCINE AGAINST ENZOOTIC PNEUMONIA (HYOGEN®)

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Introduction

Natural infection of growing pigs in farms due to *Mycoplasma hyopneumoniae* can result in substantial losses in the growth performance. It is possible to evaluate the incidence and severity of those infections by scoring bronchopneumonia lesions in slaughter pigs. Ceva Lung Program (CLP) is an efficient tool to follow the evolution and the prevalence of enzootic pneumonia.

Material and methods

The aim of the study was to validate the change of the vaccine plan with a new *Mycoplasma* vaccine, Hyogen® by measuring the consequences in reducing the lung lesions and the potential economic benefit.

The study has been set up in 27 farms from the west part of France between 2015 and 2017. These farms, for which lung controls before and after the new vaccine protocol with Hyogen® were available in the CLP database, were selected. All the farms were using a *Mycoplasma* vaccine before Hyogen. A 6-month period for each protocol was considered. Lung lesion scoring (Madec) and the percentage of healthy lungs were analysed. The economic impact was calculated taking into account the link between the weight loss, the increase of FCR and mortality (= cost) with the lung score and the percentage of pleurisy seen at the slaughter house.

Results

More than 110 lung controls have been done before and after changing the vaccine protocol (16000 lungs scored). The Madec index average have been improved in 85 % of farms and the economic impact have been positive in 70%. Using Hyogen increased the proportion of healthy lung about 12 points, divided the lung score by two to reach 1.13 and consequently decreased the economic impact of 1.16 euros.

Conclusion

This study enables to validate the value measured in farms using Hyogen, thanks to the evaluation of the lung lesions at the slaughterhouse and their economic impact.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-007

EVALUATION OF A NEWLY KIT, MULTIPLEX REAL-TIME RT-PCR METHOD FOR THE DETECTION OF SWINE CORONAVIRUSES (PEDV, TGEV AND SDCOV)

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The coronaviruses, porcine epidemic diarrhea virus (PEDV), transmissible gastroenteritis virus (TGEV), and porcine delta coronavirus (PDCoV) are causative agents for gastrointestinal diseases in pigs. All three coronaviruses show similar initial clinical signs, but treatments and remediation may be different for each. Tests specific for each of these can advise the course followed, greatly aiding herd management. The Applied Biosystems™ VetMAX™ PEDV/TGEV/SDCoV Kit is an assay that detects and differentiates the three coronavirus species in a single reaction mix. This multiplex RT-qPCR assay uses a different fluorescent dye to identify each pathogen target genomic RNA, and includes controls to ensure the assay is working.

The VetMAX PEDV/TGEV/SDCoV Kit was developed using various types of environmental and related samples obtained from the field, and found to yield high specificity and sensitivity. To examine its performance relative to other solutions offered, we compared it to 2 other RT-qPCR kits prominently used in the market. We obtained environmental, oral fluid, and faecal samples infected with PEDV (N=15), TGEV (N=10), and SDCoV (N=14) from the animal health departments at the University of Minnesota and Iowa State University. RNA isolation was performed with the MagMAX™ CORE Nucleic Acid Purification kit, and negative, positive, and no template controls were included. RT-qPCR for all three assay kits were run on the 7500Fast System according to the manufacturer's recommendations. The RT-qPCR run time for the three kits was between 90 and 100 minutes. Data analysis was done using Auto Ct settings, a method that gave good results for each kit and provided a fair comparison. The VetMAX PEDV/TGEV/SDCoV Kit consistently showed comparable or better results to the other kits tested, with consistently lower C_T's compared to one of the kits and a higher signal versus baseline noise for the other.



HERD HEALTH MANAGEMENT & ECONOMY

HHM-008

EFFECT OF A SEAWEED-CLAY COMBINATION ON THE NEONATAL DIARRHEA IN PIGLETS RAISED IN DIFFERENT MANAGEMENT CONDITIONS

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Neonatal diarrhea is one of the most frequent problem in newborn piglets in the world. It can result in high mortality and morbidity if it's not properly managed. Moreover, neonatal diarrhea leads to an over use of antibiotics. In this context, Olmix developed a new product (Seagut Paste) with 3 synergistic actions: protect the digestive tract via marine algae extract (MSP[®]_{MUCIN}) and specific clay, balance gut flora and maintain homeostasis. The objective of the present study was to evaluate the capacity of this product to keep good health status of newborn piglets in case of neonatal diarrhea in different field conditions. Several trials were set up in different countries (France, Italia, Ireland and Vietnam) in more than 13 farms with different managements. So far 140 litters from mainly Large-White/Landrace genetic were taken into account for the analysis of the results. The product was administrated to the litters including at least one piglet with diarrhea before 5 days after farrowing at 2 ml/piglet/day during one to two days depending of the piglet's status. After two days, if diarrhea persisted, the farmers were allowed to use antibiotic treatment. The age for piglet diarrhea occurrence, number of MSP_{MUCIN} & clay combination administration/piglet, ability of the combination to control the diarrhea, medication use, time to recover from diarrhea were recorded. The litter distribution was 34 % from gilts and 66 % from sows with an average lactation rank at 2.46. This multisite trial, taking into account diverse farming situations, has shown the efficacy of the MSP_{MUCIN} & clay combination on stopping diarrhea in 84% of the cases. In 70% of successful cases, a single application was needed.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-009

EFFECTS OF DIFFERENT FEED PROGRAMS ON SECOND LITTER SYNDROME IN AFTER FIRST WEANING TO SECOND PARITY SOWS

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Introduction

It is well known that second parity sows may have low farrowing rate or low reproduction performance. Furthermore, it made a negative impact on farm productivity. Hence, improving reproductive performance of second parity sows might improve farm productivity. This experiment was conducted to evaluate the effects of different feed programs on reproductive performance, litter performance and second litter syndrome in after first weaning to second parity sows.

Material & methods

The experiment was started when sows in the first weaning, and a total of 52 sows, average body weight (BW) of 173.4 kg, were allotted to one of four treatments based on BW and backfat thickness with 4 treatments and 13 replicates. The treatments were CON: weaning-artificial insemination day (gestation sow diet 3kg)-farrowing (2.2 kg); A: weaning-artificial insemination day (gestation sow diet 3kg)-farrowing (2.4 kg); B: weaning-artificial insemination day (gestation sow diet 3kg)-day 35(2.4 kg)-farrowing (2.2 kg); C weaning-artificial insemination day (lactation sow diet 3kg)-farrowing (2.2 kg).

Results

In feeding trial, the body weight change in gestation sows and second litter syndrome rate were found to be significant different between each treatment ($P < 0.01$ and $P = 0.02$, respectively). Feeding 2.4kg in whole gestation period sows showed the most body weight gain and the lowest second litter syndrome rate, but there was no significant difference in BW, BW change, backfat thickness and backfat thickness change during other period. However, there was no significant difference in reproductive performance and litter performance when fed different feed programs.

Conclusion

Consequently, feeding 2.4kg in gestating period in second parity sow could reduce the second litter syndrome rate and improved the sow productivity.



HHM-010

EFFECTS OF FEEDING FREQUENCY DURING EARLY GESTATION ON REPRODUCTIVE PERFORMANCE IN GESTATING SOWS

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Introduction

Our research group has been used daily once feeding to gestating sows from 35 day for saving labor and its cost. The period of once daily feeding in previous study was the day after pregnancy checking (35 day) due to concerns about conception and pregnancy in early gestation. To improve once daily feeding scheme, this study was conducted to evaluate the effects of feeding frequency during early gestation on reproductive performance in gestating sows.

Material and Methods

A total of 40 multiparous sows (Yorkshire x Landrace, average parity 4.1) were used in this experiment. Sows with an initial body weight of 208.2 ± 26.5 kg were allotted to one of two treatments at breeding based on body weight, backfat thickness, and parity in a completely randomized design. The treatments were: 1) 0day OF: daily once feeding after breeding (gestation 0-115 day); 2) 35 day OF: daily twice feeding after breeding (gestation 0-35 day) and daily once feeding after pregnancy check (gestation 35-115 day). Sows were fed commercial gestation diet 2.2 kg/d (2 parity) or 2.4 kg/d (over 3 parity).

Results

There was no significant difference in body weight of gestating sows among treatments. However, body weight gain (35-110 day) showed significantly higher in once feeding from breeding ($P < 0.01$). In backfat thickness, sows fed once daily feeding from breeding showed higher backfat thickness at day 35 and 110 rather than sows fed once daily feeding from 35 day ($P = 0.08$; $P = 0.06$). There were no significant differences in total born, stillbirth, born alive, total litter weight, alive litter weight, and piglet weight. However, once daily feeding after breeding had a tendency of increase number of mummy ($P = 0.05$). Starting time of once daily feeding had no influence on conception rate and farrowing rate.

Conclusion

Consequently, once daily feeding could apply to gestating sows after breeding without reproductive problems.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-011

A NORWEGIAN PROJECT STUDYING OUTBREAKS OF ACUTE RESPIRATORY DISEASE IN FATTENING PIGS

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Introduction

The Norwegian pig population has a favorable health status when viewed in an international perspective. The population is free from *Mycoplasma hyopneumoniae* and several viral agents [(PRRSV, PRCV, SIV (except H1N1pdm09)] involved in respiratory infections in pigs. However, over the last four years, there has been an increase in reported cases of acute respiratory disease in the Norwegian pig population. The project aims to investigate the etiology and risk factors of outbreaks of respiratory disease in Norwegian pig herds.

Material and methods

Practicing veterinarians or project associates are to submit lungs, oral fluids and paired blood samples from animals in 20-25 herds with clinical outbreaks and an equal number of matched control herds with no clinical signs of respiratory disease in the period of October 2017-April 2018. The same biological samples and epidemiological data are collected in the control herds as in the case herds.

Samples are submitted to the Norwegian Veterinary Institute where they are subjected to pathological and histopathological examination, bacteriological culture, characterization and antimicrobial resistance analysis, serology and PCR for agent detection. Lung tissue samples are also collected for microbiome analysis.

Results

The project is at an early stage. At the time of submission, the results of the laboratory investigations are pending, and preliminary data will be presented in the poster.

Discussion & Conclusion

The current project will investigate the complexity of agents and risk factors involved in porcine respiratory disease outbreaks in a pig population with absence of several important respiratory pathogens. Implementing correct and relevant preventive measures are important in order to maintain Norway's favorable status with regard to animal health, welfare and antimicrobial resistance.



HHM-012

INVESTIGATION OF PORCINE RESPIRATORY DISEASE COMPLEX (PRDC) OUTBREAKS AT POST-WEANING IN FARMS FROM WESTERN FRANCE USING A NEW BRONCHOALVEOLAR LAVAGE TECHNIQUE

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Recently, a French swine practitioner developed a bronchoalveolar lavage (BAL) sampling method that uses two catheters and can be performed on live, unsedated pigs without causing undue stress.

The trachea is accessed via the mouth. In its diagnostic support services to practitioners, Zoetis' technical service in France implemented this sampling method in the field when requested by practitioners. The experience from 31 farms with respiratory disease post- weaning in 2015-2016 is summarized.

The main findings are: i. successful implementation of the 2-catheter BAL sampling technique (6 pigs per farm); ii. a higher detection frequency for *Mycoplasma hyopneumoniae* and/or SIV genomes in BAL samples on farms where respiratory clinical signs were present at sampling than on farms where no obvious clinical signs were detected on that day; iii. PRRSV detection was only requested in 6 instances (with a positive result obtained in only two farms) indicating that most practitioners correctly identified the status of the farm (stable or free of PRRS); iv. the frequency of presence of *M. hyorhinis* on farms with respiratory clinical signs was surprisingly high, and absent on farms with no respiratory signs, which deserves further investigation.

Overall, the double-catheter BAL sampling method proved relatively easy to perform under field conditions and systematically provided samples that were suitable for further diagnostic testing (no contamination by the oral flora) in a wide variety of farm situations.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-013

THE ECONOMIC BENEFITS OF A SINGLE SHOT VACCINATION AGAINST SWINE ENZOOTIC PNEUMONIA, WITH HYOGEN®, IN A FARM PRODUCING HEAVY PIGS IN ITALY

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Introduction

Enzootic pneumonia (EP) remains one of the major conditions affecting pigs' respiratory health and farms' economic efficiency. Vaccination against *M. hyopneumoniae* is proven to be beneficial for controlling EP and the related reduced feed efficiency and high medication cost. The aim of this study was to evaluate the economic benefits of applying a single vaccination against EP, with Hyogen®, compared to applying double vaccination with vaccine A, in a farm producing heavy pigs in Italy.

Material and methods

A commercial two site farm was selected for the trial. In total 5867 pigs of 9 batches were vaccinated with Hyogen® at 3 weeks of age (WOA) and 8870 pigs of 12 batches vaccinated with Vaccine A at 3 WOA and boosted with Vaccine A (*M.hyopneumoniae booster*) together with Aujeszky vaccination at 5 months. The percentage of animals died and culled, feed efficiency and total medication costs were recorded in the fattening units and compared between batches vaccinated with different vaccines. The financial balance was calculated by using Respinomics™.

Results

The percentage of fatteners died and culled was lower ($p < 0.05$) for pig vaccinated with Hyogen® compared to those vaccinated with Vaccine A (4.75% vs 5.14%). The total medication cost per pig, comprising the oral and injectable antibiotics, was 3.49€ for Hyogen® and 4.93€ for Vaccine A ($p > 0.05$). FCR for pigs vaccinated with Hyogen® was by 0.104 lower compared to Vaccine A. Although this difference was not statistically significant ($p > 0.05$) it was economically interesting. The calculated benefit due to lower mortality, FCR and medication cost for batches vaccinated with Hyogen® was 4.08€ per pig.

Conclusion

In this study, a single dose vaccination with Hyogen® resulted in better economic efficiency due to lower mortality and culling rate, FCR and medication cost in heavy weight pigs compared to double shot vaccination, which is commonly used in Italian farms.



HHM-014

A NEW APPROACH TO DETECT REPRODUCTIVE DISEASE OUTBREAKS USING SOW PRODUCTION RECORDS. A FOCUS ON PRRSV

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Introduction

Porcine reproductive and respiratory syndrome (PRRSV) is a viral disease with negative impact on sow reproduction, being associated to a decrease in the number of born alive piglets (NBA) and an increase in the number of lost piglets (NLP). It is of interest to quickly assess whether a farm is under a PRRSV outbreak situation. The aim of this research work is to develop a new method to distinguish between healthy and disease phases in PRRSV positive and negative farms using performance data.

Material & Methods

NBA and NLP records from a farm were used. Different discrete bivariate probability distributions were considered to model NBA and NLP using different R packages. Since a relevant negative correlation between NBA and NLP was observed, a conditional Poisson on NBA was the model showing the best goodness of fit. The expected values of NBA and NLP under a non-outbreak scenario were estimated using a maximum likelihood procedure. Then, for each farrowing, a single p-value was computed, defined as the probability of jointly observing a lower NBA and higher NLP than the expected ones. In order to assess the existence of an outbreak, a combined p-value using the last 100 p-values was computed using the Khi^2 -inverse method, procedure that was performed for each farrowing.

Results

The results showed two clear outbreak periods revealing a displacement of the mean NBA (lower) and NLP (higher) values that were confirmed with diagnostic techniques. In addition, the method was used to detect PRRSV outbreaks in two PRRSV positive and one PRRSV negative farm as control.

Discussion & Conclusion

The method was able to detect PRRSV outbreaks previously diagnosed in two farms using laboratory techniques while no suspicious case was observed in the PRRSV negative farm. Finally, this method is being routinely used for syndromic surveillance purposes.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-015

EFFECT OF FARM MANAGEMENT PROCEDURES ON THE PRODUCTIVE PERFORMANCE IN A PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRSV) VIRUS INFECTED FARM USING PDP MODELS

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Introduction

Several strategies to control PRRSV have been described such as implementing a gilt acclimation protocol, a PRRSV vaccination program for gilts and sows and to control the spread of pathogens in suckling pigs. In this context, the impact of management procedures, focus on limiting the transmission of infectious agents through the population (non-mixing litters and limit cross fostering), has not been deeply analyzed. The aim of this research work is to use PDP models to decipher the impact of different management decisions on the epidemiology of PRRSV under field conditions.

Material & Methods

A PDP model has been developed to simulate a pig farm. This model is able to run in parallel multiple processes to model complex problems. In this model, different scenarios were analyzed taking into account the percentage of PRRSV infected sows in the farrowing unit (1, 2.5, 5 and 10%), the use (CF) or not (NCF) of cross-fostering the first week of piglet life and maintaining the litter integrity (LI) or not (NLI) during the rearing period (nursery and fattening). The outcome of the model was the percentage of sick animals at the end of the nursery and fattening period and the number of sick and dead animals during the rearing period.

Results

NCF and LI management decreased significantly the percentage of sick animals at the end of the nursery and fattening period and the number of sick and dead animals during the rearing period versus the CF and NLI management in all the range (1-10%) of PRRSV infected sows. Moreover, a significant interaction exists between the NCF and LI management.

Discussion & Conclusion

These results highlight the relevance of different management strategies to control diseases and quantify the effect of the MCREBEL management on PRRSV epidemiology under field conditions to optimize animal production.



HHM-016

ARE PIGS WITH IRON DEFICIENCY LESS ABLE TO PRODUCE ANTIBODIES IN RESPONSE TO VACCINATION COMPARED TO PIGS WITH ADEQUATE IRON STATUS?

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Introduction

Iron deficiency is common among newly weaned fast growing pigs and it is possible iron status is associated with immune function. Pigs are often vaccinated at weaning for diseases they will face in the grower stage of production. The objective of this research trial was to determine if antibody production in response to vaccination against *Mycoplasma hyopneumoniae* is affected by the iron status of pigs at the time of vaccination.

Material and Methods

Three different iron treatment groups were created. Pigs received via intramuscular injection either 100 mg of iron dextran (Uniferon®, Pharmacosmos) at 3 days of age (n=24) (low-iron), or 200 mg of iron at 3 days of age (n=24) (medium-iron), or 200 mg of iron at 3 days and at 14 days of age (n=22) (high-iron). At weaning and 3 weeks later, pigs were vaccinated against *M. hyopneumoniae*. Six weeks post-weaning the serum was tested using IDEXX antibody ELISA.

Results

The average hemoglobin levels for pigs in the three treatment groups at weaning were 81g/L, 105g/L, and 123g/L for low-iron, medium-iron and high-iron, respectively. Based on the interpretation of an S/P ratio of equal to or greater than 0.4 as a positive antibody titre, there were 54%, 42% and 54% positive pigs in the high-, medium- and low-iron groups, respectively. The S/P ratio at 6 weeks post-weaning was found to be not associated with hemoglobin levels of pigs at weaning.

Discussion and Conclusion

Iron status at weaning was improved by a second intramuscular injection of 200mg of iron dextran at 14 days of age, but the iron status at weaning did not affect the number of pigs that tested antibody positive to vaccination against *M. hyopneumoniae*. Other immune parameters are being evaluated, as we recognize antibody production is only one aspect of the immune response.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-017

ARE PIGS WITH IRON DEFICIENCY LESS ABLE TO DEFEND AGAINST ENTEROTOXIGENIC *E. COLI* INFECTION COMPARED TO PIGS WITH ADEQUATE IRON STATUS?

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Introduction

Health problems often occur after weaning, a time when iron deficiency is commonly present. The objective of this research trial was to determine if iron deficient pigs were less capable of combating a challenge of enterotoxigenic *Escherichia coli* (ETEC) than pigs with adequate iron status.

Material and Methods

Ten pigs given 100mg (low-iron) and 10 pigs given 200mg of iron dextran (Uniferon®, Pharmacosmos) at Day 3 (medium-iron), and 10 pigs receiving 200 mg of iron at Day 3 and 14 (high-iron) were experimentally challenged with ETEC at 3 weeks of age. In addition an unchallenged control group with 2 pigs from each iron treatment group was included in the trial. All pigs were euthanized 2 days post-ETEC challenge and bacterial culture and histological examinations were performed.

Results

The average hemoglobin levels at 3-weeks of age were 85g/L, 104g/L, 124g/L for low-, medium- and high-iron, respectively. The control room of pigs did not shed hemolytic bacteria or have histological evidence of ETEC infection. Of the pigs challenged with ETEC, diarrhea was observed in 40%, 50%, 60% of the high-, medium- and low-iron, respectively. Hemolytic *E. coli* was cultured from 80% of all pigs. At necropsy adherent bacilli were observed in 50% of high-iron pigs and 60% of pigs in medium- and low-iron groups. Histological lesions were present in 70% of the high-iron and 80% in the medium- and low-iron pigs.

Discussion and Conclusion

Iron status at weaning was improved by administering an additional 200mg of iron dextran at 14 days of age and these preliminary results suggest iron status may help protect pigs that are challenged by ETEC. Further studies are ongoing.



HHM-018

COMPARISON OF THE EFFICACY OF SYNCHRONIZATION OF ALTRESYN® WITH ANOTHER ALTRENOGEST-BASED PRODUCT IN REPLACEMENT GILTS

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Introduction

The introduction of gilts into a breeding herd requires an effective method to synchronize estrus. Gilt oestrus synchronization by altrenogest (Altresyn®, Ceva) improves the farm performance minimizing the number of days for gilts insemination, planning of mating program and increasing fertility and prolificacy. The aim of this study was to evaluate the effect of Altresyn® synchronization on fertility of treated gilts in comparison with gilts treated with another commercial progesterone-based product.

Material and Methods

A total of 198 sexually mature gilts of two consecutive batches were investigated in a commercial farrow to finish farm with a weekly batch management. In batch A, 90 gilts were treated with 20mg of Altresyn® (5mL/animal/day during 18 consecutive days) and in batch B, 108 gilts were treated another commercial progesterone-based product according to manufacturer's recommendation. Both groups were managed under the same conditions defined by farm standard operation procedure (SOP), minimizing the variance. Four days after the last treatment of each batch, gilts were examined for oestrus twice a day by moving mature boars in front of the gilts while farm personnel performed the back-pressure test. Gilts were inseminated twice during oestrus and pregnancy diagnosis was performed at 4 weeks after mating by the same person. Statistical analysis was performed using contingency tables (Fisher's exact test).

Results

Number of gilts which came in heat after the treatment in batch A (82/90, 91.11%) was significantly higher ($p < 0.05$) compared to batch B (85/108, 78.70%). On the other hand, as expected, in terms of pregnancy rate (pregnant gilts/inseminated gilts), no statistical differences among batch A (77/82, 93.90%) and batch B (80/85, 94.12%) were found.

Discussion and conclusion

The use of Altresyn® for synchronization of replacement gilts represents an efficient and successful strategy for managing the gilt introduction and increase the insemination rate. However, no differences on pregnancy rate among batches were observed.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-019

CONSIDERATIONS FOR ASSESSING THE IMPACT OF INFLUENZA IN GROWING PIGS

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Introduction

Observational studies have reported the cost of IAV-S in swine production systems to range from approximately US\$3-10 per growing pig. At this time there is no standard method to assess the impact of interventions targeted against IAV-S. Here we propose key parameters which, when collected in the growing phase, provide insight into the association of pathogens and disease presence with key performance indicators (KPI).

Materials and Methods

The measurable unit of growing pigs is defined as a group of pigs that starts and markets together, resulting in a single closeout. Collecting routine measurements in multiple groups, over time is necessary for assessment. At group start, document source farm descriptive data including any relevant health history. In each group, routinely collect oral fluids throughout the growth period, testing for the pathogens of interest by PCR. Perform additional diagnostic investigations with evidence of clinical disease to confirm the presence of pathogens of interest and associate the diagnostic results with the clinical picture in the barn. Additional objective clinical data collection includes monitoring cough routinely with app based tools or other sound technology. Individual pig treatments for secondary infections may also be recorded, although they will likely lag behind the influenza infection. Individual mortality records should also be recorded, although a longer lag exists. Each group will also have final closeout reports including daily gain, culls, and other system KPIs that may be used in an assessment.

Results

In process data should be collated and charted. An example of biweekly oral fluid (OF) monitoring for key respiratory pathogen detection over time in a growing pig population using commercial screening PCR assays is reported in Figure 1. Consistent and prospective data can be aggregated over multiple groups of animals for in depth analysis. Recently, Stika et al., using K-Means Clustering for pathogen burden by grow-out time point in routine OF diagnostics from 45 independent groups of pigs, found associations with pathogen pattern (defined as Clusters) and mortality.¹ The analysis demonstrated average total mortality was highest when pathogen burden increased through the nursery phase and decreased slowly in the finishing phase (Cluster 2, Figure 2), and it became significantly worse when multiple pathogens were observed in a similar pattern.¹

Discussion & Conclusions

Systematic methods for measuring, reporting and associating the presence of pathogen with clinical disease and performance parameters, will provide a more objective assessment of the success of intervention strategies targeted against influenza.



HHM-020

INFLUENZA TRANSMISSION: CREATING A SEEDER PIG MODEL USING NATURALLY INFECTED PIGS

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Introduction

The objective of this study was to develop a seeder pig model that simulates transmission of influenza A virus in growing pigs, to evaluate strategies to control influenza under field conditions.

Materials and Methods

554 weaned pigs from a known IAV-S PCR negative source were placed in a Pipestone Applied Research (PAR) barn. These pigs served as direct contacts and were distributed in 21 pens alternating with empty pens. Seventeen weaned pigs from a known IAV-S positive source served as seeder pigs. These pigs tested IAV-S positive by nasal swabs (NS) using BD Veritor™ System Flu A+B (Becton Dixon) and IAV screening PCR assays. Day 0, seeder pigs were placed 1 per pen in 17 of the 21 pens. Four pens were left without a seeder pig for indirect IAV transmission assessment. Six randomly selected IAV-S negative pigs, as well as the seeder pig itself, were systematically sampled in each pen by NS 3 times per week until the IAV PCR results were negative for 3 consecutive sampling events. All pens had oral fluids (OF) collected three times per week until three consecutive samplings proved negative. Oral fluids and nasal swabs were tested for IAV-S PCR targeting the matrix gene.

Results

All direct contact pigs tested IAV-S PCR positive within 2-5 days post seeder pig introduction. Pigs in the indirect contact pens became infected within 5-7 days. Pigs remained positive for 16-35 days post introduction of seeder pigs. All sequenced viruses were found to be a H3N2 cluster IV IAV-S.

Discussion and Conclusions

The seeder pig model developed in this study proved effective in providing a method of mimicking influenza field transmission dynamics. Heat maps used to visualize the spread of IAV-S throughout the barn showed the transmission period lasted over 3 weeks.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-021

A NOVEL CONGENITAL SYNDROME WITH PALATOSCHISIS IN PIGLETS IN THE PROGENY OF A SINGLE PIETRAIN BOAR COULD BE EXPLAINED BY A *DE NOVO* MUTATION

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Introduction

Palatoschisis are oronasal fistulas, and often supposed to be inherited resulting in death.

Material & Methods

In a satellite farrowing farm of a sow pool system, piglets with palatoschisis were noticed in six out of thirty litters. A DNA-based examination was conducted, revealing that all affected litters were progeny of the same Pietrain boar. Thirteen affected piglets, males and females, had a unilaterale or bilaterale palatoschisis. All sows were from the same origin and had received the same feed. All littermates and their parents were sampled and the affected piglets were finally euthanized.

Results

A necropsy was performed, showing that all male animals were unilateral or bilateral cryptorchids, eleven animals of both sex had renal cysts and further different congenital defects were found single cases. A genetic aetiology due to a dominant inheritance with incomplete penetrance or a mosaic germline mutation was suspected as all recorded cases were indeed progeny of the same boar. Single nucleotide polymorphism genotyping data of 13 cases and their parents were used to map the defect in the porcine genome. Significant genetic linkage was obtained for three regions located on different chromosomes. Whole genome sequencing of an affected piglet and a normal fullsib revealed a total of 46 variants affecting the coding sequence of annotated genes which are present in heterozygous state in the affected piglet only.

Discussion & Conclusion

Systematic surveillance is needed to identify genetic defects as early as possible and to avoid the occurrence of further losses. The ultimate option in terms of prevention is to cull the boar in question once identified. For dominantly inherited disorders occurring within the offspring of single asymptomatic boar mosaicism could be suspected. The largely improved genomic resources in pigs facilitate the identification of the responsible boar and finally to unravel the responsible mutations.



HHM-022

SUDDEN DEATH IN SOWS AFTER INJECTION OF CONTAMINATED MEDICAL PRODUCT

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Introduction

The highest mortality rate in sows is during the lactation period and several causes are known.

Material & Methods

Sudden death of two sows occurred after birth in a batch of 16 sows. In addition, one sow was found to be in bad general health condition. The sows were submitted for clinical examination and necropsy. The moribund sow was euthanized after collecting blood samples.

Results

A lymphopenia, > 10% of immature neutrophils and azotaemia were detected. The necropsy of all three sows revealed multifocal hyperaemia and acute haemorrhage in the skin over the whole body. In one sow also petechial bleedings on the epiglottis were present. Epidemic diseases such as African and Classical Swine Fever and Porcine reproductive and respiratory syndrome virus were ruled out by submitting tissue samples. A bacteriological investigation of the moribund sow revealed unspecific bacterial growth. Sepsis or toxæmia was suspected after the necropsy. Following the post-mortem investigation a herd examination was performed. Sows were found in good general health condition. To rule out epidemic diseases blood samples of ten randomly selected sows in the gestation unit were taken. The applied farrowing management of the affected batch was analysed, revealing that only diseased sows had received a medical product. The death of both sows occurred within 24 hours after application. Bacteriological investigation of this medical product confirmed a contamination with *Bacillus cereus* and *Clostridium perfringens*. Based on all findings we concluded that a toxæmia arising from the application of contaminated injection fluid was responsible for the sudden death and clinical deterioration of the three sows.

Discussion & Conclusion

In this case, the contamination of the medical product was due to an improper handling, i.e. re-use of old and dirty needles. After improvement of the management no further losses of sows in the farrowing unit appeared.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-023

EVALUATION OF THE EFFICACY OF A SINGLE SHOT VACCINE, HYOGEN[®], IN COMPARISON WITH A TWO SHOT VACCINE, ON PROTECTION AGAINST SWINE ENZOOTIC PNEUMONIA IN THE PARMA HAM - PIGS IN ITALY

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Introduction

Pigs raised for the Parma ham production in Italy are slaughtered at approximately 170kg body weight. Typical late infections like *M.hyopneumoniae* represent a severe challenge in those farms. The efficient prevention of infection and its impact on growth performance requires a long lasting immunity and protection, which can be evaluated by scoring lungs at slaughter and by recording pigs' growth rate. Therefore, the aim of this trial was to evaluate the efficacy of a single shot vaccine, Hyogen[®], in comparison with a two shot vaccine (A), on protection against Enzootic Pneumonia (EP) in Parma ham-pigs.

Material and methods

A commercial multisite farm with 2200 sows was selected for the trial. In total 1190 pigs of 9 batches were vaccinated with Hyogen[®] at 3 WOA (group G1) and 405 pigs from 3 batches vaccinated with vaccine A at 1 and 3WOA (group G2). Pigs' growth performance was recorded and the relevant economic impact was calculated by using RespinomicsTM. Lung scoring was performed at slaughterhouse according to the Ceva Lung Program.

Results

G1 had on average 60 gr higher ADG ($p > 0.05$) compared to G2. The EP-Index (calculated from the frequency and severity of EP-like lesions) was on average by 0.4 lower ($p < 0.05$) for animals which were vaccinated with Hyogen[®] compared to those vaccinated with Vaccine A, whereas the percentage of scars did not differ significantly ($p > 0.05$) between the two groups (G1=0.44, G2=1.0). The economic benefit due to higher ADG in G1 was 4.17€ per pig.

Conclusions

The single dose vaccination with Hyogen[®] improved pigs' lung health and farm's profitability due to better growth performance. Moreover, it was more convenient for the personnel and less stressful for the pigs compared to the double shot vaccination, suggesting an easily applicable and rewarding measure for long lasting protection against EP.



HHM-024

EUBIOTICS AS AN ALTERNATIVE STRATEGY TO ZINC OXIDE USE IN WEANING PIGS

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Introduction

The recent EU ban on therapeutic levels of zinc in animal diets has led to concern regarding potential performance losses and animal welfare. The aim of this trial was to evaluate a eubiotic in replacement for therapeutic zinc oxide in an E. coli challenge piglet study.

Material & methods

Thirty six piglets (PIC (Yorkshire × Landrace) × Duroc)) were allocated to treatment diets at weaning (21 days) for 28 days in a random block design (2 pigs per pen, 6 replicates). All diets were formulated in excess of recommendations in NRC (2012) and were fed in a mash form. Treatments were; Control (CON), basal diet no additive; Eubiotic (EUB), organic acid blend on a mineral carrier (Anpario plc, Worksop, UK) 4g/kg; Zinc oxide (ZnO) commercially available 3g/kg. Eight days post weaning (29 days of age), piglets were challenged with 6 mL (6.1×10^9 cfu/mL) ETEC (E. coli, strain K88+). Body weight and feed intake were measured weekly and digesta pH was measured at D7, 14 and 28; data were evaluated using ANOVA using JMP Pro 13 (JMP.inc, SAS).

Results

A significant ($p < 0.05$) improvement of 2.11kg in final body weight between EUB compared to CON group with 18.46kg compared to 17.76kg and 16.35kg (EUB, ZnO and CON respectively). FCR did not differ significantly between treatments. Digesta pH was reduced at D28 with EUB being sig. lower ($p < 0.05$) (6.26) compared to ZnO (6.58) and CON (6.61).

Discussion & Conclusion

The eubiotic, included in this trial has resulted in similar growth performance and diet efficiency to the zinc oxide treatment. Digesta pH was also significantly reduced, which can improve diet digestibility and help maintain good gut health. Using material costs at the time of the study the eubiotic treatment provided an economical benefit over the control and zinc oxide treatment.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-025

ASSESSMENT OF SUBJECTIVE HEALTH STATUS PERCEPTION IN WEANER PIG HOLDINGS WITH RECURRING RESPIRATORY DISEASE OUTBREAKS

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Introduction

Respiratory diseases are identified as a priority issue in raising weaners. One approach to reduce the application of antibiotics for treatment of such respiratory diseases is to improve assessment of early disease development to maintain a good health status of the pigs after weaning. Therefore in this study the subjective respiratory disease assessing by the farmers was evaluated by comparing their individual estimation with an objective respiratory health score.

Material/Methods

30 piglet producer farms with preceding recurring respiratory diseases in weaner units were visited twice. The first visit (day1) took place when according to the farmer the health status of the weaners was not affected; the second visit (day2) when the farmer recognized a respiratory disease outbreak requiring antibiotic treatment. During each visit the respiratory health of 15 weaners was evaluated by a scoring system including the parameters breathing type, respiratory rate, coughing, posture, general behavior and body temperature. For scoring the clinically sickest pigs of the affected groups, if existent, were chosen.

Results

The analysis shows that on day1 24.0% of the assessed weaners showed no respiratory symptoms whereas 76.0% showed mild respiratory symptoms. At day2 1.9% showed no symptoms, 94.2% mild symptoms and 3.89% moderate symptoms of a respiratory disease. None of the weaners examined showed severe clinical symptoms. Calculating the median of the scores six farms were considered healthy without clinical symptoms on day1; none on day2.

Discussion/Conclusion

In summary most farmers considered mild symptoms of a respiratory disease as an acceptable health status. Early disease development was therefore often not recognized. Although the farmers sensed a significant worsening of the disease situation, in many cases there was only a slight shift within respiratory health status by objective consideration. Environmental and social factors influencing the subjective cognition of the health status need to be further investigated.



HHM-026

A RETROSPECTIVE STUDY OF INFECTIOUS AGENTS ISOLATED IN CASES OF DIARRHEA IN SUCKLING PIGLETS IN SPAIN

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Objective

The aim of this study was to determine prevalence of *E.coli*, *C.perfringens* and Rotavirus strains isolated in pre-weaning diarrhea cases in Spain, and to compare them to historical results.

Material and Methods

From 2015 to 2017, 164 samples of fresh feces from suckling-piglets suffering diarrhea were processed at the Laboratori Veterinari de Diagnosi de Malalties Infeccioses (UAB). *E.coli* isolation and typing was done on all samples with a PCR for the fimbriae K88ab (F4ab), K88ac (F4ac), K99 (F5), 987P (F6), F41, F18 and EAE and the toxins Sta, STb, LT, EAST1, VT1 and VT2. Samples were also tested against *C.perfringens* (n=131) and if positive, PCR typing of toxins was done (α , β , β_2 and ϵ). Rotavirus-type A was tested with an ELISA or PCR (n=127). Results were compared to the ones obtained in the same laboratory between 2009 and 2012.

Results

K88ab and K88ac were found in 12% and 12.2% of the isolates respectively. K99 and 987P were not found and F18 in only 4.3%. F41 was found in 18.3%, and the most common fimbriae were EAE (36.6%). The most prevalent toxin was EAST1 (81.7%), followed by STb (31.1%), STa (23.2%), LT (11%), VT2 (1.8%) and VT1 (1.2%). Rotavirus was found in 34.7% of the samples, with increasing prevalence in 2017. Only one sample was positive for β -toxin of *C.perfringens*, and none for ϵ -toxin, whilst 77.1% were positive for α -toxin and 37.4% for β_2 .

Discussion

EAE and EAST1 were still the most common fimbriae and toxin, although their pathological relevance is not clear. The prevalence of F41 increased 7%. But the highest increase was for K88ab and K88ac, which tripled in prevalence, even in *E.coli* vaccinated farms, suggesting the importance of needing high colostral antibodies level. Rotavirus-A also increased, supporting its potential importance in the etiology of suckling-piglets diarrhea.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-027

ASSESSMENT OF KNOWLEDGE, COMPLIANCE, AND ATTITUDES OF ENGLISH AND SPANISH SPEAKING EMPLOYEES TOWARDS BIOSECURITY PRACTICES

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Introduction

For biosecurity to be effective, employees must follow all protocols. For employees to follow all protocols, they must have good knowledge, compliance and attitudes of the protocols. The purpose of this study was to assess knowledge, compliance, and attitudes of English and Spanish speaking farm employees towards biosecurity Standard Operating Procedures (SOPs).

Materials and Methods

14 sow farms in the Carthage System having a minimum of 3 English speaking employees and 3 Spanish speaking employees were selected. A survey was given to each employee in English or Spanish according to the employee's first language. The survey contained 8 knowledge based questions about farm biosecurity SOPs. An open ended knowledge question required participants to mention all key points to receive credit on primary attempt. If participants failed to address all points, leading questions allowed participants to receive points in a secondary attempt. Questions were asked to assess self vs peer compliance and overall importance to biosecurity.

Results

Biosecurity practices were considered by most employees as highly important procedures. There was a difference reported in self vs peer compliance with self-reported compliance always being higher than peer reported. In the knowledge portion, both language groups received a total score of around 90%. Spanish speaking employees answered more questions on the primary attempt than English speaking employees. Farm managers scored higher on primary attempt than other groups. Employees who have been on the farm >36 months scored higher than employees with <36 months experience.

Discussion

Surveys serve as a valuable model to identify gaps in protocols and training programs. Our results identified which groups training should be focused toward as well as which protocols need to be improved to improve overall compliance. By understanding our biosecurity gaps, production systems can focus training, reduce training time and cost and improve interventions in deficient areas.



HHM-028

HEALTH MONITORING IN NURSERY AND FINISHER PIGS BY EXTENDING DIAGNOSTIC SCREENING

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Introduction

Infectious diseases are of great economic importance in swine production, causing both clinical and subclinical disease influencing welfare, productivity and antibiotic use. The course of diseases is often multifactorial and laboratory diagnostics are not routinely performed. The aim of the study was to evaluate the benefit of monthly health monitoring in nursery and finisher pigs using fecal sock samples and oral fluid samples on a high-throughput qPCR platform, able to detect up to 48 pathogens, combined with serology.

Materials and methods

Three monthly sampling rounds were conducted in 6 nursery and 4 finisher herds. Three different age groups in each herd were sampled. Clinical signs were assessed and fecal sock samples, oral fluid and blood samples were collected from two randomly selected pens in each age group. Sock samples and oral fluid samples were analyzed for 20 different pathogens, using the high-throughput qPCR platform BioMark (Fluidigm). Oral fluid and blood samples were additionally analyzed for antibodies against selected pathogens.

Results

The results from the first round matched the current SPF health status on the farms. Swine influenza virus and porcine circovirus type 2 were detected in all herds, but in different age groups. Results from second and third round are yet to be analyzed and will be presented.

Discussion

By implementing a high-throughput qPCR platform it is possible to lower the diagnostic costs making repeated diagnostic sampling affordable. The diagnostic tool can be used to continually monitor pathogens and dynamics of disease in pig herds. Combined with data on production, health status, clinical signs, antibiotic consumption etc. the detailed knowledge on the presence and dynamics of pathogens in the different sections provide a new, innovative and objective basis for intervention, such as adjustments of vaccination programs, antibiotic treatment protocols etc.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-029

LUNG SCORING SURVEY IN EUROPEAN COUNTRIES IN 2017

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Introduction

Scoring of lung lesions in slaughter pigs provides very important information about the respiratory health in the pig population. Lesions suggestive for previous *M.hyo* or *A.p.* infections and their scoring were described before. Scoring of those lesions allows quantifying the problems with enzootic pneumonia and pleuropneumonia. The aim of this survey was to collect the results of major swine producing European countries in 2017.

Materials and methods

Ceva Lung Program scoring methodology was implemented to score the lesions at the slaughterhouse. The results were collected from 19 European countries in the 12 months period from December 2016 till November 2017. The mean values and quartiles were calculated for % of lungs with bronchopneumonia (%BP), % of affected lung parenchyma out of sick lungs (% parenchyma), % of dorso-caudal pleurisy (%DP) and APP index (APPI). For the two latter indicators the results from France were not included, because there they were not scored routinely.

Results

The total number of scored lungs was 325624 from 2918 reports with the average of 112 lungs per batch. The median of %BP was 41.22% with the Q1=23.53% and Q3 62.91%. The median for % of parenchyma was 5.32% with the Q1=2.83% and Q3=8.41%. For % DP the median, Q1 and Q3 were 10.07%, 3.56% and 24.38% respectively and for APPI the corresponding values were 0.26, 0.09 and 0.61 respectively.

Conclusions

The data set from 19 European countries in 2017 shows very similar distribution of the values as the analysis made in 2016. This confirms CLP as a repeatable, relevant scoring methodology considering that fact that the amount of reports in 2017 increased by 50% compared to 2016. The incidence of especially EP-like lesions remains high despite the decrease for 8.5% vs 2016. The control of *M.hyo* infections seems still to be a major challenge.



HHM-030

ANTIMICROBIAL USAGE: PIG FARMERS' PERCEPTIONS, ATTITUDES AND MANAGEMENT

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Introduction

In order to update data concerning the different practices and perception for antimicrobial usage in pig farms, a study has been conducted to compare antimicrobial usage, technical performances, management practices, farmers' perception of their antimicrobial usage and farmers' attitudes toward antimicrobial resistance.

Materials and Methods

The survey was carried out in 20 selected pig farms located in the West region in France among the 156 monitored since 2015 for their antimicrobial usage (based on vet prescriptions). A questionnaire has been filled during an interview with farmers. The association between practices, technical performances or perceptions has been analyzed with Khi2 or Kruskal-Wallis tests.

Results

No link has been seen between technical performances and antimicrobial usage.

Vaccination is considered as a major tool of antimicrobial reduction like biosecurity (17/20) or the use of "alternatives" (15/20). Nevertheless, during an opened question concerning the ineffective measures, these «alternatives» have been cited (5/20).

In all the interviews, pig farmers underline the strong advisory role of the veterinarian and state that antimicrobial resistance is a main concern. Among the farmers' proposals as key measures for antimicrobial reduction, a better training and more informations/knowledge concerning diseases, treatments or alternatives were cited (8/25).

Discussion/Conclusion

This study highlight brakes and levers for antimicrobial reduction in pig farms. Many positive and encouraging points like the strong implication of the veterinarian as the main advisor on animal health. Strengthened advisory role implies veterinarians to have better communication skills as asked by the farmers and to adjust their advices to the perceptions and attitudes of the farmers. Finally, the absence of link between the technical performances and the consumption of antimicrobials is also a major point to help veterinarians to engage farmers to reduce their antimicrobial use and comply with the alternative measures they recommend.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-031

ECOPORC SHIGA[®] VACCINATION AND PERFORMANCE IMPROVEMENT

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Introduction

Edema disease (ED) is a disease due to an enteric bacteria, *E. coli* producing Shiga toxin 2e (Stx2e). Since October 2013, Ecoporc SHIGA[®], a vaccine against Stx2e is available in France. The vaccine reduces mortality and clinical signs due to ED, but users observed that vaccinated pigs were in general healthier and showed better performance. This study was conducted to scientifically verify these observations.

Material and Methods

Inclusion criteria of the farms (n = 5) were:

- Clinical ED post weaning and implementation of Ecoporc SHIGA[®] for over 1.5 year.
- Performances registered every trimester and piglets weighted when entering fattening.
- No significant changes in genetics or animal management, and no concomitant disease incident.

The comparison was made between 1 year before vaccination (trimester T-4 to T-1) and 1 full year after vaccination (T2-T5). The trimester when vaccination had been implemented (T0) and the following (T1) were excluded; therefore the effect of the ED crisis itself was not evaluated.

Results

Over all farms, losses were reduced in post weaning (-2.2%) and in fattening (-0.9%). Standardized ADG was improved (ADG 8-30 kg: +5.2g; 30-115 kg +26.5g). Standardized economical FC was reduced (FC 8-30 kg: - 0.11; FC 30-115 kg: -0.12). This represents a gain of 6 € per pig, reduction of losses representing only a third.

At farm level, two farms improved standardized ADG 8-30 kg, three their fattening losses and standardized ADG 30-115 kg and four economical FC 30-115 kg. All farms improved their post weaning losses and economical FC 8-30 kg.

Discussion and Conclusion

The results presented here support the observations of the users: Ecoporc SHIGA[®] not only controlled the clinical effects of ED but also improved performance with an excellent return on investment. The specific mechanism behind this effect will be investigated in further studies.



HHM-032

VACCINATION FAILURE/SUCCESS - ARE VETS DOING A PROPER MANAGEMENT OF ON-FARM VACCINATION?

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Introduction

Sometimes a vaccination strategy that you recommended did not present the expected results? It can be frustrating when you did an excellent veterinary work, with accurate diagnostics, proper selection of vaccine and vaccination program, and in the end it didn't work.

In our practice we evaluated vaccination success and failure in over 50 farms for several diseases (Aujeszky's, PCV2, MHYO, PRRS and Bordetella) and found that this is highly influenced by the PEOPLE that manage on-farm vaccination procedures.

We implemented a program (**P**lan.**E**xplain.**D**emonstrate.**R**egister.**A**udit.) to improve vaccination success involving Vets, farm managers and workers.

Material and Methods

PEDRA training program is an on-farm tool to improve vaccination management. People involved are the farm Vet, the manager/owner and the workers.

PLAN: Vets are responsible for proper diagnostics, vaccine choice, vaccination program, vaccine application method. Put it all in writing, with clear instructions and put it on the farm wallboard.

EXPLAIN: Assemble the team (manager and workers), explain why you recommend this vaccination, what you expect to improve and how important is each person's role in the process. Tell each person what to do exactly.

DEMONSTRATE: Do a detailed vaccination session showing key-points for success. Vaccine storage/preparation, syringe (other devices) choice and disinfection, proper needles, IM/ID route, where exactly to apply the vaccine, proper angle, welfare concerns.

REGISTER: Provide maps with planning for every vaccination, with fields for registration of the vaccination. Name who is responsible for keeping records.

AUDIT: By the Vet at least twice/year, checklist with scoring points. Audit refrigerator with temperature data-logger. Monitor immune response in piglets (maternal immunity) and in growers/fatteners by blood testing for specific anti-bodies. Organize meetings for evaluation of results and improvement actions.

Results, Discussion and Conclusion

This program allowed our Vet team to improve on-farm vaccination success, with better results for disease control.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-033

PREVALENCE OF MATERNALLY DERIVED IAV ANTIBODIES IN SUCKLING PIGS IN 28 US SWINE HERDS

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Introduction

Influenza A virus (IAV) is known to persist in swine breeding herds. The herd level prevalence of IAV and within herd prevalence of IAV antibodies in US swine herds is poorly understood.

Materials and Methods

A convenience sample of 28-mixed parity herds (inventory >2000) from 7 states were enrolled. A 73-question survey identified herd characteristics and management practices. Three to five day old piglets were sampled in three separate cohorts at monthly intervals. Each consisted of 2 pigs from 24 litters (n=48) stratified over three dam parity groups. Antibodies in serum against IAV were detected with three assays: 1) NP ELISA assay (NP), 2) Hemagglutination Inhibition (HI) assay against H1N1 (H1) and 3) an HI assay against H3N2 (H3).

Results

The enrolled herds had a median size of 2,800 from which 124-146 samples were collected per farm. All herds had antibodies against IAV detected by at least one of the tests. There were no significant differences between herds for mean NP, and Log₂ mean H1 or H3 titers. For all assays, P4+ sows had higher antibodies than P2-3 and P1 sows and P2-3 were higher than P1 sows (p<0.001). Increasing the length of herd closure and the age of gilts at entry were associated with lower odds of NP positive results. Vaccination of gilts or sows was associated with a higher odds of H1 and H3 positive results (cut point=160). Herds closed for PEDv or those that employed continuous flow gilt development had lower odds of H3 positive results.

Discussion and Conclusions

IAV infection is common in US swine herds. A high degree of within herd variation was observed in all herds and is expected due to variation in colostrum quality and piglet colostrum intake. Herd management practices influence the probability of maternally derived antibodies against IAV in piglets.



HHM-034

THE COUGH INDEX CALCULATOR APP: US EXPERIENCE WITH THE TOOL IN A LARGE SCALE FIELD TRIAL

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Introduction

Coughing pigs are a common complaint that producers report and veterinarians make recommendations to address. The measurement of cough is subjective, e.g. “better or worse”, or categorical, e.g. mild, moderate or severe, which makes the assessment of an intervention based on cough challenging. In 2016, a free, app-based tool was published by Boehringer Ingelheim Animal Health GmbH to make the measurement of cough more standardized and objective in a production setting. The tool is a Cough Index Calculator and results in a cough index score. A score of 2.5 or greater is indicative of a respiratory event. Cough was measured using this tool within a large scale field trial conducted in the United States. Our experiences are reported here.

Materials and Methods

Eleven flows were enrolled in the field trial with four groups of pigs selected per flow to routinely assess cough using the tool. Producers entered a farm/group name into the tool, decided on the number of pigs and pens to routinely assess, and followed the instructions in the tool to obtain a cough score. Scores were generated weekly from weaning to market.

Results

Following an initial walk through of the tool, producers could easily navigate and obtain cough index scores for a group of pigs. Not only was it valuable to note when a group exceeded the threshold, indicating a respiratory event, but producers could also note the change in the numerical score over time and in many cases, track a resolution of cough in the group.

Discussion & Conclusions

Producers can now easily obtain objective measurements of cough with this tool. The industry should continue to adopt technologies to assist in obtaining objective clinical information in order to better define a clinical case, assess the effectiveness of interventions and guide future intervention recommendations.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-035

USE OF A CRITICAL POINT QUESTIONNAIRE AS PART OF PRRS MANAGEMENT IN 53 FRENCH FARMS

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Introduction

PRRS control needs a global approach to be successful. At farm level, identifying the critical points which contribute to maintain PRRS virus circulation is crucial. To list these points a dedicated questionnaire has been used in 53 French farms as part of the 5-Steps[®] approach. The objective of this work is to give a summary of the results obtained.

Material & Methods

From July 2015 to June 2017, 53 farms with a project of PRRS control were investigated. During these visits a questionnaire consisting in 4 parts (external and internal biosecurity, management and hygiene) giving 62 questions was performed. Each question was weighted. The maximum rating for an "ideal" farm was 100. The visit was divided in two parts. The first one to fill in the grid took place in the farm office room. The second one was dedicated to the farm building visit. A report was written at the end.

Results

The total mean score was 59/100 with external biosecurity: 7.7/15, internal biosecurity: 7.8/15, management: 25.7/40 and hygiene: 17.6/30. The most well controlled measures met in more than 80% of the farms were: washing and disinfecting after emptying rooms, no held-back piglets in the farrowing room. Most important criteria that did not comply in more than 60% of the farms were: no correct farm entry room, no specific clothes per farm sectors, no washing and disinfecting of the rendering tank.

Discussion & Conclusion

All farmers involved in the study were motivated to implement a PRRS control plan. So they were proactive for the questionnaire. For each critical point identified a clear explanation helped to convince the farmer. As often as possible a feasible solution was proposed. Then a realistic action plan, based on vaccination and sanitary measures to control PRRS with the highest probability of success was elaborate.



HHM-036

IMPACT OF WHOLE HERD VACCINATION AGAINST PRRSV-1 ON SOW AND PIG PERFORMANCE ON A MULTI-SITE FARM IN SERBIA

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Introduction

The impact of PRRS on sow and pig performance can be reduced by use of vaccination. This study aimed to investigate sow and pig performance after implementation of a whole herd vaccination programme on a farm in Serbia.

Material & Methods

The study was conducted on a multi-site farm with 1250 sows on a farrow-to-feeder site and 2 separate finishing units. Pigs showed respiratory symptoms and low growth rates during nursery and fattening. Reproductive problems were also described. Serological testing revealed PRRSV antibodies in all stages of production. PRRS vaccination was not implemented prior to this study.

Vaccination started with double mass vaccination of breeding animals (aged > 150 days) with ReproCyc® PRRS EU and single vaccination of piglets from 17 days until end of nursery with Ingelvac PRRSFLEX® EU. Vaccination was continued for breeding stock repeatedly every 3 months and for piglets once, batch-wise, at around 3 weeks of age. Performance data of sows and pigs was collected over 8 months after implementation of the vaccination programme and compared with the same period one year before.

Results

PRRS vaccinated sows had a numerically higher farrowing rate (p=0.073) and a significant improvement of live-born and weaned piglets per litter (p<0.001). The number of stillborn per litter did not differ. Weaning weight of piglets coming from vaccinated sows was significantly higher (p≤0.007). PRRS vaccinated pigs showed a numerical improvement of average daily weight gain throughout production and feed conversion rate (FCR) in fattening, as well as a significantly lower mortality in nursery (p=0.025). Mortality in fattening and FCR in nursery didn't show relevant changes.

Discussion & Conclusion

The results show an overall positive impact of PRRS whole herd vaccination on the performance of sows and pigs. The return on investment of pig vaccination was 3.71:1 per pig.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-037

IMPACT OF AN INTRADERMAL PCV2 VACCINE ON VARIOUS PRODUCTION PARAMETERS AND ANTIBIOTIC CONSUMPTION IN FINISHERS

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Introduction

PCV2 plays an important role in porcine respiratory disease complex (PRDC) and viremia in late fattening pigs contributes to extended lung lesions, reduced daily weight gains and increased antibiotic use. The following investigation was conducted to show efficacy of an intradermal PCV2-vaccine on production parameters after an acute PCV2 infection under field conditions in Germany.

Material & Methods

This field trial was done in a closed herd with 2,000 sows and a three-week production system in North Germany. The herd was classified as high health and PRRS unsuspecting. Sows were routinely vaccinated against Ery, Parvo and Influenza, while piglets were non-vaccinated. In October 2016, an acute PCV2-infection occurred with high PCV2-viremia but without typical clinical PCV2-signs like PDNS. A piglet vaccination with an intradermal PCV2 vaccine (Porcilis® PCV ID) was immediately implemented at 21 days of age.

Results

A significant reduction of PCV2-viremia in vaccinated animals was observed (from 107.43 PCV2 DNA copies/ μ l serum to 101 c/ μ l serum). Vaccinated animals had an improved average daily weight gain (from 1,014 g/day non-vaccinated and affected piglets to 1,050 g/day vaccinated animals). Mortality rate in fattening decreased from 3.7% during the acute PCV2-outbreak to 1.3% in PCV ID vaccinated groups. The number of antibiotic treatments was also reduced from 7.8% to 0.6%. Since the introduction of the PCV2 vaccination, the proportion of medium to high grade pleurisies dropped from 3% to 0.5%.

Discussion and Conclusion

PCV2 infections can occur even in high health herds with high biosecurity standards. In this field trial, intradermal PCV2 vaccination of piglets further improved the already excellent performance parameters and carcass quality. In addition, the intradermal PCV2-vaccine effectively reduced PCV2 viremia and antibiotic use under field conditions in this German farm.



HHM-038

IMPROVEMENT OF PRODUCTION PARAMETERS AND HEALTH STATUS AFTER IMPLEMENTATION OF A STRATEGIC PRRS PIGLET VACCINATION WITH IDAL IN A COMMERCIAL FARROW-TO-FINISH-FARM IN GERMANY

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Introduction

Porcine reproductive and respiratory syndrome virus is one of the most challenging diseases in pigs. Vaccination (IM and ID) against PRRS has been established as an important tool to minimize the clinical impact of the diseases. The impact of a strategic piglet PRRS vaccination with IDAL on standard production parameters and general herd health status was investigated. Emphasis was particularly on antibiotic use during the nursery and fattening period.

Material and Methods

In a closed herd with 1000 sows in a weekly production system in North-West Germany, sows were routinely vaccinated against Ery and Parvo, Influenza and PRRS. Piglets were IM vaccinated against PRRS on day 14 and PCV Mhyo on day 21. After an acute PRRS infection in fattening in December 2016, the PRRS vaccination was switched to an intradermal (ID) vaccination with Porcilis® PRRS with a needlefree device (IDAL).

Results

The PRRS ID vaccinated piglets had improved average daily weight gain (ADWG) of 54g/day, an increase from 766g/day to 820 g/day. Mortality rate in fattening decreased from 2.7% to 1.4%. The percent antibiotic treatments reduced from 42% to 5.6%. The percent of altered lungs dropped from 10.6% to 3%. Since the introduction of the intradermal PRRS vaccination, the proportion of medium to high grade pleurisies also significantly reduced from 4.19% to 0.9%.

Discussion and Conclusions

Following the introduction of a strategic PRRS piglet vaccination with IDAL from December 2016 onwards, a significant improvement of performance parameters and health status, including a reduction in antibiotic use and improved carcass quality was noted. Therefore, it could be stated that intradermal PRRS piglet vaccination is an effective tool to improve health status and production parameters in a closed herd system in a pig dense area.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-039

IMPLEMENTATION AND FOLLOW UP OF A REGIONAL SWINE HEALTH PROGRAM IN A PIG DENSE REGION IN THE NETHERLANDS

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Introduction

In addition to PRRS, Influenza and *Mycoplasma hyopneumoniae* also have a regional impact. Regional programs often fail due to a lack of funding. Structural implementation of technical-, financial- and antibiotic use parameters (KPI's) can stimulate the intrinsic motivation of farmers to keep participating. Two vet-practices and MSD-AH implemented a regional swine health-program in a pig dense region. The above KPI's and disease prevalence are monitored.

Material and methods

Five farrow-finish farms and 3 finishing farms are participating. A biannual cross-sectional serology+PCR sampling of all production groups (4 units/per piglet-, finishing group) is done for PRRSV, Mhyo, Influenza and APP. A biosecurity audit is completed and results are discussed. Farmer and veterinarian define specific goals and actions for reducing clinical- and technical impact and/or prevalence of the investigated diseases. Antibiotic use is monitored and PRRSV economic effect is measured in an economic simulator. On farm- and regional prevalence per disease is calculated.

Results

In June 2017, the regional PRRSV prevalence at unit level was 27% and varied between farms from 0% to 50%. One farm suffered a PRRS outbreak in sows caused by a phylogenetic related PRRSV of a neighboring farm. Compared with Jan 2017, the Mhyo seroprevalence in finishers reduced to 29%, while APP seroprevalence at 29% didn't change. Influenza seroprevalence increased to 57%. Antibiotic use in the PRRS-outbreak farm increased 5 times compared with a 19% (range 5-53%) reduction in the other farms. The economic impact of PRRS varied in farrow-finish farms from €43-309/sow and €1-11/pig produced.

Conclusion

All farmers are motivated, share and implement the defined actions. The monitoring results support reduced Mhyo prevalence and improved PRRSV prevalence in most farms despite an outbreak in one farm. In contrast, Influenza prevalence increased. PRRS outbreak in one farm increased antibiotic use. PRRS economic impact varies by farm.



HHM-040

FIELD EXPERIENCE OF AN IMPROVED RODENT CONTROL PROGRAM IN CENTRAL EUROPE

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Introduction

The objective of this field study was to evaluate the placement of bait station and the application of rodenticides at a swine farm facility that has dealt with uncontrolled, high populations of rats and mice. The facility faces the challenge of having a feed mill plant in near proximity.

Material & Methods

Two problem barns were chosen for evaluation of a new protocol (Barn 30 and Barn 31). The rest of the farm would continue using its typical methodology and products. The barns tracked their methodologies on a weekly basis for six weeks to evaluate bait station attack percentages, bait feeding, and replacement rates. There were 20 existing stations between the two barns, and 20 more were added, for a total of 40 stations between the two buildings.

Better-performing bait stations were placed, including the classic bait flat style and the T-shaped stations. All stations had rods or spikes onto which bait can be attached to prevent water from washing them away, and to prevent rats from pulling bait out while feeding. As for the types of bait, whole wheat pellets and Pasta Bait were tested in the trial. The bait stations were properly filled (100 grams), and bait was scheduled to be replaced on a weekly basis.

Results

1. The percent of attack in Barns 30 and 31 was 75% with Pasta Bait placed in stations during the first six weeks of evaluation, compared to just 25% with the rest of the farms regular program, even though the percent of attack at the farm did see a slight increase (from 18% in the prior months to 25% during the trial period), especially by mice.
2. Using the Pasta Bait for bait feeding yielded higher consumption, demonstrating a better attraction/palatability that competes with the regular pig feed.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-041

PIG DATA: HEALTH ANALYTICS FOR SWISS PIG FARMING

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Large data volumes can no longer be analyzed using conventional methods; they have to be made usable by applying new methods. So far, such methods have not had much impact on animal husbandry. Swiss pig production differs from the intensive production systems in other European countries because of its complex, small-scale structure. Although all stages of production generate animal health data, it is not being used in a way that brings together all the various stages of production. If this information is suitably prepared and analyzed, it will be possible to identify new links, causes and risk factors in relation to diseases and/or a drop in performance – and to identify the best strategies for combating them.

The project will develop new methods aimed at gaining a better understanding of, and optimizing, the structure and complexity of the pig farming and production network in Switzerland. Various production data will be integrated in a large data base (called the Pig Data Space).

This project will not only utilize existing data but also tap into potential sources of new data in order to improve animal health, boost animal welfare and make pig production more sustainable. The results of this project will enable livestock owners and veterinarians to take steps to improve animal health and prevent disease.

Optimized production processes will lead to greater efficiency, sustainability and value creation. Ultimately, end users such as consumers will benefit from improvements in animal health, reduced antibiotic use and the resulting foodstuffs.



HHM-042

ASSESSMENT OF MATERNALLY DERIVED ANTIBODY LEVELS IN COLOSTRUM FROM SOWS VACCINATED WITH ONE OF TWO DIFFERENT *E. COLI* VACCINES

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Introduction

Escherichia coli (EC) is a primary pathogen involved in neonatal diarrhea (ND). ND occurs when the protection granted by maternally derived antibodies (MDA) is overwhelmed by a high bacterial challenge of the piglets. The objective of this study was to assess the levels of EC antibodies (ab) induced by two commercially available vaccines in sows.

Material & Methods

In a 500 sows indoor farrow to finish farm, 31 maiden gilts not previously vaccinated against EC were included in this study and randomly allocated to either group A (14 gilts), vaccinated with Porcilis® ColiClos (2ml, intramuscular (IM)) or group B (17 gilts), vaccinated with a competitor EC vaccine (5ml, IM). Vaccinations were done as recommended on the product datasheets. Body condition score (BCS) was assessed and recorded to ensure no difference was due to BCS.

Colostrum samples were collected and tested for quantification of ab by ELISA with purified antigens K88ab, K88ac, K99, 987P and LT (Boxmeer Servicelabs, MSD AH). Due to management practices it was not possible to collect mortality or clinical disease scores.

Results

The Mean Log₂ antibody titers in Group A colostrum were significantly higher for K99 and LT than in group B, (A:10.29, B:8.78, p=0.002 and A:9.19, B:7.86, p=0.04). The sample size was too small to establish significant differences between groups A and B for 987P (A:10.5, B:9.31, p=0.06) or for K88ab (A:10.99, B:10.46) and K88ac (A:10.79, B:10.63).

Discussion & Conclusions

Under the study conditions, Porcilis® ColiClos induced significantly higher ab titers than the competitor vaccine against F5 fimbrial adhesins (K99) and LT toxin. Prevention of ND caused by EC relies on good hygiene, management practices and sow vaccination. Higher antibody titers in the colostrum are desirable and may result in better protection of the piglets.



HERD HEALTH MANAGEMENT & ECONOMY

HHM-043

ASSESSMENT OF PERFORMANCE, HEALTH AND ANTIMICROBIAL USE FOLLOWING PRRS PIGLET VACCINATION IN A UK SWINE FARM

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Introduction

Piglet vaccination against Porcine reproductive and respiratory syndrome (PRRS) can play a very important role in the control of this disease. Here we document the impact of a PRRS piglet vaccination implementation under commercial conditions in the UK with PRRS clinically present.

Material & Methods

PRRS virus circulation was confirmed with serology and PCR. To assess the impact of PRRS vaccination in the control of PRRS, live weights (LW), average daily weight gains (ADWG), feed conversion ratio (FCR), morbidity, mortality and antimicrobial use were analyzed. Three consecutive batches of pigs were vaccinated with Porcilis® PRRS (Porcilis), two preceding (NV) batches and data collected between April to November 2015 (Hist), non- vaccinated, were assessed and compared.

Results

Live weight before slaughter for Porcilis, NV and Hist was 103.3^a, 93^b and 99.3^c kg respectively. ADWG from entry in the feeding herd to slaughter for Porcilis, NV and Hist was 967.4^a, 871.5^b and 956.6^{ab} g / day respectively. The FCR from entry in feeding herd to slaughter for Porcilis, NV and Hist was 2.2^{a,b}, 2.5^b and 2.4^{c,b} respectively. No differences were observed for morbidity and mortality due to low number of animals. The percentage of animals individually treated in Porcilis, NV and Hist groups was 0.7%, 5.8% and 8.5^{b,c}% respectively. Different superscripts indicate statistically significant difference (p<0.05).

Discussion & Conclusions

Under the study conditions, Porcilis vaccinated batches had a 10.3 kg heavier live weight at slaughter than the preceding batches and 4 kg heavier than the pigs killed before PRRS became clinically important (Hist). The FCR was also improved with Porcilis PRRS vaccination by 0.22 (NV) and 0.13 (Hist). The improved FCR and extra average weight at slaughter results in an extra profit of £3.5 per slaughtered pig in an endemically affected herd.



HHM-044

EFFECTS OF DIETARY FIBER ON METABOLISM AND PERFORMANCE IN SOW DURING GESTATION AND LACTATION

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Introduction

Addition of crude fibres-CF in the sow diet has beneficial effects on the gut health; however, the effects on metabolism are not clear. This field study investigated the effects of Arbocel® (raw CF concentrate made from lignocellulose with a CF content>65%) on sow’s metabolism and performance.

Material & Methods

100 sows of a farm suffering from postpartum dysgalactia syndrome (PDS) were allocated into 2 groups; T1 group: basal gestation-GF (CF 4.5%), pre-farrowing-PFF (CF 4.3%), and lactation-LF (CF 3.8%) feed, T2 group: basal GF, PFF and LF supplemented with extra 50 gr of Arbocel®/day on top (104th day of gestation until weaning day). The feeding schedule was: a) GF: 2.5-3kg (2 meals), b) PFF-110thday of gestation to 2nd day post-farrowing: 2.5-3kg (2 meals), 2 days pre-farrowing: 1.5-2kg (1 meal), 1 day pre-farrowing: 1-1.5kg (1 meal), 1st-3rdday of farrowing: 1/1,5/2kg (1/2/2 meals), c) LF-4thday post-farrowing until weaning: 2.5kg plus 0,4 kg/piglet (3 meals). Health parameters (faeces score-FS, PDS score-PDSS, Body condition score-BCS), reproductive and performance parameters were recorded. Blood samples were collected 24h after birth of last piglet and at 14 days of lactation. The levels of insulin, leptin and ghrelin were measured in serum.

Results

In T2 group, BCS at farrowing, FS and PDSS were improved. The number of deadborn piglets decreased (T1:2.36, T2:1.0-p=0.001), while the number of liveborn (T1:12.0, T2:14.0-p=0.014) and weaning piglets increased (T1:12.0, T2:13.0-p=0.001) in T2 group. Moreover, the gestation length (T1:116.0d, T2:117.0d-p<0.001) and the BW of piglets at weaning (T1:7.2, T2:7.6-p<0.001) were higher in T2 group. Insulin (T1:0.0, T2:1.55-p=0.032) and leptin (T1:0.13, T2:2.53-p=0.032) serum levels 24h post-farrowing were increased in T2 group. No difference was noticed in ghrelin levels.

Discussion & Conclusion

The supplementation of extra CF in breeding stock with PDS problems during pre-/post-farrowing period has beneficial effects on their health and performance.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-045

A DIAGNOSTIC APPROACH FOR DETECTION OF *MYCOPLASMA HYOPNEUMONIAE* IN LOW PREVALENCE SCENARIOS

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Introduction

Eradication of *Mycoplasma hyopneumoniae* (Mhp) from breeding herds has become a popular method in U.S. production systems to improve downstream performance. However, there are no guidelines available to confirm success of an eradication program. Therefore, the objective of this study was to develop diagnostic sampling guidelines specific to Mhp low prevalence populations.

Methods

A sample size calculator was used to determine the number of pigs to sample in various population sizes in order to detect at least one positive individual or one positive pig in a pool of 3 or 5 to represent Mhp low prevalence scenarios. Input values included: individual diagnostic sensitivities determined during the chronic phase of Mhp infection (> 100 days post-exposure) for laryngeal swabs (53.01%) and deep tracheal catheter samples (47%) as previously described; pool sensitivities for Mhp high Ct (36) value in 3:1 pools (79.1% (99% lower confidence limit)) and 5:1 pools (58.5% (99% lower confidence limit)) as previously described; population size (200, 300, 500, 600, 1,000, 2,500, 5,000, and 10,000); confidence level ($\geq 99\%$ and $\geq 95\%$); and percent prevalence (1%, 3%, and 5%).

Results

The number of individuals to sample required for detection of 1%, 3%, or 5% Mhp prevalence increases when pooling is applied and as pool size increases, population size increases, confidence level increases and as prevalence decreases. However, cost of the testing scenario decreases as pooling is applied and as pool size increases from 3 to 5.

Conclusions

These sampling guidelines are specific to Mhp and take into account individual diagnostic sensitivity for two ante-mortem sample types with the highest known Mhp PCR diagnostic sensitivity, pool sensitivity, population size, and confidence level, to provide guidance for determining number of pigs to sample to economically detect Mhp in low prevalence scenarios. These guidelines are being implemented to monitor Mhp suspected negative populations.



HHM-046

GILT FLOW AND ACCLIMATION AS DRIVERS OF *MYCOPLASMA HYOPNEUMONIAE* SOW HERD STABILITY

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Introduction

The objective of this study was to characterize the *Mycoplasma hyopneumoniae* (*Mhp*) colonization and seroconversion pattern in negative gilts, which had been recently introduced to three positive farms.

Materials

Farms practiced different types of replacement gilts' flow. Two of the three farms (A and B) practiced continuous flow, where gilts were co-housed with older gilts exhibiting coughing immediately post-entry, and shared the same air space, regardless of age. The remaining farm (C) practiced an all-in/all-out flow, where gilts were housed in separate air space from older gilts, and were co-housed with coughing culling sows at 130 days of age. Two replicates, of 35 gilts each, were randomly selected per farm and followed longitudinally. All gilts were sampled by blood collection and laryngeal swabs four/ five times every 60 days, approximately. Samples were assayed for *Mhp* antibodies and genetic material using a species-specific ELISA and real time PCR. The last sampling event took place peri-farrowing in all 3 farms, and 60 suckling piglets were sampled in Farms B and C to evaluate sow-to-piglet transmission. Moreover, *Mhp* genetic variability was evaluated in gilts at all farms using a MLVA typing method. The results showed a similar detection pattern of *M. hyopneumoniae* by PCR, as well as a similar seroconversion pattern.

Results

No difference in the detection or seroconversion pattern was observed at farms regardless of the flow type. *Mhp* genetic material was not detected in the last sampling event (prior to farrowing), including in gilts introduced to the farm at 130 doa.

Discussion

No sow-to-piglet transmission was detected. However, 30.9% of the gilts were not detected positive by PCR during the study, which may have resulted from a possible acclimation failure. Additionally, the genetic variability analysis revealed a limited number of *Mhp* variants in gilts at the three different farms.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-047

CLASSIFICATION OF COUGH PATTERNS IN GROWING PIGS USING CONTINUOUS SOUND MONITORING AND AN ALGORITHM-BASED RESPIRATORY DISTRESS INDEX

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Introduction

Continuous sound monitoring systems hold the potential to remotely differentiate the primary etiology of clinical episodes of respiratory disease. The purpose of this project was to evaluate the ability of a continuous sound monitoring system to classify patterns of clinical respiratory disease in growing pigs according to their primary etiology under large-scale commercial production conditions.

Materials and Methods

Cough monitors (SOMO+ Respiratory Distress Monitor, SoundTalks NV, Leuven, Belgium) were obtained and installed in three large commercial wean-to-finish facilities designed to house 1200 to 2400 pigs per airspace. Three different farm sites / production systems were enrolled in the project. Pigs were placed into these site facilities per normal practice. An algorithm-based respiratory distress index (RDI) was continuously generated from recorded sound files and uploaded to a cloud database. The RDI data were charted and patterns of cough were categorized. For each RDI episode, diagnostic samples were collected and tested by PCR for PRRS, IAV-S, Mycoplasma hyopneumoniae, PCV2 and parainfluenza. RDI episodes were aligned with their corresponding diagnostic results and the resulting aggregate cough patterns were characterized.

Results

Two distinctive RDI patterns were detected across the three farm sites, one associated with IAV-S (H1N1 or H3N2), and another associated with Mycoplasma hyopneumoniae. IAV-S associated RDI patterns had a distinctive bi-modal shape, whereas the pattern associated with Mycoplasma hyopneumoniae showed a gradual relatively linear rising pattern.

Discussion and Conclusions

The ability to classify cough patterns according to primary etiology is useful at both a local site and global aggregate levels. With this information, local site managers can better adjust and respond with more timely, appropriate diagnostics and treatment. Further, those responsible for flows/ systems and areas/networks can better assess larger scale behavior of specific disease agents and the clinical impact of intervention and control protocols.



HHM-048

DETERMINING THE OPTIMAL NUMBER AND CONFIGURATION OF SOUND MONITORING DEVICES FOR DETECTING AND ASSESSING DIRECTIONALITY OF COUGH IN GROWING PIGS

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Introduction

Continuous sound monitoring systems have been shown to better detect clinical episodes of respiratory disease. However, microphones used in such systems have distance limits of sound detection. The purpose of this project was to evaluate the optimal placement and configuration of a continuous sound monitoring system in large airspace buildings containing growing pigs to enable both a high sensitivity for detection and establishing directionality of clinical respiratory episodes.

Materials and Methods

Cough monitors (SOMO+ Respiratory Distress Monitor, SoundTalks NV, Leuven, Belgium) were obtained and installed in three large commercial wean-to-finish facilities designed to house 1200 to 2400 pigs per airspace. Three different farm sites / production systems were enrolled in the project. Pigs were placed into these site facilities per normal practice. Five devices were installed in each of the two 1200 head buildings, spaced equidistant from each other along the center alleyway. In the 2400 head building, 11 devices were installed, with four devices over the middle of the pens on each side of the building spaced equidistant from each other and three in the central alleyway spaced equidistant from each other.

Results

Where the device microphone was the center of a circle, the estimated optimal diameter for best detection of cough was determined to be approximately 18 meters. For optimal sound coverage in the 1200 head buildings the optimal number of devices was determined to be three to four, and for the 2400 head building the optimal number of devices was determined to be six to eight (depending on the length of the building).

Discussion and Conclusions

Each device represents an 18 meter sound detection “zone”. The detection and directionality of cough is then a function of the square meters covered by the “zones” out of the total possible square meters in a barn.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-049

A STUDY OF TILMICOSIN SUPPLEMENTATION IN FEED AND IT'S EFFECT ON LACTATION PERFORMANCE IN SOWS

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Introduction

Porcine Reproductive and Respiratory Syndrome (PRRS) is considered as the most economically important diseases in pig industry worldwide. Active infection during farrowing period cause vertical transmission of PRRSv from sow to piglets. Umbilical blood testing can be used to identify such transmission. Tilmicosin, a macrolide antibiotic has been reported to reduce the severity of PRRSv infection in nursery pigs. Moreover, tilmicosin provides activity against PRRSv. The objective of this study was to investigate the effect of tilmicosin (Pulmotil®) supplementation in sows feed prior to farrow and during lactation on lactation performance parameters in a farm with PRRSv infection.

Materials and Methods

Total of 64 sows were selected from a farm with history of PRRSv. Sows were divided into two groups, control (C) group (32 Sows) was fed conventional feed and treatment (T) group (32 Sows) was fed supplemented feed with Pulmotil® 400 ppm during pre-farrowing period and 200 ppm during lactation period. Blood was collected from umbilical vein of piglets born from each sow (15 sows from each group) for PRRS RT-PCR assay. Sow and piglet performance and also the estimated costs associated with treatment and control were recorded and calculated.

Results and Discussion

Results are showing an increase in litter size (14.16 vs. 14.63), number piglets born alive (11.59 vs. 12.22), post weaning litter size (10.06 vs. 10.32) and a reduction in the percentage still birth (-1.8%) and mummified pigs (-0.76%) in the treatment group. Treated Pigs showed a significant increase ($p < 0.05$) in weaning weight (+13.8%) and litter weight gain (+21.6%). Analysis of cost-effectiveness showed that, at costs of 10.30\$ per sow for Pulmotil, the total benefit of litter per sow was 15.33\$, resulting in a return on investment of 48.8% In conclusion, use of Pulmotil reduced clinical expression of PRRSv infection with positive performance effects.



HHM-050

IS SKIN TEMPERATURE RELIABLE AS CORE BODY TEMPERATURE INDICATOR?

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Introduction

The circadian system is based on a multioscillatory neural network that generates and sends a temporal signal throughout the entire organism, which drives biological rhythms. From the main marker rhythms of the circadian system core body temperature (CBT) and skin temperature (ST) are two of the most used due to its reliability and ease of use, respectively. Thus, the aim of this study is to check the reliability of ST as CBT indicator.

Material and methods

Thermochron iButton DS1921H (Maxim Integrated Products, Sunnyvale, California) were used to measure CBT and ST with a precision of $\pm 0.125^{\circ}\text{C}$ and a sample rate of 1 minute during 1,4 days. One device was subcutaneously implanted under sedation in the neck and other device was placed in contact with skin in the opposite side of neck. The animals were subjected to natural illumination (dawn: 8:13, sunset: 17:46).

A nonparametric analysis was performed for each animal to characterize their temperature cycle. It consisted on the following parameters: L8 and M8 as the average of the 8 hours with the minimum temperature and maximum values and their respective timing (TL8, and TM8); RA or Relative Amplitude calculated by $(M8-L8)/(M8+L8)$.

Results

Our animals showed a circadian CBT pattern with the highest values ($M8=37.97\pm 0.27$) at the end of the day ($TM8=20:04\pm 01:31$) and the lowest values ($L8=36.86\pm 0.12$) at the end of the night ($TL8=05:40\pm 00:44$). The differences between day and night values were statistically significant (student t test; $p < 0.01$). ST pattern showed similar results with lower temperatures during day and night and a slightly phase advance respect to CBT. The regression analysis showed a positive relationship between CBT and ST ($r=0.65$; $p < 0.01$).

Discussion and conclusion

This preliminary study suggests ST as a CBT indicator due to the similarities between CBT and ST patterns and the strong existing relationship between them.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-051

COMBAT A NEW TOOL FOR FAST EVALUATION AND BENCHMARKING OF BIOSECURITY, PIG FLOW AND MANAGEMENT

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Introduction

COMBAT (Comprehensive Online Management and Biosecurity Assessment Tool) is a new app developed by Boehringer Ingelheim Vetmedica to help farmers and veterinarians to evaluate and improve the level of biosecurity, pig flow and management procedures and benchmark against other farms. COMBAT is based on a detailed set of 55 questions to be answered directly in the application.

Material & Methods

This study is based on more than 1000 COMBAT's (questionnaires) from 46 different countries globally. The relative risk of not being able to prevent, control or manage a PRRSV infection is calculated in 4 categories: Internal risks, External risks, Location risk, Management and pig flow. Feedback is given to each category and categorized as very high, high, medium and low risk, to facilitate discussion of behaviors and prioritize fields of importance.

Results

Very high risky behaviours (percentage in brackets) were identified regarding; -external biosecurity; poor or no restrictions to vehicles for animal and feed transportation, pick up dead animals, (cleaning and disinfection) (38,45% - 64,51%) . -Internal biosecurity; persons (61,08%), clothes and boots (51,4%), nurse sows being moved unrestricted between areas of production (47,06%) and Incoming gilts in contact with PRRSV infected animals before introduction (54,81%). -Location; Unstable PRRSV or unknown status of nearest neighbouring farm (72,44%). -Management and pigflow; Holding pigs back for weaning quality (77,10 %), weaned pigs in farrowing room (58,55%), continuous flow after weaning (48,23%) and risky gilt introduction (74,29%).

Discussion & Conclusion

COMBAT facilitates improved biosecurity, pig flow and management practices, by highlighting the most important risk areas related to PRRS incidence. Successful PRRS control must incorporate measures to reduce the risk of new virus introduction (external risks) and improve the ability to control PRRSV internally on a farm/site/area. Immediate feedback encourages and veterinary advisers to address risky behaviors on the actual production site.



HHM-052

EFFECTS OF HISTOPATHOLOGICAL ABERRATIONS ON LUNG FUNCTION IN PIGS

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Introduction

Diseases of the respiratory tract are often summarized as the “porcine respiratory disease complex” (PRDC). PRDC shows a high variability in the field. Because of a wide spectrum of etiological factors, diagnosis needs to combine clinical examination, dissection and the isolation of pathogens. Impulse oscillometry (IOS) might be a new, non-invasive method that could add valuable information from living pigs. The aim of the present study was to validate IOS in pigs with respiratory diseases based on their associated histopathology.

Material & Methods

Fifty-eight pigs from 29 herds with PRDC were examined with classical clinical methods, pathology, histopathology and IOS. Lungs were divided into 76 triangles. Macroscopic lesions were scored 0 to 4 for each triangle. Lung tissue was taken from six lobes for histopathological examination and more than 70 histopathological parameters were extracted and specified. Based on these individual histological parameters, the following forms of pathological specifications were defined: interstitial pneumonia; suppurative and non-suppurative bronchitis, bronchopneumonia and pneumonia.

Results

Individual histological parameters correlated well with the IOS parameters and explained up to 70% of lung function variability. Disturbed reactance at lower frequencies resulted from changes in lung parenchyma like thickening of the alveolar septa and infiltration with inflammatory cells. Infiltration of the epithelium of alveoli, bronchioles and bronchi with neutrophils and macrophages significantly affected lung function as characterized by IOS.

Discussion & Conclusion

The results of this study indicate that IOS could supplement classical clinical examination in respiratory diseases in pigs. IOS parameters were well reflecting the histopathological situation of the lungs. However, some aspects of lung clinical pathology (e.g. bronchospasm) that are important for IOS results, could not be verified by histopathology. A relatively high effort to generate IOS data might limit field applications.



HERD HEALTH MANAGEMENT & ECONOMY

HHM-053

USE OF COMBAT-COMPREHENSIVE ONLINE MANAGEMENT AND BIOSECURITY ASSESSMENT TOOL- IN 21 FARMS IN SPAIN

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One of the pillars of the prevention, control and eradication of Porcine Reproductive and Respiratory Syndrome is the biosecurity. Boehringer Ingelheim has developed COMBAT (Comprehensive Online Management and Biosecurity Assessment Tool) that allows pig producers to identify areas of improvement and to correct high risk practices.

Materials and Methods

COMBAT is based on a set of 58 questions. The relative risks are calculated in 4 categories: Internal risks, External risks, Location risks and management risks. 21 Spanish farms completed COMBAT on-line between August 17th and November 17th.

Results

The most important findings are:

Internal Risks:

- 43% of farms don't have boots and clothes restrictions on people moving between production areas.
- 10% of farms don't clean and disinfect farrowing, nursery or finishing rooms.
- 10% of producers don't use commercial modified live vaccine.

External risks:

- 67% of producers don't have requirements on drying time following the washing of the vehicles used to transport animals.
- 62% of producers don't mark flow restrictions on vehicles used to transport animals.
- 22% of farms receive gilts from a ELISA positive farm.
- 77% of farms have their dead animals managed by another company.

Location risks:

- 45% of farms are located in an area with at least one more farm within 3 km radius.
- In 72% of the farms the nearest neighboring pig farm is PRRS positive.

Management risks:

- 30% of farms don't follow a strict all in all out system.
- 42% of farms leave sometimes weaned piglets in the farrowing room.
- 35% of farms mix piglets from different age groups.

Conclusions and Discussion

A successful PRRS control must include taking actions to reduce the risk of new virus introduction, spreading, shedding and transmission. COMBAT is a tool that allows producers to measure risks and benchmark against other production sites.



HHM-054

SURVEY UPDATE ON MYCOPLASMA HYOPNEUMONIAE ACCLIMATION OF GILTS IN THE SPANISH SWINE INDUSTRY

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Introduction

The introduction and management of replacement gilts is an important topic with regard to the control of *Mycoplasma hyopneumoniae* in the farm. Improper acclimation may result in colonization of the suckling piglets and increased M. hyo related respiratory disease in growing pigs.

This survey is the second part of a previous one on the same subject in the Spanish swine farms.

Materials and Methods

The survey included 16 questions designed to identify which gilt acclimation methods for M. hyo are currently used in Spanish farms nowadays. The survey covered different farm related factors, demographics and detailed the structure of health protocols:

Results

The survey was completed by 116 production systems representing 639.695 sows.

The most important findings were:

- 42% Receive naïve gilts into positive farms.
- 60% of farms have a replacement rate higher than 50%.
- 75% of farms practice late age acclimation, beyond 15 weeks of age.
- 79% of farms do not acclimate to the herd specific strain.
- 53% of farms use vaccines against *M. hyo* during the acclimation.
- 77% of farms do not perform diagnostics to verify an adequate acclimation.
- 63% of farms use antibiotics during the acclimation process.

Conclusions and Discussion

While 88% of the producers or veterinarians are convinced that a proper gilt acclimation program plays a major role in the *M. hyo* stability of their farms, 54% of the respondents did not rely on their methods. Most of them do not have a clear definition of sow herd stability and the time needed for a proper acclimation. Besides, 77% do not verify the acclimation process of the gilts.

Therefore, the survey reveals some opportunities to improve the acclimation process such as:

- The implementation of an early and efficient exposure method is needed.
- A “Best practice” for M hyo diagnostics has to be developed.



HERD HEALTH MANAGEMENT & ECONOMY

HHM-055

AIRBORNE DETECTION OF SWINE INFLUENZA A VIRUS, PRRS VIRUS AND *MYCOPLASMA HYOPNEUMONIAE* IN FRENCH SWINE HERDS

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Introduction

The detection in bioaerosols of three pathogens involved in the porcine respiratory disease complex (PRDC), namely swine influenza A virus (swIAV), porcine reproductive and respiratory syndrome virus (PRRSV) and *Mycoplasma hyopneumoniae* (Mhp), was evaluated in six pig herds affected by PRDC.

Material & methods

The herds were previously known to be affected by swIAV, PRRSV and Mhp. Bioaerosols were collected using a wet cyclone technology (Coriolis[®]μ air Sampler). In all herds, air samples were taken in rooms housing pigs. The loading area with pigs waiting for the slaughterhouse delivery was sampled in two herds. Air samples were collected in the corridors of the buildings of 5 herds (without pigs). Aerosols were also collected in the attic under the roof of one building and outdoor, in the building surroundings of 2 herds. Specific real time RT-PCR or PCR tests were used to detect swIAV, PRRSV and Mhp genomes, respectively.

Results

swIAV was found in air samples of all herds. Mhp and PRRSV were detected in air from 4 and 1 herd(s) respectively. swIAV was the most frequently detected pathogen (18/27 samples) followed by Mhp (9/27 samples) and PRRSV (2/27 samples). All pathogens were found in the rooms housing pigs (8/13 rooms, 5/13 rooms and 1/13 rooms for swIAV, Mhp and PRRSV respectively). swIAV and/or Mhp were also found in the building corridors, the loading areas, the attic under the building roof and even in the building surroundings.

Discussion & Conclusion

Although the infectivity potential of the pathogens detected in air samples was not investigated, these results show that swIAV, Mhp and PRRSV were present in detectable concentrations in bioaerosols of these PRDC affected herds and might be airborne transmitted within commercial swine building environments. The significance of this finding from an epidemiological point of view will need further investigation.



HHM-056

PRRSV IGM-IGA ELISA DETECTS INFECTION IN THE FACE OF CIRCULATING MATERNAL IGG ANTIBODY

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Introduction

Oral fluids (OF) are used extensively for PRRSV surveillance: qRT-PCR detects active infection and antibody ELISA is useful for establishing prior exposure. However, in weaned pig populations originating from PRRSV infected and/or vaccinated sow herds, colostral IgG cannot be differentiated from IgG produced by the pigs in response to infection. To address this problem, we developed and evaluated IgM- and/or IgA-specific oral fluid ELISAs as a means to detect PRRSV infection in weaned pig populations with circulating colostral antibody.

Materials & Methods

Antibody isotype-specific PRRSV ELISAs were evaluated using samples from two studies. Study 1: individual OF samples were collected from pigs housed under experimental settings and vaccinated with a commercial PRRSV MLV vaccine. OF were collected from days post vaccination (DPV) -7 to DPV 42. Study 2: OF samples were collected from 3 commercial wean-to-finish sites. Pigs originated from PRRSV vaccinated and/or exposed sow herds, but the pigs themselves were not vaccinated for PRRSV. Samples were collected weekly from every occupied pen for 9 samplings. All OF in Study 2 were randomized and tested by PRRSV qRT-PCR. OF samples from both studies were randomized and tested for IgG, IgA, IgM, and the combination of IgM-IgA using ELISAs developed in our laboratory.

Results

Study 1 showed that the combined IgM-IgA PRRSV ELISA provided better discrimination than individual IgM or IgA ELISAs. Study 2 confirmed the findings of Study 1 and showed that the IgM-IgA ELISA could detect antibody produced by pigs infected with wild-type PRRSV, despite the presence of maternal PRRSV IgG.

Discussion & Conclusion

Swine practitioners need both nucleic acid- and antibody-based tests to track PRRSV in the field. This study suggested that the PRRSV IgM/IgA ELISA could be used to detect active infection in populations of weaned pigs in the presence of circulating maternal antibody.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-057

SPATIAL AUTOCORRELATION AND WHAT IT MEANS FOR SWINE SURVEILLANCE

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Introduction

Spatial autocorrelation is based on Tobler's 1st law of geography: "everything is related to everything else, but near things are more related than distant things." This simple concept has huge implications for the way we conduct disease surveillance. In a recent study, spatial patterns associated with the spread of PRRSV were explored using oral fluid sampling data.

Materials & Methods

Oral fluids were collected from every occupied pen (108 pens; ~25 pigs per pen) in 3 commercial wean-to-finish barns on one finishing site for 8 weeks for a total of 972 OF samples. Oral fluid samples were completely randomized, tested for PRRSV by RT-rtPCR, and then analyzed for the presence of spatial autocorrelation.

Results

Moran's I , a quantitative measure of spatial autocorrelation calculated using GeoDa 1.10, showed positive global spatial autocorrelation in the distribution of PRRSV RT-rtPCR results within barns. LISA (Local Indicators of Spatial Association) analysis identified PRRSV clusters within barns and showed that the spatiotemporal pattern of clusters differed among barns.

Discussion & Conclusion

Contagious diseases move from pig-to-pig and pen-to-pen, i.e., spatially. With this in mind, the fact that PRRSV exhibited spatial autocorrelation is not surprising. However, this outcome is important because of its implications for the surveillance methods we have relied on since the mid-1980s. Current surveillance methods are based on "hypergeometric distribution" which assumes that the target (disease) is randomly distributed within the population. This assumption is violated when the target demonstrates a spatial pattern, i.e., shows positive spatial autocorrelation.

Spatial autocorrelation appeared as the swine industry modernized. That is, as the industry shifted from extensive herds to intensive, technified herds. Surveillance methods have not evolved with the industry. In particular, the presence of spatial autocorrelation signals the need to reevaluate and explore new surveillance methodologies that account for positive spatial autocorrelation.



HHM-058

MONITORING OF NASAL TURBINATES IN NURSERY PIGLETS AS A FIELD TOOL TO EVALUATE VACCINATION STRATEGIES AGAINST NON PROGRESSIVE ATROPHIC RHINITIS (NPAR)

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Introduction

Bordetella bronchiseptica (BB) causes Non Progressive Atrophic Rhinitis (NPAR) with reversible atrophy of the nasal turbinates in young piglets, causing sneezing, coughing, and secondary respiratory infections (Brockmeier, 2008).

To evaluate the results of 3 different vaccination strategies against BB, we performed necropsies of piglets to score the nasal turbinates atrophy, collected oral fluids for PCR (BB), and correlated the results with nursery mortality.

Materials and methods

4 pig farms were selected for this study based on similar nursery facilities, same genetics and feed source.

Vaccination against BB: Farm A only gilts twice; Farm B and D gilts twice and sows 1 dose at 12 weeks gestation; Farm C gilts twice, 1st litter sows at 8 and 12 weeks and all sows at 12 weeks gestation.

114 necropsies of piglets from 4 farms were performed and snouts were cut perpendicular to the 1st pre-molar tooth, to access the nasal turbinates.

Scoring of the turbinates used the methodology described in the European Pharmacopoeia (between 0 points (no lesions) and a maximum of 18).

80 piglets from each farm were tested at 6 and 8 weeks of age for BB using PCR in oral fluids.

Results

Nursery Mortality rate: Farm A=2.2%; B=3.2%; C=1.6%; D=6.1%.

Turbinate atrophy scoring (TAS) (0-18): Farm A=2.79; B=4.13; C=2.90; D=3.33.

Oral fluids (PCR for BB): Farm A=negative; Farms B,C,D=positive.

Discussion and Conclusion

Farm A tested negative for BB and has the lowest TAS of all farms, as expected.

Farm C used the more complete vaccination program and had the lowest mortality rate and the lowest TAS amongst the BB positive farms.

Vaccination of gilts (2x) and gestating sows (1st litter 2x, sows 1x) had the best results reducing the TAS and the incidence of NPAR, but does not eliminate the presence of BB in the herd.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-059

SURVEILLANCE OF EDEMA DISEASE IN NURSERY AND FATTENING SWINE FARMS

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Introduction

Edema disease (ED) in pigs is caused by verotoxigenic strains of *Escherichia coli* producing Vt2e. Currently, a bacteriology test is the gold standard to confirm Vt2e infection, which is a resource-intensive process. The aim of this study was to test an alternative diagnostic method for ED surveillance, based on the detection of bacterial shedding in growing pigs.

Material & Methods

A descriptive longitudinal study was conducted in the nursery and fattening units of 5 farms. Individual rectal swabs (RS, n=30-50/cohort) and pen oral fluids (OF, n=3-7/cohort) were collected at the entrance in the nursery, at 6-7 weeks of age, at the entrance in fattening unit, at 15-16 weeks of age and at the end of the fattening unit. Samples were assessed for Vt2e by real-time PCR.

Results

Vt2e was detected in at least one RS in all farms. Three and five farms were Vt2e-positive in the nursery and fattening periods, respectively, showing high prevalence rates in both (33-90% and 29-44%, respectively). Similarly, OF allowed the detection of Vt2e in 4 and 5 farms during the nursery and fattening period, respectively. PCR outcomes showed high correlation when RS and OF were used to classify farms as positive or negative. However, results from OF did not correlate with the estimation of Vt2e prevalence using RS.

Discussion & Conclusion

These results suggest that both RS and OF provide good samples to detect Vt2e-positive farms. The optimum sampling periods will be 6-7 and 15-16 weeks of age, coinciding with the transition periods (2-3 weeks) after moving the animals to the nursery and fattening units. Furthermore, pen OF sampling coupled with real-time PCR could be an efficient and cost-effective approach for ED surveillance in swine populations.

Acknowledgment

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HHM-060

COLOSTRUM HERITABILITY IN SOWS

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Introduction

Pork production has experienced tremendous genetic progress, which has been achieved an increase in litter size and survival of young piglets; this resulting in an increase of piglets at farrowing and negative consequences as higher variability in weight and higher percentage of weak piglets that compromise his vitality and require intensive care.

Thinkinpig studied heritability of colostrum since colostrum is the first food for piglets at birth being essential the intake to reduce mortality pre-weaning. The aim of this study is to analyze colostrum heritability and assess this parameter to include in selection programs.

Materials and methods

GP litters were weight at birth, at 24 hours after birth and at weaning in two cycles as it would be possible. Also productive results of gilts from those litters were registered after first parity.

The productive results (average weight at birth at 24 hours and at weaning of gilts, average daily gain in each moment, mortality of litter at weaning) and productive results at first parity of gilts (average weight at birth and at 24 hours) were registered to calculate colostrum intake and colostrum production of sows to assess colostrum heritability.

Results

The results indicate that there is a low heritability in colostrum production because of average daily gain at 24 hours ($p= 0, 0035$). Correlations were evaluated using the Spearman´s coefficient. A multiple regression model was run with 2 variables to explain heritability of colostrum (parity and number of born alive piglets).

Conclusion

1.parity and number of born alive piglets are positively correlated with average daily gain in 24 hours ($p<0,001$).2. The average daily gain at 24 hours suggests low heritability in colostrum production.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-061

STRATEGIC MEDICATION OF SUCKLING PIGLETS

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Introduction

Strategic medication of piglets in the first week of life is common to prevent umbilical hernias, arthritis, and other infections. In Denmark, the drugs used can roughly be grouped into penicillins/ amoxicillins and long-term acting macrolides. Due to the public debate about antibiotic resistance, some farmers are reluctant to use macrolides, but in some cases the clinical problems cannot be handled by administration of penicillins or amoxicillin.

Materials & methods

This study was set up in a Danish 800 sow herd with high prevalence of umbilical hernias despite strategic medication of all piglets on day 1 after birth. Piglets were sold for finishing at 30 kg live weight, and umbilical hernias posed a problem for the sales.

Farmer and vet agreed to test a long-term acting macrolide against the usual treatment. Every second litter was treated with a long-term acting macrolide at day 1 (Zactran, Boehringer-Ingelheim), and every second litter were treated with Penicillin/DHS (Norostrep Vet., ScanVet Animal Health). After day 1, piglets were only treated with antibiotics, if clinical symptoms were observed. Parameters recorded were: Pre-wean mortality, pre-wean antibiotic treatments against joint diseases or diarrhoea, and prevalence of umbilical hernias before sale.

Results

Totally, 1400 piglets were treated with Zactran, and 1451 with Norostrep. The pre-wean mortality in the Zactran group and the Norostrep group was 8.7% and 11,6% ($p=0.021$), the prevalence of piglets treated against joint diseases 3.07% and 2.76% ($p=0.703$), and the prevalence of pigs treated against diarrhoea 20.3% and 28.2% ($p<0.001$). Before sale, the prevalence of umbilical hernias was 2.0% and 3.2% ($p=0.104$).

Discussion & conclusion

The use of the long-term acting macrolide for strategic medication of piglets at day 1 significantly reduced pre-wean mortality and diarrhoea among pre-wean piglets, compared to the usual treatment. Furthermore, the prevalence of umbilical hernias was numerically reduced to 2/3.



HHM-062

CASE REPORT: IMPROVED MANAGEMENT PROCEDURES COMBINED WITH A TRIPLE PIGLET VACCINATION DECREASED ANTIBIOTIC USE IN WEANED PIGLETS

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Introduction

PRRS infections increase susceptibility for secondary bacterial infections like *Streptococcus suis* (Ss), which in many Dutch farms leads to high antibiotic use in weaners. This case describes how on a multiplier site PRRS and Ss were controlled using the 5 Step Process.

Material and Methods

A multiplier farm - 1600 sows - in the Netherlands produces and sells 25 KG piglets. 'Before' sows were vaccinated PRRS-MLV using the post-farrow pre-breed program. Piglets were vaccinated 3 times before weaning: PCV2, Mhp and PRRS-MLV. In the two quarters 'before' the antibiotic use in weaning piglets was considered high, primarily due to oral treatment of Ss meningitis. The 5 Step Process was followed: 1) goal of no use of oral antibiotics in weaned piglets, 2) current PRRS status: PRRSV wild type virus in the weaned piglets, 3) constraints: a high level of external biosecurity, intermediate level of internal biosecurity, 4) solutions: minimizing mixing of litters at weaning, optimizing piglet feeding before and after weaning and providing partially closed floors after weaning. Vaccination protocols were changed to PRRS-EU sow mass vaccination 4 times a year and one-shot piglet vaccination (off label) with a 2 ml IM triple vaccine combination of PCV2 - Mhp and PRRS-EU at 3 weeks of age. Finally 5) solutions were implemented and monitored.

Results

A period comparison of two quarters 'before' and two quarters 'after' the implementation of the 5 Step Process showed: PRRS wild type virus still present, mortality 6-25 KG 2.2-2.7%, decrease in antibiotic use by 52% (Defined Daily Doses).

Discussion and Conclusion

The 3 in 1 piglet vaccination resulted in a labor reduction and in less stress for the piglets.

The combined strategy following 5 Step Process of improved management and vaccination resulted in better health and subsequent less use of antibiotics in weaned piglets.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-063

BLASTOCYSTOSIS IN WEANER PIGS ASSOCIATED WITH PROFUSE DIARRHEA

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Introduction

Blastocystis sp. often is found as a ubiquitous protozoan parasite in the intestine of humans and animals, such as pigs. Although this protozoan was first described in 1911, pathogenesis and pathogenicity are still not clarified. Moreover its role in diarrheic processes in swine is not yet fully understood.

Material & Methods

In March 2015, a piglet producing farm in Lower Austria struggled with profuse diarrhea in weaners. Except fulminant diarrhea and wasting, no other clinical symptoms could be observed. Therapy with common antimicrobials was unsuccessful and therefore one piglet was euthanized to perform necropsy and further diagnostics. Tissue samples were obtained for pathohistological examination and further investigations, including PCR and in-situ hybridization (ISH). To exclude PCV-2 associated enteritis, ISH was carried out on FFPE gut tissue samples. Feces from large intestine were subjected to a triplex PCR for simultaneous detection of *Lawsonia intracellularis*, *Brachyspira hyodysenteriae* and *Brachyspira pilosicoli*. For identification of coccidian oocysts and protozoal parasites, fluorescence microscopy and conventional light microscopy of feces was conducted.

Results

Histologically, gut tissue samples showed physiological architecture and no pathological alterations could be observed. In close proximity to epithelial cells and within luminal material, numerous vacuolar forms of *Blastocystis* sp., with no evidence of attachment or invasion, could be discovered. In addition, neither molecular methods nor bacteriological and parasitological methods identified any other known pathogenic agent. Deoxynivalenol was found in maize silage. Antimicrobial therapy using paromomycin was the only effective measure which led to cure.

Discussion and Conclusion

The fact that in all investigated samples none of the common enteropathogenic agents in piglets could be found, suggests a major etiological role of the massive *Blastocystis* sp. infestation. It is supposed that a continuous exposure to deoxynivalenol at high levels led to immunosuppression, which enabled *Blastocystis* sp. to unfold its pathogenic potential.



HHM-064

EVALUATION THE EFFICACY OF A COMPLEX CONCEPT BASED ON SYNERGY OF ESTERIFIED ACIDS, MEDIUM CHAIN FATTY ACIDS, PLANT EXTRACTS AND ESSENTIAL OILS LIKE ALTERNATIVE TO ZNO AND ANTIBIOTICS FOR DIGESTIVE TROUBLES IN NURSERY PIGLETS UNDER COMMERCIAL CONDITIONS

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Introduction

Zinc oxide (ZnO) in the feed of weaned pigs has been shown to reduce the incidence of post-weaning diarrhoea and to improve growth performance. After the statement of the European Medicines Agency that the environmental risks outweigh the benefits of ZnO to prevent diarrhoea in pigs it is scheduled a ban on its prescription in the pig's diets.

Many factors are involved in post-weaning digestive disorders and performance: weaning age and weight, dietary protein and its source, pre-weaning performance and homogeneity, water quality, immunity status, management, environment etc.

This study investigated the effectiveness of in-feed of complex alternative formula of esterified butyrins, medium chain fatty acids, plant extracts and essential oils (Lumance®, Innovad, Belgium) on average daily weight gain (ADWG) and feed conversion rate (FCR) in growing pigs, weaned without ZnO and antibiotics against post-weaning diarrhoea on-farm conditions in Spain.

Material & Methods

1199 piglets randomly selected after birth were allocated in control group (n=576) and trial group (n=623). Average body weight at weaning (d=21) was 5.80 kg.

During 27 days post-weaning period the pigs in the control group were treated with ZnO (3000 ppm) and the pigs in trial group were treated with Lumance® (3 kg/T).

ADWG and FCR were recorded.

Results

At the end of the trial, the trial group had a higher ADWG (263 g) versus the control group (257 g). FCR was respectively 1.17 for the trial group and 1.13 for the control group.

Discussion & Conclusion

This comparative study shows that Lumance® is an effective concept to replace ZnO at weaning while keeping and even improve the performance of the animals.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-065

LUNG LESION SURVEY USING CEVA LUNG PROGRAM IN RUSSIA, UKRAINE AND BELARUS: COMPARISON OF PERIODS 2016 AND 2017

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Introduction

Lung scoring at the slaughter house is an effective way how to evaluate respiratory health status, economic impact and efficiency of vaccination on the swine farms. Ceva Lung program (CLP) is tool allowing for rapid scoring and was successfully used for evaluation of real prevalence of EP and A.p like lesions on national level.

The aim of the study is to evaluate prevalence and severity of lesions caused by EP and A.p in the Russia (RU), Ukraine (UA) and Belarus (BY) and compare main parameters with status on 2016.

Materials & Methods

In the period of 2017 a total number of 151 batches and 10968 lungs were scored. Lungs were scored originating from the RU (85 batches), UA (49) and BY (17). EP -like lesions and dorsocaudal pleurisy score (A.p- like lesions) were evaluated and compared with 2016.

Results

All countries showed similar % of affected lungs by EP- like lesions in RU, UA and BY- 28, 81%, 31, 15% and 34, 65%, respectively, in case of all countries there is a notable decrease of EP- like lesions in 2017 (2016: 48- 50%).

The highest % of lungs affected by A.p like lesions was evaluated in BY (66, 67%) and A.p prevalence is growing compared to previous year, increase was confirmed on UA farms as well (18, 75% vs. 13%). RU remains similar with almost no difference in 2017 (10, 42% vs. 11% in 2016). All expressed as median.

Discussion & Conclusion

The prevalence of EP- like lesions has decreasing tendency. One of possible explanation is improvement of control of EP and increasing of effective vaccination against EP. A.p.- like lesions remains high in BY, increase was observed in Ukraine and A.p deserve high attention to be controlled.



HHM-066

MODULATION OF INFLAMMATORY MARKERS BY A PHYTOGENIC FEED ADDITIVE

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Introduction

The growth-promoting effect of certain antibiotics may be mediated by an anti-inflammatory mode of action. Numerous plants and phytochemicals are known for their anti-inflammatory activities and might therefore be utilised as growth promoters without having the undesirable side-effects of antibiotics. The phytogenic (plant-derived) feed additive (PFA) Digestarom® DC (BIOMIN Holding GmbH, Austria) has demonstrated a beneficial influence on piglet production parameters. In order to identify potential anti-inflammatory effects, the product and its components have been studied *in vitro* in cell-based assays and *in vivo* in a metabolic study.

Material and Methods

The PFA and its components were tested in a reporter gene assay for trans-activation of nuclear factor NFκB using TNF-α-stimulated porcine intestinal epithelial cells (IPEC-J2). Subsequently, the influence on inflammatory gene expression was assessed via RT-qPCR and release of the inflammatory cytokine IL-6 was analysed via ELISA. Furthermore, a metabolic study with 24 weaned piglets was conducted for 21 days. Piglets were allocated to one of two groups, which received a basal diet either without additives (control) or PFA (150 g/t feed). Acute phase proteins (APP) from blood samples were analysed as markers of inflammation.

Results

The PFA inhibited trans-activation of NFκB *in vitro* (-20%; p<0.05) and reduced the expression of inflammatory genes (IL-6, CXCL8, CCL2; p<0.05) and the release of the cytokine IL-6 (-36%; p<0.05). Of the tested product components, oregano oil displayed the strongest activity. The feeding trial revealed significant differences in the APP Pig-MAP, which was lower in the group fed the PFA (-13%, p<0.05).

Discussion and Conclusion

The results indicate a possible anti-inflammatory mode of action of the PFA and illustrate the contribution of its components. Additional feeding trials in larger scale with monitoring of inflammatory markers seem promising to correlate these with production performance parameters.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-067

THE USE OF PCV2 VACCINES IN 60 DANISH HERDS

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Introduction

Porcine circovirus type 2 (PCV2) is an essential factor for developing Post weaning Multisystemic Wasting Syndrome (PMWS) in weaned piglets. Not all cases of PCV2 infections develop into PMWS, and in sows, it may cause reproductive failure and weak newborn piglets. After 2004 vaccines have been developed, both for sows and piglets, and now PMWS is practically non-existing in Danish herds. However, PCV2 is expected to be present in most of the Danish herds today. Vaccination could therefore be important to prevent PVC2 related problems in the herds. Hence, this study conducted by SEGES Pig Research Center investigated the vaccination strategies in Danish sow herds.

Material & Methods

In total, 60 herds, with 39 different veterinarians affiliated, were included in the study. The herd veterinarian was asked to answer a questionnaire concerning which group of animals the given herd vaccinated and the time of vaccination. The animals were divided into groups of piglets, gilts, sows, and boars.

Results

Out of the 60 herds, 43 (72%) vaccinated piglets, 29 (48%) vaccinated gilts, 4 (7%) vaccinated sows, and 2 (3%) vaccinated boars. Eleven (18%) refrained to vaccinate any animals. Piglets were mostly vaccinated at 3-4 weeks of age and gilts were vaccinated from the age of 15 weeks to 30 weeks, presumably before first service. The four herds which vaccinated sows all vaccinated them 3 weeks pre-farrowing.

Conclusion & Discussion

Relatively few herds used PCV2 vaccines for adult animals, meaning that PCV2 is apparently not considered a problem in this groups of animals in Danish pig herds. However, if the piglets should be protected by PCV2 antibodies from birth, it is crucial that they receive maternal antibodies through the colostrum. A way to ensure that is to vaccinate the sow, as acquired immunity from past infections may not be sufficient.



HHM-068

IMPACT OF WHOLE HERD VACCINATION AGAINST PRRSV-1 ON SOW PERFORMANCE ON A ONE-SITE FARM IN SERBIA

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Introduction

The impact of PRRS on reproduction in sows can be reduced by the use of vaccination. This study aimed to investigate sow performance after implementation of a whole herd vaccination programme on a farm in Serbia.

Material & Methods

The study was conducted on a one-site farm with 1600 sows. Sows showed an increased rate of irregular returns to oestrus and other reproductive problems. Serological testing revealed antibodies against PRRSV in all stages of production and PRRSV was detected by PCR in aborted foetuses. PRRS vaccination was not implemented prior to the start of this study.

Vaccination started with double mass vaccination of the breeding herd, including gilts over 150 days of age, with ReproCyc® PRRS EU and single vaccination of piglets from 17 days until end of nursery with Ingelvac PRRSFLEX® EU. Breeding stock was revaccinated every 3 months and vaccination of piglets was continued in every batch at around 3 weeks of age. Performance data of sows was collected over a period of 7 months after implementation of the vaccination programme and compared with the same period one year before.

Results

PRRS vaccinated sows had a significantly higher farrowing rate and significantly more live-born piglets per litter ($p < 0.001$). The return to oestrus rate ($p = 0.093$) and number of abortions ($p = 0.067$) did numerically improve after implementation of vaccination. The number of stillborn and weaned piglets per litter, as well as the pre-weaning mortality did statistically not differ between the observation periods. However, results of pre-weaning mortality were influenced by piglet diarrhoea as a possible consequence of a lack of vaccine supply (*E.coli* / *Clostridium perfringens* type C) at the end of the observational period.

Discussion & Conclusion

The results show an overall positive impact of whole herd vaccination against PRRSV on the performance of the sows.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-069

TAILOR-MADE COACHING FOR ANTIMICROBIAL REDUCTION IN PIG FARMS WITHIN THE BELGIUM - DUTCH CROSS BORDER PROJECT; I-4-1-HEALTH

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Introduction

Antimicrobial use in pigs (AMU) has led to an increase in antimicrobial resistance (AMR). This has prompted measures to reduce AMU, which has been associated with AMR reduction on national level. However, it remains unclear how on-farm dynamics of AMU and its effects on AMR are exactly related. Moreover, it is challenging to influence farmers' behavior towards increased infection prevention and AMU reduction. In this project we use specific coaching skills to reduce AMU and evaluate the effects on AMR.

Material and Methods

The i-4-1-health project started in 2017. In Flanders as well as in The Netherlands, 15 pig farms with an above average AMU are visited four times in 1.5 year. During the first visit, an assessment is made of e.g. biosecurity, technical performance, AMU and AMR. AMR is determined in faecal samples phenotypically in *Enterobacteriaceae*. The results of the assessment are evaluated using a designated new tool (V-iris) to start coaching four weeks later. In the coaching process, farmers and veterinarians reflect upon their own perceived behavior. A tailor-made action plan will be developed together with the farmer and veterinarian. After 6 and 12 months the farm is revisited to evaluate implementation and reinforce compliance to the action plan. At the 2nd and 3rd visit faecal samples are obtained for analysis of AMR development.

Results

Preliminary results indicate presence of AMR for ciprofloxacin as well as ESBL-producing *Enterobacteriaceae*. In addition a difference in prevalence between Belgium and Dutch farms is observed.

Discussion and conclusion

In both countries veterinarians and farmers face the challenge to reduce AMR. Preliminary experiences indicate that there is not a one-size-fits-all approach within, nor between countries. To increase knowledge and awareness during the project, knowledge sharing sessions are organized for people working in public health, human medicine and veterinary medicine.



HHM-070

THE DEVELOPMENT AND USE OF PCR'S IN PORCINE RESPIRATORY DISEASE COMPLEX (PRDC) CONTROL

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Introduction

PRDC is one of the major swine disease complex and is economically important. Since it is a complex of multiple pathogens, diagnosis of PRDC is not always easy. PCR's have become a common tool in diagnostics, both for clinical diagnosis and monitoring program. This paper is describing the developments of a full respiratory PCR panel.

Methods and materials

Pathogens: PPRSV, PCV2, SIV, Mycoplasma's, APP, Hps.

Design of specific primers and probes: literature search, GenBank and unique in house post-blast software.

Set up: pathogen specific PCR's and multiplex PCR's.

Pathogens: PPRSV, PCV2, SIV, Mycoplasma's, APP, Hps.

Sensitivity testing: reference strains, vaccine strains, cultures, tissues, blood/serum, oral fluids and FTA cards.

Specificity testing: non relevant bacteria, viruses and related pathogens.

Extraction methods: crude methods such as heat boil and extraction buffers, spin column based methods and bead based methods.

PCR Cyclers: different most used PCR cyclers.

Run protocol: all PCRs are running on the same PCR cyler protocol.

Results

From the results all PCR's showed a highly specific and highly sensitive performance with a low level of detection. Set up in multiplex formats are performing similar to single format PCR's.

Discussion and conclusion

In PRDC one should test for all possible pathogens which could be involved. Since this can be an expensive exercise, multiplex PCR's can be help to determine the pathogens of interest in a cost effective way. If followed up by specific target PCR's in order to gain in depth information on pathogens of interest it becomes a powerful approach. The availability of a full respiratory panel in different formats will be of help to make the correct diagnosis in a limited time with limited costs and with valuable information.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-071

ELIMINATION OF *BRACHYSPIRA HYODYSENTERIAE* FROM A FATTENING UNIT IN THE NETHERLANDS: A CASE REPORT

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Introduction

Swine dysentery (SD) caused by *Brachyspira hyodysenteriae* (*B. hyo*) is an important intestinal disease with clinical signs typically consisting of mucohaemorrhagic diarrhea. Economic losses are due to mortality, diminished growth rates and cost of medical treatment. Diagnosis is performed using pooled faecal samples (microbial culture, PCR test). The objective was eradicate *B. hyo* from a large fattening unit through a cleaning and disinfection (C&D) protocol, including rodent and fly control, manure management and improved external and internal biosecurity rules.

Materials & methods

A large fattening unit (6000 pigs), receiving nursery piglets (25kg) from one sow farm has been diagnosed positive for *B. hyo* for several years. An audit - to identify critical control points to be improved - was performed. Several steps in C&D, rodent and fly control and biosecurity issues were optimized before eradication could start. Depopulation of the stables upon delivery of the finisher pigs to the slaughterhouse was followed by repopulation with clean *B. hyo*-negative piglets when all compartments (n = 44) were cleaned, disinfected and dried. In order to check for residual environmental *B. hyo* infection, several environmental samples were collected for a *B. hyo* PCR analysis. To evaluate the C&D protocol, Rodac plates for total bacterial count were collected. Piglets within the first production groups after the eradication protocol were thoroughly monitored for clinical signs of SD and regular samples were collected for *B. hyo* PCR analysis.

Results

Results on evaluation of C&D protocols through Rodac plates were low and specific detection of *B. hyo* showed overall absence of *B. hyo*. Monitoring of piglets is currently ongoing.

Discussion & Conclusions

Eradication of *B. hyo*, the etiology of SD, on a fattening unit was possible through a combination of thorough C&D protocols, rodent and fly control and biosecurity measures.



HHM-072

TRACHEOBRONCHIAL SWAB SAMPLING CONFIRMS *MYCOPLASMA HYOPNEUMONIAE* IN A CENTRAL EUROPEAN SPF BREEDING HERD

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Introduction

Dedicated programs to monitor for freedom of several economically important diseases are present within most breeding companies currently delivering high health breeding animals to their end customers. Serology is the preferential approach in order to screen for most of these diseases, such as *Mycoplasma hyopneumoniae* (*M.hyo*). However, in case of positive serology, further decisions on farm health status and related consequences are based on detection of the pathogen. The objective was to detect *M. hyo* using trachea-bronchial swab (TBS) sampling following dubious *M. hyo*-seropositivity.

Materials & methods

A high health breeding farms in Central Europe (25 years SPF) was shown positive for *M.hyo* using the conventional ELISA serology. Looking for confirmation with a second ELISA test, however, samples showed negative serology. Moreover, throughout the entire monitoring period, no coughing, necropsy lesions or lesions at slaughter could be detected. Therefore, TBS was used to confirm the health status for *M.hyo*. In total 162 samples were collected at different ages (3-6-9-12-15-18-21-24-27 weeks) to detect *M. hyo* with 99% certainty at 2% prevalence level.

Results

ELISA S/P ratios were 0.86 ± 0.15 at first *M. hyo* detection in March 2017. Thereafter, the S/P ratios gradually decreased. Collected TBS samples were negative until 15 wk of age, but older gilts (18-27 wks of age) were shown highly *M.hyo*-positive (83-100%). The *M. hyo* load was moderate to high based on the average Ct-values of nPCR.

Discussion & Conclusions

TBS samples demonstrated no infection until 15 weeks of age, however, older rearing gilts were shown positive. These results imply potential eradication possibilities with partial depopulation/repopulation of the gilt rearing facilities. In conclusion, PCR testing of TBS samples confirmed the presence of *M. hyo* in a herd that was serologically doubtful for *M. hyo* without typical clinical signs of *M. hyo* infection.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-073

EVALUATION OF THE PREVALENCE AND SEVERITY OF ENZOOTIC PNEUMONIA AND PLEUROPNEUMONIA ON CZECH PIG FARMS BASED ON LUNG LESION SCORING IN THE YEARS OF 2015-2017

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Introduction

Monitoring of respiratory disease by lung scoring is beneficial to assess the farm health status. Correlation between lung lesions, the economic impact of the disease and the efficiency of vaccination has been reported. Ceva Lung Program (CLP) was confirmed as a valuable tool to establish the prevalence and severity of Enzootic Pneumonia (EP) and pleuropneumonia. The aim of this study is to evaluate level of EP and A.p.-like lesions on Czech pig farms in the period of 2015-2017.

Material & Methods

The survey was conducted on conventional pig farms excluding those with M.hyo and A.p. SPF status. A total of 13804 lungs in 133 batches of slaughtered pigs were scored using the CLP app. This standardized methodology assessing the presence and extension of EP- and A.p.-like lesions was described previously. Bronchopneumonia lesions, cranio-ventral pleurisy and scarring associated with older EP-like lesions were recorded and scored. Dorsocaudal pleurisy suggestive for previous pleuropneumonia was scored to describe A.p.-like lesions and A.p Index (APPI) was calculated.

Results

In 37,7% of lungs the lesions typical for EP were found. The area of affected surface of lung parenchyma in pneumonic lungs reached 5,4%. Six % of lungs revealed older EP lesions in the form of scars. Cranio-ventral pleurisy was recorded in 12,9% of total number of lungs. As for pleuropneumonia - 11,1% of lungs were affected by A.p.-like lesions with the APPI index 0,28. All values are expressed as median.

Discussion & Conclusion

EP-like lesions have relatively high prevalence in lungs from Czech farms which, however corresponds to the numbers described in other EU countries. Actually more than every 3rd lung investigated has revealed changes characteristic for EP. In comparison with EP-like lesions, changes characteristic for A.p infections were less prevalent showing that pleuropneumonia is not as much spread across the farms.



HHM-074

THE DR. MORRISON SWINE HEALTH MONITORING PROJECT AN INDUSTRY INITIATIVE THAT BRINGS NEW INSIGHTS INTO PRRS EPIDEMIOLOGY

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Introduction

The Dr. Morrison Swine Health Monitoring Project (MSHMP) is a voluntary program managed by the University of Minnesota in which U.S. producers and veterinarians share sow farm PRRS status weekly. Currently, the project participants account for 50 % of the U.S. sow population. One of the MSHMP's main goals is to contribute to the understanding of PRRS epidemiological features and, ultimately, to build a nationwide system should a foreign animal disease enter the country.

Material and methods

The dataset has been analyzed through different approaches, including time series, spatial, phylogenetic and ecological analysis. A real-time visual and analytic tool that also incorporates modelling and prediction has been tested.

Results

Use of those methods has helped the U.S. swine industry to quantify the cyclical patterns of PRRS. In addition, it has also helped to describe the impact that emerging pathogens such as PEDv had on such a pattern. Furthermore, the project has aided to understanding the nature and extent at which environmental factors (e.g. precipitation, slope or land cover) influence PRRS risk, along with identifying PRRS virus emerging strains. Recently, the project was able to uncover the relationship between PRRS infection season and on the length of viral clearance from the sow population.

Discussion and conclusions

This industry-led approach shows the importance and the impact that collaboration through sharing data has in facing one of the most costly diseases in swine production. The project also demonstrates how different data visualization and analytical approaches may help to add value to the routine collection of surveillance data, and can support infectious animal disease control, which ultimately provides information for improving the decision-making processes.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-075

COST-BENEFIT OF ERADICATION SWINE DYSENTERY IN A FARROW-TO-FINISH HERD

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Introduction

Swine dysentery (SD) induce animal ill-thrift and financial losses. One way to control the disease is to eradicate it, but farmers may hesitate for costs.

Materials & methods

A two-sited integrated pig herd with 300 sows and growers on one site and fatteners 1 km away. Every third week, 40 sows farrowed. Piglets were weaned at 33 days of age. Intestinal disorders had frequently been recorded in growers/fatteners since years, and occasionally also in gilts/sows. *Brachyspira hyodysenteriae* (BH), sensitive to tiamulin and tylosin, had been demonstrated in diseased pigs. Pigs were treated for SD-like diseases for 9000€ per year (30€ per sow/year).

SD was eradicated in in the summer of 2016 by transferring washed and tiamulin-treated sows to emptied and disinfected farrowing units. Thereafter units for growers and fatteners were sanitised before pigs born by sanitised sows were installed.

Results

No clinical signs of SD have been recorded after the eradication. Sow production was improved with 2 pigs/year. As the eradication attempt not demanded any production stop, the total cost was 22.200€, corresponding to 74 € per sow.

- 1) Extra work (Wash and movements of sows etc) 4350€
- 2) Cleaning of units (commission) 8800€
- 3) Disinfectants 1050€
- 4) Medical treatment of sows and gilts 8000€

Conclusion and discussion

The improvement with 2 pigs/sow/year indicate an improved production. The annual cost for endemic SD has been estimated to 250€/sow in Sweden (increased mortality with 10% and 3%; prolonged rearing with 3.5 and 5 days for weaners and fatteners, respectively), to which medicines for 30 € ought to be added. If so, there will be a payback for eradication within 4 months. At a more significant SD, the pay back will be faster. Provided that the eradication has been successful, the production improvement will remain over time.



HHM-076

GASTRIC ULCERS AND DIARRHOEA ARE ASSOCIATED WITH REDUCED PRODUCTIVITY IN FINISHER PIGS

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Introduction

It has previously been established that pigs with severe gastric ulcers have a reduced daily weight gain (DWG). But the association between gastric ulcers and feed conversion rate (FCR) is unknown. A common cause of diarrhoea is *L. intracellularis*, and high excreting pigs have a reduced daily weight gain. Furthermore, it has been reported that pigs with unspecific diarrhoea have a poorer FCR. The purpose of this study was to investigate the association between gastric ulcers, diarrhoea, DWG, and FCR in finisher pigs.

Material & Methods

A total of 526 pigs (Danish LYxD, females/castrates) were followed from 30 kg live weight until slaughter. The feed consumption and weight were recorded for each pig by an electronic feed station. The diarrhoea status (<18% dry matter = diarrhoea) for each pig was determined four times during the study period. At slaughter, stomachs were collected and scored on a 11-level gastric ulcer scale.

Results

A strong association between DWG and gastric ulcer score ($p=0.001$) as well as diarrhoea ($p=0.001$) was identified. Castrates with severe gastric ulcers (Score 8-10) had a reduced DWG compared to castrates with no or mild gastric ulcers (estimated reduction: 177 gram/day). This was not the case with females. Pigs with high prevalence of diarrhoea had a reduced DWG compared to pigs with no diarrhoea (estimated reduction: 51 gram/day). An association between diarrhoea and FCR was identified ($p=0.021$). Pigs with high prevalence of diarrhoea (>1 positive sample out of four total samples) had a higher FCR compared to pigs with no diarrhoea (estimated increase: 0.07 kg feed/kg weight gain).

In this trial, there was no significant association between gastric ulcers and FCR.

Discussion & Conclusion

This trial showed that gastric ulcers and diarrhoea have an influence on the productivity with castrates being more sensitive to gastric ulcers than females.

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HERD HEALTH MANAGEMENT & ECONOMY

HHM-077

APPLICATION OF A RISK ASSESSMENT TOOL TO ASSESS THE EXTERNAL BIOSECURITY OF PIG FARMS

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Currently, the generation of knowledge and implementation of biosecurity on farms is essential in pig production. The development of tools to identify where to focus efforts for improving biosecurity and objectively compare the level of biosecurity among farms is an important component.

The aim of this study was to evaluate the external biosecurity of pig farms in Argentina by adapting a previously developed tool (Allepuz et al. 2017). It was applied in the context of a hypothetical porcine epidemic diarrhea (PED) outbreak where PED herd prevalence was obtained from Beam et al. (2015). We considered six possible routes of disease introduction: i) replacement animals; ii) vehicles transporting replacement; iii) vehicles to the slaughter; iv) vehicles transporting feed; v) visits of people and vi) neighborhood (i.e. from farm, slaughterhouse, road). The importance of the different biosecurity measures aimed at reducing the probability of virus introduction and the probability of transmission given a certain contact were obtained in an expert opinion workshop with 18 veterinarians and researchers following the guidelines described in OIE (2014). Then, we estimated the percentage of risk reduction and the score of the probability of PEDV introduction by the different routes and the overall probability of introduction. In total 192 farms were analyzed. The results showed that there is high margin for improvement the biosecurity of the above farms. The percentage of risk reduction was 42% (range: 5-90%) and the routes with the great margin of improvement were replacement animals, both replacement and food vehicles and finally visits. Besides, for most of the farms, the risk of PEDV introduction was high, especially through the food vehicle, the replacement animals and the visits. This study also showed that in the case of entry of PED a most farms would be infected as happened in North America.



IMM-001

FIELD SAFETY STUDY OF A VAGINAL MUCOSAL VACCINATION FOR PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) IN SOWS

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Introduction

Mucosal vaccines, specifically autogenous vaccines, offer a new method of immunization against PRRSV; however, intranasal vaccination of sows represents an obstacle for producers. Therefore, this study evaluated the clinical safety of a mucosal PRRSV vaccine administered intravaginally to sows.

Materials and Methods

The treatment (TMT) group included 10 pregnant sows (mid-gestation) and 10 open sows. Each sow received the killed vaccine (2 ml dose; Strain 1-7-3 [killed], Barricade PRRS®) as a small volume infusion into the anterior vagina. The control (CON) group included 10 pregnant sows and 10 open sows. The CON group received a placebo intravaginal infusion. Blood samples and oral fluids were collected from sows at day 0 (prior to vaccination), day 21, and day 50. Serum samples were tested for ELISA and neutralizing antibody responses (FFN) at Iowa State University. The IgA levels in oral fluid samples also were evaluated with ELISA testing. Results were analyzed by an ANOVA with treatment, reproductive stage, day and interactions as the independent variables. Means were compared with Tukey's test.

Results

Many sows had existing ELISA and FFN titers prior to the vaccine and placebo infusions. Few differences between TMT and CON sows were evident in open or pregnant sows. All other open sows (both CON and TMT) conceived at a subsequent mating (prior to Day 21), and all pregnant sows remained pregnant throughout the course of the study. At no time did the TMT sows become inappetent nor lose their pregnancies.

Discussion

The typical route of natural PRRSV infection is through mucosal membranes. Therefore, this method of vaccination appeared to be a logical and valid approach. To conduct whole-herd vaccinations, producers would have the option of vaccinating sows without the use of needles for IM injections. Studies with PRRSV-naïve sows are needed to show antigenic stimulation.

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IMMUNOLOGY & VACCINOLOGY

IMM-002

INFLUENCE OF ANTIBIOTIC THERAPY ON THE HUMORAL IMMUNE RESPONSE TO VACCINATION IN WEANED PIGS

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Introduction

Pigs commonly are vaccinated at weaning and often treated with long-acting antibiotics. Some antibiotics were shown to impair responses to vaccination. The objective was to investigate the influence of long-acting antibiotics on antibody and immune cell responses in weaned pigs vaccinated with a circovirus type 2 (PCV-2) - *Mycoplasma hyopneumoniae* (Mhyo) vaccine.

Materials and Methods

Pigs were selected at weaning (day 0) and assigned to 8 treatment groups (n=8 pigs/group). Treatments included control, PCV-2/Mhyo vaccine, tulathromycin only, ceftiofur only, enrofloxacin only, and the combination of the PCV-2/Mhyo vaccine with one of the antibiotics. Vaccinations and antibiotics were administered on day 0. Blood samples were collected on days 0, 14, 21 and 35. Complete blood counts, number of immune cells (lymphocytes, T-cells, B-cells) and antibody titers were determined. Results were analyzed using repeated measures ANOVA and least square means were compared with the Tukey's method.

Results

In all groups, Mhyo antibody S/P ratios were highest at day 0 (0.58 ± 0.04) and lowest at day 35 (0.17 ± 0.02). The control group and groups receiving antibiotics only had highest PCV-2 antibody titers at day 0 (314 ± 42) and lowest at day 35 (107 ± 3.3). The vaccine only group and groups receiving vaccine and antibiotic combinations had increased ($P < 0.05$) PCV-2 antibody titers at day 35 (629 ± 133) compared to days 0 (355 ± 52), 14 (183 ± 17), and 21 (211 ± 20.1). Immune cell populations (CD4+CD8+, CD8+, CD4+, CD3+, CD3+CD21+), were significantly impacted by age (time). For example, the numbers of CD8+ cells increased from 1703 ± 77 /uL at day 0 to 3019 ± 214 /uL at day 35. Cell numbers were not significantly affected by treatments.

Discussion

The failure to observe an increase in Mhyo titers was due to maternal antibodies interfering with vaccine response, lack of sufficient antigen in the vaccine, or insufficient time to note a response.

There was no interaction between the response to the PCV2 vaccine and the three antibiotics. This lack of interaction does not support previous reports that long-acting antibiotics modulate the immune system and impact vaccination responses.



IMM-003

BOOSTER VACCINATION OF SOWS WITH A MODIFIED LIVE ATTENUATED PRRS VACCINE IMPROVES REPRODUCTIVE PERFORMANCE AFTER PRRSV CHALLENGE

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Introduction

Gilts in acclimation period usually receive several doses of the main swine breeding vaccines, before they are allowed to enter the herd as part of the reproductive stock. In the case of PRRSV, it is a common practice to vaccinate them twice. The objective of the study was to evaluate the efficacy of a double vaccination of gilts with PRRS MLV vaccine at 16 weeks after the first administration, against challenge with the PRRSV-1 strain Olot/91 at 79-91 days of pregnancy.

Materials and methods

Twelve PRRSV seronegative gilts were divided into two groups. One group (6 gilts) was kept as negative control, and the other group (6 gilts) was vaccinated with Suvaxyn PRRS MLV; 112 days later (time that would have required a complete reproductive cycle), they received a second dose. Four to five weeks after the 2nd administration gilts were mated. At 79-91 days of pregnancy, gilts were challenged with PRRSV. At farrowing, litters were evaluated and piglets were clinically observed until weaning. Gilt data after challenge consisted of clinical observations and rectal temperatures, viremia and shedding, reproductive performance and detection of PRRSV in lung exudates of born dead piglets. Piglet data included clinical observations and rectal temperatures, piglet viremia at birth and at weaning, lung scoring at necropsy and detection of PRRSV in bronchoalveolar lavage samples collected at necropsy.

Results

A significant increase in the % of born alive (88% versus 45%), born healthy (86% versus 42%) and weaned piglets (76% versus 41%), and a significant reduction in the % of stillborns (8% versus 52%) and incidence of transplacental infections (virus load in piglet serum at birth - 4 log reduction, at weaning - 4 log reduction, and lung lavages at necropsy - 3 log reduction) were observed in vaccinated gilts, compared to controls. The % of pigs with lung lesions and % of lung with lesions at necropsy were significantly reduced (3% versus 0%). Efficacy was supported by significant reduction of viral load in gilt serum (4 log reduction), nasal (2 log reduction) and oral swabs (1 log reduction).

Conclusions

The administration of two doses of Suvaxyn PRRS MLV to gilts was able to reduce the impact of PRRSV infection during pregnancy, as seen by the positive effects of vaccination in reproductive performance and in virological data from gilts and piglets.

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IMMUNOLOGY & VACCINOLOGY

IMM-004

VACCINATION OF 1 DAY-OLD PIGS WITH A PRRSV MODIFIED LIVE ATTENUATED VACCINE CONFERS PROTECTION UNTIL SLAUGHTER

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Introduction

Suvaxyn PRRS MLV is the first vaccine licensed in Europe which can be used in 1-day-old pigs. Since the vaccine is intended to be used in a single dose vaccination schedule, it is crucial to ensure protection of the animals from vaccination to slaughter.

The objective of the study was to evaluate the Duration of Immunity (DOI) of Suvaxyn PRRS MLV in pigs vaccinated at 1 day of age by intramuscular route, upon inoculation with a PRRS-1 isolate as a respiratory challenge at 26 weeks post-vaccination.

Materials and methods

Thirty-eight 1-day-old piglets, born from PRRSV seronegative sows, were divided into two groups. One group (20 pigs) was kept as negative control, and the other group (18 pigs) was vaccinated at 1 day of age with Suvaxyn PRRS MLV. The animals were challenged by IN route with Olot/91 strain 26 weeks after vaccination. Viral load in serum, rectal temperatures, shedding, clinical signs and body weight were evaluated. Nine to ten days after challenge pigs were necropsied and lungs evaluated for macroscopic lesions.

Results

A protective effect of vaccination was observed since a significant reduction of viral load in serum (3.8 log reduction) and in nasal shedding (1.0 log reduction) was demonstrated, as well as in mean percentage of lung macroscopic lesions (3.7% versus 1.0%).

Conclusions

Vaccination with a single administration of the Suvaxyn PRRS MLV to 1 day-old seronegative pigs by IM route conferred a duration of immunity of 26 weeks, as seen by the significant reduction on the viral load detected in serum after challenge 26 weeks post-vaccination. Efficacy was also supported by the significant reduction on the percentage of lung lesions at necropsy, as well as the reduction of nasal and oral shedding.



IMM-005

EVALUATION OF AN AUTOGENOUS ROTAVIRUS TYPE A, *CLOSTRIDIUM PERFRINGENS* TOXOVAR A & *E. COLI* VACCINE IN A COMMERCIAL PIG IRISH UNIT

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Introduction

An indoor fully-slatted 1000 sow unit in Ireland experienced an increase of diarrhoea in 5 - 10 days old piglets. Sows were vaccinated with a combined *E. coli* + *Clostridium perfringens* type C (CptC) 3 weeks pre-farrow and its was historically necessary to control neonatal colibacillosis and clostridiosis.

New neonatal diarrhoeas episodes occurred in 2016 (watery) and 2017 (necrotic) causing until 8.2% pre-weaning mortality; diagnostic process (molecular and histologic methods) reported Rotavirus type A and *Clostridium perfringens* type A (CptA) beta-2, as causative agents. Rotavirus diarrhoeas were partially controlled with sows feed-back.

The aim was to reduce neonatal diarrhoea, mortality and reducing the use of antimicrobials.

Materials and Methods

Faecal samples, swabs and formalin-fixed sections of small and large intestines from untreated acute diseased 4 days-old piglets were submitted to the laboratory.

Rotavirus type A, *Escherichia coli* (EAST1) and *Clostridium perfringens* type A (alpha and beta-2 toxins) were isolated in different animals and used to elaborate an autogenous vaccine (Anicon GmbH, Germany).

The vaccine was applied 5 and 3 weeks prior to farrow to gilts and sows. The other *E.coli*+CptC vaccine was removed.

Results

The incidence of neonatal diarrhoea was significantly reduced from 22% to 5% and pre-weaning mortality dropped to 8.2%, only 2% directly attributed to diarrhoeas.

Discussion & Conclusions

There are different ways to control neonatal diarrhoea and it can be achieved by improvement management and hygiene. The necessary practices are difficult to implement and other preventive or therapeutic measures are compelled.

In this farm, a decision was taken to improve prevention by comprising the different pathogens causing clinical neonatal diarrhoeas in a single product to reduce vaccination costs (money and time). Neonatal diarrhoea problems and mortality were prevented, farmer work burden was reduced and there was a reduction of antimicrobial usage derived from the piglet treatments.

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IMMUNOLOGY & VACCINOLOGY

IMM-006

SEROLOGICAL RESPONSE AGAINST *ERYSIPELOTHRIX RHUSIOPATHIAE* IN GILTS VACCINATED WITH DIFFERENT COMMERCIAL VACCINES

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Introduction

Erysipelothrix rhusiopathiae is the causative agent of Erysipelas. In pigs vaccination is the primary strategy to prevent the disease.

The objective of this study was to compare *E. rhusiopathiae* antibody induction in the serum of gilts after vaccination with four different commercial vaccines.

Material & Methods

Blood samples were obtained from non-vaccinated and vaccinated gilts from herds located in Denmark. Gilts were vaccinated with either vaccine A (Parvoruvax[®]), vaccine B (Farrowsure[®] Gold B), vaccine C (Porcilis[®] Ery/Parvo) or vaccine D (Eryseng[®] Parvo).

E. rhusiopathiae antibodies in serum samples were tested with the CIVTEST SUIS SE/MR indirect ELISA Kit (HIPRA, Spain) and the results obtained were based on sample-to-positive ratio.

Results

In 52 herds, serological levels for non-vaccinated gilts were 24.6; SD = 29.4; n = 317 gilts and for vaccinated gilts 53.6; SD = 36.4; n = 328 gilts. In vaccinated gilts, 46.0% were serologically negative (serological value < 40).

A total of 31 herds and 190 vaccinated gilts were included in a multilevel statistical analysis comparing the serological response against *E. rhusiopathiae*. Mean serological levels obtained for the different vaccines were vaccine A: mean = 35.4; SD = 20.0 (n=70); vaccine B: mean = 34.7; SD = 17.7 (n=48); vaccine C: mean = 30.5; SD = 18.9 (n=30); and vaccine D: mean = 46.8; SD = 23.0 (n=42). Serological levels from gilts vaccinated with vaccine D were statistically significantly higher compared to gilts vaccinated vaccine A ($P = 0.024$), vaccine B ($P = 0.025$) or vaccine C ($P = 0.008$). No statistical differences were found between serological levels in gilts vaccinated with vaccine A, B or C.

Discussion & Conclusion

In conclusion, gilts vaccinated with the commercial vaccine D exhibited the highest serological response compared with animals vaccinated with one of three other commercial vaccines against *E. rhusiopathiae*.



IMM-007

RESULTS OF VACCINATION WITH SUVAXYN® CIRCO+MH RTU IN A PILOT GROUP OF FARMS: LONGITUDINAL STUDY OF GROWTH PERFORMANCE PER BATCH

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Lung checks of pig carcasses at slaughter is a well-established standardised procedure for monitoring respiratory health at farm level. However, pig slaughterhouses also collect other data for carcass classification and payment of farmers that can be used to monitor health and growth performance. Since 2015, Zoetis has been offering French pig veterinarians a longitudinal batch growth performance monitoring service. This service, called IPC ABATTOIR, allows veterinarians to substantiate the impact of on-farm changes in real time.

In the last three months of 2016, veterinarians from several pig veterinary practices in France prescribed vaccination with Suvaxyn® CIRCO+MH RTU in a pilot group of 20 farms. The impact of this preventive measure on growth performance at batch level was evaluated using IPC ABATTOIR. On each farm, the data of an average 5.7 batches of pigs vaccinated according to the farm's previous protocol (14 farms vaccinated against both enzootic pneumonia and PCV2, 6 vaccinated only against enzootic pneumonia) were compared to the data of 6.0 subsequent batches vaccinated with Suvaxyn® CIRCO+MH RTU (data from 68,475 pigs in total).

There was no statistically significant difference between groups for any of the growth performance parameters (individual wean-to-slaughter ADWG; carcass weight; time between first and last shipment within a batch; variation coefficient of the wean-to-slaughter ADWG), although a numerical improvement was observed. Furthermore, comparison of these parameters in the subgroup of farms without previous vaccination against PCV2 showed a significant improvement of the variation coefficient of the ADWG, indicating a probable presence of subclinical PCV2 infection on these farms.

This field study confirmed that Suvaxyn® CIRCO+MH RTU proved at least as efficacious regarding growth performance as the previous vaccine protocols in place in the pilot group of farms.

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IMM-008

RESULTS OF VACCINATION WITH SUVAXYN® CIRCO+MH RTU IN A PILOT-GROUP OF FARMS: LONGITUDINAL STUDY OF LUNG LESIONS AT THE SLAUGHTERHOUSE

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In France, about 70% of piglets are vaccinated against PCV2 and nearly 90% are vaccinated against *Mycoplasma hyopneumoniae*. Ready-to-use bivalent vaccines have only recently reached the market. The benefit of a one-shot ready-to-use bivalent vaccine against these two major pathogens in pig farming is obvious: such vaccines are easy to use by farmers and satisfy a demand for making vaccination sessions less tiresome, as well as more animal-friendly. However, farmers as well as their practitioners are well-known to be quite reluctant to change their health management routines, unless the efficacy and/or the practicality of a new product is proven under local field conditions.

From November 2016 to January 2017, practitioners from the largest French swine veterinary practice have prescribed Suvaxyn® CIRCO+MH RTU (Zoetis) in a pilot group of 21 farms, in order to assess the impact of this new vaccine on the proportion of lung lesions at the slaughterhouse. Farms had been selected to be representative for the practice's client pool, both for geographical location and for the previous vaccine protocol against either *M. hyopneumoniae* only or both pathogens.

Lung checks were performed at the slaughterhouse for more than 3,000 pigs that had been vaccinated with the previous protocol, and more than 3,000 pigs vaccinated with the bivalent ready-to-use one-shot vaccine. There were no statistically significant differences between both groups for the average lung score (Madec scoring on 24) and for the percentage of lungs found to be lesions-free.

This field study confirmed that Suvaxyn® CIRCO+MH RTU proved at least as efficacious in preventing respiratory lesions as the previous vaccine protocols in place in the field, while limiting the number of animal manipulations at weaning.



IMM-009

SUCCESSFUL CONTROL OF PORCINE PLEUROPNEUMONIA IN A FATTENING FARM BY VACCINATING WITH COGLAPIX®

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Introduction

Actinobacillus pleuropneumoniae is the causative agent of Porcine Pleuropneumonia (PP), distributed worldwide and responsible for considerable economic losses in the pig industry. An increase of new cases is reported from Austria. The aim of this study was to compare CoglapiX® vaccinated fattening pigs to unvaccinated pigs from one farm in terms of antibiotic consumption, lung health and mortality.

Material & Methods

A fattening farm located in Styria, Austria, housing 1000 pigs from one origin was presented with respiratory problems and a relatively high consumption of antibiotics. In June 2017 a group of pigs was evaluated in terms of antibiotic consumption, slaughter lung health according to Ceva Lung Scoring Methodology and mortality. The owner then decided to vaccinate the next batch of pigs with CoglapiX® according to manufacturers guidelines, evaluate the parameters end of September 2017 and compare them.

Results

Antibiotic consumption of the unvaccinated group was calculated at 12.26 g per pig housed (n=288) whereas for vaccinated group it was 0.07 g (n=130). Mortality was 1.04% and 0.77% (P>0.05) for the first and the second group, respectively. At slaughter, lungs of unvaccinated animals had significantly higher (P<0.05) frequency of dorsocaudal pleurisy compared to lungs of vaccinated animals, with 48% (n=121) and 2% (n=99) affected lungs and APP-Index of 1.19 and 0.05, respectively. Pneumonia was observed in 31% of the lungs from unvaccinated pigs and in 30% of vaccinated ones, with an EP-index of 0.67 and 0.43, respectively.

Discussion & Conclusion

During this field trial it was shown that CoglapiX® is highly efficient in controlling PP. Vaccinated pigs performed better than the unvaccinated in terms of lung health and mortality. Furthermore the vaccinated group had a much lower consumption of antibiotics, highly suggesting that vaccination is superior to antibiotics in preserving lung health of fattening pigs affected by PP.

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IMM-010

COMPARISON OF DIFFERENT VACCINATION SCHEMES AGAINST PCV2 AND *M.HYO* IN EASTERN AUSTRIA

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Introduction

Austrian piglets are usually vaccinated against *Mycoplasma hyopneumoniae* (*M.hyo*) and porcine Circovirus type 2 (PCV2). Separate vaccinations by monovalent PCV2 and two-shot *M.hyo* vaccines offer reliable protection but are more labor-intensive than a ready-to-use one-shot combination vaccine. This study compared lung lesions and detection of *M.hyo* and PCV2 by PCR after vaccination with Porcilis® PCV M Hyo or separate vaccinations.

Material & Methods

Piglets from 3 farrowing groups were randomly assigned to two groups: 386 piglets in group A were vaccinated at 21 days of age with Porcilis® PCV M Hyo, 390 piglets in group B were vaccinated on days 7 and 28 with Porcilis® M Hyo and on day 21 with Porcilis® PCV. All piglets were regularly weighed and blood samples and tracheobronchial swabs (TBS) were repeatedly collected from 50 randomly selected animals. Slaughter lung checks were performed on all pigs and tissue samples of the lungs were taken.

Results

Lung lesion scores and fattening performance were not significantly different between groups A and B. All samples tested negative for PCV2. Results of the examination of TBS and lung tissue samples for *M.hyo* varied between different PCR-methods: 54% (A) and 58% (B) tested positive in the nested PCR, whereas three other PCRs only had one single positive result. Immunohistochemistry (IHC) for *M.hyo* gave positive results in 17% (A) respectively 19% (B) of the samples.

Discussion and Conclusion

PCV2 could not be detected and *M.hyo* pressure was very low in this farm. The different results of the examination for *M.hyo* antigen in lung tissue and TBS samples by different *M.hyo* PCRs and IHC are an indicator of the different test sensitivities, which needs to be considered when performing routine diagnostics. Both vaccination schemes showed no significant differences in lung lesions and direct detection of *M.hyo* and PCV2.



IMM-011

COMPARISON OF INTRADERMAL AND INTRAMUSCULAR VACCINATION METHODS IN PIGS - A CASE STUDY

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Introduction

IDAL (IntraDermal Application of Liquids) is a needle free device for applying vaccines intradermally (ID). Previous studies have proven this method to be 18 % faster than traditional needle vaccination (IM), which is only of interest if vaccine efficacy is maintained. This case study therefore evaluated productivity parameters and antibiotic usage following PCV2 vaccination either by the ID or IM method.

Materials and Methods

The case study included over 4,700 pigs that were equally divided into two groups and were vaccinated ID or IM with a commercial PCV2 vaccine according to the licensed vaccination route. PCV2 viremia was demonstrated in serum samples from finishing pigs prior to study start and during the study period. Pigs, weighing around 30 kg, were vaccinated at arrival to the finishing barn and were followed until slaughter. Two pens (with 36-38 pigs each) that shared a liquid feed chute was the statistical unit and 56 units were included in each group. The two groups were housed side by side with number of pigs per pen, gender and weight at arrival balanced between groups. Feed conversion rate, mortality and average daily gain was recorded as well as number of antibiotic injection treatments.

Results

Productivity parameters or antibiotic injection treatments were not significantly different between ID and IM vaccination routes. Feed conversion rate was 2.50 and 2.51 feeding units/kg gain and number of antibiotic treatments per unit was 18.8 and 17.0 for ID and IM groups, respectively. Mortality and average daily gain was 1.1% and 1,055 g, respectively, in both groups.

Discussion & Conclusion

As route of PCV2 vaccination did not impact productivity parameters or antibiotic treatment, the decision to vaccinate with IDAL can be based on other advantages such as reduced time to vaccinate as well as welfare of pigs due to removal of needle.

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IMM-012

SEROLOGICAL RESPONSE TO HYOGEN® BY DIFFERENT ELISA TESTS

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Introduction

Mycoplasma hyopneumoniae (Mh) is one of the most important pathogens involved in the Porcine Respiratory Disease Complex (PRDC). Diagnosis of Mh infection is usually confirmed by serological methods and serological methods might be used to check the seroconversion after Mh vaccination. The aim of this study was to compare four commercially available ELISA kits to measure the response in piglets vaccinated with Hyogen®, inactivated vaccine against Mh.

Material and methods

This study was conducted in a farm located in Spain and serologically negative to Mh. A total of 60 weaned piglets were randomly selected and included in the study, 30 non-vaccinated and 30 vaccinated with Hyogen® against Mh at 3 weeks of age. Blood samples were collected three weeks after vaccination and antibodies against Mh were titrated using four commercially available ELISA kits (ELISA A, ELISA B, ELISA C and ELISA D). One piglet from the vaccinated group died before blood sample was taken.

Results

All non-vaccinated piglets were serologically negative by four ELISA kits used. Regarding vaccinated piglets with Hyogen® the results were different depending on the type of ELISA kit with which samples were analyzed: ELISA C showed most positive samples from vaccinated piglets (96,55%), followed by ELISA D (89.65%), ELISA A (82.76%) and the last one by ELISA B (58.62%).

Conclusion

The specificity of all kits was 100% in this study. Each ELISA kit detected a different percentage of positive animals after vaccination with Hyogen®. It indicates that there might be a high difference among the kits validated for the post-infection responses, when used to measure the post-vaccination seroconversion. More studies will be needed to assess and select the most appropriate test.



IMM-013

INTRADERMAL VACCINATION WITH UNISTRRAIN® PRRS IN GILTS PROTECTS AGAINST REPRODUCTIVE DISEASE AFTER A HETEROLOGOUS CHALLENGE

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Introduction

The aim of this study was to demonstrate that UNISTRRAIN® PRRS applied by the intradermal route (ID) with a Hipradermic® device clinically protects gilts after a heterologous PRRSV challenge.

Material & Methods

Sixteen gilts, clinically healthy and free from virus and antibodies against PRRS, were randomly assigned to two different groups. One group was vaccinated with UNISTRRAIN® PRRS by the ID route (0.2 ml/dose; $10^{3.5}$ CCID₅₀/animal) 4 weeks before artificial insemination (AI). Animals in the non-vaccinated group received 0.2 ml of PBS (ID). At 90 days of gestation, all the gilts were challenged by the intranasal route with a heterologous pathogenic strain of genotype I of the PRRSV (Italian strain; 89% ORF5 homology; $10^{5.4}$ CCID₅₀ / gilt).

Results

After intradermal UNISTRRAIN® PRRS administration there were no adverse effects resulting from vaccination. No premature farrowing or abortion occurred in any vaccinated sow (100% farrowing rate). Vaccination with UNISTRRAIN® PRRS significantly reduced reproductive failure caused by heterologous wild-type infection during gestation. In the vaccinated group, a clear statistical increase was observed in the live born piglets/gilt (13.4 ± 4.1 vs 7.3 ± 3.0). Furthermore, vaccination statistically reduced the number of stillborn piglets (0.6 ± 1.1 vs 6.0 ± 2.4). Although it was not statistically different, the number of weak piglets and mummies also improved in the vaccinated group (0.3 ± 0.7 vs 0.8 ± 1.5) and (0.0 ± 0.0 vs 1.0 ± 1.4), respectively.

Discussion & Conclusion

The results obtained allow us to conclude that a single vaccination of gilts with UNISTRRAIN® PRRS ID using a Hipradermic® device significantly reduced reproductive failure caused by heterologous wild-type infection during gestation.

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IMMUNOLOGY & VACCINOLOGY

IMM-014

INTRADERMAL VACCINATION WITH UNISTRAIN® PRRS IN GILTS IMPROVES THE PERFORMANCE OF THEIR OFFSPRING

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Introduction

The aim of this study was to demonstrate that UNISTRAIN® PRRS applied by the intradermal route (ID) with a Hipradermic® device in gilts improves the performance of piglets born from vaccinated gilts.

Material & Methods

Sixteen gilts, clinically healthy and free from virus and antibodies against PRRS, were randomly assigned to two different groups. One group was vaccinated with UNISTRAIN® PRRS by the ID route (0.2 ml/dose; $10^{3.5}$ CCID₅₀/animal) 4 weeks before artificial insemination (AI). Animals in the non-vaccinated control group received 0.2 ml of PBS (ID). At 90 days of gestation, all the gilts were challenged by the intranasal route with a heterologous pathogenic strain of genotype I PRRSV (Italian strain; 89% ORF5 homology; $10^{5.4}$ CCID₅₀ / gilt).

Results

Piglets from the non-vaccinated gilts suffered more clinical signs than those born from gilts that had been vaccinated (1.1% vs 10.6%). Depression and anorexia were the two clinical signs most observed in this group, and the difference in the proportion of litters affected by depression was statistically higher in the non-vaccinated group (2/8 litters vs 8/8 litters).

The mean piglet weight (7.9 ± 1.3 kg vs 6.5 ± 1.5 kg) and increase (6.5 kg vs 5.4 kg) at weaning (28 days after parturition) were significantly better in the vaccinated group. Indirectly, vaccination of the gilts had an impact on their litters with significantly better weight performances and average daily weight gain in the vaccinated group (232.5 g/piglet/day ± 45.1 g vs 191.8 g/piglet/day ± 46.9 g). Furthermore, vaccination with UNISTRAIN® PRRS by the ID route resulted in a significantly higher number of piglets weaned (10.6 ± 2.9 weaned piglets vs 4.3 ± 2.1 weaned piglets).

Discussion & Conclusion

Vaccination of gilts with UNISTRAIN® PRRS ID by Hipradermic® improves piglet performance. Moreover, piglets were healthiest during the lactation period and the number of weaned piglets also increased when females were vaccinated with UNISTRAIN® PRRS.



IMM-015

INTRADERMAL VACCINATION WITH UNISTRRAIN® PRRS IN GILTS REDUCES VIRAEMIA AND VERTICAL/HORIZONTAL TRANSMISSION AFTER A HETEROLOGOUS CHALLENGE

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Introduction

The aim of this study was to demonstrate that UNISTRRAIN® PRRS applied by the intradermal route (ID) with a Hipradermic® device in gilts controlled viraemia and vertical/horizontal transmission after heterologous PRRSV challenge.

Material & Methods

Sixteen gilts, clinically healthy and free from virus and antibodies against PRRS, were randomly assigned to two different groups. One group was vaccinated intradermally with UNISTRRAIN® PRRS (0.2 ml/dose; $10^{3.5}$ CCID₅₀/animal) 4 weeks before artificial insemination (AI). Animals in the non-vaccinated group received 0.2 ml of PBS (ID). At 90 days of gestation, all the gilts were challenged by the intranasal route with a heterologous pathogenic strain of genotype I PRRSV (Italian strain; 89% ORF5 homology; $10^{5.4}$ CCID₅₀ / gilt). Virus detection was performed by RT-PCR.

Results

No clinical signs were observed resulting from the intradermal administration of UNISTRRAIN® PRRS in gilts 4 weeks before AI.

Vaccination statistically reduced the length of viraemia (0.9 ± 2.5 days vs 20.6 ± 5.5 days) induced by the heterologous strain in gilts. In the vaccinated group, a statistically significant reduction in the number of viraemic gilts was also observed (12.5% vs 100%). Vaccination with UNISTRRAIN® PRRS resulted in a statistical reduction in the nasal shedding period (0.9 ± 2.5 days vs 22.3 ± 13.0 days), decreasing the possibility of horizontal transmission during lactation. Furthermore, vaccination reduced vertical transmission in the piglets that died during the study (18.5% of dead piglets were positive for PRRSV vs 61.9% in the non-vaccinated group).

Discussion & Conclusion

The results obtained allow us to conclude that vaccination of gilts with UNISTRRAIN® PRRS ID using a Hipradermic® device enabled the gilts to clear the virus and reduced its vertical and horizontal transmission to piglets. UNISTRRAIN® PRRS, when administered via the ID route, is a safe and useful tool to reduce the transmission of PRRS virus within and between pig populations.

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IMM-016

COMPARATIVE FIELD STUDY ON EVALUATING THE EFFICACY OF TWO DIFFERENT TWO SHOT *M.HYOPNEUMONIAE* VACCINATION SCHEMES, ONE INCORPORATING A PCV2/M.HYO READY TO USE COMBINATION PRODUCT

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Introduction

Mycoplasma hyopneumoniae (M.hyo) and Porcine Circovirus type 2 (PCV2) are two major infectious agents in the Porcine Respiratory Disease Complex. Vaccination against both pathogens is standard practice in pig production and a number of different vaccination strategies are available. The aim of the study was to compare the efficacy against M.hyo infection of two vaccination regimes under field conditions.

Material and Methods

The study was performed in a two-site production system with 200 sows in Germany. 300 one-week-old piglets were randomly divided into two treatment groups (n=150/group). One group (V1) was vaccinated with Suvaxyn® M.hyo (7th day of life) followed by Suvaxyn® Circo+MH RTU on 21st day of life. The other group (V2) was vaccinated with Suvaxyn M.hyo as a two dose (7th and 21st day of life) and received another PCV2 vaccine on 21st day of life. 20% of the pigs (V1=30, V2=31) were selected as sample animals. The efficacy of the PCV2/M.hyo-vaccination was determined by comparing bodyweight as well as average daily weight gain (ADG) between day 84 and the end of finishing (day 154). Furthermore lung lesions were scored (modified Madec-score) at slaughterhouse.

Results

Bodyweights at the end of finishing between group V1 (100.0kg) and V2 (101.1kg) were not significantly different. The ADG of pigs from group V1 and group V2 was 912.5g and 928.4g respectively (p>0.05). Lung lesion scores of V1 and V2 were 2.50 and 2.60 respectively (p>0.05).

Discussion and Conclusion

The study showed that vaccination with one dose of a two dose M.hyo vaccine followed by a PCV2/M.hyo-ready-to-use-vaccine leads to similar results concerning ADG, bodyweights and lung score compared to a two-dose M.hyo vaccine with the addition of a separate one-dose-PCV2-vaccination at the time of the second M.hyo vaccination.



IMM-017

COMPARISON OF THE EFFICACY OF TWO READY-TO-USE VACCINES AGAINST *MYCOPLASMA HYOPNEUMONIAE* AND PCV2 UNDER FIELD CONDITIONS IN GERMANY

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Introduction

Mycoplasma hyopneumoniae (M.hyo) and Porcine Circovirus type 2 (PCV2) are two major infectious agents in the Porcine Respiratory Disease Complex. A combined vaccine against both pathogens allows to reduce the number of injections thus reducing handling stress for the piglets and labor for the user. The objective of the present study was to assess efficacy of a ready-to-use vaccine against M.hyo and PCV2 in comparison to another bivalent commercial M.hyo/PCV2 vaccine under field conditions.

Material and Methods

The study was performed in 2 consecutive batches in a farrow-to-finish farm with 200 sows in southern Germany. A total of 300 healthy suckling piglets (21 (+4) days old) were randomly allocated to the treatment groups: V1 (n=149, 2 ml Zoetis Suvaxyn® Circo+MH RTU), V2 (n=151, 2ml of the other bivalent commercial M. hyo/PCV2 vaccine). About 20% of the pigs (V1=31, V2=29) were selected as sample animals. The efficacy of the PCV2/M.hyo-vaccination was determined by comparing performance parameters such as bodyweight as well as average daily weight gain (ADG) between day 84 and the end of finishing (day 154). Furthermore lung lesions were scored (modified Madec-score) at slaughterhouse. SPSS® Statistics 21 (IBM SPSS, Chicago, USA) was used for statistical evaluation of performance parameters.

Results

Bodyweights at the end of finishing did not differ significantly between groups V1 (100.7kg) and V2 (101.2kg). The ADG for the pigs belonging to group V1 and group V2 was 881.5g and 882.7g respectively (p>0.05). Lung lesion scores at slaughterhouse of V1 and V2 were 4.09 and 3.52 respectively (p>0.05).

Discussion and Conclusion

Vaccination of piglets at 3 weeks of age with Zoetis Suvaxyn Circo+MH RTU leads to similar results concerning ADG, bodyweights and lung-score at slaughter compared to another bivalent commercial M.hyo/PCV2 vaccine. No significant differences concerning the efficacy could be observed.

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IMM-018

ASSESSMENT OF ANTIBODY RESPONSE AND EFFICACY OF VACCINES AGAINST NEONATAL DIARRHOEA BY *E.COLI*

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Introduction

Neonatal *E. coli* enteritis results in mortality and curative treatments. Sow vaccination is an effective prevention through transfer of antibodies via colostrum. This study compares F4ab, F4ac, F5, F6, LT antigen seroconversion in gilts vaccinated with either Porcilis[®] ColiClos (PC), vaccine N (+F41 ag) vaccine E (+F18 ag). Protection was evaluated in piglets by clinical and faecal scoring, and antibiotic treatment rates.

Materials and Methods

In a 4,000 sow farm with F4+ *E.coli* neonatal diarrhoea, 92 gilts were vaccinated with one of the 3 vaccines according to the leaflet. Blood sampling was done at 1st, 2nd vaccination and farrowing, and antibody response against F4, F5, F6 and LT was measured. The litter general health, appetite, faecal consistency and composition were scored from 0 (normal) to 3 (ill, not suckling, watery, blood/casts), so a low score means a better result. Litter diarrhoea treatments were scored.

Results

Serology: All vaccines induced antibodies against the measured antigens. PC induced significantly higher F6 and F5 titers than vaccines N and E, while titers were numerically higher for the other antigens with the exception of F4ac (for vaccine E).

Protection: Litter scores for general health and faecal consistency of the PC and vaccine N in gilts were significantly lower (= better) than in the litters when compared to vaccine E. In PC vaccinated litters, scores for appetite were significantly lower (=better) than in vaccine E litters. Faecal composition was considered fairly normal as mucus or blood was barely observed.

Diarrhea treated litters: PC: 38%. Vaccine N: 52%. Vaccine E: 68%.

Conclusion

All vaccines induced an increase in antibody titers against the vaccine antigens. Porcilis[®] ColiClos induced the highest titers against several of the antigens, which may explain the better general health, appetite, and faecal consistency scores and the numerically lower litter treatment percentage.



IMM-019

LINEAR MIXED MODEL TO EVALUATE THE CLINICAL OUTCOME AFTER A VACCINATION AGAINST SWINE INFLUENZA A VIRUS (H1N1)PDM09 IN PANDEMIC SWINE INFLUENZA A VIRUS POSITIVE SOW FARMS

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Introduction

Swine Influenza A viruses (SIV) affect swine worldwide and causes significant economic losses. New pandemic Swine Influenza Viruses are isolated with an increasing incidence. All subtypes are known to induce respiratory disease and fever with high morbidity and low mortality. Besides, an involvement in reproductive disorders such as an elevated return-to-estrus-rate or abortion is assumed. In the present study a retrospective observation of 16 naturally pandemic SIV infected swine farms was conducted. The monthly development of fertility after vaccination against the pandemic SIV was analysed by means of a linear mixed statistic model.

Material & Methods

The present analysis included 16 pandemic SIV positive farms with known fertility disorders that provided well documented data. The farms were evaluated regarding the potentially alteration of their reproductive performance after implementing the vaccination with an inactivated vaccine against SIV (H1N1)pdm09 (RESPIPORC FLUpanH1N1, IDT Biologika GmbH). The return-to-estrus-rate as a representative parameter for reproductive performance was determined monthly for a time frame of six months before and after immunization. In a linear mixed model the seasonal impact was considered together with the vaccination status. A random intercept per farm adjusts for monthly repeated measures.

Results

The calculated mean of the return-to-estrus-rate of the 16 included farms during the six months before vaccination was 13.8% (± 9.24) and over the course of the six months after immunization 11.2% (± 6.97). The calculation of the linear mixed model estimated a significant ($p=0.005$) effect of 2.77 (± 0.96). The model was not convergent due to the small number of cases.

Discussion & Conclusion

The linear mixed model showed a significant improvement of the return-to-estrus-rate of sows for the period of time with vaccination against pandemic SIV. This might be interpreted as an indication for an involvement of pandemic SIV in fertility disorders and the positive influence of vaccinating against it.

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IMM-020

SIMILAR EFFECT OF DEOXYNIVALENOL *IN VIVO* AND *IN VITRO*: DECREASED PRODUCTION OF CYTOKINES IN PBMC AND LYMPHOCYTES

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Deoxynivalenol (DON) is a mycotoxin which causes very important losses in pig industry. Consumption of contaminated feed leads to modulation of immune responses, impairment of intestinal barrier function and anorexia, resulting in reductions in feed efficacy. This study aimed to investigate the effect of DON on cytokine production in piglets' peripheral blood mononuclear cells (PBMC) *in vivo* and in PBMC and particular lymphocyte subpopulations *in vitro*.

PBMC for *in vivo* study were taken from 21 days old piglets which obtained DON from their mothers transplacentally and via colostrum. DON concentration in piglets' serum was 1,83 ng/ml in average. For *in vitro* study PBMC were isolated from blood samples of 4-6 month old DON free pigs. Lymphocyte subpopulations (cytotoxic T cells (Tc), gamma delta T cells ($\gamma\delta$), helper T cells (Th) and double positive T cells (DP)) were isolated with fluorescence associated cell sorting. Both PBMC and sorted cells were then treated with 10ng/ml of DON. Gene expression of IFN γ , TNF α , IL-2 and IL-17 was determined using quantitative RT-PCR. Production of cytokines on protein level was assessed using flow cytometry.

PBMC *in vivo* treated with DON had significantly lower expression of IFN γ , TNF α , IL-2 and IL-17 compared to controls. *In vitro* DON treatment of PBMC resulted in lower expression of IFN γ , TNF α , IL-2 and IL-17 after both 18 hours and 5 days stimulation. When analysing particular lymphocyte subpopulations we found significant expression decrease of IL-2, IL-17 and IFN γ in Th, IL-17 in DP and TNF α in $\gamma\delta$. These results were in concordance with flow cytometric analysis of cytokine production on protein level.

The results of this study corroborate that even very low concentrations of DON, similar to those reached after moderately contaminated feed consumption, can significantly influence pigs immune response.

This study was supported by MEYS CZ (COST-CZ LD15055).



IMM-021

COMPARATIVE STUDY TO MEASURE THE EFFECT OF PCV VACCINATION ROUTE (IM VS ID) ON BODY TEMPERATURE AND WEIGHT GAIN

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Background & Objectives

The objective of this trial was to compare the effects of the needle-free IDAL vaccination and the conventional needle-syringe vaccination procedure on Average Daily Gain (ADG) and rectal temperature of weaned piglets.

Materials & Methods

A total of 339 28 day old piglets were distributed in 3 study groups: i) vaccinated with Porcilis® PCV ID intradermally with IDAL (IDAL); ii) vaccinated with Porcilis® PCV intramuscularly (IM); iii) control, managed identically but not vaccinated (Control). At the time of vaccination, all pigs were picked up by their hind legs and vaccinated according to the treatment (control pigs were touched with the hand).

Rectal temperature and body weight were measured on 84 animals. Rectal temperature was assessed on day 0 (pre-), +1 (+28h), +2 (+42h) and +21. Piglets were weighed on day 0 and day +21 after vaccination. Rectal temperature and ADG were tested using the MIXED procedure in SAS. The model included the main effect of the treatment (2 levels) and the initial level at day 0 as the covariate.

Results

Rectal temperature was not significantly different between treatments at +28 hours (Control=39.4 ± 0.47 °C, IDAL=39.4 ± 0.44 °C, IM =39.5 ± 0.41 °C; P=0.83); at +42 hours (Control=39.3 ± 0.35 °C, IDAL=39.1 ± 0.49 °C, IM =39.2 ± 0.44 °C; P=0.15); and 21 days post-vaccination (Control=39.9 ± 0.35 °C, IDAL=39.8 ± 0.53 °C, IM =39.7 ± 0.32 °C; P=0.15). The ADG at day 21 did not differ significantly (P = 0.45) between treatments (Control=440 g/day, IDAL=420 g/day, IM=440 g/day).

Discussion & Conclusion

The vaccination method and vaccination procedure did not affect rectal temperature or ADG, demonstrating that Porcilis® PCV and Porcilis® PCV ID are safe vaccines.

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IMM-022

COMPARATIVE STUDY OF THE HUMORAL RESPONSE AGAINST SWINE ERYSIPELAS INDUCED BY ERYSENG® PARVO AND ANOTHER COMMERCIAL VACCINE UNDER FIELD CONDITIONS IN GERMANY

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Introduction

The aim of this study was to compare the humoral immune response to Swine Erysipelas (SE) developed by ERYSENG® PARVO and Vaccine B under field conditions in Germany.

Material & Methods

A total of 54 gilts free of antibodies against SE from a commercial farm in Germany were randomly assigned in 2 groups of 27 animals each. The animals in group 1 and 2 were vaccinated twice intramuscularly (days 0 and 21 of the study) with ERYSENG® PARVO and Vaccine B respectively. Serum samples were taken on days 0, 21, 42 and 63, and tested using a commercial ELISA kit (CIVTEST® SUISE/SE/MR) for SE. The results regarding the serology were analyzed using t-Student test, at a significance level of 95 %, and the percentage of seropositive gilts was analyzed using chi-squared test.

Results

The mean antibody titers against SE of the group vaccinated with ERYSENG® PARVO were the highest throughout the study (except day 0) and showed statistically significant differences ($p < 0,05$) compared to Vaccine B during the days 21, 42 and 63 of the study.

The percentage of seropositive gilts in the group vaccinated with ERYSENG® PARVO, was higher than 90% from the day 21 to the end of the study, being 100% on day 42, meanwhile the group vaccinated with Vaccine B did not reach 80% at any point. Statistically significant differences ($p < 0,05$) were observed on days 42 and 63 of the study, always in favour of ERYSENG® PARVO group.

Discussion & Conclusions

The humoral immune response against SE elicited by ERYSENG® PARVO was faster, more intense and lasted longer than after vaccination with Vaccine B.



IMM-023

THE MYCOTOXIN DEOXYNIVALENOL (DON) SUPPORTS THE DEVELOPMENT OF CD4⁺ T CELLS WITH A PRO-INFLAMMATORY CYTOKINE PROFILE IN THE LIVER

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The mycotoxin deoxynivalenol (DON) is frequently consumed by pigs via contaminated grain. DON binds to the A-site of the ribosome peptidyl transferase center which leads to activation of mitogen-activated protein kinases (MAPKs). MAPKs are central in the function of T cells, which in turn are key players in the adaptive immune system. We investigated whether long-term uptake of DON would influence cytokine production capacity and the differentiation-related phenotype of T cells.

Four groups of pigs were fed for 60 days either with a high (3 ppm) or a low dose (0.9 ppm) of DON with or without a mycotoxin deactivator (MD). Two further groups were fed a control ration ± MD. Following isolation of lymphocytes from blood, mesenteric lymph nodes, liver, and *lamina propria* from the jejunum, T cells were stimulated with phorbol 12-myristate 13-acetate and ionomycin and analysed for production of interferon- γ (IFN- γ), tumor necrosis factor- α (TNF- α), interleukin-17A (IL-17A), and IL-10 by intracellular cytokine staining.

Results indicated an enrichment of CD4⁺ T cells with the capacity for IL-17A and TNF- α production in the liver of pigs fed on high or low doses of DON compared to pigs that had received the MD or were fed the control diets. These cells had partially a CD27⁺ phenotype, indicative of an early effector stage. Differently, slightly elevated levels of IL-10 producing CD4⁺ T cells were found in the livers of all pigs on a DON-diet, regardless of the presence of MD. Such IL-10 producing CD4⁺ T cells were mainly CD25⁻, indicating that they were not classical regulatory T cells.

In summary, our results suggest that long-term uptake of DON has the capacity to drive CD4⁺ T cells in the liver into a pro-inflammatory phenotype, which may contribute to chronic inflammation. This may negatively affect the health status and performance of growing piglets.

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IMM-024

MONITORING PIGLETS' QUALITY VACCINATION

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Introduction

Nowadays, vaccines represent about 60% of health cost in farms. Due to the restriction of the use of antibiotics this percentage is going to increase. Nevertheless, this task is often considered as a painful chore for farmers who usually want to perform as quickly as possible. However, the vaccination of piglets brings together the main concerns of current pig farming: productivity and comfort of the workforce, animal welfare and economic efficiency. Therefore, piglets' quality vaccination is a major issue. To date, there is no guarantee to carry out the vaccination properly so as its monitoring.

Material and Methods

The study focused on the follow-up for 5 months of 8500 piglets vaccinated at the age of 28 days, by 3 employees, with a 2 ml vaccine injection against *Mycoplasma hyopneumoniae*. The duration of the vaccination and the number of good injections (at first time) - among others - were the chosen criteria to evaluate the quality of the vaccination. This was studied and compared both from one session to another and also during a same session. The registration and monitoring of these criteria were achieved through the use of the Smartvac[®] injector and its Vaccinomics[®] app.

Results

It has been demonstrated that the measure of the quality of vaccination makes it possible to rapidly improve the rate of good first injections (from 90% at first session to 96% at 3rd session) and to maintain it at a high level (98%). In addition, we proved a correlation ($R^2 = 0.6323$) between the vaccination time and its quality: after one hour and a half, the quality was severely degraded.

Discussion and conclusion

Being able to measure the quality of vaccination highly contributes to maximize the vaccine investment for farmers. In addition, this restores the interest in the vaccination act with the operators.



IMM-025

COMPARATIVE STUDY TO EVALUATE IMMUNITY INDUCED BY *E. COLI*-CLOSTRIDIUM VACCINES

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Introduction

Colostrum immunoglobins are a source of protection against microbial infections and confer passive immunity to the piglets until they have a mature immune system. The purpose of this study was to compare safety and humoral immunity of different *E. coli* vaccines by measuring specific antibodies (IgG) against the main virulence factors in sows vaccinated with Porcilis® ColiClos or a competitor vaccine with the same indication (vaccine A).

Material & Methods

In a Spanish farm (1,500 sows), 22 primiparous sows were randomly allocated in 2 groups. Prior to farrowing, sows were vaccinated with either Vaccine A (Ginseng adjuvant) or Porcilis® ColiClos, according to manufacturer's instructions. Three blood samples were collected from the sows prior to first and second vaccine dose and 2 weeks after 2nd dose and from piglets (54 piglets, 3 per litter). As a measure of vaccine efficacy antibody titers against specific *E. coli* antigens were measured with an ELISA test (internal MSD AH test). Safety of the vaccine was evaluated based on changes in body temperature and any adverse reactions and efficacy was based on antibody titers. Linear Method (GLM: program SPSS 15.0) was used for the statistical analysis.

Results

Safety: Feed intake was not impacted and no other adverse systemic or local reactions were observed.

Humoral immunity: Antibody titers were in Porcilis® ColiClos versus Vaccine A group, in primiparous sows (2 weeks after 2nd dose): (987P: 8.8 vs 7.43 p=0.05; K88ab: 9.87 vs 9.11 p=0.932; K88ac: 9.3 vs 9.19 p=0.947; K99: 8.04 vs 6.51 p=0.229; LT: 7.11 vs 6.16 p=0.312) and in the piglets of those sows: 987P: 9.67 vs 7.72 p=0.03; K88ab: 11.14 vs 9.75 p=0.03; K88ac: 10.65 vs 9.66 p=0.01; K99: 9.16 vs 7.34 p=0.11; LT: 8.23 vs 6.52 p<0.001).

Discussion & Conclusion

Porcilis® ColiClos was safe and induced higher and more homogenous titers against every *E. coli* antigen than Vaccine A in piglets with vaccinated sows. Achieving a high post-vaccination immunity in sows is important to ensure sufficient transfer of passive immunity to the current large litters.

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IMM-026

EFFECT OF TWO DIFFERENT VACCINE COMBINATIONS AGAINST PCV2 AND MYCOPLASMA HYOPNEUMONIAE (MHYO) ON PIGS' WELL-BEING

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Introduction

Body temperature, acute phase proteins (APPs) and weight gain (ADG) are suitable indicators of inflammation and stress in pigs. The aim of this study was to evaluate the physiological effects of 2 PCV2 and Mhyo vaccines, registered in EU, by measuring these parameters.

Material and Methods

This study was conducted in 3 herds according to the same protocol. One day before weaning, piglets were randomly allocated to 2 vaccine groups and ear tagged. At T0, piglets were weighed individually and vaccinated either with 2 ml of a mixed preparation of Ingelvac CircoFLEX[®] and Ingelvac MycoFLEX[®] (Group 1) or with 2 ml of Suvaxyn[®] Circo+MH (Group 2). Vaccines were used according to their Summary of Product Characteristics. All piglets were individually weighed again 14 days after vaccination. Twenty piglets per treatment group were selected for the assessment of body temperature and APPs (Haptoglobin and C - reactive protein (CRP)) within the 48 hours following vaccination. The serum concentration of Haptoglobin and CRP were measured using a Pig Haptoglobin ELISA kit (Life Diagnostics HAPT-9) and a Pig C-Reactive Protein Elisa kit (Life Diagnostics CRP-9) respectively.

Results

The body temperature was significantly lower in Group 1 than in Group 2, 6 and 24h after vaccination ($p < 0.001$ and $p < 0.05$ respectively). The concentrations of Haptoglobin and CRP were significantly lower in Group 1 compared to Group 2, 24h post-vaccination ($p < 0.001$). Fourteen days after vaccination, ADG was significantly higher in Group 1 compared to Group ($p < 0.05$).

Discussion and Conclusion

The outcome of this study is consistent with other trials showing that vaccination with Ingelvac CircoFLEX[®] and Ingelvac MycoFLEX[®] lead to less inflammatory reactions than other M. hyo and PCV2 vaccines. Thus selection of vaccines should be based on efficacy but also on their effect on piglets' well-being.



IMM-027

IN VITRO CHARACTERIZATION OF PRRSV ISOLATES WITH DIFFERENT IN VIVO PATHOGENICITY BY USING MONOCYTE-DERIVED MACROPHAGES

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Introduction

Porcine reproductive and respiratory syndrome virus (PRRSV) is classified in two genotypes: type 1 and type 2. Within these two genotypes, several isolates exist with different virulence and pathogenicity features. Recently, highly pathogenic (HP) isolates emerged causing severe economic losses. In this study the in vitro behavior of an Italian HP-PRRSV (PR40) was compared with other European PRRSV-1 strains, with different in vivo pathogenicity.

Materials and Methods

As previously described, in order to assess the PRRSV-1 strains infection ability and the induction of cytokine production we used monocyte-derived macrophages (MDMs) polarized with IFN- γ , IL-4 or IFN- β . Nine PRRSV-1 isolates were analyzed: two Italian strains, five Eastern European strains, and Lena and Lelystad as reference-strains for HP and low pathogenic (LP) PRRSV, respectively. MDMs were infected with 0.1MOI of each virus and 16h post-infection, cells were harvested for PRRSV-N protein detection by flow cytometry, while supernatants were collected for PRRSV titration and cytokine measurements by ELISA (IFN- α , TNF- α , IL1- β and IL-10).

Results

The different strains were able to infect MDMs, with the best efficiency in unpolarized M \emptyset and IL-4 treated MDMs, and the least in IFNs-treated. Lena showed the highest infectivity independently to the different MDMs treatments, compared to the other HP strains. Regarding the cytokines measurement, IFN- α and IL-10 were not detected in the supernatant of infected MDMs; moreover, the Italian PR40 strain was the only one that induced a significant release of TNF- α and IL1- β .

Discussion and Conclusion

The genome analysis of PR40 showed amino acid deletions in the nsp2 coding gene. The deletions in this gene may affect the strain virulence and the TNF pathway. Therefore, it could be speculated that the in vivo pathogenicity of the PR40 strain may be associated also to the enhanced production of TNF- α and IL1- β .

*The first two authors contributed equally.

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IMMUNOLOGY & VACCINOLOGY

IMM-028

EFFECT OF ID AND IM ADMINISTRATION OF A PRRSV MLV VACCINE IN PIGLETS ON APOPTOSIS-RELATED SERUM BIOMARKERS

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Introduction

PRRSV-infection can induce cell apoptosis both *in vivo* and *in vitro*. Soluble Fas-sFas/APO-1 is an inhibitor of apoptosis, while angiotensin II (AT-II) plays an essential role in the apoptosis. This study investigated the ID and IM administration of a PRRSV MLV vaccine in piglets on apoptosis-related serum biomarkers.

Material & Methods

The study included 104 piglets (2 weeks-wks of age) from a commercial PRRSV-positive pig farm (13x4 groupsx2 replicates); group A: IM vaccination with Porcilis®PRRS at 2 wks, group B: ID vaccination with Porcilis®PRRS at 2 wks, group C: ID placebo and group D: IM placebo. Blood samples were collected from the same 3 pigs/group/replicate at 4, 7 and 10 weeks of age. Sera were examined by qRT-PCR for PRRSV (type 1, 2) and by ELISA for sFas and AT-II.

Results

The qRT-PCR results for PRRSV at 4 wks were negative in all groups, at 7 wks only group A was negative and at 10 wks all groups were positive. No differences in sFas levels (pg/ml) were observed over time in vaccinated groups, while sFas levels increased in unvaccinated groups: C (4vs7wks:199.2±32.0vs329.3±35.4, 4vs10wks:199.2±32.0vs390.0±52.3, 7vs10wks:329.3±35.4vs390.01±52.3) and D (7vs10wks:271.8±76.7vs370.6±66.0). Significant differences among groups of sFas levels were noticed only at 10 weeks (A:293.9±49.8, B:281.7±56.8, C:390.0±52.3, D:370.6 ±66.0; AvsC, AvsD, BvsC, BvsD) and of AT-II at 7 weeks (A:0.26±0.5, B:3.44±6.1, C:0.55±1.0, D:17.6±18.4; AvsB, AvsD, BvsD, CvsD).

Discussion & Conclusion

In unvaccinated piglets, increased sFas levels reveal apoptotic suppression in comparison to vaccinated piglets. In the latter, vaccine-derived immunity limit the infection and may contribute to the reduced Fas expression, suggesting a weak induction of lymphocyte-mediated cytotoxicity. Finally, higher sFas levels were observed with ageing, possibly due to persistent PRRSV infection. The results suggest that AT-II maybe involved in the pathogenesis of PRRSV and especially in the induction of apoptosis in immune cells.



IMM-029

FIELD EVALUATION OF ID AND IM PRRSV MLV VACCINATION IN SUCKLING PIGLETS ON HEALTH AND PERFORMANCE

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Introduction

PRRSV vaccination is a potential strategy to reduce not only the virus shedding, but also the severity of respiratory signs of growing/finishing pigs. This field study evaluated the ID and IM vaccination in suckling piglets.

Material & Methods

The study included 187 piglets (2 weeks-wks) from a PRRSV-positive farm (11-12 x 4 groups x 4 replicates); group A: IM-vac with Porcilis®PRRS at 2wks, group B: ID- vac with Porcilis®PRRS at 2wks, group C: ID placebo, group D: IM placebo. Indicate when they were vaccinated. Blood samples were collected at 4, 7, 10, 13, 17 and 21 wks. Sera were examined by qRT-PCR for PRRSV (types 1 and 2) and by ELISA for PRRSV Abs. Local/systemic reactions, performance parameters (ADG), mortality, lung lesion (LLS) and pleurisy score (PS) were recorded.

Results

Based on qRT-PCR Ct results (0=negative, 1=weak positive-Ct \geq 35, 2=positive-Ct<35, \geq 25, 3=strong positive-Ct<25) category 3 was more frequent in non-vaccinated groups at 7, 10 and 13 wks. The analysis of ELISA and qRT-PCR results indicated that the ID or IM vaccination induces important seroconversion 2-5 wks after vaccination.

No local/systemic reactions were observed. ADG from admission of vaccination until slaughter was statistically improved in group B (A:0.75 \pm 0.01, B:0.74 \pm 0.01, C:0.72 \pm 0.01, D:0.71 \pm 0.01; BvsC-p=0.043, BvsD-p=0.043). The mortality rate at finishing stage (A:4.3%, B:2.3%, C:17.5%, D:17.9%; AvsC-p=0.039, AvsD-p=0.039, BvsC-p=0.015, BvsD-p=0.015) and totally from nursery to finishing stage (A:6.3%, B:8.5%, C:28.3%, D:32%; AvsC-p=0.002, AvsD-p=0.002, BvsC-p=0.007, BVsD-p=0.005), as well as the LLS (A:7.76 \pm 2.89, B:7.57 \pm 2.99, C:11.44 \pm 6.43, D:11.84 \pm 7.07; AVsC-p=0.001, AVsD-p=0.002, BVsC-p=0.001, BVsD-p=0.001) and PS (A:0.06 \pm 0.25, B:0.06 \pm 0.32, C:0.46 \pm 0.75, D:0.45 \pm 0.77; AVsC-p=0.001, AVsD-p=0.002, BVsC-p=0.001, BVsD-p=0.001) were significantly lower in vaccinated groups.

Discussion & Conclusion

Both ID and IM vaccination against PRRSV leads to a significant decrease of mortality rate and of respiratory disorders compared to non-vaccination. Moreover, ID vaccination has beneficial effects on protection against PRRSV viremia, equally with IM vaccination.



IMMUNOLOGY & VACCINOLOGY

IMM-030

DEVELOPMENT OF A MONOVALENT PIG VACCINE BASED ON A HUMAN PANDEMIC H1N1 (2009) STRAIN

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Introduction

Immediately after initial emergence in humans in 2009, pandemic H1N1 has now spread globally and represents a threat for global pig production by inducing economic losses worldwide. Based on a human virus isolate from 2009, IDT Biologika developed an inactivated full virus vaccine and gained market authorisation for Europe in 2017 under the name Respiorc® FLUpan H1N1. Primary aim for development was protection of the naïve swine population against pandemic Influenza virus. Pandemic influenza virus is considered as a zoonotic pathogen and hence development of the vaccine for use in pigs follows the One Health approach.

Material & Methods

In total, 77 influenza A seronegative pigs were vaccinated with Respiorc® FLUpan H1N1 at 53 to 56 days of life followed by a second vaccination 3 weeks later (injection dose= 1 ml, *i.m.*). Challenge strain was one of three different pandemic field virus isolates originating from different European countries with virus titres between 5.92 and 9.46 log₁₀ TCID₅₀. Challenge was performed 7 and 92 days after second vaccination according to European Pharmacopoeia.

Results

The vaccination with Respiorc® FLUpan H1N1 showed a significant decrease in viral lung load ($p=0.002$ to 0.056) and a significant reduction in viral shedding via nasal secret ($p < 0.0001$ to 0.0083). This translates up to 7943 fold reduction of viral lung load and up to 2986 fold reduction of viral shedding, respectively. Dyspnoea was relatively reduced by 44 to 99% in the mean cumulative score. All animals seroconverted on day 8 after 2nd vaccination.

Discussion

Vaccination with Respiorc® FLUpan H1N1 showed significant efficacy against three pandemic H1N1 field virus isolates from different European countries. Thus, Respiorc® FLUpan H1N1 is the appropriate tool to stimulate an active immunity in the European swine population against the widely present subtype pdmH1N1(2009).



IMM-031

EFFICACY OF RESPIPORC® FLUPAN H1N1 UNDER FIELD CONDITIONS

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Introduction

Due the lack of an efficacious vaccine against the globally spreading pandemic subtype of Influenza A virus in swine, IDT Biologika developed an inactivated full virus vaccine for use in pigs based on a human pandemic virus isolate from 2009. Proof of efficacy under field conditions is one requirement to achieve market authorisation by EMA.

Material & Methods

Administration of vaccine or placebo (NaCl) was performed at a commercial farm. In total, 39 pigs were injected at 53 to 56 days of life with either Respiorc® FLUpan H1N1 (n=19) or placebo (n=20) followed by a second vaccination 3 weeks later. Challenge of the pigs (n=39) was performed at infection unit at IDT Biologika headquarter. Inoculation dose was 9.39 log₁₀ TCID₅₀ of a heterologous pandemic H1N1 field virus isolate from Spain administered by nebulization. Primary efficacy parameters were reduction of viral lung load, nasal excretion, and clinical signs followed by seroconversion. Clinical investigations, blood and nasal swab sampling and necropsies including lung samplings were conducted in frame of ethical guidelines.

Results

Vaccinated animals showed significant reduction in viral lung load ($p= 0.002$ to 0.004) and highly significant reduction in viral shedding ($p < 0.0001$) compared to placebo group. Seroconversion was detected in all vaccinated animals 8 days post 2nd vaccination. Furthermore, clinical score dyspnoea was relatively reduced by 99% compared to placebo group in the mean cumulative score.

Discussion

This study shows that pigs vaccinated with Respiorc® FLUpan H1N1 under field conditions are protected against heterologous pandemic field challenge strain is the appropriate tool to stimulate an active immunity in the European swine population against the widely present subtype pdmH1N1(2009).

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IMMUNOLOGY & VACCINOLOGY

IMM-032

EVALUATION OF THE GENETIC DIVERSITY OF H1PDM INFLUENZA FIELD VIRUSES IN RESPECT TO RESPIPORC® FLUPAN H1N1

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Introduction

Since the emergence of pandemic H1N1 Influenza virus in the swine population in 2009 this subtype has established itself as endemic in swine. In contrast to pandemic H1N1 variant isolates in humans, which hardly undergo any change genetically, the swine isolates frequently undergo genetic events of drift and shift characteristic for Influenza A viruses.

Material & Methods

Field isolates of pandemic H1Nx (n=27) and nucleotide sequences of hemagglutinin gene (n=74) derived from the Influenza Research Database IRD were pairwise compared, phylogenetically analysed, and aligned in respect to their antigenic sides. For proof of efficacy of Respiorc® FLUpan H1N1 against different H1pdm virus isolates, isolates from different phylogenetical positions were chosen for challenge trials.

Results

Compared to the vaccine strain, pairwise comparison of the 101 available full length nucleotide sequences from pandemic H1 gene revealed nucleotide homologies of 95.5 to 99.8 percent (average = 98.1 percent) and amino acid identities of 95.5 to 99.8 percent (average = 98.5 percent). Phylogenetic analyses indicated genetic diversity without strong tendency of creating clusters. This is new as cluster building is commonly seen in non-pandemic subtypes of swine influenza viruses. One challenge strain with 96.2 na homology and 97.7 aa identity to the vaccine strain was positioned separately from the vaccine strain in the phylogenetic tree. Respiorc® FLUpan H1N1 showed significant efficacy with regard to viral shedding and vial lung load in all challenge trials including challenges with the heterologous field virus isolate. Additional benefit was the reduction of dyspnoea. In the heterologous challenge the reduction of dyspnoea was highly significant ($p < 0.0001$) with a relative reduction of 99%.

Discussion

In spite of genetic diversity of pandemic H1 isolates indicating frequent events of genetic drift and shift, efficacy of Respiorc® FLUpan H1N1 could be demonstrated in homo- and heterologous challenge trials.



IMM-033

SAFETY PROFILE OF THE NEWLY REGISTERED SWINE INFLUENZA VACCINE RESPIPORC® FLUPAN H1N1

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Introduction

Since the emergence of pandemic H1N1 in 2009, this subtype has become endemic in pigs. European Pharmacopoeia requires inter alia safety profile to gain market authorisation in Europe. Balance between broad efficacy and excellent safety is crucial in particular for inactivated vaccines. This abstract summarizes the safety profile data of Respiporc® FLUpan H1N1.

Material & Methods

In total, four registration trials were performed on 77 influenza seronegative pigs. First vaccination was performed between 53rd and 56th day of life followed by a second vaccination three weeks later. Pigs were systemically scored on alterations of temperature, systemic and local reactions at up to 10 different time points after first and second vaccination.

Results

In summary, all pigs showed a good general condition. A transient increase in rectal temperature occurred in less than 10% of the pigs after vaccination, but did not exceed 2°C and did not persist for more than one day. A transient swelling of up to 2 cm³ occurred in less than 10% of the vaccinated animals. The swelling resolved within 5 days. No other clinical signs or impairment of general condition was observed within 2 weeks after vaccination.

Discussion

In conclusion, Respiporc® FLUpan H1N1 meets the requirements of a safety profile as specified by the European Pharmacopoeia. Furthermore, the balance between good safety and efficacy is given using a highly efficacious and safe adjuvant. The same adjuvant is used in Respiporc® FLU3 showing the same good safety profile in pigs. Thus, Respiporc® FLUpan H1N1 is a vaccine that is safe for use in pigs from the age of 8 weeks following Good Veterinary Practise.

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IMMUNOLOGY & VACCINOLOGY

IMM-034

SIGNIFICANT REDUCTION OF PCV2-VIRAEMIA AND IMPROVEMENT OF PRODUCTION PARAMETERS DURING FATTENING FOLLOWING VACCINATION WITH A READY-TO-USE PCV MHYO VACCINE

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Introduction

In order to improve animal welfare and production processes, one-shot vaccines that are as effective as separate vaccination schemes, have been developed. The aim of the field trial was to compare efficacy of a combination PCV-Mhyo vaccine against another conventional PCV / Mhyo vaccine by measuring PCV2-virus reduction and production parameters under field conditions.

Material & Method

The study was done in a farrow-to-finish farm in Southern Germany. Piglets from 3 farrowing groups were randomly assigned to three groups: 142 piglets in group A were vaccinated with Porcilis® PCV M Hyo, 142 piglets in group B received CircoFLEX®/MycoFLEX® and 143 piglets in group C were left untreated. All piglets were weighed 3 times in regular intervals and blood samples were collected from 10 % of the animals before vaccination (T0) and in the middle of finishing (T1) to assess PCV2 viremia.

Results

PCV2-viraemia was significantly reduced in both vaccinated groups compared to the control group. At time T0, no PCV2 DNA could be detected. The average PCV2 antigen levels in group A at time T1 were significantly lower compared to the control group ($p > 0.0001$) and numerically lower than group B (not significant $p = 0.1979$). Average daily weight gain during the finishing period was significantly higher in group A (724g) compared to group C (692g; $p = 0.028$) and group B (713g; $p = 0.0311$). The Group A animals grew more uniformly than Group B and C animals, resulting in fewer fattening days.

Discussion and Conclusion

The results supported an acute PCV2-field infection during the study. Vaccination with a PCV Mhyo RTU vaccine effectively reduced PCV2-viremia and improved ADWG under field conditions. Since introduction of the vaccine, the animals are growing more uniformly and have improved health status.



IMM-035

DEVELOPMENT A POTENTIAL IMMUNOGENIC RECOMBINANT HEMAGGLUTININ-NEURAMINIDASE PROTEIN OF PORCINE RUBULAVIRUS

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Introduction

Blue eye disease caused by *Porcine rubulavirus* (PorPV) is an endemic viral infection of swine causing neurological and respiratory disease in piglets, and reproductive failure in sows and boars. The hemagglutinin-neuraminidase (HN) glycoprotein of PorPV is the most abundant component in the viral envelope and the main target of the immune response in infected animals. In this study, we expressed the HN-PorPV-recombinant (rHN-PorPV) protein in an *E. coli* system and analyzed the immune responses in mice.

Material & Methods

The HN gene was cloned from the reference strain PorPV-La Piedad Michoacan Virus (GenBank accession number **BK005918**), into the pDual expression vector. The rHN-PorPV protein concentration was quantified in a bio analyzer (Agilent Technologies, Inc. Copyright©). The immunogenicity of the rHN-PorPV protein was tested by inoculation of BALB/c mice with AbISCO-100® as adjuvant.

Results

The expressed protein was identified at a molecular weight of 61.7 kDa. Three-dimensional modeling showed that the main conformational and functional domains of the rHN-PorPV protein were preserved. The antigenicity of the expressed protein was confirmed by Western blot with a monoclonal antibody recognizing the HN, and by testing against serum samples from pigs experimentally infected with PorPV. Analysis of the humoral immune responses in mice showed an increased level of specific antibodies 14 days after the first immunization, compared to the control group ($P < 0.0005$).

Discussion & Conclusion

The results show the ability of the rHN-PorPV protein to induce an antibody response in mice. Due to its immunogenic potential, the rHN-PorPV protein will be further evaluated in pig trials for its suitability for prevention and control of blue eye disease.

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IMMUNOLOGY & VACCINOLOGY

IMM-036

SAFETY OF VEPURED® VACCINE IN TWO DAY OLD PIGLETS

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Introduction

The aim of this study was to evaluate the safety of VEPURED® under laboratory and field conditions.

Material & Methods

Laboratory study: Twenty-six healthy 2-day old piglets were randomly assigned to 2 groups. The piglets were either vaccinated intramuscularly with 1 mL of VEPURED® (n=13) or received 1 mL of PBS (n=13). General reactions (adverse reactions and mortality), local reactions, rectal temperature and productive data were monitored.

Field trial: A multicentre, randomised, placebo-controlled, clinical field trial was carried out in 1,769 2 - 3-day old piglets from five commercial farms. The piglets were either vaccinated intramuscularly with 1 mL of VEPURED® (n= 945) or received 1 mL of PBS (n=824). General reactions (adverse reactions and mortality) were monitored in all the animals included in the study. Local reactions, rectal temperature and productive data were monitored in 150 animals/group.

Results

Laboratory study: No general reactions related to the vaccination were observed during the study. In the evaluation of local reactions at the inoculation site, only mild inflammation was observed in two vaccinated piglets, which had disappeared at 48 hours post-vaccination. Statistical differences were not detected between the body temperature of the vaccinated and non-vaccinated groups. Furthermore, no statistical differences were observed between groups in the weight development of the piglets.

Field trial: No general reactions related to the vaccination were observed during the study. In the evaluation of local reactions, only mild transient inflammation at the injection site was observed in the vaccinated group. Mean rectal temperature in the vaccinated group increased slightly four hours after vaccination and returned to baseline values after 24 hours. Furthermore, no statistical differences were observed between groups in the weight development of the piglets.

Discussion & Conclusion

The results obtained in this study demonstrated that VEPURED® is safe when administered to 2-day old piglets.



IMM-037

CHEMICAL CLARIFICATION OF ORAL FLUIDS DOES NOT AFFECT PRRSV IGG ELISA

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Introduction

Routine surveillance using individual animal samples (serum, nasal swabs) is labor intensive and expensive. In contrast, oral fluids are easily collected and welfare-friendly. However, oral fluid often contains feed, feces, and other undesirable contaminants/particulates. Processing (filtration or centrifugation) of oral fluids is not practical in high-throughput laboratories, e.g., our laboratory performs 200,000 oral fluid tests annually. Alternatively, highly reactive chemicals (coagulants and flocculants) are used to clarify liquids in a wide variety of applications. The objective of this study was to determine whether clarification of oral fluid with one such chemical (chitosan) would affect PRRSV IgG antibody.

Methods

Oral fluids of known status were generated by vaccinating pigs (n = 17) with a PRRSV MLV vaccine. Individual pig samples were collected from day post vaccination -7 to 42 and subdivided into 4 aliquots. Each aliquot was treated with one flocculant formulation (A, B, C) with the 4th aliquot serving as an untreated control (NC). All samples were tested with a commercial PRRSV oral fluid IgG ELISA immediately after treatment (day post-treatment DPT 0) and then held at 4°C and re-tested on DPTs 2, 4, 6, and 14.

Results

Statistical analyses (Kruskal-Wallis and Cochran's Q tests) detected neither an immediate effect (DPT 0) nor residual effects (DPT 2, 4, 6, 14) of clarification treatments on the PRRSV oral fluid IgG ELISA quantitative (S/P) or qualitative (positive-negative status) results.

Conclusions

Clarification of oral fluids using chitosan-based formulations did not affect PRRSV IgG ELISA testing. These results suggested that chitosan (or other chemicals) could be used to clarify oral fluids without affecting antibody detection. This approach could be adapted for use in the field or used in the laboratory prior to testing. Further, this process may improve the handling of other diagnostic specimens, e.g. feces. Additional research is justified by these results.

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IMMUNOLOGY & VACCINOLOGY

IMM-038

REDUCTION OF THE PREVALENCE OF *BORDETELLA BRONCHISEPTICA* INFECTION IN PIGLETS AFTER SOW VACCINATION

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Introduction

Vaccination is one of the methods used for the prevention of bacterial diseases in domestic animals. Although non-progressive atrophic rhinitis (NPAR) caused by *Bordetella bronchiseptica* (Bb) is endemic in commercial pigs, little information about the effect of NPAR-specific vaccines is available. The aim of this study was to investigate the effect of vaccination on the prevalence of NPAR in a Spanish farm with Bb-associated disease.

Material & Methods

A farrow-to-nursery pig herd was selected and enrolled in a controlled clinical trial. Selection was based on clinical signs and laboratory results showing Bb infection in the nursery. Four pregnant sows were primo-vaccinated with RHINISENG® (V Group), and four received PBS (NV Group). The presence of Bb in nasal secretions was assessed by real-time PCR in sows and their offspring (4-5 piglets per sow) at 1, 7, 21, 46 and 67 days post-farrowing (dpf).

Results

All sows were Bb-negative prior to farrowing. However, Bb-positive piglets were detected in both groups from 7 dpf. The prevalence of Bb was significantly higher in both, NV and V groups, at 21 and 46 dpf (p -value <0.001). Similarly, the number of Bb-positive piglets per litter was lower in the V group than in the NV group. Finally, the piglets in the V group showed lower relative bacterial load than those in the NV group.

Discussion & Conclusion

Immunization of pregnant sows prior to farrowing reduced the prevalence of Bb, and the bacterial load in their offspring, as shown in this paper. This finding agrees with those previously published, pointing out that, although vaccination does not avoid bacterial colonization, it does reduce the Bb burden.

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IMM-039

EVALUATION OF THE EFFECT OF UNISTRAIN VACCINATION BY SERUMPROFILING AND ANTIBIOTIC USAGE

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Introduction

At a Dutch farm a recurrent respiratory problem appeared in the weaned piglets of 6 - 8 weeks. Clinical signs were coughing and diminished growth. Antibiotics were used to relieve clinical signs. Diagnosis was made by a serumprofile, collecting blood in various age groups. The result of the serumprofile made the farmer change his PRRS vaccination strategy. Evaluation of this strategy was executed by serumprofiling every 6 months.

Material & Methods

The serumprofiles consisted of bloodsamples from 6 gilts of 5 and 8 months, 1-st, 3-rd, 5-th and 7-th parity sows and also in piglets of 4, 7 and 10 weeks of age. The pathogens monitored were PRRS, App, Mycoplasma hyopneumoniae, Erysipelas, Parvo and Influenza. Collection data were Oktober 2016, March 2017 and Oktober 2017.

Results

In serumprofile Oktober '16 sows of different parities had high PRRS titers indicating a field infection, although mass vaccinated 4 times a year. Piglets were not vaccinated and titers were PRRS positive at 10 weeks. The vaccination strategy changed per November '16 towards 4 times a year mass vaccination of the sows and vaccination of the piglets with Hipra Unistrain Intradermal. Follow up with serumprofiles at March '17 and Oktober '17 showed lower average titers in the sows at various parities. In piglets, 10 weeks, average titers were negative (Graph 1). The clinical signs were diminished and also antibiotic use evaluated with 'Animal Daily Dosages' decreased since 1-12-16 (Table 1).

Discussion & Conclusions

Serumprofiles are usefull in the diagnosing process and in evaluating vaccination strategies. Important is to sample a large number of age groups with a reasonable number of samples. Than it gives an indication when a disease starts in a herd and the preferred vaccination moment. Also evaluation of antibiotic usage can show the effect of a change in vaccination strategy.

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IMMUNOLOGY & VACCINOLOGY

IMM-040

FIELD EXPERIENCE WITH AN INTRANASAL MUCOSAL PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS VACCINE DURING AN ACTIVE PRRSV BREAK

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Introduction

Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) remains to be one of the major pathogens in the swine industry worldwide. Recently an intranasal (IN) mucosal autogenous PRRSV vaccine, Barricade® PRRS has been made available. The objective of this study was to evaluate the efficacy of Barricade® PRRS during an active PRRSV break in growing pigs via comparison of mortality and morbidity.

Materials & Methods

In May 2017, a 2400 head sow farm located in the midwestern part of the United States was confirmed PRRSV positive with a 1-7-2 lateral challenge. Piglets were confirmed positive with weekly monitoring of the sow herd using PRRSV PCR detection. At 10 weeks post PRRSV break pigs in the Barricade® PRRS group were vaccinated IN at processing (5 days of age) with 1 ml Barricade® PRRS 1-7-2 strain and again at weaning (21 days of age) with 2 mls. The Barricade® vaccinated pigs (n=9929) averaging 21 days of age were weaned into a hotel style nursery site. The 1-7-2 Barricade® PRRS strain utilized was found to be 97% homologous to the 1-7-2 outbreak strain. Piglets were followed for an eight-week period with the objective of nursery mortality improvement. Secondary objective was reduction of antibiotic treatments.

Results

The Barricade® PRRS group had significantly lower mortality (0.5%) compared to average nursery mortality (5%). Farm protocol includes a controlled antibiotic program for prevention of secondary bacterial pathogens given at processing and weaning. Barricade® PRRS piglets did not require the antibiotic program.

Discussion & Conclusion

In this study, Barricade® PRRS pigs demonstrated more effective protection against PRRSV challenge than previous non-vaccinates as evidenced by significant reduction in mortality and morbidity. Resulting in more higher value pigs at the end of the nursery phase and elimination of antibiotic programs. Heterologous protection of Barricade® PRRS pigs was evident as well.



IMM-041

NO INFLUENCE OF MATERNAL ANTIBODIES ON PIGLET SEROLOGICAL IGM RESPONSE TO PCV2 VACCINATION

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Introduction

Several field cases in the Netherlands showed varying proportions of PCV2-IgM positive piglets at 3-5 weeks post vaccination (pv) with Ingelvac CircoFLEX (CF). A possible explanation for the variation in serological IgM results pv is the level of maternal antibodies (MDA), as in some studies apparently MDA interfered with the humoral immune response pv.

The aim of the study was to have an indication of the percentage of positive IgM results in the first weeks after CF vaccination, comparing high and low MDA, under field conditions.

Material and Methods

In a Dutch farm 26 sows parity 1 to 3 were classified according to their serological PCV2 antibody status: IgG positive (high MDA) and IgG negative (low MDA). In every litter 2 piglets of good condition were included and tested serologically at 2, 4 and 9 weeks of age (woa) for PCV2 IgG and IgM (Ingenasa) and by pooled PCR for PCV2. All piglets were vaccinated 1 ml CF at 2.5 woa. After weaning at 4 woa the piglets were placed into one nursery room.

Results

IgG response at 2 days before vaccination was seen in 75% of 'high MDA' piglets and in 4% of 'low MDA' piglets.

IgM response at 12 days after vaccination was seen in 50-73% of the piglets and at 50 days after vaccination in 0-4% of the piglets.

All samples were tested negative for PCV2 by PCR.

Discussion and conclusion

It has been repeatedly demonstrated that CF vaccination is efficacious also at high levels of MDA.

The IgG results of the piglets before vaccination reflect the sow's IgG status. After vaccination no difference in IgM response was seen between 'MDA high' and 'MDA low' piglets.

In this case we found no influence of level of MDA on the IgM response following Ingelvac CircoFLEX vaccination.

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IMMUNOLOGY & VACCINOLOGY

IMM-042

IMMUNOGENIC POTENTIAL OF A *SALMONELLA* TYPHIMURIUM LIVE VACCINE FOR PIGS AGAINST MONOPHASIC *SALMONELLA* TYPHIMURIUM DT 193

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Introduction

Monophasic *S. Typhimurium* (mSTm) strains derived from pork have an increasing zoonotic importance in humans. The *S. Typhimurium* (STm) live vaccine SALMOPORC (IDT Biologika GmbH) has proven to be successful in combating STm infections in pigs. This study aimed to investigate the immunogenicity and antibody response (IgM, IgA, IgG) after oral vaccination and infection with a virulent mSTm strain.

Material & Methods

Eight weaners were vaccinated twice orally at an interval of 3 weeks with 5×10^8 CFU of SALMOPORC. Non-vaccinated controls were kept likewise. Oral infection was done 3 weeks after the 2nd vaccination with 5×10^9 CFU of a virulent mSTm (DT 193) strain. Blood samples (serology) were taken before the vaccinations, before as well as 6/7 days post-challenge during necropsy. The immunogenicity was evaluated by the challenge strain content in ileal and caecal mucosa and ileocecal lymph nodes (CFU/g). Serum samples were analyzed to demonstrate *Salmonella*-specific LPS, IgM, IgA and IgG. Statistics were performed using the Wilcoxon-Mann-Whitney-Test ($p < 0.05$).

Results

Clinical symptoms, pathological lesions and the challenge strain content in the intestine and lymph nodes were significantly lower in vaccinated animals than in the controls. Antibody levels of LPS, IgA and IgG increased significantly after vaccination and in response to challenge. In contrast, IgM antibody levels only increased in the controls post challenge.

Discussion & Conclusion

Due to the vaccination clinical symptoms and pathological lesions were significantly milder. Vaccination also led to a significantly reduced challenge strain burden in the intestine and the lymph nodes which is comparable to previous studies using the same vaccine in a challenge with biphasic STm. Therefore, it is concluded that this vaccine induces immunity against STm and mSTm. Furthermore, the results of antibody profiles in response to vaccination and infection provide additional evidence for humoral immune mechanisms triggered during *Salmonella* infection or vaccination.



IMM-043

KINETICS AND IMMUNOGLOBULIN SUBTYPING OF MATERNALLY-DERIVED ANTIBODIES AFTER VACCINATION OF GILTS WITH A *SALMONELLA* TYPHIMURIUM LIVE VACCINE

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Introduction

SALMOPORC (IDT Biologika GmbH) is a *S. Typhimurium* live vaccine for pigs licensed for oral (piglets) and subcutaneous (sows) application. The antibody kinetics evoked by each administration route have been studied so far, but knowledge about the maternal transfer of antibodies, the transferred immunoglobulin classes and their respective kinetics during the first weeks of a piglet's life is lacking. This was therefore aimed to be investigated by this study.

Material & Methods

Seven pregnant gilts were subcutaneously vaccinated twice 6 and 3 weeks prior farrowing with 5×10^6 CFU of the vaccine SALMOPORC. Further 8 gilts received physiological NaCl (s.c.) at the same time points (control). Blood samples were taken from the gilts prior to each vaccination and after farrowing as well as weekly from two piglets per litter from their 1st until the 5th week of life. Colostrum was collected during farrowing. The samples were serologically analysed by ELISAs detecting *Salmonella*-specific LPS antibodies (Swine Salmonella Ab [IDEXX]) and the isotypes IgM, IgA and IgG [in-house ELISAs]. Statistics were performed using the Wilcoxon-Mann-Whitney-Test ($p < 0.05$).

Results

The vaccination of the gilts led to significantly increased *Salmonella* specific antibodies in serum and colostrum at farrowing. These antibodies were transferred to the offspring and showed decreasing amounts in the piglets. The antibodies were still detectable until 5 weeks after farrowing. The antibodies belonged primarily to the isotypes IgG and IgA.

Discussion & Conclusion

Salmonella-specific antibodies were induced by immunization of gilts with SALMOPORC and transmitted to the offspring by colostrum milk. Transfer of IgA and IgG might be of superior importance in providing immune protection during the first weeks of life. STM-specific IgM antibodies seem of minor importance.

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IMMUNOLOGY & VACCINOLOGY

IMM-044

EFFECT OF THREE ADJUVANTS USED FOR AUTOVACCINE PRODUCTION AGAINST ACTINOBACILLUS PLEUROPNEUMONIAE ON SEROLOGICAL PARAMETERS WHEN USED ON FIELD

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Introduction

Actinobacillus pleuropneumoniae (App) Autovaccine is complementary to the commercial vaccines in herds with recurrent troubles. Extent of inflammatory response and subsequent immunization is influenced by the chosen adjuvant. In this study, different formulations are assessed (with and without App antigen) in order to optimize safety without compromising immune response, in an infected farm environment.

Materials and methods

This controlled, randomized and blinded trial was conducted in accordance with GCP principles. One batch of 200 piglets was included on a commercial farm where an App autovaccine was usually administered (biovar 1, serovar 2). At 9 weeks, healthy subjects were randomized into 8 treatment groups: complete vaccines (App antigen and the 3 tested adjuvants - mineral oil, water based gel, and micro-emulsion) were administered to 3 groups, whereas 3 control groups received these adjuvants without antigen. One control group received only NaCl solution and another one the antigen solution with no adjuvant. Blood samples were performed on 10 animals per group on D0 -3, then D1, D3, D14, D28, D56, D84 and D112. Inflammatory response was monitored by ELISA PigMap and immune response by ELISA App serovar 2.

Results

At D1 and D3, significant differences in PigMap titres are found between all groups, the highest levels being observed with the first adjuvant (associated with Ag or not). Afterwards, titres became similar between groups.

At D14, the App antibody response is appearing for vaccinated animals, and at D28, the observed level for animals vaccinated with the first adjuvant has risen significantly when compared to control (antigen alone). Between D56 and D84, all groups show a marked seroconversion.

Discussion and Conclusion

Whatever the adjuvant, serological parameters after vaccination show an effective immune stimulation, with significant App-antibody response and a PigMap peak, particularly when mineral oil adjuvant is used.



IMM-045

SAFETY OF THREE ADJUVANTS USED FOR AUTOVACCINE PRODUCTION AGAINST ACTINOBACILLUS PLEUROPNEUMONIAE: A FIELD EVALUATION ON FATTENERS

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Among alternatives to antibacterial treatments, autovaccines remain a relevant customized solution in herds affected by *Actinobacillus pleuropneumoniae* (App). In this trial, different formulations are tested (with and without antigen) to assess secondary effects under field condition.

This controlled, randomized and blinded study was conducted in accordance with GCP principles. One batch of 200 piglets was included on a commercial farm where an App autovaccine was usually administered (biovar 1, serovar 2). At 9 weeks, healthy subjects were randomized into 8 treatment groups of 20 cases, sex, litter and weight being taken in account. Three complete vaccines (App antigen + the 3 tested adjuvants - a mineral oil (1), a water based gel (2), and a micro-emulsion (3)) were administered to 3 groups, whereas 3 control groups received these adjuvants without antigen. One placebo group received only NaCl solution and the last one the antigen solution with no adjuvant. A clinical follow-up was implemented on all included animals. Local reactions were monitored during 2 weeks after injections, and necks were assessed macroscopically and histologically after slaughter.

During the two weeks following DO, weight gain was not affected by vaccination. A significant increase in rectal temperature was observed between all groups, particularly with adjuvant (1) + Ag - more than 88.2 % of cases showing an increase above 2°C after 6 hours. Adjuvant (1) also had a significant impact on general state (+3h, +6h). Local reaction scores were significantly different from NaCl group for all groups. At 26 weeks old, histological lesion score on injection site showed no significant differences between groups.

All three tested adjuvants, combined with Ag or not, induce significant local and general reactions during first 24-48h, but have no long-term impact on growth and neck quality.

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IMM-046

LIMITATIONS OF USING HISTORICAL COMPARISON TO ASSESS VACCINE EFFICACY AND THE VALUE OF DIAGNOSTIC DATA

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Introduction

For many producers the only practical way to assess the impact of any change is by comparing the performance of successive batches of pigs. This example illustrates the potential limitations of this approach as well as the value of diagnostic data in aiding interpretation.

Material and methods

A Dutch farrow-to-finish farm (850 sows, 5000 finishers), changed its routine vaccination against PCV2 and *M.hypopneumoniae* from Ingelvac®Circo/MycoFLEX combination to Suvaxyn®Circo+MH RTU, primarily to reduce the labour of product mixing. The last batch of finishers vaccinated with Ingelvac (n=384) and the first group vaccinated with Suvaxyn (n=384) were compared. Blood samples were taken every 4 weeks for serology and pools were used for PCV2 qPCR. The respiratory distress index (RDI) was evaluated during the finishing period using sound monitoring (Soundtalks SOMO) and lung scores were checked at slaughter. Occurrence of clinical signs, anti-infective use and mortality were recorded.

Results

Neither group showed evidence of PCVAD or PCV2 viremia, but serology showed exposure of the Suvaxyn group to PCV2 in mid-finishing. There was no evidence of exposure in the Ingelvac group. Slaughterhouse checks showed gross lesions of enzootic pneumonia in the Ingelvac group, but the potential pathogen isolated was *Manheimia varigena*. The RDI during finishing was also higher in this group (peak 14.53); whereas there was no evidence of enzootic pneumonia in the Suvaxyn group and the peak RDI was 9.86.

Other parameters were similar and overall the producer considered the performance of both vaccines satisfactory.

Conclusion

Even using consecutive batches on the same farm, differences in disease challenge may impact the validity of historical comparisons. Regular diagnostic monitoring will at least help identify these and facilitate overall interpretation. Differences in RDI assessed using sound monitoring correlated with differences in lung lesions at slaughter and the technique appears interesting for the future.



IMM-047

SEROLOGICAL RESPONSE TO *M. HYOPNEUMONIAE* AFTER VACCINATION OF BREEDING GILTS WITH SUVAXYN® CIRCO + MH RTU OR PORCILIS® PCV M HYO AT 3 WEEKS OF AGE

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Introduction

Future breeding gilts are often vaccinated as piglets against both Circovirus and *M. hyopneumoniae*. Later, typically before moving at around 12 weeks of age, it may be desirable to confirm low or absent *M. hyopneumoniae* infection by demonstrating a negative serological titer. Any vaccine induced antibodies could interfere with this assessment.

The aim of this study was to evaluate the difference in serological reaction after vaccination with either Porcilis® PCV MHy or Suvaxyn® Circo+MH RTU.

Material and methods

On a Dutch farm producing breeding gilts and with an historically low incidence of *M. hyopneumoniae*, 13 animals from a batch vaccinated with Porcilis® PCV MHy and 13 from a batch vaccinated with Suvaxyn® Circo+MH RTU were bled at 3, 7 and 11 weeks of age. Titers against *M. hyopneumoniae* were determined by IDEXX ELISA.

Results

All 13 Suvaxyn® Circo+MH RTU vaccinated gilts showed high maternal derived antibodies when vaccinated at 3 weeks of age. Samples became mainly negative at 7 weeks and completely negative at 11 weeks.

Samples from all 13 Porcilis® PCV MHy vaccinated gilts also showed high maternal derived antibodies at 3 weeks. Samples at 7 weeks showed some declines (7/13) and some increases (6/13). At 11 weeks of age all blood samples showed higher titers than at 7 weeks.

Conclusion and Discussion

Circulating antibodies are not correlated with protection against *M. hyopneumoniae* but may still be induced by vaccination depending on the adjuvant used. The MetaStim adjuvant in Suvaxyn Circo+MH RTU is known to induce strong cell-mediated immunity but typically a minimal *M. hyopneumoniae* antibody response, although a strong anamnestic response is seen on subsequent challenge. Results confirm the absence of antibodies in non-challenged vaccinated pigs and likely lack of interference with later testing, in contrast to a vaccine containing a mineral oil adjuvant.

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IMM-048

SURVEY OF PORCINE LUNG LESIONS AT SLAUGHTER FROM BATCHES VACCINATED WITH DIFFERENT *MYCOPLASMA HYOPNEUMONIAE* VACCINES

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Introduction

Piglet vaccination against *Mycoplasma hyopneumoniae* (*M.hyo*) is an effective method to tackle enzootic pneumonia (EP), reducing clinical signs and improving performance. The aim of this study was to compare lung lesions at slaughter from pigs vaccinated with four different vaccines against *M.hyo*.

Material & Methods

From January 2016 to November 2017 15693 slaughter lungs were evaluated across Germany and Austria with Ceva Lung Scoring Methodology. Altogether 153 batches with a size superior to 30 lungs per batch were either assigned to the group vaccinated by Hyogen® (Ceva), One-Shot A, One-Shot B or Two-Shot A vaccines, with at least 20 batches per vaccination group. For each vaccine, mean lung values and incidences were recorded and compared statistically.

Results

The Hyogen® vaccination group had an EP-index of 1.013 (n=7413), group One-Shot A 2.622 (n=3730), group One-Shot B 2.569 (n=2630) and group Two-Shot A 2.106 (n=1920). Scar incidence was 8.19% for the Hyogen® group, 18.4% for group One-Shot A, 13.21% for group One-Shot B and 11.07% for group Two-Shot A. Cranial pleurisy was at 15.65% in the Hyogen® group, 19.80% in group One-Shot A, 20.19% in group One-Shot-B and 19.1% in group Two-Shot A.

Discussion & Conclusion

Under the conditions of this study the Hyogen® vaccination group showed the lowest EP index and also other EP-related indicators, suggesting that this vaccine induces superior lung protection in terms of *M.hyo* than the other three products. Similar results with this vaccine were previously reported from Spain. Furthermore, compared to the two-shot bacterin included in this survey, it requires less labour and is less stressful for the piglets.



IMM-049

EFFICACY OF THREE COMMERCIAL LIVE VACCINES AGAINST PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) IN WEANED PIGLETS

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Introduction

Vaccines against PRRSV are useful to: 1) reduce clinical signs, 2) improve zootechnical parameters and 3) decrease virus transmission. In the present study, the efficacy of three PRRSV1 live vaccines were compared in a PRRSV1 challenge model of weaned piglets.

Material and Methods

Sixty-four 4-week old piglets were distributed in four groups and intramuscularly vaccinated: A (Porcilis PRRS, MSD Animal Health); B (INGELVAC PRRSFLEX EU, Boehringer Ingelheim); C (UNISTRAN PRRS, Hipra Laboratories); and D (unvaccinated). After 36 days, namely 0 post-infection (PI), animals were challenged (PRRSV1 strain 3267). Body temperature, clinical scores (respiratory signs, behavior) and body weight gains (BWG) were recorded. Viremia was quantified (qRT-PCR). Antibodies were measured by ELISA and by viral neutralization test (VNT) using the vaccine virus of each group. Cell-mediated immunity (CMI) were measured by ELISPOT IFN- γ .

Results

The lowest accumulated clinical score corresponded to group A (A=16; B=41; C=46 and D=47). Fever was transient with differences on days 2-3 PI (A<B=C=D; p<0.05). Differences in BWG were noticed during 14 days PI (A=6.39^a; B=4.21^b; C=4.96^{ab}; and D=5.01^{ab}; p<0.05) but disappeared afterwards. The area under the curve for the viremia was reduced significantly in vaccinated groups compared to controls (p<0.05). The highest ELISA S/P ratios were measured in C. On day 0 PI, the average VNT titers were different between groups (log₂ A=4.37^a; B=1.98^b; C=2.57^{ab}; p<0.05). CMI differences were observed between groups A and C (A=47.2 ± 17.9 > C= 31.4 ± 5.9 at day 0 PI, and A=35.0 ± 3.4 > C= 26.7 ± 12.2 at day 7 PI; p<0.05).

Conclusion

All three vaccines afforded partial protection against the heterologous challenge and although vaccine A provided better clinical protection, reduction of viremia was similar for all vaccines. The highest CMI was induced by A and B while VNT titers were highest in A and C.



REPRODUCTION

REP-001

INFLUENCE OF TRANSPORT TEMPERATURE IN SEMINAL DOSES: BTS VS LONG TERM EXTENDERS

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The transport temperature of boar semen doses is a critical factor to maintain an optimum seminal quality until the artificial insemination time. The spermatozoa metabolism decreases at 16°C, which favors the preservation of viability for a longer period. Extenders should protect and buffer the harmful effects (capacitation, decrease mitochondrial activity, apoptotic process,...) of temperature changes during transport and storage in sperm cells of seminal doses for an optimal fertilizing capacity. The objective of this study is to evaluate the protective effect of the extenders BTS vs. Long-term against the influence of the transport temperature of seminal doses.

10 ejaculates from 10 different boars were extended each one with BTS and two different long-term extenders (A and B) in 2 different artificial insemination centers. They were transported to Magapor and the temperature during the process was recorded. To evaluate sperm quality, several parameters including viability, mitochondrial potential, acrosome integrity and early apoptosis by flow cytometry and motility by CASA system were analyzed at the reception.

Samples extended with BTS showed significant differences in the doses that had temperature changes during transport in all analyzed parameters: less motility (80% vs. 92%, 91%), viability (75% vs. 94%, 92%), mitochondrial potential (80% vs. 93%, 90,6%), higher percentage of reacted acrosome (27% vs. 9%, 10%) and higher percentage of early apoptosis rate (20% vs. 7%, 9%) (BTS vs. A, B). In doses with continuous transport temperature there are no significant differences although the seminal quality parameters were worse with BTS.

Our results confirm that long-term extenders preserve the seminal quality of the doses in better conditions, in addition to avoiding the sperm damage produced by the temperature changes that may occur during transport. This is due to a better antioxidant and protective capacity of these extenders also in short periods of time.



REP-002

POST MORTEM ANATOMICAL STUDY OF BOARS TESTICLES ELIMINATED FROM ARTIFICIAL INSEMINATED CENTERS

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Introduction

Post-mortem collection of boar genitalia in the slaughterhouse and its later study in the laboratory is a useful diagnosis tool for the veterinarian. In the past several years, an increase of slaughtered young boars due to bad semen quality has been recorded. This fact worsens the animal amortization and decreases the productive capacity of the boar stud because they are slaughtered long before the end of their useful life. The aim of this study was to analyze the relationship between anatomical-histological study (through in vivo biopsies) and reproductive problem or semen quality able to make an early diagnosis of treatable diseases, thus increasing the boar retention rate.

Materials and Methods

100 testes from boars were collected in the slaughterhouse. Boars were culled due to the bad quality of their ejaculates, disease or genetic progress. The following parameters were assessed: macroscopic examination, histological evaluation and testes biopsy.

Results

From the 100 boars, 85% were slaughtered due to bad semen quality (abnormal forms, or low volume/concentration) or libido, 5% due to lameness and 10 % due to genetic progress. In 90% of cases, macroscopic lesions were identified. Most common lesions were oedema, inflammation, fibrosis and varicocele. The epididymis was the most frequently injured area. The microscopic study of injuries found is essential to confirm the macroscopic diagnosis.

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REPRODUCTION

REP-003

DYNAMIC CHANGE OF FUNCTIONAL MAMMARY GLANDS IN DIFFERENT PARITIES IN A HERD OF HIGHLY PROLIFIC SOWS

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Introduction

The number of functioning mammary glands (FMGs) is vital in highly prolific sow herds.

Materials and methods

A total of 2468 farrowings of 588 sows with at least two farrowings in the test period were evaluated. The distribution of farrowings was as follows (parity/number of sows): 1/588; 2/588; 3/470; 4/347; 5/232; 6/140; 7/68; 8/23; 9/10. The functionality of mammary glands was evaluated by hand milking during or just after farrowing. Blind, inverted, short and pin teats as well as MGs with any mastitis or oedema were regarded as non-functioning. Regression analyses were performed by GraphPad Prism 7.03 (GraphPad Software Inc.) using a second-order polynomial (quadratic) equation ($Y=B_0 + B_1 \cdot X + B_2 \cdot X^2$).

Results and discussion

Regression analyses revealed that the number of FMGs slightly decreased up to the fifth parity (about 14 FMGs/sow) and after that it increased again ($R^2=0.84$). The number of live-born piglets increased from 13 to 14 up to the fourth parity and decreased to about 12 by the 8th-9th parity ($R^2=0.80$). Thus, in the early and late life of sows there is a surplus of FMGs. Despite the equalisation of litters to 14 the number of weaned piglets follows the curve of live-born piglets ($R^2=0.71$) but it is about two less. At each farrowing we counted the sows whose FMGs decreased (parity/% of sows: 2/12.6; 3/14.9; 4/11.5; 5/11.2; 6/14.3; 7/10.3; 8/13.0; 9/20) or increased (parity/% of sows: 2/9.9; 3/11.1; 4/10.9; 5/12.5; 6/11.4; 7/7.4; 8/8.7; 9/10.0). Our data show that altogether about 20 percent of the sows showed an increase or a decrease in the number of FMGs.

Conclusion

On herd level the increases and decreases in the number of FMGs were almost equalised. The underlying mechanisms and especially the pattern of weaned piglets' number need further investigations.



REP-004

THE EFFECT OF CLOPROSTENOL AND CARBETOCIN IN FARROWING INDUCTION

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The induction and synchronization of parturition in sows is an habitual practice carried out in many commercial farms to improve and attend sows' farrowing process. The aim of this study was to evaluate the effects of cloprostenol (PGF-Veyx*) and carbetocin (Hypophysin*) in order to concentrate the maximum number of births. This practice increases farrowing assistance in favour of reducing stillborn piglets, improving the colostrum intake and increasing the transference of passive immunity reducing the pre-weaning mortality. A total of 342 sows were randomly divided in three groups: A) Control group= sows without treatment; B) Treatment group= sows treated with cloprostenol and carbetocin, C) PGF group= sows with onset of birth after injection of cloprostenol prior to receiving carbetocin. Animals from group B and C received 2ml/animal (intramuscular) of cloprostenol around 24 hours before the expected farrowing date (day 114 of pregnancy). Animals from group B also received 0.5 ml/animal (intramuscular) of carbetocin between 21 and 24 hours after cloprostenol administration. No differences were found among different groups in total born, live-born piglets and mummified pigs. Neither differences were reported in piglet mortality during the first 48h. However, pigs treated with carbetocin presented fewer stillbirth compared with control group ($p < 0.001$). Furthermore, farrowing duration was shorter in animals treated with carbetocin compared to control and PGF group ($p = 0.01$ and $p = 0.04$ respectively).

In conclusion, when cloprostenol (PGF veyx) and carbetocin (Hypophysin) are administered to the animals, farrowing becomes shorter and more synchronized, simplifying the assistance. Thus, together with good farrowing practices, pre-weaning mortality can be reduced.

*Marketing Authorization Holder: Veyx pharma, Schwarzenborn, Germany; distributed in Spain by Ecuphar, Barcelona, Spain.

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REPRODUCTION

REP-005

HIGH NUMBERS OF STILLBIRTHS CAUSED BY AN UTEROTONIC AGENT DURING FARROWING

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Introduction

A good target level for stillbirths per litter varies between 5-7% of total born piglets in hyper-prolific sows. Large litter size, duration of farrowing, uterotonic agents and infections have been described being major risk factors for increased percentage of stillbirths.

Material & Methods

A piglet-producing herd suffered from an increased stillbirth rate of 8.7%. A herd examination was conducted to reveal the general health status of the herd. The birth process of ten sows was analysed for birth management, total duration of birth and duration of piglet expulsion. Each piglet was scored for meconium staining and vitality. In addition, material from stillborn and weak-born piglets was subjected to further examinations.

Results

The general physical examination of the sows before farrowing revealed no abnormalities. During parturition, all sows routinely received an intramuscular treatment of 35 µg carbetocin, which caused a prolonged piglet-to-piglet interval directly after application, loss of colostrum and an increased number of weak and stillborn piglets. Histological examination of five heart samples of stillborn piglets was without findings. Moreover, a qPCR for porcine circovirus type 2 on these samples was negative. Serology on pre-colostral serum samples of one litter with a mummified piglet was negative for porcine parvovirus. Porcine reproductive and respiratory syndrome virus was excluded by PCR examination of the serum of ten weak-born piglets. After stopping the routine treatment with carbetocin and improving the birth management, the level of stillbirths decreased to 4.6%.

Discussion & Conclusion

Herd problems with stillbirths require a comprehensive herd investigation including monitoring the birth management and ruling out potential pathogens. In this case, the administration of carbetocin during parturition led to severe undesirable side effects. A good monitoring during the farrowing process combined with appropriate measures and the omission of prophylactic carbetocin administration enhances the birth process and thereby piglets' survival.



REP-006

INTEREST OF QPCR FOR THE CONTROL OF *MYCOPLASMA SUIS* INFECTION: A FRENCH CASE STUDY

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Objective

Mycoplasma suis (Ms) is endemic in pig herds. It affects all physiological stages and causes infectious anemia.

The aim of this present study was to investigate Ms infection in swine herd using quantitative PCR test.

Materials and methods

A 1000 sows breeding herd was included because of evocative clinical signs of MS infection at farrowing (fever, vaginal discharges, dysgalactia and neonatal diarrhea). Before inclusion, the farm was PRRSV, *Mycoplasma hyopneumoniae* and *Leptospira* negative.

Forty gilts and parity 2 and 3 sows were blood sampled one week before farrowing in order to diagnose Ms infection using qPCR before (N=20), and after the implementation of control measures (N=20). Analytical and technical results were monitored on 5 treated (TB) and 5 not treated batches (NTB) representing respectively 431 and 446 sows.

Results

All the samples were Ms qPCR positive before treatment. Contamination level ranged from 1.1 10⁶ to 6.3 10⁸ copies per ml of total blood.

Doxycycline (12.5mg/ kg of body weight) was administered *per os* to the sows during 2 weeks from 93 to 107 days of gestation. The farmer was recommended to use one needle per sow and to improve the hygiene level of all injection materials. 18 out of 20 samples after treatment returned Ms negative. 2/20 were weakly positive, below the quantification limit. At the same time, the percentage of losses on born alive piglets dropped sharply (from 15.5% in NTB to 11.7% in TB). We did not see any difference in percentage of mortinatalities (8.4% and 8.6% respectively).

Conclusion

Clinical importance of Ms is still questionable. In this study, qPCR was used for successful detection in a sow herd and evaluation of the control measures efficacy. This new diagnostic tool could help practitioners to investigate different aspects of Ms infection in pig herds. Further investigations are ongoing.

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REPRODUCTION

REP-007

COMBINED USE OF REGUMATE® AND PORCEPTAL® IN MULTIPAROUS TO MAINTAIN THE ORGANIZATION IN FARMS WITHOUT HARMING THE PRODUCTIVE PARAMETERS

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Introduction

Swine fertility and prolificacy is affected worldwide due to short lactation length, hormonal control is widely used by swine industry to reduce these reproductive problems. The aim of this study was to evaluate an altrenogest short-term treatment (5 or 9 days) during the last days of lactation, in sows that need a pre-weaning (avoid short lactation) and combined with Fix Time insemination (FTI) to synchronize ovulation and grouping farrows to keep reproductive performance and farm organization.

Material & Methods

The study was performed in a two-site pig farm with 3 weeks batch management, 800 breeding sows. A total of 127 sows were randomly selected and distributed in two groups at farrow: Group 1, control (C) treated with altrenogest (Regumate®) during 5 or 9 days before weaning, the treatment finish at weaning (64 sows) and Group 2 (RP) where sows were treated with altrenogest (5 or 9 days) and when the sows finished the treatment, these sows were injected with buserelin (Porceptal®) 120 hours post altrenogest treatment, and were inseminated with only one semen doses (FTI) at 30 hours post buserelin treatment (63 sows).

Results

There were no significant differences in the farrowing rate (C) 85.9% vs (RP) 74.6% $p=0.108$ (inside RP group sows with 5 days in altrenogest treatment had 94.4% $p=0.026$). Total Born in control group (C) were 14.07 vs 14.13 piglets in RP group, total weaned in C were 9.41 vs 10.13 in RP group $p>0.05$. Gestation length had statistical differences (C) 116.34 days vs (RP) 115.36 $p=0.003$. Grouping of farrows in the working days (Monday, Tuesday, Wednesday) was 65.4% in C vs 76.7% in RP, and during the weekend 23.7% in control group vs 10.7% in RP group. In RP group were used 1.1 doses of semen vs 2.5 in C group.

Discussion & Conclusion

Due to the combined use of altrenogest and buserelin it was possible to maintain the batch management and the productive parameters despite performing very early weaning in some sows of each batch, It was obtained better results with only 5 days altrenogest treatment than with 9 days. Gestation length in RP group was significantly different because in this group you inseminate only one day all the sows versus 2-3 times in control group. In addition were obtained some FTI advantages as saving of semen and grouping of farrows in working days.



REP-008

EVALUATION OF REPRODUCTIVE PERFORMANCE OF FIXED TIME ARTIFICIAL INSEMINATION VERSUS CONVENTIONAL MULTIPLE INSEMINATION PROTOCOL IN IBERIAN GILTS

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Introduction

The aim of this study was to compare the efficacy of a FTAI program using Buserelin 4µg/ml (Porceptal®, MSD Animal Health) and conventionally based estrous insemination on reproductive performance in commercial Iberian gilts during favorable season.

Material and Methods

Sixteen nuliparous gilts (Iberian x Duroc breed, located in a commercial farm in Badajoz, Spain) were included in the study and were randomly assigned to Control (CG, n=8) and Proceptal group (PG, n=8). Gilts were treated with 20 mg of altrenogest [5 ml of Regumate® oral solution (0.4%)] from D-18 to D1. In CG, estrus was reviewed once a day from D4 until heat onset and two AI were done at 4 and 24h after estrous detection. PG were treated with 2.5ml of Porceptal® (i.m. 10µg buserelin) 131±3h after DO, and were FTAI 30-33h later. Females with estrous behavior before FTAI or not showing estrus at insemination were identified and excluded from the study. Pregnancy rate, gestation length, and farrowing data were recorded.

Results

Pregnancy rates were not different between groups (CG: 100% vs PG: 100%) (p >0.05). Gestation length of P dams was almost 2 days lower than in C ones (111.0 ±0.18 d vs 112.8 ±0.16 d, respectively, p <0.001). Both CG and PG had the same farrowing rate (100%). Total born was 6.1 ±0.57 (CG) vs 6.8 ± 0.55 (PG), while stillborns trended lower in PG compared to CG (0.1 ±0.08 vs 0.5 ±0.22; p<0.1).

Conclusions

Although pregnancy rates or farrowing rates were not different between groups, gestation length was shorter in Porceptal® than control gilts. Total number of piglets delivered was also not different between groups, but Porceptal® gilts tended to have lower number of stillborn piglets than control gilts.

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REPRODUCTION

REP-009

EVALUATION OF REPRODUCTIVE PERFORMANCE OF FIXED TIME ARTIFICIAL INSEMINATION VERSUS CONVENTIONAL MULTIPLE INSEMINATION PROTOCOL IN IBERIAN SOWS

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Introduction

The aim of this study was to compare the efficacy of a FTAI program using Buserelin 4µg/ml (Porceptal®, MSD Animal Health) and conventional based estrous insemination on reproductive performance in commercial Iberian sows during favorable season.

Material and Methods

A total of 42 multiparous sows (Iberian x Duroc breed, located in a commercial farm in Badajoz, Spain) were included in the study and were randomly assigned to Control (CS, n=21) and Porceptal group (PS, n=21). Sows were weaned on D0. In CS, estrus was checked once a day from D4 until heat onset and two AI were done at 4 and 24h after estrous detection. PS were treated with 2.5ml of Porceptal® (i.m. 10µg buserelin) 135±3h after D0, and were FTAI 30-33h later (a single AI was performed). Females with estrous behavior before FTAI or not showing estrus at insemination were identified and excluded from the study. Pregnancy rate, gestation length, and farrowing data were recorded.

Results

Pregnancy rates were not different between groups (CS: 86.6% vs PS: 81.6%; p >0.05). Gestation length of P dams was almost 2 days lower than in C ones (111.0 ±0.18 vs 112.8 ±0.17 d, respectively, p <0.001). Farrowing rate was not impacted by treatment (CS: 84.4% vs PS: 78.9%) and prolificacy was also not different (total born CS: 6.2 ±0.38 vs PS: 6.6 ±0.42 piglets; p>0.05). Piglet weight at birth from PS was significantly higher than CS (P<0.05) while no differences were observed in the intra-litter coefficient of weight variation (P>0.05).

Conclusions

Although pregnancy rates or farrowing rates were not different between treatments, gestation length was shorter in Porceptal® compared to control sows. Number of total piglets delivered was not different between groups, but piglet weight was higher in the Porceptal group.



REP-010

FIXED TIME INSEMINATION EFFECT ON THE CHARACTERISTICS OF HYPERPROLIFIC SOW PROGENY

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Introduction

After optimizing seminal doses production, the next step in reproduction is applying fixed-time insemination programs to obtain greater profitability at insemination time by reducing labour costs, number of seminal doses and increasing reproductive performance. The aim of this study was to evaluate a single fixed-time artificial insemination program (FTAI) with buselerin and measure effect on litter performance.

Material & Methods

The trial was conducted in a 5,000 sow farrow-to-finish farm in Zaragoza (Spain). A total of 305 multiparous sows and 2,500 piglets were evaluated. Sows were randomly allocated in two groups every week (during 12 weeks): Control group (C) - the estrus was detected after weaning, at 12 hours post estrus 1st Artificial Insemination, at 24h the 2nd insemination and if estrus continues at 48h, the third insemination is received; Treatment group (P) was treated with Porceptal® to induce ovulation at 75 hours after weaning followed by a single FTAI at 30 hours after Porceptal®. At birth 1195 piglets in P and 1337 in C (76 litters in P, 81 in C) were identified with individual tags and weighed in different productive moments: at birth, weaning, nursery and fattening. Reproductive data and weights were compared with Mann-Whitney U Test of Levene and ANOVA.

Results

Fertility (C 93.6%, P 93.2%; $p=0.9$) and total born piglets (C 18.93, P 17.75; $p=0.233$) were not statistically different between groups. Birth weight (Kg) was significantly higher in P (C 1.33, P 1.365; $p<0,001$) but intra-litter coefficient of weight variation was not different ($P>0.05$). Weight at end of nursery was significantly higher in P than C (C 11.53, P 12.42; $p<0.010$), while weaning (C 5.2, P 5.4; $p=0.277$) and fattening (C 50.78, P 53.14; $p=0.6$) weight were only numerically different. Total mating cost per sow was less in P than C (C 5.62€, P 5.22€).

Discussion & Conclusion

Birth and nursery weight were significantly higher in P and birth weight distribution in P tended to be concentrated in higher weight categories in comparison with C. FTAI allows us to know the genetic value of each boar through evaluation of the productivity parameters of their offspring.



REPRODUCTION

REP-011

FIXED TIME INSEMINATION, A REALITY IN THE PROGRESS OF REPRODUCTION

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Introduction

After more than a decade of research, Fixed-Time Insemination (FTI) in swine is now a reality via the use of GnRH analogues (Porceptal®) that induce ovulation at a precise time, to allow high fertility and prolificacy rates from a single, well-timed AI.

Material & Methods

The trial was conducted in a 1,800 Hermitage genetics sow farm in northeastern Spain. For 3 consecutive weeks, weaned sows were divided into two groups randomized according to the cycle number (C: Control and P: Porceptal), in total 96 sows were studied in group C and 95 in P. Weaning age averaged 24 days. Group C followed the standard farm procedures for estrus control and insemination and group P was treated with Porceptal® at 83-89 hours after weaning followed by a single FTI at 30-33 hours after Porceptal® treatment.

Different reproductive parameters were reviewed (Interval Oestrus Weaning, fertility, prolificacy, average gestation days, grouping of farrowings, number of inseminations).

Results

The number of inseminations was significantly lower in group P 1.1 vs C 2.4, fertility was similar in both groups (90.63 C vs 90.53 P; $p > 0.05$), prolificacy was also similar in both groups (14.16 C vs 14.04 P; $p > 0.05$) despite the fact that in the previous parturition the mean prolificacy for these sows was 14.69 P vs 15.48 C.

Discussion & Conclusion

Porceptal® can be a very useful tool in FTI programs in large farms, considering that fertility and prolificacy are similar to standard multi-insemination programs. FTI demonstrated other benefits such as: semen savings, grouping of farrowings, reduction of non-productive days and efficiency in the farm organization and management.



REP-012

LOW WATER INTAKE IN GESTATION MAY AFFECT PIGLET VIABILITY

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Introduction

Data from our research centre reflect large variation in individual water intake in gestating sows (2.2 to 20 L/d, 6.6 L/d average in 364 sows), and suggest that this may affect piglet survival. Sows with high intake (> 8 L/d) had similar litter size (15.3 vs 15.3 and 15.0 total born), but piglets with higher birth weights (1431 vs 1362 and 1353 g), compared to sows with average (4.5 to 8.0 L/d) and low intake (< 4.5 L/d), respectively. This paper presents preliminary data on the effect of Selko-pH, a blend of organic acids that improves gut health but also increases water intake, on reproductive performance.

Material and Methods

Mixed parity Hypor sows received normal, QA tested, mains water (n=33; pH=7.77), water with 0.1% (n=20; pH=3.87), or 0.2% (n=17; pH=3.63) Selko-pH, from day 80 of gestation until farrowing. Individual water intake was monitored daily. Feed allowance was equal across treatments. Born alive and birth weights are presented as LS-Means corrected for total born. Data for 0.1% and 0.2% Selko-pH were pooled.

Results

Average water intake was 6.8 L/d in control sows, and was clearly increased (P<0.01) at 0.1 % (16.1 L/d) and at 0.2 % (24.3 L/d). Born alive (14.1±0.3 vs. 14.4±0.3) and litter birth weight (19.4±0.6 kg vs. 20.0±0.5 kg) for controls and Selko-pH, respectively, were not significantly different. However, when sows were pooled based on their water intake (<6L/d vs 6-15 L/d vs >15 L/d), sows with lowest intake tended to have less born alive (P<0.12) compared to sows with high intake (13.8±0.3 vs 14.4±0.3 vs 14.5±0.3, for L, M, and H). Litter birth weight for sows with low intakes also tended to be lower (P<0.08) than for sows with high intakes (19.1±0.7 vs 19.3±0.7 vs 20.8±0.7 kg, for L, M, and H). Proportion of piglets <1000g (12%) was not affected by treatment or water intake.

Discussion and Conclusions

Low birth weights are known to be related to increased mortality at birth and preweaning. Our data show that low maternal water intake in gestation may have impact on birth weight and survival. There were no differences between treatments, which may be due to the large variation in water intake, even within treatments.

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REPRODUCTION

REP-013

VARIATION IN BOAR FERTILITY IN A MIXED SEMEN EXPERIMENT

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Introduction

Boars fertility can be a serious problem in pig production. Numerous studies compared the effects of individual boars on a herd or between herd levels. Unsystematic effects, however, like herd, sow, season etc. impede the accuracy of the boars' fertility estimation. Mixed insemination can increase the total number of piglets in litters, because temporary unfavourable conditions of single boars can be absorbed by a second or further boars in the field. It remains unclear, if besides this positive effect, the assertiveness of distinct boars might be reduced in some combinations. Aims of the present study were to estimate the variability of boar fertility and interactions between semen from different boars under the extensive exclusion of environmental effects in a mixed insemination model.

Material & Methods

Twentyseven sows were inseminated with mixed semen of two out of four boars from two distinct boar-lines. Semen was produced, diluted and mixed on a commercial German stud boar station. Mixing was done to guarantee equal numbers of motile spermatozoa from each boar. Sows were heat oriented inseminated with a SafeBlue® Foamtip insemination catheter. Paternity of any born piglets was detected by microsatellite analysis.

Results

The percentage of piglets in a litter originating from individual boars varied between 0 and 100%. Effects for a boar with low assertiveness were lowest in combination with semen of boars with high fertility. Fertility of boars correlated with spermatological parameters of their ejaculates. Differences in assertiveness between the two boar lines showed significant genetic effects.

Discussion & Conclusion

The mixed insemination model with consecutive paternity analysis of the piglets is a well suited method to directly compare effects of boars under exclusion of unsystematic environmental effects. Differences in fertility and assertiveness were outstanding between boars, although the mixing process guaranteed equal numbers of motile spermatozoa for each boar.



REP-014

A CASE REPORT COMPARING THE TREATMENT EFFECT OF GAMITHROMYCIN AND AMOXICILLIN IN A DANISH SOW HERD INFECTED WITH CHLAMYDOPHILA PECORUM

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Introduction

Chlamydophila Pecorum infections are sometimes causing reproductive problems in Danish sow herds. The case herd had reproductive problems and Chlamydophila pecorum was found in still born / fetuses. An alternative treatment, gamithromycin, was given to a smaller group of sows to compare a standard treatment with amoxicillin.

Gamithromycin was chosen, because it is comparable to azithromycin, often used in human cases of Chlamydia.

Material & methods

Design: Side-by-side study with 17 sows in the treatment group treated once with 6 mg/kg gamithromycin before weaning and 37 sows in the control group treated once with 28 mg/kg amoxicillin after farrowing.

The sows were followed until the next farrowing. The effect was evaluated for each sow comparing the results from the farrowing before treatment with the farrowing after treatment.

Results

The farrowing rate was 94.12 % in the gamithromycin group and 86.49 % in the amoxicillin group.

The mean number of total born in the gamithromycin group raised with 2.63 pigs pr. litter, whereas the mean number of total born in the amoxicillin group raised with 1.91 pigs per litter.

In the gamithromycin group the mean number of liveborn raised with 2.75 pigs per litter after treatment. This difference was statistically significant ($p=0.011$). The mean number of liveborn in the amoxicillin group raised with 1.62 pigs per litter.

The mean number of stillborn pr. litter decreased with 0.12 in the gamithromycin group, whereas the mean number of stillborn in the amoxicillin group increased with 0.28 pigs per litter.

Discussion & Conclusion

This case report from a Danish sow herd showed good results using gamithromycin against Chlamydophila Pecorum infection. The results indicate that the alternative treatment with gamithromycin might have better effect than the standard treatment with amoxicillin.

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REPRODUCTION

REP-015

EFFECTS OF POST-PARTUM ADMINISTRATION OF DINOPROST ON SOWS HEALTH PARAMETERS

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Introduction

Benefit of using prostaglandins for farrowing induction is well known, post-partum use and its positive effect is less frequently discussed. Aim of the presented study was to evaluate an effect of dinoprost- Enzaprost® (Ceva) administration post-partum established based on clinical index score.

Material and Method

Study was conducted on large scale farm located in Northwest Italy on 88 sows with randomisation stratified by parity (2nd -13th parity). Group A (n= 45 sows) treated by dinoprost (Enzaprost) according to manufactures recommendation and group B (n= 43 sows) not treated. Sows were examined on day 2 after treatment and following parameters were recorded: rectal temperature, feed intake, respiratory rate, vaginal discharge, inflammation of mammary gland and milk flow. Final score was calculated as sum of parameters based on Hirsch and collective, 2003.

Results

No statistical difference was observed in between the groups, but treated sows (A) showed numerically better score in all parameters. The biggest difference was reported in degree of mammary inflammation- 81, 8% sows (A) and 69% animals (B) with optimal score 1 (no signs of inflammation). Detailed analysis based on parity distribution showed positive impact of treatment mainly on 5-6 parity sows, with significant reduction of mammary inflammation (P= 0,009) with improvement of milk flow. Significant effect of treatment on occurrence of vaginal discharge was reported on sows with 5 or more uterine explorations (n= 13) (P= 0,026) and improvement of milk production was recorded on sows (n= 14) with presence 3 or more stillborn piglets (P= 0,05).

Discussion and Conclusion

Post-partum treatment by dinoprost improved general clinical score, particularly with the positive effect on mammary gland and milk production. Positive treatment effect would be expected mainly in cases of manual intervention during the farrowing and on sows with presence of stillborn piglets.



REP-016

EVALUATION OF THE EFFECT OF ALTRENOGEST USE, ALONE OR IN COMBINATION WITH GONADOTROPINS, FOR GILTS' OESTRUS SYNCHRONIZATION, ON THEIR REPRODUCTIVE PERFORMANCE IN A RUSSIAN FARM

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Introduction

Synchronisation of oestrus by using altrenogest was proven to be effective tool for optimal gilt management. In the present study, the effect of altrenogest (Altresyn®), alone or with gonadotropins, on gilts' reproductive parameters was investigated, in a Russian farm.

Material & Method

The study took place in farm with 4000 sows applying one week batch management. Three groups, A, B and C with 141, 154 and 141 gilts, respectively, were included. In group A, altrenogest was administered according to manufactures recommendation, in group B altrenogest was used followed by injection with PMSG 400 IU and HCG 200 IU and group C was the control. The reproductive parameters recorded for 31 consecutive weeks were, insemination rate (IR), farrowing rate (FR), total number of piglets born (TNBP) and piglets born alive (NLBP), culling rate (CR).

Results

IRs for groups A, B and C were 89.6%, 85.7% and 81%, respectively, with significant difference ($P=0.036$) between groups A and C. FR was higher ($P=0.031$) in group A compared to C (88.1% and 78.2%, respectively). In group B, FR was 84%. CR differed significantly ($P=0.008$) between groups A and C (14.9% and 27.4%, respectively) and B and C ($P=0.049$) (17.7% and 27.4%, respectively). Mean (\pm Sd) TNBP was significantly higher ($P=0.032$) in group A compared to C, with 9.5 ± 5.4 and 8.1 ± 5.9 piglets, respectively, whereas for group B it was 9.2 ± 5.5 . Mean (\pm Sd) NLBP was significantly higher ($P=0.043$) for group B compared to C, with 8.8 ± 5.4 and 7.5 ± 5.7 piglets, whereas for group A it was 8.5 ± 5.5 .

Discussion & Conclusions

Groups that were treated had better reproductive performance compared to control, highlighting the beneficial role of altrenogest in gilts' reproductive efficiency. Treated gilts had increased chance not to be culled before delivery of first litter.

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REPRODUCTION

REP-017

IMPROVEMENT OF REPRODUCTIVE PERFORMANCE OF GILTS IN ONE WEEK BATCH MANAGEMENT SYSTEM BY SYNCHRONISATION OF OESTRUS

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Introduction

Optimal gilt management decreases variation within weekly service numbers and synchronisation of gilts by altrenogest (Altresyn®) was proven effective tool. Aim of our study was to evaluate the effect of synchronisation by altrenogest on reproductive parameters and total number of piglets born per group.

Material and Method

The reproductive performance of 50 randomly selected cycling gilts synchronised by altrenogest (group A) was compared with control group of gilts of same size (group B). First oestrus was confirmed by the back-pressure test in the presence of boar. Both groups of gilts were inseminated on their 2nd oestrus. The study was performed on the large scale farm (4000 sows) in Italy, practising one week batch management system. Following parameters were evaluated: Insemination rate (IR), pregnancy rate (PR), farrowing rate (FR) and total number of piglets born per group (TNBP).

Results

All followed reproductive parameters were numerically better in group of synchronised gilts (A). IR was better in group A (98% vs. 94 %); (P= 0.8841). PR was higher in synchronised gilts (98% vs. 91%); (P= 0.8155) as well as farrowing rate (81.60% vs. 72.3%) (P=0.4246). TNBP was greater in group A, brings 47 piglets more per synchronised group of gilts (518 and 471 piglets). Size of the litter did not differ statistically (P=0.8438).

Discussion and Conclusion

Altrenogest synchronisation was an effective tool to improve reproductive parameters and increase final piglet's production. This study showed that the effective gilt management can optimise utilisation of expensive farrowing recourses.



REP-018

TREATMENT OF SPERM WITH MAXIPIG® BEFORE ARTIFICIAL INSEMINATION IMPROVES REPRODUCTIVE PERFORMANCES

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Introduction

Optimal reproductive performance is crucial for economic success in commercial pig herds. Different management strategies, such as optimized feeding strategies, hyperprolific dam lines, batch farrowing systems and extended photoperiod during the post-weaning phase, are applied in order to meet the high performance expectations of modern sow farmers. However, inevitable variations in farm conditions, such as season, infection pressure or feed ingredients can negatively impact the results of high productive genetics. Recently, a new technology (maXipig®; IUL-NoHow) has been developed to improve fertilization capacity of spermatozoids through a patented LED-treatment. The objective of the present study was to investigate the effect of pre-treated sperm on reproductive performances under field conditions.

Materials & methods

A high productive 225-sow farm managed on a 5-week batch-management-system was enrolled in the study. Four subsequent groups were enrolled for a pairwise comparison between the standard insemination protocol (control, C-group) and the application of maXipig® (30 min) on the sperm doses prior to insemination (maXipig®, M-group). Several standard reproductive performance parameters were collected during the study: farrowing efficiency index (FEI, # farrowings per 100 inseminations), total born piglets (TBP), live born piglets (LBP) and live piglet index (LPI, # LBP born per 100 inseminations).

Results

Farrowing efficiency index significantly ($P=0.04$) improved from $94.15\pm 1.15\%$ (C) to $99.04\pm 0.96\%$ (M). Total born piglets were significantly higher in the M-group (16.43 ± 0.17 vs. 15.79 ± 0.20 ; $P=0.02$). Overall, LPI significantly ($P=0.02$) improved with 9.3% in the M-group (1470 ± 39) as compared to the C-group (1345 ± 36).

Discussion & Conclusions

Sperm pre-treatment with maXipig® had a significant impact on FEI, TBP and LPI. This implies that fertilization capacity improved through pre-insemination treatment with the maXipig® concept, based on LED-technology. In conclusion, reproductive performances are significantly improved following pre-treatment of the sperm doses to improve fertilization capacity.

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REPRODUCTION

REP-019

PRACTICAL USE OF PROGESTERONE TEST IN GILTS

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Introduction

Progesterone level can be used to determine precise moment of the reproductive cycle in gilts/sows. Reproductive cycle has a follicular and luteal phase (high levels of progesterone). During luteal phase, progesterone level increases until day 12-14 when the luteal corpus (LC) become sensitive to PGF_{2α} and progesterone level decreases in 48h just until the next estrus. Prepuberty gilts just around heat, have very low progesterone levels; 24-48h post-heat progesterone levels are high and remain high for at least 15-18 days indicating LC presence; finally 24-48h prior to heat progesterone levels drop very quickly again. The objective of this study is to demonstrate under field conditions how a commercial kit Ovu-check® can help establish whether a group of gilts that have not manifested consistent heat symptoms had cycled or not.

Material & Methods

Sixty gilts older than 9 months of age were included in the study. These gilts were introduced to the breeding unit at 7 months of age and since then they were heat checked at least once a day through direct contact with boars. During this period, none of them demonstrated consistent signs of heat. Before sending them to slaughterhouse (due to absence of reproductive signs) serum samples were collected and ran with Ovu-check®, a commercial kit to determine progesterone levels in serum (colorimetric change).

Results

Thirty seven (37) out of 60 (61.7%) gilts showed high progesterone level and 18 out of 60 (30%) had very low progesterone level without heat signs. Therefore, 61.7% of gilts were not detected in heat by the farmer.

Discussion & Conclusion

Ovu-check® can be used in farms to establish the correct hormonal therapy as well as to detect management failures so that correct actions can be taken to improve reproductive performance and decrease economic loss due to non-productive days in gilts.



REP-020

STUDY OF REPRODUCTIVE BEHAVIOR AND DESCRIPTION OF ANATOMICAL REPRODUCTIVE STRUCTURES BY ABDOMINAL ULTRASOUND IN IBERIAN SOWS

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Introduction

The lower prolificacy of the Iberian sows breed (IS) can be due to a lower ovulation rate, a lower percentage of fertilization, a lower implantation rate. The limited uterine space for embryo implantation would justify the greater embryonic losses.

The objective of the study was to determine the estrus weaning interval (WEI), estrus duration (ED), weaning ovulation interval (WOVI) and Estrous ovulation interval (EOVI) in weaned sows of the Iberian breed. As well as estimate the ovulation rate. In addition the weight of the uterus was estimated. Results were compared with those obtained in a commercial “white” sows (WS) farm LwxLD evaluated in the same period of time.

Materials & methods

In March 2017 a total of 123 IS and 110 WS, all from a weaning, were evaluated reproductively. The WEI, ED, WOVI, EOVI were measured and compared. The follicular dynamics were performed by abdominal ultrasound, performing ovarian studies sequentially in time at intervals of 12 hours from 96 hours of weaning until the time of ovulation, that was defined as the time between two ultrasound measurements on the same sows where only preovulatory follicles were observed in the first (> 6mm) and in the second CH was observed with no more than one preovulatory follicle. The weight of the uterus, estimated by ultrasound, is measured according to the area of the uterine horns (averaged over several sections) and assuming that there is a relationship between the average of these sections and the weight of the uterus, ($Y=172 \times \text{sectional area} + 320$), it was compared with bibliographic data of the WS. The ovulation rate was estimated in one of the two ovaries by sonography by the number of preovulatory follicles founded.

Results

WEI was 158 ± 43 [109- 325] h ($X \pm SD$ [range]) in IS Vs 98 ± 13 [84-140]h in WS. The ED was 65 ± 13 [48-96] h in IS Vs 52 ± 10 [36-80] in WS. There was no relationship between WEI and ED in the case of IS, $R^2 = 0.005$, in comparison with WS, $R^2 = 0.36$. WOVI was 188 ± 30 [144-253] h in IS Vs 131 ± 13 [116-168] h in WS. The EOVI was 42 ± 11 [24-72] h Vs 38 ± 10 [20-54] h in WS. The estimate ovulation rate was in WS: 4-6 follicles we have 3 of 35 (9%); 6-8 18 of 35 (51%); 8-10 13 of 35 (37%) and 10-12 1 of 35 (3%). The weight of the uterus was 863 ± 113 [674-1004] g comparable with previous studies on conventional puber gilts 802 ± 314 [424-2260] g.

Conclusion

Important differences were observed between Iberian sows and classical sows in terms of reproduction behaviour. The ED not depend on the WEI as happens in “White” sows. By the other hand they are similar data in terms with EOVI. A big variability was observed in ovulation rates between the Iberian sows and the size of the uterus was significantly different in compare with conventional sows.

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RESIDENT SESSION

RES-001

OUTBREAK OF ENZOOTIC PNEUMONIA IN SWITZERLAND - A CASE REPORT

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Introduction

Enzootic pneumonia is classified as notifiable disease in Switzerland in 2004. The incidence for *M. hyo* outbreaks is below 1% since 2005. In positive cases a cantonal controlled eradication has to be conducted on affected farms. This case report is reporting an enzootic pneumonia outbreak at three fattening farms and the delivering breeding farm.

Material and Methods

At the abattoir *Mycoplasma hyopneumoniae* (*M. hyo*) was detected in lungs of one fattening (farm 1). Due to the positive *M. hyo* result in the slaughter check, a site visit of the fattening farms and the breeding farm was performed. In cases of *M. hyo* suspicion a law regimented standard diagnostic protocol has to be performed. Therefore 10 nasal swabs were taken at all three fattening farms and at the breeding farm. Additionally, 10 tracheal brushes and 20 blood samples were taken from pigs of one fattening farm and the breeding farm.

Results

In all fattening farms and in the breeding farm fattening and weaning pigs showed coughing. All farms were tested positive in nasal swabs and tracheal brushes by PCR. All tracheal brushes and four to eight out of ten nasal swabs were positive for *M. hyo*. Due to the positive results the potential risk for dissemination of the disease within 2km radius was estimated. The breeding farm started a total depopulation of the breeding stock. At the fattening farms all pigs were treated with antibiotics for 14 days and finishing pigs were slaughtered within three months.

Discussion and Conclusions

Farms have to be closed if there is a suspicion of the presence of *M. hyo*. The closure is present during the whole elimination process fattening pigs have to be slaughtered in an appropriate time or culled immediately. Breeding farms might be reconstructed by partial or total depopulation.

RES-002

MYCOBACTERIOSIS IN BREEDING SOWS

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Introduction

A breeding farm with 150 sows reported of anorectic sows with unspecific disturbed general conditions. After site visits, necropsies, molecular biological and microbiological testing, an infection of the herd with *Mycobacterium* ssp. was diagnosed.

Case Description

The present report describes an infection of breeding pigs with a *Mycobacterium* ssp. On the farm problems have occurred in sows after farrowing since several months. Affected sows showed mild depression, a reduced feed intake, teeth grinding and rough hair coat. About 10% of the sows were affected, mortality was around 1%. A site visits was done and four affected sows were euthanized and necropsied. Three of the four examined sows had massively enlarged mesenteric lymph nodes and a caseous lymphadenitis. The gross lesions and the histopathological findings were typically for an infection with mycobacteria. A smear of affected mesenteric lymph nodes was done. After Ziehl-Neelsen staining of the smears very few acid fast rods were found. Using PCR mycobacteria specific 16S rRNA was found. A Tuberculin-Skin-Testing (TST) of all pigs older than 3 months was performed. In this TST 43 % of the animals showed a positive reaction. All responders were older than 20 months. For eradication of mycobacteriosis on this farm, all TST-responders were replaced with gilts continuously.

Conclusion

Mycobacteria are an important issue for food safety and public health. The current prevalence of mycobacteriosis on pig farms is unknown and may be higher as generally considered. Especially in herds with a weak immunological status and unexplainable clinical signs mycobacteriosis should be considered as one potential differential diagnosis.

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RESIDENT SESSION

RES-003

PATTERNS IN BIOSECURITY PRACTICES AND THEIR ASSOCIATIONS WITH PRODUCTIVE PERFORMANCE IN IRISH PIG FARMS

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Biosecurity is associated with performance in pig production. However, the importance of specific measures could vary depending on the (national) context. We analysed the different sections of the biocheck.ugent scoring system to understand which aspects are more variable in Irish farms and how different types of farms differ on productive performance.

The biocheck.ugent was applied to 56 farrow-to-finish Irish pig farms (Feb to Nov 2016) and their 2015 performance parameters were retrieved from the Teagasc national herd monitoring database. Principal Components Analysis (PCA) was performed to identify the main biosecurity sections describing Irish farms, followed by hierarchical clustering (FactoMineR package, version:1.36). Farm performance across clusters was tested using ANOVA (Base-R, version:3.4.1).

The PCA's first two dimensions accounted for 42.5% of variation. In dimension 1 (30.2%), two opposite clusters (clusters 1 and 2) were identified by their scores in compartmentalizing, working lines and equipment; cleaning and disinfection; removing of animals, manure and carcasses; and in disease management. In dimension 2 (12.3%), the scores in the farrowing and nursery period and in the feed and water supply described a third cluster (cluster 3). Piglet mortality, No. of pigs produced per sow-year, and ADG differed between clusters ($P<0.05$, $P<0.01$ and $P<0.001$) whereas finisher mortality and FCR did not ($P>0.05$). Cluster 2 and 3 represented the best and worst performing clusters with 9.0% vs 11.5% piglet mortality, 26.5 vs 24.4 pigs/sow/year and 728 vs 666 g/d, respectively.

Although biosecurity's power lies in its full implementation, the characterization of a set of farms may allow the identification of practices deemed to impact on performance the most. Results suggest that internal biosecurity's sections are the main issues limiting Irish farms' performance. Practices such as cleaning and disinfection, compartmentalizing and management of the different stages need to be particularly addressed in low performing farms to improve productivity.



RES-004

SEVERE CONGENITAL TREMOR PROBLEMS DUE TO INFECTION WITH ATYPICAL PORCINE PESTIVIRUS (APPV)

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Congenital tremor (CT) in pigs is a well-known disease problem. Affected animals suffer from insufficient colostrum and milk intake, resulting in mortality, insufficient growth and/or higher antibiotic use. The condition may have different aetiologies, including viral infections. The present study reports a case of CT in Germany caused by a novel virus namely atypical porcine pestivirus (APPV).

The case occurred in a closed production system, comprising of two sow farms located 1.5 km away (site A 210 sows; site B 180 sows), and nursery and fattening units on site C. The first litter with trembling piglets occurred on site A in December '16. From July to September '17, the number of affected litters increased significantly. Fourteen blood samples of sows with affected and non-affected litters were taken and analysed for presence of mycotoxins (ELISA), antibodies against *Leptospira* (microagglutination test), PRRS virus (RT-PCR) and PCV2 (RT-PCR). Two affected piglets were euthanized and sent to the laboratory for analysis of APPV (PCR, histopathology).

From December '16 to September '17, 7% of all the litters were affected (79% of them between July and September) and pre-weaning mortality was 63% (167/263 piglets) and 16% (511/3149 piglets) in affected and non-affected litters, respectively. Severity of trembling improved with age, but some piglets continued to show trembling after weaning. Mean parity of sows with and without affected litters was 2.47 and 5, respectively. The blood samples of all sows were positive for T2 Toxin (8.26µg/l) and DON+3-Acetyl-DON (111.29µg/l). Blood samples were negative for antibodies against *Leptospira*, PRRS virus and PCV2. APPV was detected in brain tissue and multiple vacuolization was visible in the white substance of the brain.

Detection of APPV together with the histopathological lesions confirmed the diagnosis. Further research is ongoing to investigate the source of APPV infection and/or factors predisposing to clinical disease.

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RESIDENT SESSION

RES-005

ASCARIS SUUM INFESTATION IN DANISH HIGH HEALTH GILTS - A CASE REPORT

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Introduction

Ascaris suum is a common parasitic infestation in modern pig production and clinically often silent. In young pigs, *A. suum* can cause reduced growth, and “white spots” due to larvae migration can lead to condemnation of the liver at slaughter. Clinical signs in breeding animals are rare.

Material & Methods

In a Danish SPF herd, seropositive of *M. hyopneumoniae* (600 sows with weaners, bought-in replacement gilts, Danish LY) mated gilts developed severe respiratory symptoms with dyspnea and fever after the transfer to the gestation unit. Five of the 17 affected gilts died, and 12 gilts had abortions, however slowly recovered. Necropsy of the dead gilts was performed by the herd veterinarians, and lungs were submitted to the Laboratory of Swine Diseases, Kjellerup, Denmark for pathological, bacteriological, and virological examinations as well as to the Danish Veterinary Institute, Lyngby, Denmark for histopathological examination.

Results

The gross lesions indicated interstitial pneumonia. PRRS, PCV2, and influenza virus could not be detected by PCR. The histopathological examination revealed interstitial and purulent pneumonia with small necrotic foci and massive eosinophilia. Cross-sections of roundworms identified as *A. suum* were present in necrotic foci and alveolus.

Discussion & Conclusion

The final diagnosis was acute parasitic pneumonia caused by a massive infection of *A. suum*. The farm has previously changed gilt supplier which may have resulted in the introduction of naïve gilts to a heavy infected farm environment. To prevent further clinical cases, large portions of sow fecal material were introduced to the gilts immediately after insertion to the farm. Five days later, the whole herd was treated with Fenbendazol 5 mg/kg live weight for one day. Furthermore, the gestation unit was washed and disinfected. In the following period, no clinical problems after the introduction of gilts to the gestation unit have been observed.



VPH-001

ANTIBIOTIC RESISTANCE PROFILES OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) FROM PIG PRODUCTION CHAIN IN NORTHERN ITALY

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Introduction

Pig herds are an important reservoir for Methicillin-Resistant *Staphylococcus aureus* (MRSA), one of the most commonly identified antimicrobial-resistant pathogens worldwide.

The aim of this survey was to evaluate antimicrobial resistance (AMR) profiles of MRSA isolated from finisher pigs in relationship with antimicrobial usage (AMU).

Materials and Methods

A total of 400 samples were collected from 50 fattening herds, located in Lombardy (Italy). Three environmental samples were collected from each farm. Cutaneous swabs were also collected, from five pigs per farm, at slaughterhouse. MRSA identification was carried out by phenotypic and a quadruplex-PCR. AMR was evaluated by disk diffusion test, following the Clinical Laboratory Standard Institute recommendations. Fifteen prototype molecules, belonging to 12 different drug classes, were tested.

AMU was estimated, as days of treatments per bred pig (days/pig), using defined daily dose animal for Italy (DDDAit) and a standard weight at treatment of 100 kg. DDDAit were established according to Italian summaries of product characteristics. Data were collected retrospectively regarding AMU and pig population of 2016.

Results

37 MRSA strains were isolated from 21 out of 50 finishing pig herds. 37/37 (100%), 30/37 (81.1%) and 8/37 (21.6%) isolates were resistant to at least one, four and eight classes of antimicrobials, respectively. Medians of AMU were 22.8, 19.5, and 18.3 days/pig in farms where isolates were resistant to 8 or more, 4-7, and 3 or less classes of antimicrobials, respectively. AMU was not significantly different among the three different groups of farms.

Discussion & Conclusion

Multidrug resistance in MRSA was frequently observed in this survey. Nevertheless, AMR patterns seem not related to AMU, which may be due to a sampling limited in numbers and farms type (finishers only). Further studies are needed to confirm these preliminary findings, which should encompass a larger sample and MRSA molecular characterization.



VETERINARY PUBLIC HEALTH

VPH-002

SWEDISH PIG FARMERS' OPINIONS OF ON-FARM MEASURES TO IMPROVE PIG HEALTH AND REDUCE ANTIMICROBIAL USAGE

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Introduction

In this survey, conducted within the MINAPIG project, we investigated how Swedish pig farmers would use antimicrobials in three different hypothetical scenarios, and explored their opinions on different preventive measures.

Materials and Methods

In a paper-and-pencil questionnaire, farmers were presented with three scenarios in which 10% of pigs showed symptoms of 1) neonatal diarrhoea, 2) diarrhoea in weaning pigs or 3) respiratory disease in fattening pigs (assessed on Likert scales). They were asked how, when and what animals they would treat. Additionally, they evaluated four preventive measures: vaccination, optimal stable climate, reduced stocking density and cleaning and disinfection on their current implementation or intention to do so, their perceived effectiveness for disease prevention, and their perceived costs (financially and labour). They were furthermore asked to estimate how much they could reduce their AM usage within the next five years.

Results

In all, 390 farmers (45%) completed the survey. For the proposed scenarios, 32% of the participants would always initiate AM treatments immediately to piglets and weaners and 15% to fatteners, whereas about 10% would always wait before initiating treatment. Approximately sixty-seven percent answered that they always treated only sick piglets, weaners and fatteners. An optimal stable climate was considered the most effective preventive measure followed by cleaning and disinfection, vaccination and reduced stocking density. Cleaning and disinfection was the most commonly used measure (87%) and optimal stable climate the most likely to be implemented (19%). The mean estimated possible reduction in AM usage the next 5 years was 18%.

Discussion and conclusion

The majority of farmers applied AM only to diseased pigs, which probably contributes to the overall low AM sales in Sweden. Farmers' positive attitude towards optimization of stable climate indicates this could be a feasible measure to improve health, and potentially reduce AM usage even further.



VPH-003

BIOSAFETY TEST OF COMMERCIAL PORCINE PLASMA TREATED WITH UV RADIATION WHEN INOCULATED INTRAPERITONEALLY IN PIGLETS

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Introduction

The objective of this study was to assess the risk of virus transmission to piglets using both liquid native and ultraviolet C (UV-C) irradiated plasma at different doses. Biosafety tests evaluated Porcine circovirus type 2 (PCV2) and Porcine reproductive and respiratory syndrome virus (PRRSV) as usual contaminant indicators because their importance in swine industry.

Materials and methods

A 8-L batch of plasma containing 2.71×10^4 PCV2 DNA copies/mL (Ct= 30,96) and a Ct = 35.35 for PRRSV, seropositive against both viruses, was selected. This batch was divided in 3 sub-batches: non-irradiated, irradiated at 3000 J/L, and irradiated at 9000 J/L. A total of 37 PRRSV and PCV2 negative piglets were divided into 5 groups. All treatments were administrated intra-peritoneally: Group 1 (negative control received PBS); Group 2 (plasma UV-C irradiated at 9000 J/L); Group 3 (plasma UV-C treated at 3000 J/L); Group 4 (native non-UV-C irradiated plasma); and Group 5 (positive control was inoculated with PCV2 at a dose of 100 TCID₅₀/mL). After inoculation animals were blood sampled at 0, 14, 28, 50, and analyzed by qPCR for PCV2 and qRT-PCR for PRRSV, and antibodies against PCV2 and PRRSV.

Results

Group 1 remained free from PRRSV and PCV2 and showed no seroconversion against those viruses. All piglets from group 5 (inoculated with PCV2) got infection and seroconversion against PCV2. Piglets injected with UV-C irradiated plasma at both doses (groups 2 and 3) did not experience infection/seroconversion by PCV2 or PRRSV. Piglets injected with raw plasma (group 4) got infection by PRRSV but not PCV2.

Discussion and conclusions

Results demonstrated that UV-C treatment is a useful step to reduce load of PRRSV and PCV2 in liquid plasma. Therefore, UV-C radiation should be considered as an intermediate additional safety feature for the manufacturing process of SDP.

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VETERINARY PUBLIC HEALTH

VPH-004

REDUCTION OF CARRY-OVER BY MICROGRANULATION

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Introduction

The extent of carry-over and the following risk of cross-contamination of medicated premixes depend on the feedmill installation and the product formulation. The relative wall adhesion factor is closely correlated with this extent of carry-over. Through this factor, the number of flushing batches that is minimally required to remain under a defined residue content can be predicted. To illustrate, three premixes of the benzimidazole group of anthelmintics for pigs were tested.

Materials and methods

The relative wall adhesion factor was determined based upon the final concentration of the active ingredient in a flushing batch after application of a fixed concentration in a first batch. Cobaltchloride was used as reference (assumed wall adhesion factor 1). Triplicate tests were carried out on a standard pig feed with a moisture content of 122g/ kg. Two formulations were powders based upon simple mixtures; a 40 mg/ g fenbendazole premix and a 50 mg/ g flubendazole premix. The third formulation was Pigfen® 40 mg/ g fenbendazole premix (Huvepharma®), developed by a unique microgranulation technology. This ensures that fenbendazole is captured in microgranules which are in turn encapsulated in bigger and more homogenous particles. To not exceed a predetermined residue level, the Belgian feed chain alliance (Ovocom AT-08) stipulates that for premixes showing a relative wall adhesion factor lower than 1 only one flushing batch is required. Two flushing batches are needed if the factor is 1 or higher.

Results

The relative wall adhesion factor of the flubendazole and fenbendazole powder premixes were respectively 1.6 and 1.4. On the other hand, for the microgranulated premix a factor of 0.7 was calculated.

Discussion and conclusion

The formulation of a premix plays a crucial role in the risk for carry-over and cross-contamination. Compared to simple mixtures, microgranulated premixes reduce significantly the risk of carry-over and ensure maximal safety.



VPH-005

SURVEY OF PORCINE LUNG LESIONS AT SLAUGHTER WITH THE CEVA LUNG PROGRAM IN GERMANY AND AUSTRIA

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Introduction

Lung scoring at slaughter is a useful method to gather information about respiratory health in a herd. Although lung lesions caused by various pathogens are not pathognomonic, the results can indicate previous affections due to Enzootic pneumonia (EP) or pleuropneumonia (APP). The aim of this study was to show lung lesions in different parts of Germany and Austria.

Material & Methods

The Ceva Lung Program is a slaughterhouse adapted method to assess lung lesions and implies a software to display or share the data. Altogether 24575 lungs belonging to batches of 80 or more lungs from four geographical regions were assessed and the median values compared: North Western Germany (NWG) (n=10058), Eastern Germany (EG) (n=7422), Southern Germany (SG) (2610) and Austria (A) (n = 4485).

Results

In terms of EP-like lesions, batches from A scored highest with a median value of 2.249, followed by NWG with 2.045, SG with 1.620 and EG with 0.924. Scars were found most in A (11.68%), followed by SG (10.30%), NWG (9.00%) and EG (5.97%). Batches from NWG had the highest median APP-index with 0.605, followed by EG (0.590), SG (0.495) and Austria (0.281).

Discussion & Conclusion

Despite a very high vaccination rate against *Mycoplasma hyopneumoniae*, pigs from A and NWG had the highest median EP-index. For the same parameter, lungs from EG scored lowest, probably reflecting the high health status of large and isolated herds. The APP-index was found highest in NWG, reflecting the concerns expressed by practitioners from the region. Import of piglets from abroad, transport, genetics and the production way are some of the possible reasons for this.

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VETERINARY PUBLIC HEALTH

VPH-006

COMPARISON OF DIFFERENT STANDARD VALUES TO MEASURE ANTIMICROBIAL DRUG USE IN PIGS

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Introduction

Based on the proposal by the ESVAC project (EMA), we developed Defined Daily Doses (DDD_{ch}) and Defined Course Doses (DCD_{ch}) for Switzerland as technical units to collect data on antimicrobial consumption. DDD_{ch} and DCD_{ch} were compared to the DDD_{vet} and DCD_{vet} recently published by the EMA.

Material & Methods

DDD_{ch} and DCD_{ch} were defined for all drugs containing antimicrobial ingredients and approved for pigs in Switzerland. DDD_{ch} were defined by using the highest authorized daily dosage according to the national Summaries of Product Characteristics (SPC). DCD_{ch} were calculated by multiplying the corresponding DDD_{ch} unit with the maximum treatment duration as presented by the SPCs.

DDD_{ch}/DDD_{vet} as well as DCD_{ch}/DCD_{vet} were compared by calculating the ratios of corresponding values for each product. The influence of dosage form or number of active components in a single product on these ratios was analyzed.

Results

92 approved products containing antibiotics were included in the study and 118 ratios were calculated.

Although the mean ratio was 1.05 for the DDD_{ch}/DDD_{vet} ratios and 0.93 for the DCD_{ch}/DCD_{vet} ratios, 35 corresponding values for the DDD_{ch}/DDD_{vet} ratios and 44 values for the DCD_{ch}/DCD_{vet} ratios showed a deviation of more than 20%.

Injectables showed a significant higher DDD_{ch}/DDD_{vet} ratio (1.16) than premixes (0.81) ($p=0.02$). Daily dosages in Switzerland are lower than EMA values when ingredients are combined in one product whereas higher dosages were found for single ingredient products in Switzerland ($p<0.01$). None of these effects could be observed concerning DCD_{ch}/DCD_{vet} .

Conclusion

The newly defined values DDD_{ch} and DCD_{ch} partly show considerable differences to the published DDD_{vet} and DCD_{vet} . The great benefit of DDD_{vet} and DCD_{vet} for international comparison is undisputed, but we propose the use of nationally defined units for more accurate national monitoring of antimicrobial usage.



VPH-007

A LONGITUDINAL STUDY OF *SALMONELLA* IN PIGS FROM BIRTH UP TO SLAUGHTER

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Background and Objectives

Human outbreaks of salmonellosis are most frequently related to contaminated food products including those of animal origin. Pigs are often asymptomatic carriers of *Salmonella* and contribute to the spread of *Salmonella* through the food supply system. The objectives of this study were to investigate *Salmonella* shedding in pigs at four stages of production, and to determine whether there was an association between on-farm fecal shedding and presence of *Salmonella* in tissue samples collected at slaughter.

Materials and Methods

Fourteen cohorts for a total of 809 pigs originating from 8 commercial farrowing sources were monitored from birth up to slaughter. Fecal samples were collected from pigs five times over the entire production period and tissue samples were collected from palatine tonsils and sub-mandibular lymph node at slaughter. All samples were cultured for *Salmonella*. A survey was conducted to collect information about farm management. A multi-level mixed-effects logistic regression modelling method was used to analyze the data.

Results

Overall, 35% and 12% of pigs were tested positive for *Salmonella* at least once or on more than one occasion, respectively. *Salmonella* was recovered from 4.9%, 10.5%, 12.6%, 12.3%, and 20.2% of pigs at 1-4 days of age, at weaning, at the end of the nursery, grower, and finisher stage, respectively. Older pigs and pigs tested in the summer months were more likely to shed *Salmonella* ($p < 0.05$). *Salmonella* was isolated from tissue samples collected from 23% (134/580) of pigs at slaughter; however, the presence of *Salmonella* at slaughter was not associated with on-farm shedding ($p > 0.05$).

Conclusion

The highest level of *Salmonella* shedding in this study observed prior to market, which may increase the risk of transmission during transportation, or cross-contamination of carcasses at slaughter. Further, the identification of repeat shedders warrants interventions that target this source of infection on swine farm.

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VETERINARY PUBLIC HEALTH

VPH-008

EXPRESSION OF LISTERIOLYSIN S AND INTERNALIN A IN *LISTERIA MONOCYTOGENES* ISOLATES FROM FREE-RANGE PIGS AT SLAUGHTERHOUSE

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Introduction

L. monocytogenes is a major zoonotic pathogen that causes listeriosis, a severe disease in humans with a high case-fatality rate. This microorganism possesses several virulence factors with hypervirulent and hypovirulent clones being identified. *L. monocytogenes* is a ubiquitous bacterium previously isolated along the pork production chain; however, there is scarce information about the molecular characterization of *L. monocytogenes* isolates from swine abattoirs, in particular in pigs from free-range systems. The aim of this study was to identify the virulence factors listeriolysin O (LLO) and S (LLS) and the expression of internalin A (InIA) in 64 *L. monocytogenes* isolates from free-range pigs slaughtered in Spain.

Material & Methods

L. monocytogenes strains were serotyped using a commercial Listeria Antisera Set and subjected to a PCR assay which targets LLO (*hly*) and LLS (*lIsA*) genes. In addition, bacteria were grown overnight and routinely processed to determine the protein expression of InIA by Western blot analysis.

Results

Thirty-five (35/64; 54.7%) isolates were identified as serotype 4b, 28 (28/64; 43.7%) isolates as serotype 1/2a and one strain was nontypeable. All isolates belonging to serotype 4b were obtained from tonsils and abrasive sponges; however, the three isolates recovered from meat samples belonged to serotype 1/2a. The *lIsA* gene was identified in 56.2% (36/64) of *L. monocytogenes* isolates (mostly in strains from serotype 4b but also from serotype 1/2a). Marked differences were found at the protein level for InIA. Interestingly, InIA-truncated forms were identified in the three isolates coming from meat samples.

Discussion & Conclusion

Our results highlight a high prevalence of serotype 4b as well as the role of pig tonsils as a niche for *L. monocytogenes*. In addition, the *lIsA* gene was identified for the first time in strains belonging to serotype 1/2a (lineage II).



VPH-009

SARCOPTES INFESTATION IN TWO MINIATURE PIGS WITH ZONOTIC TRANSMISSION

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Introduction

Scabies is a highly contagious skin disease rarely described in miniature pigs, but with a known potential to affect a variety of different host species, including humans.

Material & Methods

Two 7-month-old male castrated miniature pig siblings were referred to our clinic because both animals had recently developed progressive skin lesions. They had been bought one month before from a specialized breeder, and were housed together in the owner's flat and an outdoor area. On physical examination, both miniature pigs were lethargic and had a cachectic body condition. On dermatological examination, a dull, greasy hair coat with generalized hypotrichosis and multifocal erythema was noted. Importantly, the owner reported that her daughter had recently developed pruritic popular skin lesions on the upper legs.

Results

Microscopic examination of skin scrapings taken from the miniature pigs revealed high numbers of *Sarcoptes* mites in both animals. Subsequently, both miniature pigs were fed on a well-balanced diet, received ivermectin 0.3 mg/kg subcutaneous injections twice within two weeks, and were treated with concomitant therapy. The owner was advised to thoroughly clean the animals' environment. The family's physician confirmed scabies infestation in the owner's child. Both miniature pigs and the child responded well to treatment and went into clinical remission.

Discussion & Conclusion

Nowadays, miniature pigs are exotic but popular pets. Therefore, the number of miniature pigs as veterinary patients is on the increase. Miniature pigs kept as pets can efficiently transmit zoonotic disease to humans, as described for sarcoptic mange in this case report. Furthermore, this animal species may represent a niche for *Sarcoptes scabiei* infestation in countries where sarcoptic mange in commercial pig farms has been eradicated, and could subsequently pose a hazard for specific pathogen free farms.

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VETERINARY PUBLIC HEALTH

VPH-010

ANTIMICROBIAL USAGE EVOLUTION BETWEEN 2010, 2013 AND 2016 IN A GROUP OF FRENCH PIG FARMS

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Introduction

Monitoring antimicrobial usage in pig farms is a key element of a reduction plan. The objective of this study was to analyse the antimicrobial usage evolution in the same farms between 2010-2013-2016 and to identify the factors of variations.

Material & Methods

The study monitored antimicrobial usage in 2016 in 33 farrow-to-finish farms in the West of France. The antimicrobial usage had ever been registered twice for 23 of them in 2010 and 2013 and once for 10 of them in 2013. It was quantified by the number of Course Doses per produced pig per year (nCD/pig). Farmers were asked about the factors that could explain the evolution between 2013-2016.

Results

On average, antimicrobial usage significantly decreased over six years (-38%). However, a high variability of individual evolutions was observed: among the 23 farms with three annual data, 43% decreased their use between 2010-2013 (-3 nCD/pig on average) but had a stable use between 2013-2016 (-0,2 nCD/pig). 26% decreased their use between 2010-2013 (-4 nCD/pig on average) and also between 2013-2016 (-2 nCD/pig). 9% increased then decreased their use during the two periods (+4 then -7 nCD/pig). One farm had the opposite trajectory (-9 then +2 nCD/pig) and another always increased its use (+2 then +5 nCD/pig). Among the 33 farms with data in 2013-2016, 36% decreased their use (-2 nCD/pig on average), 39% had a stable use and 24% increased their use (+3 nCD/pig).

Increases were explained by occurrence of sanitary problems (mainly urogenital, digestive and respiratory problems on sows, piglets and fatteners respectively). Decreases were explained by vaccination, stop of preventive treatments and improvement of herd management.

Discussion & Conclusion

This study highlights the variability of individual trajectories in antimicrobial usage, due to sanitary issues. It usefully complements the monitoring of average evolution at the country level.



VPH-011

ELECTRONIC TREATMENT AND HEALTH REGISTERS AND A JOINT DATABASE AS CORE TOOLS OF THE SUISSANO/SAFETYPLUS PROGRAM

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Introduction

In order to improve transparency concerning antibiotic consumption in Swiss pig production and to concurrently measure antibiotic use and health parameters the SuisSano/Safetyplus program was started in 2015. The most important evolution step in 2018 is a joint database connected with electronic treatment and health registers, which are obligatory for all participating farms. It is expected that more than 90% of all pig farms in Switzerland will participate at the program.

Material and method

Mandatory electronic data input are all antibiotic treatments including date of treatment, number of treated animals, age group (piglet, sow, weaning pig, finishing pig), average weight, indication, product and quantity. Health data include percentage of losses in each age group. For each participating farm, the number of produced animals per age group per year is stored in the database. Antibiotic consumption is reported to the farmer by calculating an animal treatment index. Treatments with certain products, e.g. containing High Priority Critically Important Antibiotics, are multiplied by an additional factor. For more profound analysis and international comparison, several calculation methods are carried out for internal use (e.g. therapeutic intensity, number of DCDVET/animal/year).

Results

Using the electronic treatment register, antibiotic consumption of each participating farm can be demonstrated in relation to the overall program. Multiplication of treatments with certain products gives impulses to reduce such use. Based on additional analysis of joint data concerning antibiotic use and health, the management of the program is able to steer antibiotic consumption by adjusting benchmarks for treatment indices and multiplication factors for certain products.

Discussion and Conclusion

The electronic treatment register and the joint database are most useful tools in order to provide transparency and enable steering and reduction of antibiotic consumption in pig production within the SuisSano/Safetyplus program in Switzerland. Monitoring health data is essential to preserve animal welfare.

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VETERINARY PUBLIC HEALTH

VPH-012

EFFECT ON MEAT JUICE EVOLUTION OF SALMONELLA IN MULTISITE PRODUCTION USING *CLOSTRIDIUM BUTYRICUM* (MIYA-GOLD® S) 0-30 KG

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Introduction

Via a controlled field trial, the effect of a probiotic, *Clostridium butyricum*, on the Salmonella level (the danish classication system) was examined.

Material and Methods

A field farm, with Salmonella level 2 (The Danish threshold for financial deduction – 2 % of carcass value) was selected. According Danish standards, sampling is done ad random at the slaughterhouse at a frequency of 60-100 pigs/year. All Salmonella meat juice samples with an percent optical density (OD%) >10 are considered positive. As a treatment with *Clostridium butyricum* (dosage 2.5×10^5 CFU / g feed) was added to all piglet and fattening pigs diets, starting the 1st week of January 2017. Salmonella OD% values were observed. All pigs slaughtered from 01/01/2017 till 31/05/2017 did not receive *Clostridium butyricum* (period 1 = control group). All pigs slaughtered from 31/05/2017 till 31/08/2017 received *Clostridium butyricum* in the feed from 0-30 kg (period 2 = treatment group).

Results

In the control group, 47 % of samples were positive (15 pigs sampled with 7 being positive). In the Miya Gold® group, the number of positive samples was significantly reduced to 17 % ($p=0.04$, Fischer´s exact test one-tailed – 29 pigs sampled only 5 positive). A relative risk (RR=2,71) of being Salmonella positive in the control period was observed. The salmonella OD titer mean was 6,7 in the Miya Gold® group vs. 15,8 in the control group ($P=0,04$, one-tailed t-test). The variance was 132 in the Miya-Gold group vs. 555 in the regular group ($P=0,0002$, one-tailed F-test).

Discussion and conclusion

Adding *Clostridium butyricum* to the piglets diet helped reducing the number of positive Salmonella samples in the slaugtherhouse. At 31/08/2017, the herd classified back to Salmonella level 1. The significant results can be explained by a combination of batch production (all-in all-out) and *Clostridium butyricum* inclusion in the piglet feed.



VPH-013

EFFICIENCY OF ORAL DOXYCYCLINE MEDICATION IN WEANER PIG HOLDINGS WITH RECURRING RESPIRATORY DISEASE OUTBREAKS

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Introduction

Antibiotic resistance has become a major public concern and reducing antibiotic usage is important. Nevertheless it is crucial to treat diseased pigs due to welfare reasons and to prevent spreading of diseases. For the treatment of larger groups of pigs often oral medication is applied. In this study a respiratory health score and plasma levels of doxycycline reached through different oral medication systems were compared and used to measure the efficiency of treatment.

Material/Methods

11 pig producing farms were visited during acute respiratory outbreaks. Before treatment 10 clinically sick weaners were selected. From these animals the respiratory health was scored and plasma samples were taken before and on the last day of antibiotic treatment. The pigs were treated orally with doxycycline via water or feed, depending on the on-site situation. Doxycycline concentration in plasma of the animals was measured by high performance liquid chromatography (HPLC). Concentrations of $>1.0\mu\text{g/ml}$ doxycycline (CLSI breakpoint) were considered as effective.

Results

Of 11 farms, 9 administered antibiotics via feed, 1 via water and 1 via both. Preliminary results show that 2/10 farms reached a median concentration of $\geq 1.0\mu\text{g/ml}$ during treatment. In plasma samples $\geq 1.0\mu\text{g/ml}$ was measured in 27%, $>0 < 1.0\mu\text{g/ml}$ in 40%, and no doxycycline in 33%. The median concentration of plasma samples measured up to now was $0.29\mu\text{g/ml}$ and the maximum measured was $4.33\mu\text{g/ml}$. Respiratory health of about 80% of these weaners improved during treatment.

Discussion/Conclusion

The results show a large variation of reached plasma levels by different oral medication systems. Sufficient concentrations were measured only on 2 of 10 farms, though fluctuations of measurements dependent on time lags between antibiotic uptake and sampling should be taken into account. As the overall health of the pigs improved despite these low levels the influence of treatment on recovery needs further investigation.



VETERINARY PUBLIC HEALTH

VPH-014

INFLUENCE OF DIFFERENT VACCINATION STRATEGIES AGAINST *SALMONELLA* TYPHIMURIUM IN PIG FARMS ON THE NUMBER OF CARRIERS IN ILEOCECAL LYMPH NODES

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Persistent *Salmonella* Typhimurium (ST) infections in pigs are characterized by chronic colonization of the lymphoid tissue and constitute a major source of human salmonellosis. The present study investigated to which extent different vaccination strategies against ST reduce the number of pigs positive for ST field-strain in ileocecal lymph nodes.

Five vaccination strategies were tested on three Belgian pig farms: 1. vaccination of sows; 2. vaccination of sows and piglets; 3. vaccination of sows and fatteners; 4. vaccination of piglets; 5. vaccination of fatteners. A comparison was made with a non-vaccinated control group (group 6). Each vaccination strategy was implemented in each farm, during two consecutive production cycles of the same sows. An attenuated vaccine (Salmoporc[®], IDT Biologika) was applied. Ileocecal lymph nodes were collected in the slaughterhouse and tested for the presence of ST field-strain (isolation using ISO6579:2002, serotyping, distinguishing field/vaccine-strains using IDT *Salmonella* Diagnostikum[®]). Data were analyzed in a logistic regression model.

In total, 2528 lymph nodes were collected. In groups 1-2-3-4-5-6, respectively, 16-3-7-9-8-10% of the lymph nodes were positive for ST field-strain. Significant differences were detected between the farms ($p \leq 0.001$), cycles ($p = 0.002$) and groups ($p \leq 0.001$). The differences between groups were independent of farm, but related to cycle. In cycle 1, no significant differences were detected between groups 1-2-3-4-5 and the control group. In cycle 2, compared to the control group, the number of pigs positive for ST field-strain was significantly higher in group 1 and significantly lower in groups 2-3-4 (odds ratios, respectively: 2.27-0.27-0.48-0.44, p-values, respectively: 0.001- ≤ 0.001 -0.014-0.009). No significant difference was detected between group 5 and the control group.

Although only clearly pronounced in the long-run, the results of this study suggest a positive effect on the number of ST field-strain carriers when applying vaccination of sows and piglets, vaccination of sows and fatteners and vaccination of piglets.



VPH-015

OCCURRENCE OF *CRYPTOSPORIDIUM* IN SWEDISH PIGS

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Introduction

Cryptosporidium is a protozoan parasite that cause enteric disease in vertebrates, including the pig. Infected pigs may develop diarrhoea, anorexia and reduced growth rates, although most are asymptomatic. Previous knowledge on the occurrence of *Cryptosporidium* in Swedish pigs is scarce. As part of a larger study, occurrence of *Cryptosporidium* spp. and molecular species determination in Swedish farm animals, pigs were included.

Materials and Methods

A total of 100 faecal samples were collected from pigs at ten different farms including both conventional and organic farms. Pigs in the age groups 0-5 weeks (n=18), 6-12 weeks (n=33) and 13-24 weeks (n=49) were included. Samples were concentrated using glucose-salt floatation and analysed with FITC labelled *Cryptosporidium*-specific antibodies. Positive samples were analysed using PCR and sequencing of the 18S rRNA gene to determine species.

Results

In this study, we showed presence of *Cryptosporidium* spp. in pigs in 90% of the herds (9/10). In the age category 0-5 weeks, oocysts of *Cryptosporidium* were found only in one sample (<1%) and in low numbers (200 opg). In the age category 6-12 weeks, 17 of 33 (52%) samples were *Cryptosporidium* positive, with oocysts count ranging from 200 to 30 600 opg. In the category 13-24 weeks, 12 of 49 (24%) samples were positive with oocysts in the range from 200 to 5 200 opg.

Species determination showed *C. suis* and *C. scrofarum* in the studied herds, the latter being more prevalent. Two farms had both species present in the herd but no individual sample showed infection with both.

Discussion and Conclusion

The high occurrence of *Cryptosporidium* in the collected samples, with 90% of the herds being positive, warrants further studies to include more herds. No *Cryptosporidium* species of great zoonotic risk were found and the high occurrence is hence of low public health risk.

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VETERINARY PUBLIC HEALTH

VPH-016

REDUCTION OF ANTIBIOTICS BY THE CONTROL OF RESISTANT AND NON-RESISTANT GRAM-NEGATIVE BACTERIA.

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Introduction

In the pig husbandry, antibiotics are still used to prevent and control infections. Bacterial infections are often related to *E.coli* and *Salmonella* infections; within those groups, also many multi-resistant pathogens are present. To further reduce the use of antibiotics and lower the presence and development of more resistant bacteria several new feed ingredients from plant origin are studied.

Material & Methods

Over 20 feed ingredients were evaluated in an *in-vitro* assay on bacterial adhesion (first step in pathogenesis). Two compounds, a selectively hydrolyzed coprameal (MCM) and rye overgrown with mycelium of *Agaricus subrufescens* (ROM) were selected for further testing in *in vivo* pig experiments. Pigs were infected with either *E.coli* F4 or *Salmonella Typhimurium* (ST) and the effects on growth performance, microbiota composition, diarrhea, and immune markers were evaluated. Moreover, the bacterial shedding of ST and resistant *E.coli* populations were evaluated.

Results

Both MCM and ROM did show improved performance of piglets after weaning, especially during the period of infection in both *E.coli* and ST challenged situation. Bacterial shedding of ST was decreased with on average 1.5 log CFU/g. Cefotaxime resistant *E.coli* was reduced with 1.5 and 4 log CFU/gram in two different experiments when a combination of the feed ingredients was used. Further, feed ingredients showed a response on serum cytokine levels of IL-6 and IL-8.

Discussion & Conclusion

ROM and MCM showed improved performance and reduced shedding of (resistant) gram-negative pathogens, which would improve health of the pigs and reduce the need for antibiotics. More in-depth analysis of microbiota and immune system is needed to fully understand the mode of action.

Both ROM and MCM were effective in control of gram-negative bacteria and can be beneficial in raising pigs without antibiotics.



VPH-017

USE OF ANTIMICROBIALS IN FINNISH SWINE FARMS AND ITS ASSOCIATION WITH ON-FARM BIOSECURITY

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We need to find effective tools for disease prevention in animal production, and evaluate farms' disease status to ensure animal welfare and public health. Moreover, there is need to reduce antimicrobial usage (AMU) because of increasing emergence of antimicrobial resistance. The aim of this pilot study was to investigate factors linked to AMU in pig farms.

The study included seven farrow-to-finish, three sow and three fattening farms according to their total animal number to small, medium and large herds. Biosecurity evaluation was made during a herd visit by using Biocheck.UGent™. Medical information was collected for 1.5-year period by using Finnish swine health care system (Sikava). Herds were allocated to a completely randomized design by the total number of the animals of the herds [Large (n = 4): 2462.8 ± 249.5, Medium (n = 4): 1503.8 ± 243.9, Small (n = 5): 519.2 ± 161.0].

During 1.5-year period 14 391 antimicrobial treatments were administered to 17 686 animals. According to preliminary results, higher AMU was found in large herds compared to medium or small herds (LS means ± SE; 3158.0 ± 688.0 vs. 585.3 ± 688.0 or 878.8 ± 615.3, $P < 0.05$). Large variation in antimicrobial usage was found between herds. The biosecurity score was not associated with the total number of animals of the herds nor the AMU of the experimental herds.

Large differences in antimicrobial usage can be partially explained by different housing systems in which the movement of animals as well as disease pressure vary considerably. In Finland, only little information is available about on-farm measures taken to avoid pathogen transmission between and within herds. Further analysis will evaluate associations between certain diseases and medications used to treat those conditions. Moreover, associations between biosecurity and AMU to certain age groups will be investigated more precisely.

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VETERINARY PUBLIC HEALTH

VPH-018

RISK FACTORS FOR THE OCCURRENCE OF ANTIBODIES AGAINST TOXOPLASMA GONDII IN AUSTRIAN ORGANIC PIG FARMS AND PROSPECTS OF THEIR CONTROL

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Introduction

In Organic pig farms pigs are often exposed to various pathogenic agents that can cause important health problems. Aim of the study was to assess the prevalence of *Toxoplasma (T.) gondii* in organic fattening farms, to identify the risk factors and to develop strategies for control.

Material and methods

The study included 59 organic farms in Austria. A total of 1035 blood samples (about 17 per farm) were taken. All serum samples were tested for the presence of antibodies against *T. gondii* by ELISA. Additionally, in every farm a questionnaire including information about potential risk factors was filled in. By comparison of antibody positive and negative farms, risk factors were identified. The influence of them on the prevalence of antibodies against *T. gondii* was tested one year after the elimination of one of the basic risk factors.

Results

In 29 farms (51 %) antibodies against *T. gondii* were detected. The presence of cats on the farms had no significant influence on the prevalence of antibodies. The age of the respective cats, however, and the facts that the cats had access to the barns and the feed of the pigs had a significant influence on the prevalence. Farms with cats aged younger than one year were significantly more often *T. gondii* antibody positive. One year after the recommendation to reduce the risk factors, 23 of the positive farms were re-tested. 12 farms had remained *T. gondii* antibody positive, in the other 11 farms, no *T. gondii* antibodies were found in the sampled pigs.

Discussion and Conclusions

Fattening pigs raised in organic farms often have contact to zoonotic agents. Through simple measures like to restrict the access of cats to pig barns and to remove younger cats from the farms, the prevalence of antibodies against *T. gondii* could often be reduced.



VPH-019

PRELIMINARY RESULTS OF HEPATITIS E VIRUS (HEV) DETECTION IN FECES AND ORAL FLUID ON 6 DIFFERENT PIG FARMS IN SLOVENIA

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Introduction

Hepatitis E virus (HEV) is a leading causative agent of acute viral hepatitis in humans. In Europe, people are infected predominantly with HEV genotype 3, which has zoonotic potential. The main route of infection is through ingestion of contaminated pork. The aim of the study was to discover the presence of HEV from samples of oral fluid (OF) and feces of different age categories from all 3 large pig farms in Slovenia and from 3 small farms and to confirm, OF as appropriate sample compared to feces for HEV RNA detection.

Materials and methods

Pooled OF and feces samples from 6 different pig farms (3 largest Slovenian farms with more than 1000 breeding sows and 3 small-sized farms with less than 100 breeding sows) were tested. A total of 24 group samples (12 OF samples and 12 feces samples) from all categories (breeding sows, different age group of weaners and fatteners) were tested for presence of HEV. The detection of HEV RNA was performed with specific qRT-PCR.

Results

One small-sized farm out of 6 farms (16.66%) was found positive for HEV RNA in both feces and OF. Thereafter, group samples from 6 age categories from that farm were tested individually: 5 week-old (w/o), 9 w/o and 10 w/o weaners were positive for HEV RNA, whereas 12 w/o weaners, fatteners and breeding sows were tested negative.

Discussion & Conclusion

Results show that all Slovenian large farms that represent the mainstream of Slovenian pork production are HEV negative. Identical positive/negative results from both OF and feces were obtained, showing that OF is appropriate sample to isolate HEV RNA. These results confirm that most of the pigs are viremic when 1-3 months old; after that HEV is spontaneously eliminated. However, food products from this age group present a potential threat for consumers.

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VETERINARY PUBLIC HEALTH

VPH-020

ANTIMICROBIAL SUSCEPTIBILITY AND GENETIC DIVERSITY OF *TRUEPERELLA PYOGENES* ISOLATED FROM PIGS IN SPAIN

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Introduction

Trueperella pyogenes infections in pigs have recently become an increasing clinical and epidemiological problem, which reflects in the rising number of condemnations by lymphadenitis in slaughterhouse. The objective of this work was to determine the Minimum Inhibitory Concentration (MIC) of different antimicrobials against this pathogen and the genetic diversity of the isolates from pigs reared in intensive and extensive systems in Spain.

Material and methods

Trueperella pyogenes isolates (n=180) obtained from slaughtered pig and belonging to animals raised in intensive systems (n=89) and free-range ones (n=91) were studied. The broth microdilution test was used, according to CLSI, to determine the susceptibility to 11 antimicrobials. Isolates were genetically characterized by Pulsed-Field Gel Electrophoresis (PFGE) method, using *Bcu I* as restriction enzyme. The PFGE patterns were visually examined and analysed by BioNumerics software (Applied Maths, Belgium).

Results

Penicillin (100%), Amoxicillin (100%), Gentamicin (99.5%) and Ceftiofur (96.7%) were the most effective antimicrobials. In general, the isolates obtained from pigs reared in extensive system showed lower resistance to different antimicrobials, with difference ($p < 0.05$) with regards to Enrofloxacin (11.2% and 2.2%), Oxytetracycline (88.8% and 63.7%) and Trimethoprim-Sulfamethoxazole (33.7% and 6.6%) between isolates.

A total of 71 pulsotypes were obtained by PFGE (GD 0.39), most of which were represented by single isolates (59.2%). Eight pulsotypes included 72 isolates (40%) and 5 pulsotypes were isolated from both pig populations. The isolates could be grouped within 4 PFGE clusters (80% similitude). Cluster C included the 94% of isolates, belonging to both pig populations, different geographical localizations and persisting in time.

Discussion and conclusion

Different profiles of resistance were detected between isolates obtained from pigs reared in intensive and extensive system, despite the high genetic similitude between of the majority of isolates, which could be explained by the differences in the use of antimicrobials.



VPH-021

OCCURRENCE OF CHINOLON-RESISTANT *E. COLI* IN ENVIRONMENTAL SAMPLES FROM PIG FARMS

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Background & Introduction

Fluorquinolones are classified by the WHO as highest priority critically important antimicrobials in human medicine. Therefore their use in veterinary medicine should be limited. As fluorquinolones are little metabolised in animals and excreted in faeces and urine they enter mostly undegraded in the environment. The aim of this study was to investigate the occurrence and the spread of chinolone-resistant *E. coli* in to the environment of pig farms.

Material and Methods

Environmental samples were collected in 65 pig farms (104 dust samples, 104 swab samples from surfaces with direct animal contact and 71 samples of liquid manure). One to two grams of these samples were diluted 1:10 in a 0.85% sodium chloride solution and plated on a Rapid- *E. coli* 2 agar plate, supplemented with 8 µg/ml nalidixid acid. 196 nalidixid acid resistant *E. coli* strains were tested by disk diffusion method for their sensitivity against 16 antimicrobial agents. The statistical comparison of the results was done with the Pearson's Chi-squared test. The significance level was set at $p < 0.05$.

Results

In 45.2% of the dust samples, 51.9% of the swab samples and 70.4% of the liquid manure samples chinolone-resistant *E. coli* could be cultivated. The liquid manure samples were significantly more often positive compared to the dust and the swab samples ($p < 0.01$). The prevalence of strains showing resistance against Streptomycin, Tetracycline, Sulfonamethaxol-Trimethoprim and Ampicillin was 69%, 61%, 46% and 45%, respectively. 62% of all the tested strains showed resistance against 3 or more antimicrobial classes.

Discussion and Conclusion

Chinolone-resistant *E. coli* are widely spread in the environment of pig farms. This is of special concern, since our data show that they are often multidrug resistant (more than 3 antimicrobial classes).

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VETERINARY PUBLIC HEALTH

VPH-022

ANDROSTENONE AND TESTOSTERONE CONCENTRATIONS IN DIFFERENT MATERIALS COLLECTED AT SLAUGHTER FROM ENTIRE, IMMUNOCASTRATED AND PHYSICALLY CASTRATED MALE PIGS

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Introduction

Boar taint is primarily caused by accumulation of androstenone and skatole in the adipose tissue from male pigs. Androstenone production is closely linked to gonadal steroids, mainly testosterone. The aim of the present study was to compare androstenone and testosterone levels in entire, immunocastrated and physically castrated male pigs from different samples taken at slaughter.

Material and Methods

Samples from 69 male pigs were taken at slaughter: blood, backfat and adjacent meat were collected from each pig. Material was collected from pigs of 3 groups: entire male, n=24 (EM); immunocastrated males, n=21 (IC) and physically castrated males, n=24 (PC). Backfat samples were analyzed for androstenone using stable isotope dilution analysis. Testosterone in serum was investigated via electrochemiluminescence. Furthermore, testosterone was determined in meat juice.

Results

Mean androstenone concentrations were 465ng/ml in EM, 89ng/ml in IC and 61ng/ml in PC group. Five EM pigs exceeded androstenone threshold of 500 ng/ml, with testosterone >2.1ng/ml in serum and >1.2ng/ml in meat juice, respectively. None of the IC and PC animals outran the threshold. Maximum serum testosterone was 1.9ng/ml in IC and 0.1ng/ml in PC; in meat juice 0.3ng/ml and 0.6ng/ml, respectively. Androstenone and testosterone in serum and meat juice differed significantly in EM from IC and PC concentrations ($p < 0.001$), whereas no differences between IC and PC were observed (mean serum testosterone: EM 5.5ng/ml, IC 0.1ng/ml, SC 0.1ng/ml; mean meat juice testosterone: 12.2ng/ml, 0.2ng/ml and 0.2ng/ml, respectively).

Discussion and Conclusion

Besides the given androstenone threshold for backfat, more materials should be considered to detect "boar taint" feasible at slaughterhouse. Further basic research is needed to establish a simple test and threshold for testosterone: the results of this study point to a threshold approximately 2ng/ml serum testosterone. As high testosterone does not necessarily coincide with high androstenone concentration, exceeding this threshold requires further testing.



VPH-023

A CANADIAN VOLUNTARY ANTIMICROBIAL USE BENCHMARKING PROJECT DEMONSTRATING ANTIMICROBIAL USE REDUCTION OVER TIME

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Introduction

Previously we demonstrated the success of a voluntary approach to antimicrobial use monitoring amongst Canadian pig producers, based on collection of antimicrobial sales data from veterinarian and feed supplier. The current study demonstrates changes over time using this methodology over multiple time periods.

Materials and Method

The Ontario Pork Industry Council, a multi-stakeholder group representing the Ontario pig production industry, sought funding and coordinated this study. Volunteer farms were recruited based on previous participation in 2014. Sales data was collected from feed suppliers and veterinarians. Antimicrobial use by weight (grams) and doses per pig were calculated using "COMPASS", a Canadian web-based antimicrobial use analysis tool developed by Boehringer-Ingelheim.

Results

Thirty-three of the original 36 farms from 2014 agreed to participate in 2016. Overall the number of sows, piglets, weaned pigs and finishers were all increased, based on individual farm expansion from 2014 to 2016. There was a 9% decrease in total antimicrobial weight sold, and an 11% increase in total weight of pig sold. In total this project demonstrated an 18% reduction in antimicrobial use per kg of pig. 70% of the participating farms reported reduced antimicrobial use from 2014 to 2016. Of the remaining 10 farms, eight reported a disease outbreak during the time period, resulting in increased antimicrobial use.

Discussion and Conclusion

This study demonstrates that benchmarking between interested farms can result in dramatic changes to antimicrobial use patterns. Farms that did not experience a disease break were successful in reducing antimicrobial use. Disease outbreaks reported by participants in this study were most commonly due to PRRS virus and *Mycoplasma hyopneumonia*.

Participants concluded that this study has increased their understanding of antimicrobial use issues, and expressed interest in repeating the study in 2018. Further analysis to measure changes in specific antimicrobials, or benchmark between suppliers, is ongoing.

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VIRAL DISEASES

VVD-001

MOLECULAR IDENTIFICATION OF PORCINE CIRCOVIRUS TYPE 3 (PCV3) INFECTIONS ON COMMERCIAL PIG FARMS IN SPAIN

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Introduction

Two species of Porcine Circovirus (PCV) are well studied at date; PCV1 which is considered non-pathogenic and PCV2 that causes significant economic impact in swine industry worldwide. Recently, a new circovirus named PCV3 has been discovered in sows affected by PDNS and reproductive failure in USA and China. However, there is still sparse information about this virus. In this study we develop a qPCR assay for detection of PCV3 and perform a preliminary evaluation of this agent in Spain.

Material & Methods

A qPCR assay targeting the *cap* gene was developed for identification of PCV3. A total of 97 clinical cases (abortion=28; respiratory=69) from Spain (n=91) and Portugal (n=6) were evaluated. Samples included fetal tissue, lung, oral fluid, swabs and BALF; and were also tested for PCV2, PRRSV and Influenza-A. Nucleotide sequences for *cap* gene from some PCV3-positive samples were additionally obtained.

Results

The qPCR assay showed specific detection of PCV3 with a LOD of 50 copies/reaction. PCV3 was identified in 10% of clinical cases, in 5 of 17 Spanish provinces and mainly in animals with respiratory disease (9/10). This circovirus was detected in all the different kind of samples, mainly in lungs (4/33) and oral fluids (3/13); but always in co-infection with other pathogens. Sequences for Spanish PCV3 showed >99% homology to sequences available in the GenBank for this circovirus.

Discussion & Conclusion

Here in, we describe first molecular identification of PCV3 infection on commercial pig farms in Spain, but also Portugal. Presence of this virus in farms from different provinces could suggest a remarkable distribution of PCV3 in our country. Although most data associate this agent with PDNS and reproductive failure, we found most of positive cases in pigs with respiratory disease. However, further studies are necessary to investigate pathogenicity and epidemiology of this novel circovirus.



VVD-002

ILL-THRIFT IN WEANERS

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Introduction

A pig unit in Ireland expanded to 1000 sows within a year. Piglets are vaccinated against PCV-2 and EP. The breeding herd is vaccinated against PRRSv with a MLV. Weaner pigs are overstocked. There is an increase of weaners losing their body condition and abdominal panting. Wean to finish mortality ranges from 10 to 15%.

Materials and Methods

Two 6 weeks old weaned pigs with clinical signs were euthanised for post-mortem examination on-farm. Samples were taken from fresh lung tissue and lung tissue, inguinal and broncho-mediastinal lymph nodes fixed in formaldehyde. These samples were sent to Anicon Labor GmbH.

Results

Post-mortem examination of both animals revealed loss of body condition, pericarditis, pleurisy and consolidation of the cranio-ventral lobes of the lung.

Histological examination of the lungs detected chronic inflammation of the lung. Bronchi were filled with neutrophilic granulocytes and hyperplasia of the bronchial epithelium. Interstitial oedema of the lung was detected.

Pasteurella multocida was isolated from both lungs and *Streptococcus suis* serotype 3 in one of the lungs.

RT-PCR was negative to EP, Flu type A, PCV-2 & PRRSv NA. Results came back positive to PRRSv EU (CT:21.2).

Based on the amplified nucleotide sequence coding for the orf5 gene of PRRSv, the RNA extracted from the sample was 94.5% related to the Lelystad PRRSv strain.

Wean to finish mortality reduced to 4% after vaccinating piglets with a MLV-PRRSv at 10 - 14 days old.

Discussion & Conclusions

The results of the present case prove the value of vaccinating pigs against PRRSv with a MLV.

Severity of PRRS infection in pig units in Ireland varies from unit to unit. Non- infectious factors like overstocking exacerbate the expression of clinical signs. Concurrent infections with some viral and bacterial agents potentiate PRRS. *Pasteurella mutocida* plays an important role as secondary agent.

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VIRAL DISEASES

VVD-003

PRESENCE OF ROTAVIRUS TYPE C IN NEONATAL DIARRHEA. PRELIMINARY RESULTS

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Introduction

Rotavirus is a major cause of diarrhea in piglets. Rotavirus type A is the most prevalent, but other rotavirus types have been described. Rotavirus type C is the second in prevalence but its implication in digestive process could be underestimated. The objective of this study was evaluating the presence of Rotavirus type C in neonatal diarrhea on commercial pig farms in Spain.

Material & Methods

A qPCR assay to detect Rotavirus type C (targeting VP6 gen) has been designed. 83 cases from piglets younger than 15 days with diarrhea were evaluated. Feces, intestines or rectal swabs were individually or in pool analyzed. Rotavirus type A was also tested with a commercial qPCR (ExoOne).

Results

Rotavirus type C was detected in 39.8% (33/83) of cases, in 10 of 16 Spanish provinces evaluated. Rotavirus type A was detected in the 59.0% of cases and in 21.7% (18/83) there were a co-infection of Rotavirus A with Rotavirus C. Rotavirus C concentration was higher than Rotavirus A in 10 cases of co-infection and had similar concentration in the other 8 cases. Besides 18.1% of cases were positive to Rotavirus C and not to Rotavirus A.

There was a difference regarding the sample: 48.6% of intestine and 44.0% of rectal swabs were positive to Rotavirus C contrasting 19.0% of feces positive samples. No differences between individual vs. pool processing have been founded.

Discussion & Conclusion

This preliminary study shows the relevant presence of Rotavirus type C in neonatal diarrhea cases on commercial farms in Spain. These results were similar to previously reported in other countries. The kind of sample could affect the diagnostic sensitivity: intestines or fecal swab show a higher proportion of positive Rotavirus C results than feces.

In conclusion Rotavirus type C should be included in the differential diagnosis of neonatal diarrhea.



VVD-004

DEEP-SEQUENCING CHARACTERIZATION OF TWO ROTAVIRUS A OUTBREAKS IN SUCKLING PIGLETS IN CATALONIA REVEALS A HIGH FREQUENCY OF RECOMBINATION EVENTS

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Introduction

Group A rotaviruses are one of the main causes of diarrhoea in pigs worldwide. In the present study, two outbreaks of diarrhoea in suckling pigs were investigated. Four rotavirus A isolates were deep sequenced and analysed to characterize the genetic diversity and identify recombination events.

Materials and methods

Two outbreaks of diarrhoea in suckling piglets were investigated. In each farm faeces from 10 diseased and 5 healthy new-borns were sampled. Faeces were initially examined for Rotavirus A by means of a qRT-PCR. Four positive samples were selected based on their low Ct (<22) in the RT-qPCR and used for further sequencing. RNA was extracted by using a TRIzol-based protocol and RNA was deep sequenced in an Illumina platform. The output for each sample was filtered and a viral quasi-species and a consensus sequence for all Rotavirus A genes (namely, VP1, VP2, VP3, VP4, VP5, VP6, VP7, NSP1, NSP2, NSP3, NSP4, NSP5) was constructed.

Results

The deep sequencing analysis obtained high quality reads (mean QC scores >30), and a deep coverage for each nucleotide along the Rotavirus A genome (>1,000 reads per position). Four recombinant events were detected in three different genes (NSP1, VP4 and VP7), leading to 3 genome types. In the first outbreak, both samples shared the same pattern, being recombinant for the VP4 and VP7 genes, while in the second outbreak, only one sample was recombinant, specifically for the NSP1 and VP7 genes.

Discussion and conclusion

The sequence analysis showed a strong case component, since sequences from the same farm were always closely related compared to the sequences of the other farm. Moreover, the results pointed to a high frequency of recombination events within different genes along the genome. The analysis clearly indicated that the circulating field strains had different ancestors, suggesting several introduction events.

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VIRAL DISEASES

VVD-005

PORCINE CIRCOVIRUS 2 WITHIN-HOST VARIABILITY, CO-INFECTION AND RECOMBINATION UNDER A NATURAL INFECTION SCENARIO

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Introduction

Porcine circovirus 2 (PCV2) is a virus characterized by high evolutionary rate, which promotes the potential emergence of different genotypes and strains. Despite the likely relevance in the emergence of new PCV2 variants, the subtle evolutionary patterns of PCV2 at individual-host level or over short transmission chains are still largely unknown.

Material & Methods

A total of 5 PCV2 infected animals were selected from 3 different farms and a longitudinal weekly sampling was done during one month after the first positive detection of PCV2. DNA extracted from each animal at each sampling point was individually deep-sequenced using the Illumina platform and analyzed to evaluate the PCV2 variability over time. Particularly, both single nucleotide polymorphisms (SNP) and global haplotypes were estimated and evaluated.

Results

Independently of the specific animal or sampling week, the analysis of polymorphisms demonstrated a remarkably higher genetic heterogeneity and the presence of several SNPs in the genome region encoding for the capsid gene. The global haplotype reconstruction allowed inferring the virus transmission network over time, suggesting a relevant within-farm circulation. Interestingly, evidences of co-infection with multiple PCV2 genotypes and of inter-genotype recombination were found in only one farm, after animals were mixed with pigs originating from other sources. In the other two farms, only one genotype was found.

Discussion & Conclusion

The present study allowed demonstrating the remarkable genetic variability of PCV2 sub-population at individual-pig level, particularly in the Cap encoding gene. Such finding suggests the pivotal role of the natural selection induced by the host immune response in driving PCV2 evolution. Moreover, it was possible to demonstrate the effect of farm and swine management in determining the occurrence of multiple genotype co-infections and likelihood of recombination.



VVD-006

DIVERSITY OF PRRS STRAINS CIRCULATING IN CANADA

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PRRS sequencing is widely used and considered essential for the control of PRRS in Canada. Through several signed agreements, a structure was put into place and has allowed achievement of near real-time transfer of all sequences to our research team from 3 different laboratories in Quebec. Up to now, a database of 5080 sequences from 1998 to 2017 is available for research and field purposes. Sequences were also obtained from other provinces in Canada: 245 from Ontario (1998-2017) and 75 from Western Provinces (2010-2017). The objective of the study was to describe Canadian strains and position them within worldwide PRRSV ORF5 genotype 2 diversity.

A reference dataset was obtained from Dr. Shi which included 841 sequences with associated genetic lineages according to a previous study on the genetic diversity of North American strains. Sequences were added to our Canadian dataset and a maximum likelihood phylogeny was inferred. The presence of known lineages among Canadian strains was determined by identifying common node grouping of both Shi's reference sequences and Canadian sequences.

Of the 9 lineages described by Shi et al., only 3 were frequently observed in the Canadian pig population. Lineages 5 and 8 which are associated with vaccine strains were very common in Quebec (>25%) and almost exclusive in Western Provinces. Regarding wild-type sequences, lineage 1 was the most prevalent, both in Quebec and Ontario provinces and lineage 2 was rarely observed. Although Canada is connected to the North American swine production, some lineages that are frequently observed in USA were not found in Canada (e.g. lineage 9).

Differences among provinces and USA partly reflect the pig production system by which pigs are generally moved from North to South, but not the opposite and with little movements from east to west.

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VIRAL DISEASES

VVD-007

PRRS VIRUS SURVEILLANCE; ROLE OF VIRUS SEQUENCING AND VIRUS DETECTION BY PCR

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Porcine reproductive and respiratory syndrome (PRRS) is a highly infectious disease, endemic in pigs throughout the world. PRRS is caused by a single stranded positive-sense RNA enveloped virus with a high mutation rate leading to greater heterogeneity of the nucleotide sequence between individual strains. The genetic diversity of the virus increases the risk of reduced sensitivity for diagnostic nucleotide detection methods. The aim of the present study was to monitor circulating PRRSV strain throughout Europe using sequencing technologies, in order to update our real-time PCR test and improve its sensitivity.

Thermo Fisher Scientific has established different partnerships to collect 102 EU-PRRSV positive samples in 10 different countries. Sequencing strategy applied depends on PRRS viral load and quality of the sampling process (sample collection, storage, shipment). Sequences obtained have been aligned by bioinformatics to identify most conservative region on EU-PRRSV genome. Based on this bioanalysis, an updated PRRSV molecular or real-time PCR or detection test method has been developed, the Applied Biosystems™ VetMAX PRRSV EU & NA 2.0 kit. To demonstrate kit's performance, verification studies have been carried out internally on 210 field samples and with 2 external partners.

Results obtained show a highly specific kit for PRRS virus. Concerning inclusivity on 200 EU-PRRSV field samples, determined positive by external laboratory or internally by sequencing, the kit shows a diagnostic sensitivity of 99 %, covering PRRSV circulating strain from all over Europe and United States.

The monitoring of circulating European PRRSV strains, using sequencing technologies enables to sequence RNA directly isolated from field samples. Sequencing approaches offer the possibility to identify new PRRSV strains, allowing to increase performance of diagnostic tool for PRRSV detection. The newly real-time RT-PCR kit VetMAX PRRSV EU & NA 2.0 has been designed to reinforce the efficacy of PRRSV surveillance program in the field.



VVD-008

THE USE OF ROUTINE SEQUENCING ACTIVITY TO MONITOR THE EPIDEMIOLOGICAL TRAJECTORIES OF PRRSV IN ITALY

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Introduction

Porcine reproductive and respiratory syndrome virus (PRRSV) is a major threat to European swine production and Italian pig industry.

Viral evolution analysis in terms of genetic variability over time and space is one of the challenging issue in the PRRSV control mostly in swine production area characterized by high pig density, fragmentation of the production chain and lack of high biosecurity levels.

The existence of a well structured multisites production system (MPS), settled in such epidemiological scenario, is a good opportunity to investigate PRRSV epidemiology, the stability of endemic strains over time and sites and efficacy of the biosecurity standards to prevent introduction of new variants.

Material & Methods

Totally 726 ORF7 sequences were obtained from samples collected between 2004 and 2017 from 116 farms, belonging to 15 MPS located in Northern Italy. Genetic variability was evaluated both globally and at MPS and year level. Additionally, the presence and directionality of significant viral flow among MPS and production phases (i.e. farrowing, nursery and finishing) were evaluated using a phylodynamic approach.

Results

Italian PRRSV strains demonstrate a remarkable genetic variability in the ORF7 gene (p-distance mean = 0.084; range 0-0.193; 5-95 percentile 0.034-0.128). A high genetic distance was typically observed even within each MPS and year. The phylodynamic analysis showed a relevant number of between-MPS transmission events. Similarly, a major epidemiological linkage was found between farrowing and nursery and from nursery to finishing.

Discussion & Conclusion

The present study demonstrates the remarkable genetic variability of PRRSV in Italy, both globally and within MPS, suggesting an only partially controlled PRRSV circulation. The reinforcement of the biosecurity measures currently implemented (general farm biosecurity, but also transport biosecurity) could eventually help the reduction of between-MPS and between-production phases spread but the real importance of "PRRSV area-spread" (airborne?), still remains unknown.

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VIRAL DISEASES

VVD-009

FULL GENOME CHARACTERIZATION AND PREVALENCE OF PORCINE CIRCOVIRUS TYPE 3 ISOLATES FROM GERMAN FATTENING FARMS

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Introduction

Recently a novel porcine circovirus called porcine circovirus type 3 (PCV3) was reported from the Americas, Asia and Europe. PCV3 was detected with high prevalence in Polish farms, but to date no genome sequences were available from European PCV3 strains. The present study was performed to estimate the PCV3 prevalence in German fattening farms and to further characterize available PCV3 isolates.

Material & Methods

1060 serum samples from pigs at the age of 20-24 weeks from 53 German fattening farms were included in this examination. PCV3-DNA was detected using a real-time PCR and subsequently complete PCV3 genome sequences were obtained after multiply primed rolling circle amplification and sequencing of overlapping PCR products. Phylogenetic analysis was performed by neighbor-joining method and maximum likelihood method.

Results

In total 75 % of the examined farms were PCV3 positive. We were able to obtain 15 complete PCV3 genome sequences and nine partial sequences including the putative ORFs 1, 2 and 3 from PCV3 viremic animals. Phylogenetic analysis of these as well as 30 full genome sequences received from GenBank divided the PCV3 strains into two main groups. Furthermore, we were able to define group specific amino acid patterns in open reading frame 1 and 2.

Discussion & Conclusion

PCV3 is distributed with high prevalence in German fattening farms. Phylogenetic analysis revealed two clearly separated groups of PCV3 strains, which might be considered as PCV3 genotypes. Specific nucleotide and amino acid marker positions may serve for easy and fast intraspecies classification and genotyping of PCV3 strains. We found comparable diversity of PCV3 strains in Germany as in other countries.



VVD-010

DEVELOPMENT OF A REAL-TIME RT-PCR FOR DIFFERENTIAL DETECTION OF REASSORTANT H1N2 (H1N2R) SWINE INFLUENZA VIRUS

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Introduction

Endemic swine influenza virus (swIAV) strains including H1_{av}N1, H1_{hu}N2 have been circulating in Great Britain (GB) for decades. In 2009, H1N1pdm09 became the dominant strain detected followed by H1N2 and the rapid decline of H1_{av}N1 detections. An H1N2-H1N1pdm09 virus reassortant was detected in 2010; comprising H1 haemagglutinin (HA) and N2 neuraminidase (NA) surface glycoproteins with the H1N1pdm09 internal cassette. Identification of the swIAV sub-type is important for surveillance, epidemiological investigations and decisions regarding vaccination, animal welfare and public health implications. While real-time reverse transcription polymerase chain reaction (RRT-PCR) assays have recently improved the sensitivity and speed of swIAV sub-typing, these protocols cannot specifically identify reassortant H1N2 (H1N2r) swIAVs. Both the conventional H1_{hu}N2 and H1N2r now co-circulate in GB. A RRT-PCR for differential detection of H1N2r in the GB pig population was therefore developed for use in conjunction with H1N2 sub-typing RRT-PCR assays.

Material & Methods

An RRT-PCR to specifically detect the nucleoprotein (NP) internal gene of H1N1pdm09 was developed to distinguish between conventional H1N2 and H1N2r swIAVs using a modification of previously-published primers incorporating a re-designed locked nucleic acid probe to impart maximal discriminatory power.

Results

The H1N1pdm09-NP RRT-PCR assay correctly identified the H1N1pdm09-NP gene segment in H1N2r viruses from a panel of four H1N1pdm09 control viruses and a further panel of 12 conventionally-typed H1N2 viruses. This will be expanded to cover all H1N2 detections since 2012 (~60 viruses).

Discussion & Conclusion The RRT-PCR will provide added value for influenza A surveillance in GB by building on the sub-typing RRT-PCR protocols to differentiate between the conventional H1N2 swIAVs and H1N2r viruses which will be of relevance to animal welfare and zoonotic risk potential.

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VIRAL DISEASES

VVD-011

CHANGES OF T AND B LYMPHOCYTES IN TISSUES AND BLOOD OF PIGS EXPERIMENTALLY INFECTED WITH AN ITALIAN HIGHLY PATHOGENIC PRRSV-1.1 ISOLATE

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Introduction

Highly pathogenic (HP) PRRSV recently emerged in Europe. The disease is characterized by high fever and respiratory distress in young pigs and high mortality rates and reproductive failure in sows. HP-PRRSV isolates can alter the pathological outcome differently from “conventional” PRRSV, in terms of more severe clinical signs and more intense dysregulation of cellular immunity.

Materials and methods

Nine 70-day-old pigs, treated as follows: 3 intranasally infected 35 days earlier with the HP Italian PRRSV-1.1-PR40 isolate, 3 with the “conventional” Italian PRRSV-1.1-PR11 isolate, 3 kept uninfected, were sampled for lungs, bronchial lymph-nodes and blood to determine T and B lymphocyte tissue distribution and major T and B subsets in blood. Samples were paraffin embedded, EE and ABC stained by immunohistochemistry for CD3 and CD79 α . Blood immune cells were quantified by flow cytometry after staining for CD3, CD4, CD8 α , CD8 β , CD16, TCR $\gamma\delta$ and CD21.

Results

In PR40 pigs, lymph nodes showed severe CD79 α + cell depletion, with positive cells located mainly around secondary follicles, while CD3+ cells were slightly more numerous in the paracortical area. PR11-infected pigs showed a less severe lymph-node depletion, with higher CD3 and CD79 α expression. In lungs, PR40 animals showed absent BAL activation, with scarce CD3+ cells, and very few CD79 α + cells scattered around bronchi.

In blood, CD3+ T cells were decreased in infected groups compared to controls ($p < 0.05$). NKT cells were comparable with controls while TCR $\gamma\delta$ + CD8 α - ($p < 0.05$) and CD8 α + T lymphocytes were lower. A strong decrease was observed also for CD4+CD8 α - T helper lymphocytes and especially for CD21+ B cells ($p < 0.05$). CD4+CD8 α + memory and CD4-CD8 α/β + cytotoxic T lymphocytes were higher in PR40 pigs only ($p < 0.05$).

Discussion and conclusion

PR40 induced more severe immunosuppression than PR11 in target organs, influencing the amount of circulating T, but mostly B lymphocytes, resulting in insufficient activation of cellular immunity.



VVD-012

1ST CASE REPORT: REPRODUCTIVE PERFORMANCE IMPROVEMENT AFTER PCV2 SOW VACCINATION IN SPAIN

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Introduction

PCV2 can be associated with reproductive failure and cause infertility and increased rates of mummified, macerated, stillborn and weak-born piglets. The aim of this study was to determine the impact of PCV2 sow vaccination on several reproductive parameters in a Spanish sow herd.

Materials and Methods

The farm of this case report is a one-site, 1200-head sow farm located in Spain. The farm was positive for PRRS (stable), Mycoplasma and PCV2. The sow herd was vaccinating quarterly against PRRSv, and for PPV post farrowing. Since 2015 the abortion rate has been above (5,2%) and the overall reproductive performance below the target. Immunological tests and vaginal swabs were all negative for PRRSv, *Leptospira*, *Clamidia* and *E. rhusiopathiae*. *Streptococcus spp* and *Treuperella pyogenes* were detected in vaginal swabs. Whole herd antibiotic treatment was applied without improvement. Regarding PCV2, vaginal swabs and blood from sows that aborted were PCR positive. Sows were mass vaccinated twice with 1 ml of Ingelvac CircoFLEX® (Boehringer Ingelheim, Spain, SA) in December 2016 and January 2017, and mass revaccinated every 4 months. Reproductive parameters were analyzed by ANOVA or non-parametric tests with Minitab.17.1.0 software.

Results

Reproductive performances of the first 38 weeks of 2017 were improved compared to the same period of 2016. Born alive (+0,3 piglets) as well as fertility rate at first 40 days of gestation (+5,4%) were statistically better after the sow vaccination. Also weekly abortions were statistically reduced (-1,68 abortions per week) after the intervention.

Conclusions

PCV2 epidemiology has changed since widespread piglet vaccination. This case report confirmed the presence of PCV2 in vaginal swabs in aborted sows. Sow vaccination has led to a significant reduction of abortions and improvement of several reproductive indexes. There might be an interest in PCV2 sow vaccination to maintain high herd immunity levels and reduce PCV2 circulations.



VIRAL DISEASES

VVD-013

2ND CASE REPORT: REPRODUCTIVE PERFORMANCE IMPROVEMENT AFTER PCV2 SOW VACCINATION IN SPAIN

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Introduction

PCV2 can be associated with reproductive failure and cause infertility and increased rates of mummified, macerated, stillborn and weak-born piglets. The aim of this study was to determine the impact of PCV2 sow vaccination on several reproductive parameters in a Spanish sow herd.

Materials and Methods

The farm of the present case report is a one-site, 2600-head sow farm located in Spain. The farm was positive for PRRS (stable), Mycoplasma and PCV2. The sow herd was vaccinating quarterly against PRRSv, and for PPV post farrowing. Since 2015 the abortion rate has been above (3,3%) and the overall reproductive performance below the target. Immunological tests and vaginal swabs were all negative for PRRSv, *Leptospira*, *Clamidia* and *E. rhusiopathiae*. *Streptococcus spp* and *Treuperella pyogenes* were detected in vaginal swabs. Whole herd antibiotic treatment was applied without improvement. Regarding PCV2, vaginal swabs and blood from sows that aborted were PCR positive. Sows were mass vaccinated twice with 1 ml of Ingelvac CircoFLEX® (Boehringer Ingelheim, Spain, SA) in December 2016 and January 2017, and mass revaccinated every 4 months. Reproductive parameters were analyzed by ANOVA or non-parametric tests with Minitab.17.1.0 software.

Results

Reproductive performances of the first 38 weeks of 2017 were improved compared to the same period of 2016. Born alive (+0.9 piglets), fertility rate at first 40 days of gestation (+3.3%), weaning fecundation interval (-1.6 days) and litter scatter rate (-2.8%) were statistically better after the sow vaccination. Weekly abortions were numerically reduced (-0,76 abortions per week) after the intervention.

Conclusions

This is the second case study from Spain showing a significant benefit of PCV2 sow vaccination on reproductive performance. Taken together the two studies highlight that PCV-RD should be taken into account in case a sow herd does not meet the expected performance.



VVD-014

IMPROVEMENT OF REPRODUCTIVE AND PRODUCTIVE PERFORMANCE AFTER PRRS CONTROL PROGRAM IMPLEMENTATION IN SPAIN

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Introduction

Controlling this disease in large production systems is challenging. This is a summary of an 18 months field trial designed to evaluate the impact of the 5 step process approach using Reprocyc PRRS EU® and PRRSFlex EU® (Boehringer Ingelheim Vetmedica GmbH), a modified-live type I PRRS virus vaccine, on control of heterologous PRRSV in a commercial herd, assessed by live animal performance.

Materials and Methods

The site was a PRRS positive 775 sow farrow to wean farm with a wean-to-finish downstream flow. The system had two field virus strains. There was no previous PRRS immunization program established in this herd. The 5 step process considers defining goals, determining current status, assessing system constraints, developing solutions and measuring results. Following the whole herd approach concept since day 0 all pig population of the site was double mass vaccinated 4 weeks apart. Sows were injected intramuscularly with 2 ml of Reprocyc PRRS EU® and pigs were administrated 1ml IM of PRRSFLEX EU®. After the first mass vaccination, every weekly piglet batch was vaccinated on regular basis at weaning (24 days). The setup of this study is a before and after treatment data analysis, comparing weekly batches performance data. No feed changes were implemented during this period. The data collected were piglet weaned per sow per week (WSW), and standardized feed conversion ratio (FCR_{st}).

Results

After the implementation of the PRRS program WSW increased in 1 piglet and FCR_{st} improved 151 grams. These differences were statistically significant.

Discussion

The combination of the 5 step process approach and the whole herd vaccination program implemented in this system, had a significant positive impact on the reproductive and productive indexes. The calculated return on investment was 11:1 for reproductive improvement, 3:1 for growing improvement and 4:1 for global performance improvement of the whole production system.

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VIRAL DISEASES

VVD-015

A PHENOTYPING METHOD TO IDENTIFY PRRSV RESILIENT SOWS IN ENDEMIC INFECTED FARMS

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Introduction

Porcine reproductive and respiratory syndrome (PRRSV) is a viral disease with negative impact on sow reproduction. An alternative to control this virus is to select animals more resilient to the infection. A key issue to deal with disease resistance is to set up a cost-efficient phenotyping strategy. The aim was to develop a phenotyping criterion to discriminate susceptible from resilient sows in endemic infected farms.

Material & Methods

A total of 296 Landrace x Large White gilts were classified as resilient (R) or susceptible (S) to PRRSV virus following vaccination with MLV-PRRSV at 6-7 weeks of age. Gilts were phenotyped as R if serum was negative to PRRSV at 0, 7 and 21 days post-vaccination (DPV) or as S if any of the samples at 7 and/or 21 DPV was positive. All the gilts were transferred to the same reproduction farm, where the total number of piglets born, born alive, dead and mummified in each parity were recorded for two years. A binomial model was used to assess the difference between R and S sows for piglet mortality. The heritability for the resilience criterion was estimated using a threshold model.

Results

The percentage of lost piglets (dead plus mummified) over the total born was lower in the R sows as compared to the S sows (2.6% and 2.2%, for first and all parities, respectively, $P < 0.05$). The heritability of the resilience criterion was 0.47 (SD 0.06).

Discussion & Conclusion

The criterion used to identify resilient sows can effectively reduce the probability of piglet mortality at farrowing. There is also evidence that this trait could display enough genetic variation to respond to selection.



VVD-016

DEVELOPMENT AND VALIDATION OF DIRECT PCR AND REAL-TIME QUANTITATIVE PCR ASSAYS TO DETECT PORCINE CIRCOVIRUS 3 (PCV-3) GENOME

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Introduction

Since the identification of porcine circovirus 2, the *Circovirus* genus has become of major relevance, especially for its impact in the swine industry. Recently, a new species (*Porcine circovirus 3*, PCV-3) has been detected in healthy and diseased pigs. Consequently, there is an urgent need for reliable and widely accessible diagnostic tools for both routine diagnosis and research purposes.

Material & Methods

Two assays, a direct PCR (requiring no DNA extraction) and a quantitative real-time PCR (qPCR) targeting the conserved Rep gene were developed to detect the PCV-3 genome. The full genome of PCV-3 was chemically synthesized and cloned in a pUC57-Kan plasmid. Ten-fold plasmid dilutions were performed on different matrices (i.e. swine lung homogenate, oral fluid and serum) and used to validate the sensitivity and repeatability of the assays. Assay specificity was evaluated using a panel of several swine DNA pathogens. Additionally, a total of 120 field samples were used to perform the diagnostic validation step.

Results

Both methods were proven to be extremely sensitive (detection up to 10 viral genome/ μ L), specific, and repeatable, independently of the considered matrix. The high reproducibility of quantitative results, combined with the implementation of an internal control, demonstrated the reliability of the qPCR assay in viral titer quantification. Diagnostic performance evaluation demonstrated the substantially perfect agreement between the two assays, strongly supporting their high sensitivity and specificity.

Discussion & Conclusion

The present study describes the development and validation of two assays for the sensitive, specific, and repeatable detection of PCV-3, which can be reliably applied to the most commonly used diagnostic matrices. The low cost and short processing time features of the direct PCR protocol, together with the reliable quantitative results guaranteed by qPCR, can cover a broad requirement spectrum and favor the establishment of common diagnostic guidelines.

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VIRAL DISEASES

VVD-017

THE HIGH WITHIN-EUROPE PORCINE CIRCOVIRUS 3 GENETIC HETEROGENEITY: FULL GENOME SEQUENCING OF FIELDS STRAINS FROM DENMARK, ITALY AND SPAIN

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Introduction

Porcine circovirus 3 (PCV3) is a new species of the *Circovirus* genus, which has recently been detected in healthy and diseased pigs. Its presence has been reported in different countries of North and South America, Asia and recently also Europe (Poland and Italy). However, little is known about PCV3 molecular epidemiology and transmission patterns in Europe, and a relevant point is the lack of available full genome sequences from European countries. Therefore, the aim of this work was to sequence and characterize the full genomes of different PCV3 strains from Denmark, Italy and Spain.

Material & Methods

Several samples, collected in 2016 and 2017, were screened for PCV3 using an in-house developed real-time PCR. Full genome sequencing was performed on a subset of samples with a high viral titer. Obtained sequences were compared with the ones already available in public databases and a phylogenetic analysis was performed to describe the relationship between PCV3 strains collected in different countries.

Results

Of the Danish samples, 36/38 of the lymph nodes, 6/20 serum samples and 2/20 lung samples tested positive. Similarly, 10/29 lungs, 20/29 organ pools, 6/33 sera and 1/8 nasal swabs tested PCV3 positive in Italy. Fourteen out of 94 serum pools from 7/14 Spanish farms were also positive. Six complete genome sequences were obtained, which showed a significant genetic distance among them and appeared widely mixed with strains collected in different continents in the obtained phylogenetic tree.

Discussion & Conclusion

Despite that the convenience nature of the sampling prevents precise prevalence estimations, the preliminary screening of the data from three European countries confirmed a wide PCV3 distribution in Europe. Furthermore, the analysis of six complete European PCV3 genomes and their comparison with the public available sequences suggests a remarkable worldwide PCV3 circulation.



VVD-018

PRRSV PREVALENCE AND CIRCULATING PRRS STRAINS IN DUTCH FARMS BASED ON RESPIG® TEST RESULTS

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Introduction

ResPig® program includes biannual serological and saliva-PCR PRRS tests of all production groups. PRRSv is further characterized upon request. PRRSv prevalence and dynamics is summarized in the database.

Material and methods

The analysis at farm level includes weaner and nursery groups in 2016 (n=124). Saliva qPCR are classified as negative or positive. PRRSv prevalence at weaning and nursery was calculated. PRRSv PCR+ samples between 9-2016 and 9-2017 were typed via a differentiating DV-PCR (Porcilis®PRRS pigs) or ORF-5 nucleotide sequence. A sequence with ≥98% homology is defined as phylogenetically related.

Together with the vaccination history, the PRRSv dynamics can be followed. Twenty nine (29) sequences and 63 PRRS DV-PCR's were completed.

Results

Piglet vaccination-rate was 29%, with PRRSv prevalence in weaners and nursery 25% and 46%, respectively. The ORF-5 homology (Lelystad Virus) of circulating field strains varied between 84%-97% (n=13). The detected genotype-2 strains (n=4) were closely related to VR2332 strain and found on non US-MLV vaccinating farms. The DV related strains (n=5) were only detected in recently Porcilis®PRRS vaccinating farms. Six (6) out of 7 94881 related strains were detected in recently 94881-strain vaccinating farms. A total of 35/63 DV-PCR tests were positive.

Conclusion

Compared with previous studies, PRRSv prevalence in weaners increased, which is influenced by increased piglet vaccination rate. Still, ±30% of PRRSv (-) weaner batches are infected in the nursery indicating the importance of biosecurity. ORF-5 LV homology distribution does not change over time and there is no evidence of drift towards more heterologous strains. In contrast to other vaccines, Porcilis®PRRS-positive samples always originated from recently vaccinated pigs, which is of importance when PRRSv eradication of farms or outflow is a goal besides control.

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VIRAL DISEASES

VVD-019

DIAGNOSTIC IN PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS INFECTIONS - A CASE REPORT

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Introduction

Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) is distributed worldwide. Both types PRRSV-1 and PRRSV-2 are endemic in Germany, where clinical outbreaks are usually caused by PRRSV-1. The present case report describes diagnostic challenges at a PRRSV infected farm.

Material and Methods

At the present pig-producing farm with 450 sows the whole breeding stock was routinely vaccinated against Erysipelas, Porcine Parvovirus and PRRSV-1. For 2 years recurring reproductive disorders were noticed. Symptoms included abortions, an increased number of dead or weak born piglets, a high mortality in suckling piglets and an increased percentage of sows returning to oestrus. Live born piglets showed pale skin and a reduced general behaviour. Weaning pigs were suffering from wasting, diarrhoea but mainly coughing. The mortality rate increased and lameness with joint swelling was found in several pigs. For further investigations blood samples of sows and pigs were analysed for the presence of PRRSV specific antibodies and RNA. Moreover a post-mortem investigation was performed on three weaning pigs.

Results

In all dissected pigs a catarrhal-purulent bronchopneumonia was observed. One pig showed a fibrinous polyserositis. In the bacteriological investigation of the lung *Bordetella bronchiseptica*, *Pasteurella multocida* and *Haemophilus parasius* were detected. A pooled lung sample of these pigs was positive for PRRSV-2 (ct 18.69). A high value of PRRSV-specific antibodies was detected in all age groups except of gilts and in 5/6 pool serum samples PRRS-2 RNA was detected.

Discussion and Conclusions

In the present case report a high amount of PRRSV-2 was detected in lungs of weaning pigs with bronchopneumonia. PRRSV might enhance the infection of bacterial secondary infections, e.g. *Bordetella bronchiseptica*. Due to these results sows and pigs were vaccinated with a PRRSV-2 vaccine. After changing the vaccination program, the health status of pigs and the reproductive performance of sows improved.



VVD-020

FIRST ATYPICAL PORCINE PESTIVIRUS ASSOCIATED OUTBREAK OF CONGENITAL TREMOR IN SWITZERLAND

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Introduction

In recent years, several outbreaks of congenital tremor in piglets associated with atypical porcine pestivirus (APPV) infection have been described in Europe. Until recently, the associated mortality has been reported being low, and only limited information is available regarding pathogenesis, prevalence and epidemiology of APPV.

Material & Methods

In a Swiss piglet-producing farm with 182 sows, an acute outbreak of congenital tremor was observed. Approximately six months before the outbreak, the farm started buying replacement gilts instead of breeding their own. Unexpectedly, in the first farrowing batch including purchased gilts, typical symptoms of congenital tremor occurred in litters only from homebred sows (n=6). The within-litter prevalence in this batch varied from 25-83% and the mortality varied between 22%-71%. Two typical diseased piglets were submitted to the veterinary faculty for further examination.

Results

The clinical examination revealed that both animals suffered from congenital tremor, but had a good general health condition. No significant lesions were observed during necropsy, but histopathological examination revealed multifocal vacuolation of mainly white matter that was most prominent in cerebellum, brainstem and midbrain and associated with suspected hypomyelination. An APPV RT-PCR targeting the NS3 and NS4B encoding regions of APPV was performed to confirm the diagnosis. For further evaluation, a continuous monitoring of the appearance of congenital tremor was established. A constant decrease of clinical signs and within-litter prevalence in the subsequent farrowing batches was recorded, finally reaching baseline values as observed before the introduction of the new gilts.

Discussion

In this first case report of APPV in Switzerland, a very high mortality rate of piglets in affected litters was observed. It is most likely, that APPV was introduced and spread by purchased gilts.

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VIRAL DISEASES

VVD-021

SEROPREVALENCE OF ATYPICAL PORCINE PESTIVIRUS IN A SUBCLINICALLY INFECTED CLOSED PIG HERD

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Introduction

In recent years, several cases of congenital tremor in piglets have been associated with atypical porcine pestivirus (APPV). Only limited information is available about prevalence at herd level and the potential source of introduction. Therefore, the aim of this study was to determine the within-herd prevalence of APPV infection in a subclinically infected sow herd in Switzerland and to analyse associations between serological results and the age of the pigs, litter number and days after last insemination.

Material & Methods

In a closed sow herd blood samples from all sows aged 180 days or older (n=125) and six boars were collected. A total of 131 samples were examined applying an APPV RT-PCR targeting the NS3 and NS4B encoding regions of APPV and an indirect APPV-specific ELISA. The APPV antibody status was classified into in low (S/P value <0.5), intermediate (S/P value=0.5-1) and high reactive (S/P value >1.0).

Results

In 53.4% of the samples S/P values >1.0 were determined, 39.7% showed an intermediate reactivity and only 6.9% samples showed low reactivity, i.e. were serological negative. Significant associations between the S/P values and the age of the pigs (p<0.001), the litter number (p<0.001) and the days after last insemination (p=0.0075) were observed. None of the serum samples, analysed in pools of five, were positive for specific genome fragments of APPV as determined by RT-PCR.

Discussion & Conclusion

The results indicate that this sow herd was endemically infected with APPV, although viremia was detected in none of the adult pigs. This might explain the absence of clinical signs in suckling pigs of this herd. A potential reinfection and spreading of APPV in this sow herd might be due to semen from a commercial boar studs or introduction of APPV-positive animals in the absence of specific clinical signs.



VVD-022

EVALUATION OF SERUM VITAMIN B₉ AND B₁₂ CONCENTRATIONS IN PIGS INFECTED WITH PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS

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Introduction

Vitamin (Vit.) B₉ and B₁₂ are essential components for genomic stability. Serum concentrations of both vitamins are altered in human patients with viral infections. Decreased Vit.B₁₂ concentrations have been described in patients with enveloped RNA virus infections, an investigation in pigs infected with a DNA virus (porcine circovirus type 2) showed no effect on serum Vit.B₉ or B₁₂ concentrations (unpublished data). No published data are available on the vitamin B status in pigs infected with an RNA virus. We aimed to evaluate serum Vit.B₉ and B₁₂ concentrations in pigs infected with porcine reproductive and respiratory syndrome virus (PRRSV), an enveloped RNA virus.

Material & Methods

Serum samples from pigs (n=9) were used as part of an unrelated study. Pigs were infected with PRRSV strains (VR2385 [n=4] and NC16845 [n=5]) and serum samples were collected prior to the PRRSV strain inoculation and on day 3, 6, and 9 post-inoculation. Concentrations of serum Vit.B₉ and B₁₂ were measured using immunoassays validated for pigs. An ANOVA and RM-ANOVA were used to compare serum Vit.B₉ and B₁₂ concentrations in pigs prior to and 3, 6, and 9 days after inoculation with PRRSV.

Results

Serum Vit.B₉ concentrations increased from prior (medians: 92.8 µg/L) to days 3 (128.0 µg/L), 6 (175.2 µg/L) and 9 (185.6 µg/L; $p=0.0044$), whereas Vit.B₁₂ concentrations decreased from prior (medians: 196 ng/L) to days 3 (188 ng/L), 6 (184 ng/L), and 9 (158 ng/L; $p=0.0092$). Repeated measures analysis confirmed those increases and decreases for serum Vit.B₉ ($p=0.0018$) and B₁₂ ($p=0.0001$) concentrations, respectively. No difference was observed between the two PRRSV strains for either vitamin ($p>0.05$).

Discussion & Conclusion

Pigs with an enveloped RNA virus infection showed decreases of Vit.B₁₂ concentrations similar to humans. However, larger studies are warranted to confirm differences in Vit.B₉ and B₁₂ concentrations in pigs with PRRSV infection.

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VIRAL DISEASES

VVD-023

NORTHERN IRISH PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) TYPE 1 ISOLATES EVIDENCE CONSIDERABLE VARIABILITY IN THE OPEN READING FRAME 5 (ORF5)

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Introduction

PRRSv is widely spread around Northern Ireland infecting most breeding and growing pig farms. PRRSv vaccines are used in 90 to 95% of infected sow herds, while less than 15% of weaning-growing pigs receive vaccines. PRRSv is frequently involved in porcine respiratory disease complex. PRRSv infection rarely causes severe clinical signs, and a remarkable number of famers reject the use of vaccines, arguing the perceived very mild-to-nill contribution of PRRSv to respiratory problems and performance drops.

Material & methods

Between 2016 and 2017, we gathered PRRSv isolates from clinical cases of mild-to-severe respiratory disease in Northern Ireland, from which 8 samples from different farms were selected. The ORF5 gene was sequenced (Anicon, Germany). The Animal and Plant Health Agency (APHA) provided additional historical sequences from Irish samples to compare the homology between them. We built a Neighbour-joining phylogenetic tree with an additional 687 nucleotide sequences from the UK and compared the nucleotide identity.

Results

Northern Irish samples were PRRSv type 1 with >85% similar nucleotide identity with the Lelystad strain.

Variability between Northern Irish strains was noticeable with nucleotide identities as low as 84%. These strains were widely spread in the phylogenetic tree (see poster) among other British, Irish and reference isolates.

Discussion & conclusion

PRRSv from these Northern Irish cases did not belong to any single cluster based on ORF5 analysis, contrary to the beliefs of many Norther Irish producers regarding the mildness of the disease and the lack of necessity to vaccinate against PRRSv in Northern Ireland.

Predictions of disease severity and vaccine effectiveness based on ORF5 sequence are not possible. Northern Irish farms are infected by a wide range of PRRSv-1 viruses, and clinical cases do need a proper investigation to elicit the best control measures – with or without vaccines.



VVD-024

ERADICATION OF PEDV INFECTION FROM 7 FARROW TO WEAN FARMS IN CROATIA

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Introduction

Agrokor is the largest swine producer with 16.500 farrow to finish sows in Croatia.

Late January 2017, 3 finisher farms, reported an outbreak of profuse yellowish diarrhea, quickly spreading. PEDv was diagnosed after 7 days, with PCR on feces and intestines. In the next 10 days the virus spread to 7 farrow to wean farms. The finisher farms suffered high morbidity (approx. 95%), no increase in mortality. The farrow to wean farms suffered 100 % morbidity in all categories, 55%-75% mortality in 1-9 days old sucklings, no increase in mortality in other categories.

Material and methods

An eradication program was implemented with four major goals:

1. Stop spread: increase farm and feedmill biosecurity, reorder truck movements, improve disinfection.
2. Control inside farms: separation of stables, employees, equipment.
3. Stabilization: gilts introduced and farm closed; sows, gilts and weaners received feedback once.
4. Eradication: 10 days after feedback inoculation, strict McRebber and high-level hygiene applied with the major goal: newborns need to suckle colostrum ASAP. Pigs were weaned off-site at 28 days, directly to finisher site. Minimizing shedding on the sow farm and eliminate the virus from the environment with daily washing and disinfecting.

Infected animals shed the virus for 7 weeks, active immunity lasts 6 months and colostral immunity 6 weeks.

10 weeks after feedback, 30 pooled feces samples PCR tested from two oldest suckling pig groups. After receiving 3 consecutive biweekly negative PCRs, sentinel gilts were introduced and serum and feces were PCR tested every week.

Results and conclusion

From all 7 sow farms PEDv was successfully eradicated during a period of 19 to 26 weeks.

It has been proven in Agrokor that under european circumstances with a very intense and strict protocol PEDv can be eradicated from a large swine production.

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VIRAL DISEASES

VVD-025

GENETIC DIVERSITY OF PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) ISOLATES IN THE NETHERLANDS FROM 2014-2016

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Introduction

Porcine reproductive and respiratory syndrome (PRRS) is the most significant swine disease worldwide and is endemic in many countries, including the Netherlands. It is caused by the PRRS virus which shows remarkable genetic variation. Epidemiological and molecular analysis of circulating PRRS-viruses is key to modern farm management and essential to review current diagnostic tools. Since the early nineties no epidemiological or molecular study has been performed on circulating PRRS-viruses in the Netherlands. To determine the genetic diversity of PRRS isolates in the Netherlands, the sequences of circulating field viruses were compared.

Material & Methods

Seventy-eight PRRS-virus isolates collected in the Netherlands from 2014-2016 were sequenced from and including ORF2 to ORF7. Phylogenetic analysis was performed using the MEGA 6.06 software and sequences were compared with sequences available on GenBank.

Results

All investigated isolates belong to the European type I viruses including twelve Lelystad-like viruses. Most isolates showed only approximately 90% similarity with published sequences in GenBank and suggest a complete Dutch cluster in the phylogenetic tree. Sequence comparison of the individual ORFs of the viruses with the Lelystad strain showed that ORF3 (84-89%) and ORF5 (82-89%) are the most diverse ORFs, whereas ORF2 (90-95%), ORF6 (88-97%) and ORF7 (89-97%) showed the highest similarity with the Lelystad strain. Furthermore, comparison of individual ORFs suggested that some of the isolates may have originated from strains with a different genetic background.

Discussion & Conclusion

PRRS viruses isolated in the Netherlands in 2014-2016 show a high variation in their sequences. Most isolates belong to a distinct phylogenetic cluster within the type I viruses. The finding that some isolates have different origins when looking at the different ORFs suggests that recombination between different PRRS viruses may occur.



VVD-026

THE PREVALENCE OF PRRS NEGATIVE SPF HERDS IN DENMARK IS CONTINUOUSLY INCREASING

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Introduction

The Danish SPF system is a production pyramid consisting of 215 breeding and multiplier herds (Red SPF) and 2501 production units (Blue SPF). 78% of the Danish sows participate in the SPF system. The SPF system is built on the principle, that health status is declared for the connected herds. Health status of pigs is taken into account in case of trading and transport. Health Status Management keeps track of the health status of all Danish SPF herds. PRRS1 and PRRS2 are declared SPF diseases, as are *Mycoplasma hyopneumoniae*, App, Swine Dysentery, Atrophic Rhinitis, Mange and Lice.

Material & Methods

Eradication programmes for PRRS are common within the SPF system. Herds undergoing surveillance after eradication of a SPF disease, is indicated by +san in the SPF status. This status is achieved when Health Status Management estimates that there is sufficient likelihood that the eradication of the disease is successful. A PRRS eradication programme requires a 6 month surveillance period, and is completed by a minimum of 30 PRRS negative blood samples and a statement from the vet.

Results

Each year between 55 and 113 SPF herds complete eradication programmes for PRRS1 and between 19 and 70 SPF herds for PRRS2. The success rate is generally good for PRRS eradication programmes as approximately 85% obtain PRRS free SPF status. As a consequence, in the Red SPF herds, the prevalence of PRRS negative herds has gone from 77% in 2007 to 99% in 2017. For the Blue SPF herds, a similar development has taken place, as prevalence of PRRS negative herds has gone from 54% in 2007 to 72% in 2017.

Discussion & Conclusion

There is a good success rate for PRRS eradication within the Danish SPF system, and the number of PRRS negative SPF herds is continuously increasing.

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VIRAL DISEASES

VVD-027

PROCESSING FLUIDS FOR PRRSV MONITORING AND SURVEILLANCE SYSTEMS

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Introduction

PRRSV is a serious and expensive problem, costing USA swine industry more than \$ USD 1 billion per year. A critical step to control and eliminate PRRSV in production systems is to interrupt the transmission cycle in breeding herds. Thus, effective PRRSV monitoring is essential to measure progress towards PRRS control and elimination efforts. The objective of this study is to describe the use of “processing fluids” to strengthen monitoring and surveillance systems in breeding herds.

Materials & Methods

Processing fluids (PF) are a serosanguinous fluid recovered at the time of piglet tail docking and castration. One group of 12 PF samples were collected from 4 sow farms, and 30 matching individual piglet serum samples were collected on the same day from the same piglets for detection of PRRSV by PCR. A second group of PF samples (n = 20) were collected from 5 sow farms, and 30 matching tail blood swabs (TS) were collected on the same day from the same piglets for detection of PRRSV by rRT-PCR and PCV2 by PCR.

Results

The frequency of PRRSV detection by rRT-PCR in PF surpassed that of the matching 30 individual blood samples. Higher frequency of PRRSV detection was also observed in PF when compared with the matching 30 individual TS. Additionally, PCV2 DNA was detected at a greater frequency in PF than in the matching 30 individual TS.

Discussion

PF sample volume allowed for multiple diagnostic tests. PF demonstrated a higher sensitivity to detect PRRSV and PCV2 when compared to individual serum and TS. PF are effective for monitoring PRRSV and PCV2 in suckling pigs with superior sensitivity, thus, this novel sampling methodology represents an improvement for screening infectious diseases in breeding herds and is becoming a powerful tool to strengthen monitoring and surveillance systems in swine operations.



VVD-028

COMPARISON OF THE EFFICACY OF CIRCOVAC® VACCINE WITH ANOTHER COMMERCIAL VACCINE IN THE PCV2D CHALLENGE MODEL

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Introduction

PCVD (Porcine Circovirus Diseases) remain a common problem in most of swine farms. Strains of different genotypes of PCV2 are circulating in the herds. Circovac® is a whole PCV2 virus inactivated vaccine. The aim of the study was to compare the efficacy of Circovac® against PCV2d genotype with other vaccine mostly used in EU.

Materials and methods

Conventional weaned piglets (21-23 per group) were vaccinated at 3 weeks of age (WOA) either with Circovac® 0.5ml or Vaccine A 1ml, a group of non- vaccinated pigs served as controls. All were challenged at 10 WOA (D0) with 6ml of the inoculum containing 9,7 log₁₀ genomic copies/mL of a PCV2d isolate. Pigs were sampled weekly and sacrificed 4 weeks (D28) post-challenge (pch). VN test to measure antibody response and qPCR to measure virus loads were used for efficacy evaluation.

Results

Both vaccinations induced significant neutralizing antibody responses compared to the unvaccinated controls by the time of challenge, i.e. 7 weeks after vaccination. The percentage of pigs with Ct>33.4 viraemia was lower in Circovac® vaccinated pigs already on D21pch compared to Vaccine A and the control: 0%, 10% and 96% respectively. Serum virus contents on D28 differed significantly among the groups with the median values 0; 4.36; and 6.01 of log₁₀ copy number/mL for Circovac, Vaccine A and control respectively (p<0.05). The amount of the virus in the lymphoid tissue was similar in the two vaccinated groups and significantly lower than in the control pigs.

Conclusion

Circovac® demonstrated good efficacy against the experimental infection with the most important genotype of PCV2 affecting currently swine herds. Circovac® vaccinated pigs cleared the virus from blood faster than Vaccine A. Viremia is an indicator relevant to the clinical outcome and economic losses. Fast reduction of viremia renders Circovac® a highly efficient tool in the control of PCVD.

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VIRAL DISEASES

VVD-029

DETECTION OF PORCINE CIRCOVIRUS 3 IN PIGS AFFECTED BY DIFFERENT DISEASES AND PATHOLOGICAL CONDITIONS

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Introduction

Porcine circovirus 3 (PCV3) is a novel species of circovirus detected in several countries around the world during the last two years. PCV3 has been found in several tissue samples or sera from pigs with different clinical presentations, as well as in healthy animals. The present study aimed to assess whether PCV3 was present in sera of pigs suffering from different pathological conditions as well as its coexistence with other pathogens.

Material and methods

PCV3 PCR positive serum samples corresponding to a retrospective study made with pigs submitted for diagnostic purposes between 1996 and 2017 were used (n=75, group A). The same number of age-matched animals with a negative PCR result for PCV3 in serum (group B) was selected from the same retrospective study. Frequency of pathogens and pathologies of the two groups were compared by Fisher's exact test using XLSTATS 365 Excel 2016 Statistics software.

Results

The most frequent pathogens in both groups of animals were PCV2 (Group A: 13.3% vs Group B: 14.7%) and PRRSV (9.3% vs 8.0%). Other pathogens that were detected in co-infection with PCV3 were *Escherichia coli*, *Candida albicans*, *Porcine epidemic diarrhea virus* (PEDV) and *Swine influenza virus* (SIV). The most common pathological findings were poor body condition (48% vs 49.7%), followed by interstitial pneumonia (25.3% vs 29.3%) and catarrhal-purulent bronchopneumonia (21.3% vs 26.7%). No statistically significant differences were observed in the frequency of any pathogens or lesions between both groups.

Discussion and conclusion

Results obtained indicate that PCV3 is present in both groups of animals, suggesting that PCV3 may be ubiquitous in the swine population. Furthermore, and although the information obtained is limited, PCV3 did not appear to be linked to any specific pathological condition included in this study.



VVD-030

INFECTION DYNAMICS OF *PORCINE CIRCOVIRUS 3* IN LONGITUDINALLY SAMPLED PIGS FROM A SPANISH FARM

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Introduction

Porcine circovirus 3 (PCV3) is an emerging circovirus species that has recently been reported in different countries around the world, suggesting a widespread circulation. Previous studies related the presence of this virus in pigs with different clinical manifestations, as well in healthy animals and a higher prevalence in nursery piglets. The objective of this study was to assess the infection dynamics of PCV3 in a commercial farm from Spain.

Materials and methods

Serum samples from 47 healthy piglets were taken at 4, 8, 12, 16, 21 and 25 weeks of age. DNA from all sera was extracted and quantified by a specific PCV3 real time qPCR. The positive samples were amplified by a conventional PCR, and the amplicons were purified and Sanger sequenced.

Results

PCV3 DNA was detected in 9 out of 47 (19%) samples analyzed in this study, with cycle threshold (Ct) values between 31.8 and 39.6; those values corresponded to a viral titer ranging from 5.11×10^2 to 2.35×10^5 genome copies/mL. PCV3 PCR positivity in pigs was detected in only one of the time points tested, except for one animal that was positive in 2 different time points (4 and 16 weeks of age). Only the pig having the Ct value of 31.8 was possible to be sequenced; the phylogenetic analysis indicates that the partial PCV3 sequence found had a close identity with the already available PCV3 genome sequences.

Discussion and Conclusions

PCV3 was found in different pig sera at all tested ages, although the number of positive animals per age was fairly low in the studied farm. These results confirm that PCV3 circulated in the farm under study; however, it was not possible to ascertain a particular infection dynamics pattern, mainly due to the apparent low infectious pressure.

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VIRAL DISEASES

VVD-031

RETROSPECTIVE DETECTION OF *PORCINE CIRCOVIRUS 3* IN PIG SERUM SAMPLES FROM SPAIN

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Introduction

A new Circovirus species able to infect domestic pigs has been recently described and named *Porcine circovirus 3* (PCV3). This virus was initially found in 2016 in the USA and subsequently in Asia, Europe and South America in 2017. The goal of this study was to perform a retrospective study to detect evidence of PCV3 infection in serum samples of pigs collected in the last two decades from Spain.

Materials and methods

Sera samples corresponding to 654 pigs submitted for diagnostic purposes between 1996 and 2017 were selected for this study. Total DNA was extracted and the PCV3 presence was assessed by conventional PCR. Quantification of PCV3 load on the positive samples was done by qPCR. For these positive samples, amplicons obtained by conventional PCR were purified and Sanger sequenced to obtain partial-sequences of PCV3.

Results

The first PCV3 positive sample dated from 1996 and viral genome was subsequently amplified from samples of all years, except 2005 and 2009. In total, 75 out of 654 (11.46 %) of the serum samples were PCV3 PCR positive and no significant differences were found in prevalence across years. A low to moderate amount of PCV3 DNA copies per reaction, ranging from 10^2 to 10^6 was detected. The sequences of thirteen amplicons were sequenced and the phylogenetic analysis showed a high identity with the known PCV3 sequences and a minor diversity between the years. Even the genetic variability was globally low, the Spanish strains were quite diverse among them.

Discussion and conclusions

This is the first retrospective study performed on PCV3, indicating that this virus has been circulating in the Spanish domestic pig population, at least, since 1996. The present results suggest a lower prevalence of PCV3 than *Porcine circovirus 2*, and the obtained viral loads point out mainly to PCV3 subclinical infections.



VVD-032

BIOSECURITY AND VACCINATION AS EFFECTIVE TOOLS TO HANDLE AN PRRSV OUTBREAK

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This report describes a case where higher number of stillbirths, weak piglets and therapy-resistant piglet diarrhoea occurred in a sow herd. In the affiliated barn for weaned pigs, an increasing number of animals showed diarrhoea and respiratory disease.

The herd with 560 sows is located in Lower Saxony, Germany. The piglet rearing is located about 500 meters from the sow barns on the opposite side of the road. The sows are vaccinated against parvovirus, *Erysipelothrix rhusiopathiae* (Porcilis® Ery + Parvo) and PRRSV (Porcilis® PRRSV). The piglets receive vaccinations against PCV2 and M.hyo (Porcilis® PCV MHy0), PRRSV (Porcilis® PRRS) and *Escherichia coli* (ECOPORC SHIGA, Coliprotec® F4/F18). Based on the clinical signs investigations of tissue samples were performed to identify specific pathogens such as PRRSV (porcine respiratory and reproductive disease virus). PCR based investigations revealed evidence of a PRRSV field strain. Sow mass vaccination for PRRSV (every 3-4 months) was maintained, but the vaccine was changed to a special sow vaccine (ReproCyc® PRRS EU). Also the piglets received a novel special piglet vaccine (Ingelvac PRRSFLEX® EU) in the third week of life. In addition, improvements have been implemented to individual biosecurity measures, such as the renewal of the biofilter in the nursery. These adjustments resulted in an immediate halt of clinical symptoms.

From April 2016 onwards, the performance data showed a decline in recurrences of estrus by 2.6 %. The number of life born piglets per litter slightly decreased by 0.2% to 14.7. The number of weaned piglets per litter similarly decreased by 0.1% to 13.1. The suckling piglet mortality rate fell by 1.1% to 10.2%.

This case report illustrates that an adjustment of biosafety measures and vaccination procedures with application of a novel sow and piglet vaccine can lead to a considerable decrease in numbers of sows returning to estrus.

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VVD-033

PRRSV CONTROL AND SOW PLANE EVALUATION ON THREE DIFFERENT SOW FARMS

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After a variety of clinical diseases occurred in three different sow farms in Germany, investigations were undertaken to identify the cause of disease. The farmers reported an increase in stillbirths, late abortions, sows returning to oestrus and piglet mortality with diarrhoea.

The farms comprise a stock of 268, 420 and 560 sows. Porcine reproductive and respiratory syndrome virus (PRRSV) vaccine for sows was given every 3 to 4 months as mass vaccination. In addition, sows were vaccinated against parvovirus and Ery, App. E. Coli and Strep. Suis. The piglets received vaccinations against PCV2, PRRSV and M.hyo. In some cases E. coli, Haemophilus, Strep and App. Stillborn piglets were examined for pathogens that could have led to abortion. Performance data were evaluated over a period of 2 years.

The investigations revealed evidence of a field infection with PRRSV. Based on these findings, a treatment switch to a novel PRRSV vaccine specific for sows and piglets respectively, was initiated. The mass vaccination scheme was maintained. The sow herd was vaccinated every 3-4 months, and piglets were vaccinated within the third week of life. In addition improvements were made to individual biosecurity measures. Change of PRRS vaccine led to a halt and striking decrease of clinical symptoms. In addition, the evaluation of the performance data showed a decrease in return to oestrus from 1.4-3% (avg -2 %). Other measurable parameters improved slightly like the number of live born piglets (avg +0.1%), suckling piglet mortality (avg -0.1%) and the number of weaned piglets (avg +0.4%).

Improved individual biosecurity measures at 3 sow farms, and a change in PRRS MLV vaccine, led to a decrease in clinical symptoms and an improvement in performance parameters, measured by lower return to oestrus rate, pre-wean mortality and an increased number of live born and weaned piglets.



VVD-034

PRRSV SUCCESSFULLY HANDLED WITH WHOLE HERD VACCINATION. CONCEPT AND BIOSAFETY ANALYSIS

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Five farmers supplied by one piglet breeder increasingly complained of disease-susceptible and poorer-growing pigs and therefore an increased need for antibiotic treatment.

The piglet breeding facility is a 2 side production system with 480 sows, located in lower Saxony, Germany. The weaned pigs are kept in outdoor climate barns, 1.5 km away from the sows. The sows are vaccinated against PRRSV (Porcilis® PRRS), Parvovirus (Parvorovac®), *Escherichia coli* (Entericolix®) and *Clostridium perfringens* typ A (CLOSTRIPORC A). The piglets are vaccinated against.

Porcine Circovirus Typ 2 (PCV2) and *Mycoplasma hyopneumoniae*. (FLEXcombo®). In order to identify the underlying cause, 30 blood samples from sows and piglets were analysed for PRRSV (porcine respiratory and reproductive disease virus) and other agents. In a pool out of 5 blood samples of unvaccinated 30-kg piglets, PRRSV EU virus was found. As from September 2015, a new vaccination scheme was established; the piglets received a new PRRSV vaccine (Ingelvac PRRSFLEX® EU) and the sow stock was treated with a new PRRSV sow vaccine (ReproCyc PRRS® EU) every 4 months. These measures were supported by a biosafety analysis with the application of critical external and internal biosafety aspects.

From September 2015 onwards, the recurrences of estrus decreased from 17% to 10.6%. The number of weaned piglets per litter was increased by 0.8% to 12.5%. The suckling piglet mortality rate dropped from 18.2% to 12.5%.

The presented case report exemplifies how the combination of biosecurity improvements together with the implementation of a novel vaccination scheme including a whole-herd-vaccination and sow vaccination substantially reduced infection pressure by PRRSV, ameliorated animal health and enhanced performance parameters (as evaluated based on sow planner analysis).

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VVD-035

AN AUTOMATED CLASSIFICATION SYSTEM FOR PRRS ORF5 SEQUENCES

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A classification system based on PRRS ORF5 sequences would be useful to assess progress in control program and for surveillance purposes. The objective of this study was to evaluate the feasibility of an automated system that could be used for very large datasets and would consistently give reliable results over time.

A database of 3661 sequences (January 1998 to December 2013) was used as a baseline dataset and classified into distinct groups. Briefly, a maximum likelihood phylogeny was inferred using RAxML and computed on 1000 randomized stepwise Maximum parsimony starting trees to select the best-scoring ML tree. Criteria used for grouping in the classification were a minimum number of sequences of 15 per group with a rapid bootstrap >70%. Following this, approximately 1300 sequences were progressively added to the baseline dataset according to sampling date, in order to mimic sequences that our laboratory would receive in a 3-month period and, analyses were repeated to obtain a total of eleven additional runs.

The baseline dataset led to the formation of 27 distinct major groups, whereas the final dataset (n=4958) led to 33 major groups classifying more than 75% of the sequences. Unclassified sequences were either insufficient in number to form a group or branches were not well supported. Analyses revealed that most clusters were stable through time under these criteria, such that sequences attributed to one group in initial classification stayed in the same group for the 12 different analyses. However, with time and an increasing number of sequences, some initial groups were subdivided into subgroups. This is an important aspect for monitoring since one specific wild-type group increased from 0% in 2007 to 45% of all sequences in 2016.

This automated classification system will be useful for assessing spatial and temporal evolution and for surveillance purposes of PRRS virus strains.



VVD-036

SURVEILLANCE OF PRRS VIRUS STRAINS-HOW NEW TOOLS CAN SUPPORT CONTROL INITIATIVES

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University of Montreal, Faculty of Veterinary Medicine, Canada.

PRRS sequencing (ORF5) is widely used in Quebec, Canada. Through several signed agreements with veterinarians, a structure was established allowing near real-time transfer of sequences to our research team from 3 different laboratories in Quebec. As a result, our database has grown to nearly 6000 sequences, with an annual averaged increase of 450 sequences. This database has allowed the development of several tools that can be used for surveillance.

Among them is an on-line application available for practicing veterinarians. Through a "secured" access, a veterinarian may obtain sequence comparisons with all sequences in our database along with nominative data for sequences that he/she had submitted (farm name and address); for all other sequences, only the name of submitting veterinarians appears in the comparison, so they can be contacted for information sharing as part of an outbreak investigation.

Another application was developed to identify introduction of new PRRS strain(s) in breeding herds based on current and historical sequencing data. Threshold for declaring new introduction was a genetic similarity <92% with historical data for that herd. When no previous sequence data were available, the attending veterinarian was contacted to confirm that the site was initially negative.

Over a 3-year period, 165 new viral introductions were identified. This technique has allowed identification of 19 new viral introductions through regular monitoring even though these herds had not shown any clinical signs. Six other introductions were related to a vaccine-type strain (farms previously negative and not using any vaccine). Some sites had experienced 2 (n=20) and even 3 (n=1) new viral introductions over the study period.

With this tool, incidence of PRRS outbreak or new viral introduction in herds could be estimated at the provincial and regional levels. Moreover, outbreak could be investigated in a timelier fashion in a clinical context or for research needs.

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VIRAL DISEASES

VVD-037

CORRELATION BETWEEN SERUM POOLS, ORAL FLUID AND FECAL SOCK SAMPLES FOR PCV2 QUANTIFICATION IN A DANISH FINISHER HERD

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Introduction

Porcine circovirus type 2 (PCV2) is often quantified by qPCR from pooled serum samples or penwise oral fluid samples (OF). PCV2 can also be detected in feces.

The objectives of the study were to compare PCV2 viral loads in pooled serum samples, OF and FS collected in the same pens and to assess the impact of individual pig's viral load on a pooled serum sample.

Materials and Methods

One fecal sock sample (FS), one OF sample and blood samples from all individual pigs were collected from each of 17 pens with pigs 14-15 weeks of age or 18-19 weeks of age in a Danish finisher herd. From each pen, one serum pool including all pigs in the pen and one serum pool including only pigs having chewed on the rope during OF collection were assembled. PCV2 was quantified by qPCR.

Results

During collection of OF, 52.2% - 100% of the pigs in each pen chewed the rope. For 14-15 week pens, just barely moderate correlations were observed between PCV2 load in OF and "all-serum" pools ($r = 0.5$) and OF and "chewers-serum" pools ($r = 0.51$). No correlations were observed for 18-19 week pens.

A barely moderate correlation ($r = -0.5$) for the PCV2 load was observed between FS and "all-serum" pool, for 18-19 week pens, while no significant correlation was observed for 14-15 week pens.

PCV2 load in OF was significantly higher than in serum.

A high variation in PCV2 load in serum from individual pigs within pens was observed.

Discussion and Conclusion

In this study, we observed neither a good agreement nor a strong correlation between the results obtained from the different sample materials. This might be a result of the high variation within and between pens, indicating that the infection dynamics may play a role for the poor correlations.



VVD-038

THE EFFECT OF POOLING TWO DIFFERENT TYPES OF SAMPLES TO DETECT TYPE 1 PRRS VIRUS ON PRE-WEANING PIGLETS IN AN ENDEMIC POSITIVE HERD AND PRACTICAL IMPLICATIONS

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Selarl Porc. Spective, Noyal Pontivy, France.

Introduction

Most of the time, breeding herd stability against PRRSv is assessed by sampling 30 due-to-wean piglets in a farrowing batch and pooling the samples by five to test them with a RT-qPCR test. The aim of this study was to compare the capacity to detect PRRSv in pre-weaning piglets using 2 different types of samples per litter and pooling them by five.

Material and methods

One PRRS positive and not vaccinated farrow-to-finish farm was selected. 80 litters of four nonconsecutive batches were sampled. In each litter, a piglet's serum and a collective oral fluid (cOF) collected with a cotton rope were taken. RT-qPCR (Labofarm, Loudéac, France) was performed for both samples, testing them individually and pooled by five.

To assess the pooling, we compared the result of each pooled sample to the individual results of the samples constituting this pool, for serum and cOF respectively. Individual analyses at pool level (IAPL) were considered positive if at least one of the samples was positive.

Results

22 pools are analysed. 12 IAPL of serum and 12 of cOF are positive. Sensitivities are 67% (95% CI 35%, 90%) and 58% (28%, 85%) for pooled serum samples and cOF, respectively. The positivity of each pooled sample is correlated with the number of individual positive samples in the pool. Ct values of pooled sera range from 24.8 to 36.3. Ct values of pooled cOF range from 35.1 to 39.4. Three out the four batches are positive and PRRSv is detected by both pooled sera and pooled cOF.

Conclusion

The sensitivity after pooling, albeit lowered, is sufficient at batch level for both sera and cOF samples. Ct values of pooled blood and cOF samples are too high for sequencing, which could be a limitation when the diagnosis is done in a MLV vaccinated herd.

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VIRAL DISEASES

VVD-039

CHARACTERIZATION OF PRRS VIRUS AND EPIDEMIOLOGICAL ASPECTS IN SWINE FARMS IN COSTA RICA

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The Porcine Reproductive and Respiratory Syndrome (PRRS) was firstly recognized clinically in the EU in 1987 and spreaded through Europe and America. This virus has two genotypes: with type 1 predominating in Europe and type 2 in North America and Asia. The aim of this study was to identify and to characterize the PRRS virus circulating and to estimate the prevalence in pig farms in Costa Rica. In a first stage, in 2015, a total of 260 pigs from 9 highly infection-suspected with PRRS virus were intentionally sampled. For the characterization of the virus, the samples that were positive to a commercial ELISA were assayed by a final point PCR and RFLP. In a second stage, a population random sampling all over the country was done in 2016, with a final sampling size of 1278 pigs from 25 farms. A third sampling in 21 farms included in the second sampling was carried out a year after. ELISA and PCR were performed to all samples in these two last surveys. In the first sampling, 5 out 9 farms resulted positive, with 64 (27.82%) positive to ELISA. The prevailing genotype in PRRS-positive farms was the American type or virus (genotype II). In the national serological survey, 12 farms distributed all over the country, with exception of the pacific coast, were positive (48%); with 171/1278 (13.38%) samples positives to PCR. In the third sampling, was done in 2017 in 21 pig farms, from which 14 farms were positive and 7 were negative. From a total of 605 samples (ELISA), 216 were positive (36%) and 389 were negative (64%). From these results we can state that PRRS type II virus is circulating in Costa Rican pig farms with a wide geographical distribution, affecting animals of different ages.



VVD-040

PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS DETECTION IN WEANING-AGE PIGLETS IN 120 FRENCH FARMS

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Introduction

To assess the stability of a sow herd against Porcine Reproductive and Respiratory Syndrome virus (PRRSv), PCR on blood in weaning-age piglets is regularly implemented. This work describes the results obtained in 120 farms.

Material & Methods

Between February 2015 and June 2017, 186 sampling-sets from 120 French farms were collected. One farm could be sampled several times. Each set consisted in blood samples from 20 to 30 in weaning-age piglets. PRRS PCR by pool of 5 was performed. The reason of each set investigation was either to assess the absence of PRRSv circulation on the sow herd in absence of clinical signs: "control" or to evaluate the presence of PRRSv in case of observation of PRRS infection-related clinical signs: "clinic". A farm was evaluated as "clinic" or "control" at each sampling time. A set was considered "positive" if at least one pool was positive, "negative" if all the pools were negative. ORF5 sequencing was performed on positive result.

Results

On the 186 sets, 44 were evaluated as "clinic" and 142 as "control". 36/186 sets were "positive": 25 in "clinic" and 11 in "control". ORF5 sequencing was successful on 18 of the 36 positive sets: 12 were characterized as field strains (10 "clinic" and 2 "control") and 6 were related to vaccine strains (3 "clinic" and 3 "control").

Discussion & Conclusion

These results cannot be extrapolated to the French situation because farms were not selected at random. To assert a sow herd is PRRSv stable it requires a minimum of 4 consecutive negative PCR herd tests in weaning-age piglets sampled every 30 days or more frequently. In our case some farms have been investigated once and even if the result was negative they cannot be considered as stable. ORF5 sequencing is mandatory in order to reveal strain related to vaccines.

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VIRAL DISEASES

VVD-041

PCV2 GENOTYPES : EPIDEMIOLOGICAL SURVEY IN THE WEST OF FRANCE

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Introduction

Since 2004 a worldwide shift of porcine circovirus type 2 (PCV2) genotypes was observed from PCV2a towards PCV2b and more recently PCV2d (since 2012).

Material and methods

In order to identify the current PCV2 field strains, samples were selected from LABOCEA 22's sample bank, a public diagnostic laboratory set in Ploufragan, France. (period: May 2016 - June 2017).

The samples were piglets sera or organs submitted for PCV2 PCR. The viral load needed was 10^7 copies/ml (sera) or g (organs). The approach was made by total virus sequencing.

Results

The survey concerned 37 farms. More than 20 Field vets took part and 32 viruses were sequenced: 14 viruses were belonging to genotype b and 18 to genotype d.

30 case history could be gathered retrospectively: Field Vets observed global symptoms of PCVD in 8 PCV2b infected farms out of 12, and in 17 PCV2d infected farms out of 18.

The average clinical score was apparently higher when strain d was isolated: 7.8 on a scale of 10 (6.2 for strain b, difference not significant). Weight loss/wasting away was mainly associated with strain d (Chi square, p: 0.016) . No statistical differences between strains were observed for the other clinical signs i.e mortality, respiratory disorders and heterogeneity.

In farms where no PCV2 vaccine was recently used, strains b or d were observed in the same proportion.

Among the 7 vaccinated farms showing clinical signs, strain d was isolated in 6 farms using a PCV2 vaccine on piglets (on the contrary, strain b was isolated only in 1 farm).

Conclusion

In this study Weight loss/wasting away seems to be significantly linked to higher occurrence of PCV2d.

The correlation between PCV2 genotype, acute clinical symptoms and vaccine protection needs to be further investigated.



VVD-042

FIRST DETECTION OF PORCINE PARVOVIRUS 7 IN POLAND

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Introduction

In the last years several novel parvoviruses (PPV) were discovered in pigs worldwide. The most recently discovered porcine parvovirus species is PPV7, which was reported in USA and China to date.

The aim of the study was to present the first evidence of PPV7 in Polish pigs.

Material&Methods

The serum and fecal samples were collected from 14 farms, from pigs of different age. Ten serum samples and fecal swabs were obtained from several age groups and were pooled by 5 prior to DNA extraction with QIAamp DNA Mini Kit or QIAamp cador Pathogen Mini Kit (Qiagen). The real-time PCR was performed according to Palinski et al. (2016). ORF1 (NS1) of PPV7 from several positive samples was sequenced by Sanger method.

Results

PPV7 DNA was detected in fecal swabs from all examined farms. The virus was detected in serum of pigs from 9 farms. Overall, PPV7 was more prevalent in fecal pools (39,0%) than in serum pools (19,6%). No positive results were obtained from 3-6-week-old pigs. In pigs of 7 weeks of age and older the virus was detected in 26,1% serum pools and 51,4% fecal pools. The nucleotide identity of partial NS1 sequences from 5 farms ranged from 92% to 96%. Polish sequences were 92%-93% identical to the sequences from USA and China.

Discussion&Conclusion

Our results are the first evidence of PPV7 infections in Europe. PPV7 is likely common in Polish pigs and exhibits surprisingly high genetic diversity. PCR profiles of PPV7 circulation suggest that passive immunity plays protective role. The influence of PPV7 on pigs health remains unknown and requires future investigation. In order to perform PPV7 surveillance in pig farms testing feces with real-time PCR is recommended.

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VIRAL DISEASES

VVD-043

PRRSV TYPE 1 TRANSMISSION VIA PIGLET TRAILERS - RELEVANCE FOR SPREADING?

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Introduction

A field study was performed in Germany to evaluate the role of transport vehicles as a source of transmission of porcine reproductive and respiratory syndrome virus (PRRSV) to susceptible pigs. Risk factors for transmission of PRRSV type 2 via transport vehicles has been described, while little is known about PRRSV type 1 transmission via trucks in Europe.

Material & Methods

The procedure was performed in autumn/winter on two wet piglet transporters with multiple shipments per day after cleaning and disinfection and was repeated five times on a weekly basis. Samples were taken with a common Swiffer® dry cloth saturated with Phosphate Buffered Saline (PBS) of ten different locations before and after cleaning and disinfection. All samples were tested for PRRSV by qPCR. Every positive PCR sample was cultivated in cell culture to verify PRRSV infectivity and was then sequenced.

Results

In total, 28% of samples before and 14% of samples after cleaning and disinfection were qPCR positive for PRRSV type 1. Samples tested positive for PRRSV between 0-70% before and 0-50% after cleaning and disinfection; 50% of the transport vehicles tested positive for PRRSV type 1 after cleaning and disinfection. The lowest ct-value for PRRSV was 30.62 before and 35.43 after cleaning and disinfection. Cultivation and sequencing of PRRS positive PCR samples was not successful.

Discussion & Conclusion

Although PRRSV transmission via transport vehicles was not proven, it can also not be excluded. In addition, the high PRRSV prevalence in tested vehicles still suggests a transmission risk and confirms the knowledge, that vehicles without drying could still remain a fomite for the transmission of PRRSV despite cleaning and disinfection. Drying of the pig transport vehicle should get major consideration in case of multiple shipments with the same vehicle per day to avoid PRRSV type 1 transmission.



VVD-044

DETECTION OF HEPATITIS E VIRUS ON SWINE FARMS IN POLAND.

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Introduction

Hepatitis E virus (HEV) is the causative agent of hepatitis E in humans. Pigs are one of the main reservoirs for genotypes 3 and 4. Little is known about the circulation of HEV on swine farms and the effect of infection on health status of pigs. The objectives of the study were to demonstrate HEV circulation on Polish swine farms and the presence of the virus in serum, oral fluid and feces.

Material & Methods

Diagnostic materials were collected from 10 large scale and family-scale pigs farms with different health status located in Poland. From each farm, 10 blood samples, 10 stool samples and oral fluid were collected from several age groups. The serum and faeces samples were pooled 10 to 1. For the detection of HEV RNA real-time RT-PCR was performed (Jothikumar et al., 2006).

Results

HEV RNA was detected in all of the 10 tested pig farms. The virus RNA was usually detected in oral fluid and feces of 13-17 weeks old pig. In one farm the virus was detected in feces and oral fluid of pigs from 6 to 17 weeks of age. In one farm HEV was found in serum of sows while materials from weaners and fatteners were negative.

Discussion & Conclusion

The results of this study indicate that HEV is common in swine in Poland but its circulation patterns differ between farms. Testing of oral fluids by PCR can be useful for monitoring HEV circulation. Future research needs to focus on the potential factors having impact on infection dynamics and pig health, as well as the role of HEV from pigs for public health.

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VIRAL DISEASES

VVD-045

INFLUENZA A SURVEILLANCE IN THE PIG POPULATION OF GREAT BRITAIN (1991-2017)

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Introduction

Swine influenza is an economically important viral disease of pigs, representing a continuing threat to production animals and zoonotic risk for humans.

Material & Methods

In Great Britain (GB), a scanning surveillance programme for swine influenza A virus (swIAV) began in 1991 including epidemiology and virological analyses, this has been augmented by phylogenetic and antigenic characterisation.

Results

From 1991-2017, 3862 swIAV submissions have been tested (range 27-275 *p.a.*), totalling 513 positive submissions producing approximately 635 virus isolates. Four main sub-types have been detected with 2-4 co-circulating: avian-like (av) H1N1 (n=232, 45.2%), H1N2 (n=73, 18.2%), H3N2 (n=29, 5.6%) and latterly pandemic H1N1 (n=77, 15%). Since 2010, the number of reassortant H1N2 viruses containing an H1N2 (external gene) – pandemic H1N1 (internal gene) has expanded. Frequency of detection of avH1N1 has declined since the initial identification in 1992 (23% to <1% of submissions) and whilst the rate of detection of H1N2 peaked in 1998 (9.8%), it declined to <1% in 2007/2008 but has increased again since 2009 (~5%). The pandemic H1N1 sub-type appeared in 2009, peaked in 2010 (~8%) and now comprises <5% of submissions. Sub-type H3N2 has not circulated in GB since 1997. Classical swine H1N1 was detected during the late 1980's but not after 1993. Demographic analysis of two subsets of submission data (1998-2006 and 2009-2012) has been performed including; frequency of swIAV submissions and virus positives per pig population, geographical distribution, seasonality, pig age, clinical signs and inter-current disease.

Discussion & Conclusion

Surveillance is needed for detection of existing and novel swIAVs in GB pigs and monitoring of prevailing disease trends. Such analyses may identify changes in the epidemiology of swIAV of relevance to public and veterinary health with respect to zoonotic and reverse zoonotic transmission, as well as to the burden of disease for the pig industry.



VVD-046

ACUTE NEUROLOGIC DISEASE IN *PORCINE RUBULAVIRUS* EXPERIMENTALLY INFECTED PIGLETS

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Background & objectives

The objective of this study was to evaluate the clinical disease, humoral response and viral distribution of recent *Porcine rubulavirus* (PorPV) isolates in experimentally infected pigs.

Material & Methods

6-piglet (5-days old) groups were employed (G1-84, G2-93, G3-147, and G4-T). Three viral strains were used for the experimental infection LPMV/1984, Mich/147/2013 y Qro/93/2013. Each strain was genetically characterized by amplification and sequencing of the gene encoding hemagglutinin-neuroamidase (HN). The inoculation was performed through the oronasal and ocular routes. Subsequently, the signs were evaluated daily and necropsies were performed on 3 different days post infection (dpi). We recorded all micro- and macroscopic lesions. Organs from the nervous, lymphatic, and respiratory system were analyzed by quantifying the viral RNA load and the presence of the infectious virus. The presence of the viral antigen in organs was evidenced through immunohistochemistry.

Results

In the characterization of gene HN, only three substitutions were identified in strain Mich/147/2013, two in strain LPMV/1984 (fourth passage) and one in strain Qro/93/2013. Neurological alterations associated with the infection were found in all three experimental groups starting from 3 dpi. Groups G1-84 and G3-147 presented the most exacerbated nervous signs.

Discussion & conclusión

The main histopathological findings were the presence of a mononuclear inflammatory infiltrate. PorPV and RNA distribution were identified in the organs of the nervous, lymphatic, and respiratory systems of the piglets analyzed at different times. The viral antigen was detected in the brain and lungs in most of the assessed groups. Seroconversion was evident in groups G1-84 and G2-93. Groups G1-84 and G3-147 were the most clinically affected by the experimental infection. Both strains were isolated in the state of Michoacán. The virulence of the new isolates maintains similar characteristics to those reported more than 30 years ago.

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VIRAL DISEASES

VVD-047

PHYLOGENETIC ANALYSES OF PORCINE CIRCOVIRUS TYPE 3 INFECT A SWINE PRODUCTION SYSTEM IN MEXICO CITY

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Background & objectives

In the United States and China, the presence of porcine circovirus type 3 (PCv3) has been described emerging disease that occurs mainly causing reproductive failures in females. Currently, in Mexico the presence of PCv3 has not been reported, however, in recent years has been detected increase in the number of cases of sows with reproductive failures, discarding the presence of other infectious agents present in national territory. The objective of this work is detecting the presence of PCv3 in females with reproductive failures in a swine production system in Mexico City.

Material & Methods

In swine production system in Mexico City, was identified two sows aborted in the second third of gestation and three gave birth to stillbirths. Samples of piglets born dead, abortions and females were taken for DNA extraction, DNA was sequenced from the complete PCv3 genome using the end-point polymerase chain reaction test (PCRpf) and sequencing by the Sanger method.

Results

The PCv3 was identified in samples of stillbirths, abortions and vaginal secretions; the phylogenetic analysis determines that the strain presents greater homology with the strains reported in United States.

Discussion & conclusión

In Korea, according to Taeyong, *et al* 2017, report a prevalence of PCV3 of 44-72%, while in China Wen *et al* in the same year, report the prevalence is between 19 and 32%. In addition, they report that the strain circulating in Korea has a 97 to 99% homology with the Chinese strain. The clinical signs associated with PCv3 in pigs are dermatitis, reproductive and urinary problems, however in the present study we only detected clinical signs associated with reproductive failure.



VVD-048

IMPLEMENTATION OF THE 5 STEPS PROCESS PLATFORM FOR PRRS CONTROL IN A FARM IN SPAIN

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Introduction

PRRS is one of the most damaging diseases in the swine industry, having negative effects typically affecting breeding herd reproductive parameters as well as pig productivity parameters.

Controlling the infection is key to keep the systems producing at target levels and involves sow herd stabilization as well as an active pig protection.

Materials and Methods

The study has been conducted in a PRRS positive 750 sow farrow-to-feeder farm located in Spain. The 5 steps process considers defining goals, determining the status at the starting point, assessing system constraints, and developing, implementing and monitoring solutions.

200 gilts entered the farm before closing it and then two mass vaccinations of sows and gilts were done 3 weeks apart injecting intramuscularly 2 ml of Reprocyc PRRS EU[®]. The rest of the pigs older than 14 days were administered 1ml IM of PRRSFLEX EU[®]. Since then, every weekly piglet batch was vaccinated on a regular basis at weaning, the McRebel protocol was implemented, and a sow and gilts quarterly vaccination was set up.

Results

Results of the means of the data before and after the implementation of 5 steps process are:

- Reduction in the abortion rate from 2.79 to 2.19.
- 0.879 more born alive piglets per litter.
- 0.595 more weaned piglets per litter.
- 1.76 more weaned piglets per sow per year.
- Reduction in the Nursery mortality from 4.82% to 3,65%.
- Reduction in the fattening mortality from 6.16% to 4,07%.

Conclusions and Discussion

The implementation of the 5 Step Process platform as well as the whole herd vaccination program implemented in this farm, had a significant positive impact on the reproductive and productive parameters. Regarding the financial impact the calculated return on investment was 12.1:1 for the intervention in sows and 6.0:1 for the intervention in pigs.

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VIRAL DISEASES

VVD-049

MODELLING AFRICAN SWINE FEVER INTRODUCTION AND GEOGRAPHICAL EXPANSION IN FRANCE AND EVALUATION OF DETECTION AND CONTROL POTENTIAL

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Introduction

Being a notifiable disease, the emergence of African swine fever in disease-free countries has huge economic consequences mainly due to export ban. Moreover, with a case fatality rate close to 100%, ASF represents a major threat for the swine industry. Recent ASF outbreaks in eastern Europe revealed the need of prospective approaches to analyse the consequences of the introduction and spread of ASF at the country level. We used a modelling framework to analyse the consequences of potential ASF emergence in France in terms of requirements for detection and control.

Material & Methods

The national swine identification database, reporting live-pigs movements in France, was analysed to derive distance-related probabilities of contact occurrence between the different types of farms of the swine production network. These specific data were further used to feed a simulation model developed in Denmark representing the spread of ASF (DTU-DADS-ASF model) within and between farms along with realistic control measures defined in the national emergency plan (movements restriction, establishment of protection and surveillance zones, depopulation,...).

Results

A high heterogeneity in the density of swine production units in France was highlighted and 10 herd types were identified. Four density zones, each including 25% of swine production sites, were determined. The epidemics characteristics were compared depending on the density-zone of the index case. Slight variations were found in terms of detection-delay but the number of surveillance visits was increased up to four times according to the index case location. The infection was largely disseminated throughout the country when the index case was in low-density areas but was geographically contained in highly populated ones.

Discussion & Conclusion

The location of the index case is a determining factor to consider to mobilize sufficient resources for active surveillance in case of emergence of ASF in France.



VVD-050

SUBCLINICAL PORCINE CIRCOVIRUS TYPE 2 (PCV2) INFECTION: DETERMINATION OF DIFFERENT HERD PROFILES SPLIT ACCORDING TO AN OPTIMAL SEROLOGICAL CRITERION

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Introduction

PCV2 is associated with various disease conditions known as porcine circovirus diseases (PCVD). PCV2 infection dynamics play a role in PCVD. However, few data are available on PCV2 infection dynamics in herds without signs of PCVD. The study aimed at 1/ assessing PCV2 infection dynamics in herds with subclinical PCV2 disease and without PCV2 piglet vaccination and 2/ identifying a serological criterion to discriminate between PCV2 infection profiles.

Material&Methods

The study was carried out in 41 French herds. In each herd, 20 finishers from 2 batches were bled (10/12-week-old pigs and at least 22-week-old pigs). Serum samples were tested by the commercial SERELISA®PCV2 Ab Mono Blocking test to detect PCV2 antibodies. The serological results were used to identify different PCV2 infection profiles by hierarchical clustering (FactoMineR, R software). Then the most contributing variable to the cluster building process was sought by a discriminant analysis (R software). The cut-off allowing the allocation of the herds in different PCV2 infection profiles and minimising the classification errors has been determined by a ROC curve (ROCR, R software).

Results

Two groups of herds were identified. Group 1 comprised 20 herds with low frequencies of pigs with high SERELISA® values and small mean and maximal SERELISA® values in both batches. The second group had higher SERELISA® values on these parameters indicating an early exposure to PCV2 and/or a higher infection pressure or intensity of exposure to PCV2 in this group. Having at least 40% of 22-week-old pigs with a SERELISA® result >5000 was found to be the best criterion to allocate the herds to this second group (sensitivity=100%, specificity=95%).

Discussion&Conclusion

Different PCV2 infection dynamics occurred in herds without PCVD signs. A serological criterion based on the SERELISA® results was defined to gain insight into the diagnostic of PCV2 infection patterns in subclinically infected herds.

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VIRAL DISEASES

VVD-051

INVESTIGATION OF THE IMPACTS AND DYNAMICS OF SWINE INFLUENZA VIRUS IN DANISH SWINE HERDS

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Introduction/materials and methods

To investigate the impacts and dynamics of influenza A virus (IAV) in Denmark, a longitudinal study was performed in four Danish herds with production of pigs from 0-12 weeks. Four batches of pigs were included from each herd. One batch consisted of four sows with each five of their own piglets ear tagged at birth. All herds were monitored over a four month period. Blood samples and nasal swabs were collected from both sows and piglets, along with recordings of clinical examinations, mortality and individual antibiotic treatments. No IAV vaccination program was used in the herds.

Results

The results revealed that IAV was highly prevalent in all herds. Surprisingly, the highest percentage of infected pigs was found in the farrowing unit, despite that the sows were positive for IAV antibodies before farrowing. Three herds presented as endemically infected herds, where circulation of IAV was maintained in all units probably due to the current intensive production system and insufficient internal biosecurity measures. The fourth herd experienced acute infection with a new subtype during the study period, and displayed completely different dynamics and clinical impacts compared to the three endemically infected herds. Another interesting observation was a number of "chronically" IAV infected pigs present in each of the four herds, however with varying prevalence.

Discussion and conclusion

Despite that, the sows were antibody positive prior to farrowing, a high prevalence of IAV were revealed in the farrowing unit, and 98 % of all infected pigs got infected before 8 weeks of age. The findings indicate that sow vaccination programs for controlling IAV infection in piglets may be insufficient in herds with high infection pressure in the farrowing unit and underline the importance of proper diagnostics in individual herds to be able to design an efficient control program for IAV.



VVD-052

KINETICS OF EXPRESSION OF CD163 AND CD107A IN THE LUNG AND TONSILS OF PIGS AFTER INFECTION WITH PRRSV-1 STRAINS OF DIFFERING VIRULENCE

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Introduction

Porcine Reproductive and Respiratory Syndrome (PRRS) is one of the most important diseases of the porcine industry worldwide. Highly pathogenic strains (HP-PRRSV) causing atypical outbreaks have been notified, stressing the marked genetic and antigenic viral variability, which has encouraged the interest to understand the immunobiology of PRRSV strains of differing virulence. Porcine alveolar macrophages (PAMs) are the primary target cells for PRRSV replication, in fact, the scavenger receptor CD163 of PAMs is the main surface receptor of PRRSV, allowing its internalization. On the other hand, it has just been reported the role of CD107a as a marker for activated and degranulated macrophages.

Material & Methods

This study assesses the expression, distribution and kinetics of PRRSV antigen, CD163 and CD107a in lung and tonsil tissues of an experimental infection with three different PRRSV-1 strains: Lelystad (PRRSV-1 prototype); 215-06 (British field strain); and a HP-PRRSV strain (SU1-bel). Animals were euthanized at 3, 7 and 35 days post-infection (dpi). Lung and tonsil samples were processed for histopathological and immunohistochemical studies by using specific antibodies against PRRSV, CD163 and CD107a.

Results

SU1-bel caused the most severe lesions and the widest viral distribution in the lungs as well as in the tonsils. These animals displayed larger number of CD163⁺ macrophages at 35dpi in both tissues than other strains ($P < 0.05$). The molecule CD107a was mainly expressed in the cytoplasm of PAMs and septal macrophages, showing statistically significant differences between infected and control groups at 35 dpi.

Discussion & Conclusion

The virulence of PRRSV-1 strains under study was able to modify the kinetics of expression of CD163, suggesting that SU1-bel may cause a higher predisposition to suffer PRRSV reinfection. In case of CD107a, regardless of the virulence of strains, the number of CD107a⁺ cells increased, proposing that CD107a might play a key role in macrophages activation.

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VIRAL DISEASES

VVD-053

ANALYSIS OF VIRAL POPULATIONS AFTER EXPERIMENTAL INFECTION WITH *PORCINE CIRCOVIRUS 2* AND ASSOCIATION WITH DIFFERENT CLINICAL MANIFESTATIONS

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Introduction

The within-host diversity is known to play a relevant role in the pathogenesis of rapidly evolving viruses, affecting their ability to evade the host immune response and conditioning the tissue tropism. *Porcine circovirus 2* (PCV2) is a rapidly evolving virus and can establish relatively long-lasting infection. Therefore, it has the potential for developing relevant within-host heterogeneity, with consequences that have never been investigated.

Material and methods

Twenty-three piglets from two different farms were inoculated with a lung homogenate (from a PCV2-systemic disease [PCV-SD] affected pig) and monitored for three weeks. Sera were weekly collected and viral titer and antibody levels estimated. Three weeks post-infection all animals were euthanized and a complete necropsy was performed. Serum samples, together with the inoculum used, were individually deep-sequenced using the Ion-torrent platform and analyzed to evaluate the within-subject PCV2 variability over time and its association with different clinical outcomes.

Results

Out of the sixteen highly viremic animals ($>10^6$ copies/mL), 9 developed PCV2-SD while 7 showed no overt clinical signs. Remaining pigs (n=7) had a lower viremia ($<10^6$ copies/mL) and no clinical signs. PCV2 genetic variability affected mainly the capsid gene and revealed remarkable heterogeneity among subjects. However, a significant association was demonstrated, especially at 3 weeks post-infection, between within-host viral heterogeneity and clinico-pathological conditions. Particularly, a significant decrease in viral genetic variants was observed in PCV2-SD cases compared to the rest of infected animals, whose PCV2 variability increased over time.

Discussion and conclusions

The present study demonstrates that PCV2 infected animals harbour several viral sub-populations over time, whose heterogeneity could be involved in disease pathogenesis. It is possible to speculate that the reduced variability observed in PCV2-SD cases could be attributable to the selection of a limited number of more fit variants or to a decreased effect of selective pressures due to immunosuppression.



VVD-054

EPIDEMIOLOGICAL SURVEILLANCE AND CHARACTERIZATION OF INFLUENZA A VIRUSES (IAV) IN SPANISH AND PORTUGUESE PIG FARMS

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Introduction

The aim of this study was to determine the diversity of IAV circulating in pig farms of Spain and Portugal retrieved from clinical outbreaks as well as from random surveillance.

Material & Methods

Nasal swabs (NS; 10-20 animals/farm) were collected from 64 outbreaks of respiratory disease compatible with swine influenza. Additionally, 20 NS from suckling piglets, weaners and fatteners were collected in 10 randomly selected farms. Presence of IAV and subtyping were initially assessed by RT-qPCR. For 11 isolates genotyping of IAV was determined after sequencing with the Illumina MiSeq[®] Plattform.

Results

IAV suspicion was confirmed in 49/64 outbreaks of which 33 happened in weaners. Detected subtypes were: H1N1, H1N2, H3N2 and H3N1. In active surveillance, 9/10 farms were positive for IAV -always H1 viruses- (6 maternities, 7 nurseries and 2 fattening units, with average prevalences of 44%, 37% and 6%, respectively). Globally, six different lineages were detected being H1avN2 (25.0%) and H1avN1av (21.4%) the most frequently ones. H1 or N1 of the 2009 pandemic lineage were not found. Regarding the genotyping, 5/11 isolates belonged to genotypes M and N, which contain the Matrix gene of the 2009 human pandemic H1N1 virus.

Discussion & Conclusion

The present results indicate that IAV is widely spread in pig farms of Spain causing both outbreaks and apparently subclinical infections. The most frequent lineage, H1avN2, was not present in Spain until 2013 a fact that indicates a rapid spread within the pig population. The common presence of reassortants, including human pandemic gene segments, emphasize the need for genotyping to get a precise picture of the molecular epidemiology of IAV.

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VIRAL DISEASES

VVD-055

PRRS RISK ASSESSMENT OF DUTCH SOW HERDS USING COMBAT

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Introduction

COMBAT is a questionnaire tool to assess farm associated PRRSV risk factors by looking at variable risks: Internal, External, Management and Location. In this overview we tried to have an insight in the most relevant risk factors for PRRSV infections of sow herds in the Netherlands, using COMBAT.

Material and Methods

In 2017 at 31 farm locations in the Netherlands that housed sows a COMBAT questionnaire was performed. Each answer was classified ('Very high', 'High', 'Intermediate', 'Low' risk) and compared.

Results

Farm location was a very high risk in 68% of the cases; 87% have more than 4 pig farms within 5 km, 90% don't know the PRRS status of the nearest pig farm.

External risks were (very) high in 56% of the cases; at 84% the pig transport vehicle was used at any farm, 61% without a need for drying the vehicle.

Internal risks were (very) high in 46% of the cases; at 93% workers could walk freely between production areas.

Management risks were (very) high in 62% of the cases; 90% puts lightweights to a younger age group and 87% had maximum 4 week quarantine period for incoming gilts.

Discussion and conclusion

This overview shows that PRRSV infection risks in Dutch farms are high. One may discuss if this is due to lack of knowledge and/ or motivation. High pig farm density is a considerable risk for PRRS infections. Nevertheless there was almost no knowledge on PRRS status of the nearest neighbor.

The infection risk of mixing age groups is hardly recognized by farmers. For good PRRS risk factor advice every individual farm needs a custom made advice and a clear visualization of what might help. For that COMBAT can be used to visualize the farm PRRSV risk status and to discuss points of improvement.



VVD-056

THE USE OF PROCESSING FLUIDS COMPARED TO SERUM FOR DETERMINATION THE PRRS TYPE 1 STATUS OF NEONATAL PIGLETS ON A COMMERCIAL DUTCH FARM

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Introduction

For diagnosing early (vertical) PRRS-infections, a lot of piglets have to be bled. Bleeding new born piglets is stressful and time consuming which can only be done by well-trained people. Recent findings from the US indicate the possibility of using processing fluids (PF) for diagnosing early PRRS-type 2 infections. Objective of this study was to compare PRRS-type 1 detection by PCR in serum and PF of neonatal piglets during a field outbreak on a Dutch farm.

Materials and methods

In a 600 sow breeding farm with a recent PRRS-type 1 outbreak in the Netherlands the PRRS status of neonatal piglets was compared by using PF and serum. Per week batch 30 piglets were bled by vena puncture at 2-4 days of life. In the same batches PF were collected: after castration the testicles were put on a polyester 0.5 cm mesh grid using the drip as sample. All samples were analyzed by PCR for the presence of PRRS-virus. Serum was tested pooled by 5 samples, PF was tested as one sample per week batch. When positive, the ORF5 sequence was analyzed.

Results

In 4 out of 4 weekly batches, serum was positive for PRRS type 1 (Ct 31.0-36.2). In 3 out of 4 weekly batches, PRRS type 1 could be detected in PF (Ct 31.4-34.3). ORF5 sequence results will be presented at the ESPHM symposium.

Conclusion/discussion

The use of PF for detecting PRRS in neonatal piglets is proven possible for PRRS-type 1 strains. However, not all PF samples were positive when serum was. The collection of PF by stockmen was easy and time efficient. In addition less PCR testing was used. With the use of PF, weekly farrowing batches can be monitored for PRRS status, saving time and money due to lesser amounts of PCR testing.

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VIRAL DISEASES

VVD-057

NO EVIDENCE OF PCV2 INFECTION OF PIGLETS IN 60 DANISH SOW HERDS

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Introduction

Porcine circovirus type 2 (PCV2) infection in sows can result in irregular rebreeders, abortion and weak newborn piglets. The extent of PCV2 related reproductive problems and impact on the status of suckling piglets has never been investigated in Denmark. Hence, this study investigated the occurrence of PCV2 in piglets.

Material & Methods

Piglets aged 1-21 days sent, by the herd veterinarian, to SEGES Laboratory for Pig Disease for necropsy were included in the study. Cases including three or more piglets were evaluated pathologically and the iliac and inguinal lymph nodes were collected. The lymph nodes were pooled submission wise and tested for PCV2 by qPCR with a detection level of 10³ copies pr. 500 ng extracted total DNA. Sample size calculations suggested 60 herds to be an appropriate sample size, with the assumption that PCV2 could be detected in piglets in 5% of the Danish sow herds.

Results

In total, 63 submissions including 501 piglets from 60 herds were included. The most common anamnesis from the submitting herds were enteric diseases and unspecific health problems such as increased mortality and unthrifty piglets. The anamneses given could not be related to the PCV2 status of the piglet, as none of the lymph node pools were positive for PCV2.

Conclusion & Discussion

The included herds all experienced piglet health problems, indicated by the need for laboratory services. The negative outcome of test of piglets from the 60 herds strongly indicated that PCV2 does not possess a major health problem for piglets in Danish sow herds. Further research is needed to investigate if the impaired health of the piglets is related to PCV2 infections in the sows.



VVD-058

CLINICAL RESEARCH TOOLS FOR PRRSV GROWTH AND DETECTION

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Introduction

The porcine reproductive and respiratory syndrome (PRRS) is an economically important disease worldwide causing reproductive failure in sows and respiratory symptoms in piglets. The main target cells of PRRSV are alveolar macrophages (AMph). The growth of PRRSV *in vitro* is not consistently achieved in cell lines like MARC-145 cells. Primary porcine macrophages are susceptible to PRRSV. The aim of this project is to phenotypically characterize primary porcine macrophage subsets by flow cytometry and to investigate the individual cell subsets for PRRSV susceptibility.

Material & Methods

Monocyte derived macrophages (MoMph) were derived from PBMC after stimulation with M-CSF. AMph were obtained from pigs by bronchoalveolar lavage. MoMph, AMph and bone marrow derived macrophages (BMMph) were analysed by flow cytometry for their expression of CD172a, CD163 and CD14. PRRSV infection was verified by RT-PCR and immunofluorescence assay (IFA) using the monoclonal antibody SDOW17. MARC-145 cells were used for further passaging of PRRSV field strains after isolation in AMph.

Results

Flow cytometric analysis revealed different phenotypic expression of CD172a and CD163. Almost 100 % of the AMph were CD172a⁺, in contrast to BMMph and MoMph with 50-66% and 48% CD172a⁺ cells, respectively. CD163 expression was observed on almost 100 % of the AMph as well as MoMph. In BMMph, CD163 expression was detected on 40-60% of the cells. CD14, a monocyte differentiation marker, was absent on AMph whereas almost all MoMph were CD14⁺. About 20% of the BMMph were CD14⁺.

Discussion & Conclusion

The phenotypic analysis of BMMph and MoMph revealed that only a minor fraction of the cell populations co-express CD172a, a marker for myeloid cells, and the PRRSV receptor CD163. Therefore further infection experiments focussed on CD172a⁺CD163⁺ AMph. PRRSV field strains showed different replication pattern. Further investigations intend to establish a robust *in-vitro* macrophage infection model for PRRSV field strains.

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VIRAL DISEASES

VVD-059

RESULTS OF PRRS CONTROL IN DUTCH FINISHER FARM AFTER OUTBREAK OF PRRS

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Introduction

The objective of this study was to evaluate the effect of a PRRS vaccination under field conditions at a PRRS positive farm with finisher pigs.

Materials and Methods

This case study was performed in a finishing farm of 3500 finishing places. The farm received since years PRRS negative piglets from a 400 sow farm. The piglets were vaccinated at 3 weeks of age against PCV2 for years; in January 2016 this was combined with a vaccination against Mycoplasma. Due to an acute outbreak of PRRS in February 2016 in the sow farm, the finishing farm received shortly afterwards PRRS positive pigs. PRRS was diagnosed by PCR on 10 week old piglets. The problems in the finishing barn consisted of increased respiratory problems, higher use of antibiotics, decreased growth, less uniform pigs and higher feed conversion rate.

In August 2016 the sow farmer started with a piglet vaccination against PRRS type 1 at 3 weeks of age, applied in a 2 ml triple combination with the PCV2 Mycoplasma vaccine.

Monthly close out data records were retrospectively collected from June 2015 until August 2017 for 3 different periods (before PRRS outbreak - outbreak pigs non-vaccinated - PRRS vaccinated pigs).

Results

In the time frame with the added PRRS vaccination the general health improved resulting in less coughing, better uniform pigs, and less losses until slaughter. All the major production parameters improved (ADG + 70 gr/day; FCR -0,17 compared with outbreak pigs data). Also the antibiotic usage decreased (-56%) below the legal recommended threshold (DDD).

Conclusions and Discussion

This retrospective analysis of a Dutch pig farm confirms that the PRRS vaccine in combination with vaccination against Mycoplasma hyopneumonia and PCV2 improved not only the clinical symptoms but also the technical performance of the pigs. This is in line with other reports.



VVD-060

DETECTION OF INFLUENZA A VIRUSES IN SWINE HERDS IN THE NETHERLANDS DURING APRIL TO SEPTEMBER 2017

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The influenza A virus (IAV) subtypes H1N1, H1N2 and H3N2 circulate in domestic pigs at variable rates in The Netherlands. Following the emergence of the human pandemic H1N1 2009 IAV (H1N1pdm), variants of this virus occurred in global swine populations. Here we describe the detection of IAV including H1pdmN1 and H1pdmNx in swine farms in The Netherlands in the period April to September 2017.

Nasal swab or oral fluid samples from clinical cases of porcine flu were sent to the FLI for detection (RT-qPCR), typing and sequencing of IAV.

Results

559 samples from 43 herds were tested. 143 (25.6%) samples and 30 (69.7%) herds were found positive for IAV. The types of IAV identified were (samples positive: S / herds positive H): H1avN1av: S 38, H 12, H1avN2: S 2, H 2, H1huN2: S 4, H 2, H1av/huN2: S 1, H 1, H1av/huN2av/hu: S 2, H 1, H3N2: S 2, H 1, H1pdmN2: S 5, H 3, H1pdmNx: S 1, H 1, HxN1av: S 7, H 1, HxN2: S 1, H 1, Swine Influenza Virus: S 90, H 6.

H1N1, H1N2 and H3N2 are still the majority of IAV that circulate in Dutch swine herds. However, as presented by our group in 2017, sows, gilts, suckling and weaned piglets appear to be highly susceptible to infection with human pandemic IAV strains and their reassortants. These data show that pandemic IAV can be found in swine during the summer period, i.e. outside the human influenza season, and in 4 out of 30 positive herds.

Current European swine influenza vaccines, including IDT's Respororc FLU3, do not confer sufficient cross protection against the pandemic strains of IAV. A homologous vaccine against the pandemic Influenza strain (Respororc FLUpan H1N1) is now available in selected countries in Europe.

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VIRAL DISEASES

VVD-061

PREVALENCE OF ENTERIC PATHOGENS IN OUTBREAKS OF NEONATAL DIARRHEA IN PIG FARMS OF SPAIN

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Introduction

Neonatal diarrhea is one of the major causes of economic losses in porcine production and many infectious agents can be involved. In this study, outbreak cases of diarrhea were tested for a panel of major enteric pathogens in suckling piglets in Spain.

Material and methods

Twenty-six outbreaks of neonatal diarrhea were investigated (February-November 2017). Fecal samples (n=239) from 1-2 week-old piglets (180 cases and 59 controls) were bacteriologically cultured and tested by PCR for: porcine epidemic diarrhea virus (PEDV), rotavirus A (RVA), transmissible gastroenteritis virus (TGEV), *E.coli* genes, *C.perfringens* (α , β , β 2) and *C.difficile* toxins (TcdA, TcdB). For *E.coli* isolates sensitivity tests were performed for 21 antimicrobials.

Results

In 23 of the cases more than one pathogen was found in diseased animals. RVA (20/26) was always found in combination with other pathogens except in one case. In the outbreaks where RVA was not found (6/26), diseased animals were positive for: TcdA and *E.coli* (15%), PEDV (4%), and TcdA (4%). All farms were positive to *C.perfringens* α and β 2-toxins. PEDV was found in 5 farms and TGEV in one associated to RVA. Regarding bacterial pathogens, 85% and 76% of *C.perfringens* were positive for α - and β 2-toxins, respectively, and 34% of *C.difficile* was TcdA and/or TcdB positive. For *E.coli*, the frequency of the examined toxins (LT, Sta, Stb, VT1, VT2) and fimbriae (F4, F5, F6, F18, F41) was < 5%, except for genes EAST1 (88%), *eae* (16%), Stb (10%).

Pure isolation of *E.coli* was obtained from 94 samples. More than 50% of the isolates were resistant to 10 drugs, being aminopenicillins and tetracyclines the less effective antimicrobials, while lower resistance was found for colistin (3%), apramycin (7%) and ceftriaxone (16%).

Conclusion

Multiple enteric pathogens are simultaneously detected in diarrhea outbreaks in Spain. However, RVA and toxigenic *C.difficile* seem to be increasingly important.



VVD-062

ASSESSING THE SOW HERD PORCINE CIRCO VIRUS-2 (PCV2) STABILITY UTILIZING PLACENTAL UMBILICAL CORD SERUM (PUCS) SAMPLES PRE AND POST MASS VACCINATION WITH 1ML INGELVAC CIRCOFLEX®

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Introduction

PUCS sampling has shown to be a convenient method to detect vertical transmission of PCV2 from viraemic dams to their offspring. Furthermore, vaccination of sows with Ingelvac CircoFLEX® has shown to reduce vertical transmission and improve the reproductive performance of the sow herd.

Materials and methods

This investigation was conducted on a 2 000 sow unit in South Africa, positive for *M.hyo* and negative for PRRS. Piglets were routinely vaccinated with Ingelvac CircoFLEX® at 18 days of age. Gilts were vaccinated at weaning and again in the gilt development unit (GDU). Sow vaccination for PCV2 was not routinely practiced. PUCS samples were obtained pre and post vaccination by milking the serum from at least three umbilical cords of one placenta into a serum tube and analyzing this by PCR for PCV2.

Results

A PUCS prevalence of 20% or greater was considered to coincide with the detection of instability. An 80% prevalence of PUCS positive samples was determined prior to vaccination. Biannual mass vaccination of the sow herd was introduced in 2017. PUCS sampling was repeated post biannual vaccination, where the prevalence had reduced to 0%.

Discussion and conclusion

The PUCS diagnostic tool was considered useful in determining the sow herd stability to PCV2. Initially, the prevalence of PUCS positive samples was greater than 20%, which coincided with the detection of instability in the sow herd. Following biannual mass vaccination of the sow herd with 1ml Ingelvac CircoFLEX®, the prevalence of PUCS positive samples was reduced to 0%, correlating to the achievement of sow herd stability to PCV2 and consequent reduced vertical transmission of PCV2 from the sows to their offspring.

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VIRAL DISEASES

VVD-063

THE UPTAKE AND DISINTEGRATION OF PORCINE CIRCOVIRUS TYPE 2 VIRIONS IN BLOOD MONOCYTIC CELLS

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Monocytic cells are important target cells for porcine circovirus type 2 (PCV2) in pigs. They can take up PCV2. However, the mechanism of this process and the outcome were still not elucidated. To examine the mechanism of PCV2 uptake by monocytic cells, blood monocytes were isolated by plastic adherence, pre-treated with different endocytic inhibitors for 30 min at 37 °C and inoculated with PCV2 in the presence of the same inhibitors for 1 h to allow the uptake of virus particles. Then, PCV2 antigens and cell contours were visualized by a double immunofluorescence staining, and the level of uptake was quantified using Image J software. The uptake of PCV2 was significantly decreased by (i) chlorpromazine (84±7 % reduction), (ii) cytochalasin D (82±11 % reduction), and (iii) dynasore (50±24 % reduction), which indicated that the particles were internalized via clathrin-mediated, dynamin-dependent endocytosis. In contrast, inhibiting macropinocytosis with amiloride and caveolae-dependent endocytosis with methyl-β-cyclodextrin or filipin did not affect the PCV2 uptake. To examine the fate of the virions after uptake, cells were inoculated with PCV2 for different periods before they were fixed and stained. Afterwards, PCV2 antigens were quantified using Image J software. After the uptake, a disassembly of the virions was observed up till 12 hours post inoculation, after which a low level of antigens remained present. In the future, it will be examined if PCV2 genomes become transported to the nucleus and if they become transcribed.



VVD-064

ORAL FLUID RESULTS FROM BEFORE, AT AND AFTER START OF RESPIRATORY SYMPTOMS

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Introduction

The objective of this study was to evaluate the dynamics of different pathogens on Dutch pig farms with PRDC problems before, at and after the start of cough by using oral fluids with PCR testing for different pathogens.

Materials and Methods

Oral fluid samples were collected in farms with respiratory problems in nursery as well as fattening pigs. Ropes were placed at 3 age groups at sampling date: "T 0" was the age group where the onset of acute cough was present; "T -2" and "T +2" was 2-4 weeks younger /older than the acute coughing group.

The samples were analyzed by a multiplex PCR (IVD- Hannover) for PRRS, Influenza, PCV2, and *Mycoplasma hyopneumoniae*. Results were reported as negative or positive for the respective pathogen.

Results and Discussion

In total 198 samples were collected from 31 farms from which 95 OFs were from acutely coughing (T0) pig groups. Over the different time points before, at and after the start of the cough, different dynamics were found for the 4 investigated pathogens. In acute cough, Influenza had the highest prevalence, indicating to be the primary pathogen especially in the nursery. PRRS is most prevalent in the first 2 months of the finishing phase and was detected more often when cough was present and with lower Ct values compared to T-2 and T+2, indicating higher amount of virus particles at acute cough. *Mycoplasma* is more a secondary agent, and an extender of the cough. Because *Mhyo* has by far the highest prevalence in the T+2 compared to its T0 and T-2, it is at least in this study not the classic 'door opener'. For PCV2, no real differences were found in prevalence in T-2, T0 and T+2.

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VIRAL DISEASES

VVD-065

RESULTS OF ORAL FLUIDS ON DUTCH PRDC PIG FARMS: PREVALENCE OF RESPIRATORY PATHOGEN

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Introduction

The objective was to investigate the prevalence of different pathogens in Dutch pig farms with PRDC problems by using oral fluids (OFs) with PCR testing.

Materials and Methods

The age of pigs sampled ranged from weaned pigs till slaughter, depending on the onset of respiratory signs. The ropes were placed in the pens for 20-30 minutes. The samples were analyzed by multiplex PCR (IVD-GmbH lab Hannover, Germany) for PRRS, Influenza, PCV2 and Mycoplasma hyopneumoniae (M hyo). Results were reported as negative or positive for the respective pathogen.

Results

198 samples were collected from 31 farms. The results were assorted into 5 age groups: 4-6 weeks (n=26), 7-9 weeks (n=35), 10-13 weeks (n=39), 14-18 weeks (n=54) and 19-24 weeks of age (n=44). For PRRS the peak of prevalence was in age groups of 10-13 weeks (61%), followed by age groups 14-18 weeks (57%). Influenza was mainly found at 4-6 weeks (62%) and 7-9 weeks (54%). The highest prevalence for M hyo was found late finishing at 19-24 weeks (27%) followed by 14-18 weeks (22%). In the other 3 groups it ranged between 2 and 10%. For PCV2 the peak was found at 14-18 weeks (56%).

Conclusions and Discussion

Results demonstrated different dynamics for the investigated pathogens: Influenza was found primarily in the nursery. This demonstrates the role of nursery pigs as a reservoir of this pathogen on farm. PRRS is slowly spreading in nursery and by the set-up/ mixing of the finishing phase, higher incidence during the first 4 to 6 weeks of finishing phase. The same dynamics is shown for PCV2. The results for Mycoplasma hyopneumoniae indicate its limited role in the nursery and there is a clear indication that the main infection takes place in the second half of finishing.



VVD-066

DEVELOPMENT OF GB PIG DISEASE SURVEILLANCE DATA IN AN INTERACTIVE FORMAT FOR PIG VETERINARIANS AND OTHERS USING PRRS AS AN EXEMPLAR

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Introduction

An interactive tool displaying pig diseases diagnosed through the GB surveillance network was recently made available on-line. Development to allow more detailed interrogation of surveillance data is in progress and this study uses data from porcine reproductive and respiratory syndrome (PRRS) diagnoses as an exemplar.

Material & Methods

Data associated with diagnoses of PRRS were extracted from the GB Veterinary Investigation Diagnosis Analysis (VIDA) database from 2012 to 2017. This included clinical and premises details from diagnostic submissions to the GB surveillance network, and diagnoses confirmed according to strict diagnostic criteria with the associated clinical syndrome. Software (“Tableau”) was used to display the data in a “dashboard” format to provide users with the ability to filter the diagnoses by pig age, clinical sign, sample type, geographic region and time period.

Results

From 2012 to 2017, over 320 diagnoses of PRRS were made, mainly in post-weaned pigs. The most common clinical signs reported were respiratory disease, wasting and pigs being found dead. Concurrent diagnoses in addition to PRRS in the same submission were added into the dashboard; streptococcal disease (mainly *Streptococcus suis*), *Pasteurella multocida*, swine influenza and salmonellosis were amongst the commonest, with sample type clearly affecting the likelihood of diagnosing additional diseases. The diagnostic rate of PRRS showed a tendency for a seasonal increase in the cooler winter months.

Discussion & Conclusion

Displaying features of PRRS outbreaks from across GB helps veterinary practitioners in recognition of disease. The seasonality trend supports anecdotal field reports and likely reflects better virus survival and transmission in colder, damper and darker conditions. The concurrent diagnoses in part reflect the immunosuppressive nature of PRRS and emphasise the importance of full diagnostic investigations in disease outbreaks. The pig disease surveillance dashboard and this PRRS study provide a user-friendly means of accessing information on disease outbreaks.

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VIRAL DISEASES

VVD-067

PORCINE CIRCOVIRUS TYPE 3 (PCV3) IN POLAND - DETECTION AND GENETIC DIVERSITY

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Porcine circovirus type 3 (PCV3) is a novel pathogen first discovered in 2016 in USA. PCV3 is suspected to be involved in numerous diseases, but its true role in pigs health is still unknown.

The objective of this study was to investigate the prevalence and molecular diversity of PCV3 in serum samples collected from 14 pigs farms from Poland.

Materials & methods

Serum samples were collected from 14 Polish pigs farms. Samples were pooled by 4-6 before DNA extraction, and tested with in house real time PCR for PCV3. ORF2 fragment from selected samples was sequenced.

Results

PCV3 DNA was detected in 12 out of 14 farms, in 5.9% to 65% of tested pools. Overall, PCV3 was detected in 24.5% serum pools from pigs and in 29.0% serum pools from sows. The virus was most common in weaned pigs (26.1%) and finishers (28.0%). Only one serum pool from 3-week-old piglets was PCV3 positive (5.0%). Nucleotide identity of partial ORF2 sequences from 9 farms ranged from about 95% to >99%. Surprisingly, some sequences were >99% identical to the sequences from USA and China.

Discussion & conclusion

The results show that PCV3 is highly prevalent in Poland. No correlation between the presence of PCV3 in serum and health status of pigs was found. 3-week-old piglets are mostly free from infection, what suggests that passive immunity is protective. The analysis of partial ORF2 sequences indicates high genetic diversity of PCV3 in Poland.

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VVD-068

CHARACTERIZATION OF ASTROVIRUS CAUSING GASTROENTERIC DISEASE IN PIGLETS IN ITALY BY A METAGENBOMIC APPROACH

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Introduction

Astroviruses are emerging viruses, Family Astroviridae, that infect mammalian and avian species. They are non-enveloped viruses with a single-stranded positive sense RNA genome. They are detected in the intestines and several other organs in diseased and healthy animals. Porcine astroviruses (PoAstVs) belong to the Mamastrovirus genus and are distributed worldwide and divided into five lineages possibly reflecting different species of origin, interspecies transmission and recombination events. Here we report a diagnostic case of acute gastroenteritis in piglets in Italy with the involvement of PoAstVs.

Materials and methods

In November 2015, an acute episode of gastroenteritis was observed in an open cycle farm of about 460 sows in North-East Italy, Treviso province. Piglets during post weaning presented diarrhea, reduction of food intake, high morbidity and low mortality. Faecal samples were collected from diseased piglets and analysed by electron microscopy (EM) and a pan mamastrovirus RT-PCR. Whole genome sequence was obtained with a metagenomic approach, from EM positive faeces.

Assembled sequence of length comparable to Astrovirus length (6-8 Kb) was selected as consensus sequence and confirmed by BWA. Phylogenetic analysis was performed on the deduced amino acid sequence of ORF2, using maximum likelihood method in PhyML3.1 and including representative strains from PoAstV1-5.

Results

The phylogenetic analysis showed the Italian virus belongs to the PoAstV2 lineage 1, clustering with viruses from Asia. Based on the ORF2 aa sequence the Italian strain shares the highest similarity (73.2%) with PoAstV2/Bel-12R021/2012 from Belgium.

Discussion and conclusions

The present case report indicates that: PoAstVs2 may be involved in enteric disorders in piglets and the low number of PoAstV sequences available rises the complexity of PoAstVs classification. Still fragmentary data are available on the role of PoAstV in the multifactorial enteric disorders of pigs. Better surveillance and diagnosis may clarify the epidemiology and taxonomical classification of PoAstVs.

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VIRAL DISEASES

VVD-069

NOROVIRUS IN FAECES OF HEALTHY PIGS IN NORTH-EAST ITALY

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Introduction

Norovirus (NoV) has emerged as one of the major causative agents of non-bacterial, food- and water-borne gastroenteritis in humans all over the world. NoVs are classified into six groups (G), from GI to GVI, which are further subdivided into 30 genotypes. NoVs identified in human gastroenteritis cases are only GI, GII, and GIV. NoVs have also been isolated from several animal species, including pigs, dogs, cattle, rodents and lions. The detection of GII NoV from pigs in Japan and Europe, and GII NoV antibodies in US swine have raised public health concerns about the zoonotic potential of porcine NoVs.

Material & Methods

Faeces were collected at slaughterhouse in 2017 in two regions of North-East Italy. Forty-six samples originated from Veneto and thirty-three from Friuli Venezia Giulia regions, covering seven and three provinces, respectively, were analysed for presence of Calicivirus. A two-step RT-PCR targeting the RdRP gene using the p290-p110 primer pairs was used. Sanger sequence was conducted on samples presenting enough amount of the target amplified DNA. Phylogenetic analysis was carried out using the neighbour-joining method and Kimura two-parameter substitution model using MEGA7 software.

Results

Fourteen samples collected in Veneto region, were PCR positive. Nucleotide sequence of about 300bp were obtained from only two samples. BLAST analysis showed a homology between 89 and 92% with swine NoV detected in Europe. Phylogenetic analysis showed that Italian strains belong to the GII.11 and cluster with other swine NoV from USA and Asia.

Discussion and Conclusion

This study identified GII.11 NoVs in the swine population of North-East Italy, similarly to a previous report in 2011. Further molecular analysis on the VP1 gene are ongoing on positive samples. The real distribution and the role of NoVs in swine needs to be further investigated by proper sampling approach and full genome analysis.



VVD-070

MOLECULAR CHARACTERIZATION OF THE SPIKE GENE OF THE PORCINE EPIDEMIC DIARRHEA VIRUS IN MEXICO

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Introduction

In Mexico, the first suggestive outbreaks of the circulation of the porcine epidemic diarrhea virus (PEDV) were identified at the beginning of July 2013. The Spike protein is the most antigenic protein of the virus and the main target for developing a vaccine or diagnostic system.

Material & Methods

To identify the molecular characteristics of the PEDV Spike (S) gene in Mexico, 116 samples of the intestine and diarrhea of piglets with clinical signs of porcine epidemic diarrhea (PED) were obtained. Samples were collected from six states of Mexico (Jalisco, Puebla, Sonora, Veracruz, Guanajuato, and Michoacán) from 2013 to 2016. After amplification of the S gene by RT-PCR, the obtained products were sequenced and assembled.

Results

The complete amino acid sequences of the spike protein were used to perform an epitopes analysis, which was used to determine null mutations in regions SS2, SS6, and 2C10 compared to the sequences of G2. A phylogenetic analysis determined the circulation of G2b and INDEL strains in Mexico. However, several mutations were recorded in the collagenase equivalent (COE) region that were related to the change in polarity and charge of the amino acid residues.

Discussion & conclusion

The PEDV strain circulating in Jalisco in 2016 has an insertion of three amino acids (²³²LGL²³⁴) and one change in the antigenic site of the COE region, and strains from the years 2015 and 2016 changed the index of the surface probability, which could be related to the re-emergence of disease outbreaks. In conclusion, in this work, 10 PEDV strains were identified from outbreaks in six regions of Mexico from 2013 to 2016. Of the four analyzed neutralizing epitopes, the Mexican strains presented mutations only in the COE region. Funded by PDCPN2014-1, 249177, RF 13592932977.

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VIRAL DISEASES

VVD-071

FIELD EVALUATION OF ID AND IM PRRSV MLV VACCINATION (PORCILIS® PRRS) IN SUCKLING PIGLETS ON THEIR HEALTH STATUS AND PERFORMANCE

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Introduction

PRRSV causes significant economic losses to the global swine industry. The aim of this study was to evaluate the ID and IM PRRSV MLV vaccination in suckling piglets under field conditions.

Material & Methods

The study included 187 suckling piglets (2 weeks) from a commercial PRRSV-positive farm (11-12 piglets x 4 groups x 4 replicates); group A: IM- vac with Porcilis® PRRS, group B: ID- vac with Porcilis® PRRS, group C: ID of placebo and group D: IM of placebo. During the trial, blood samples were collected (3 pigs / group / replicate) at the age of 4, 7, 10, 13, 17 and 21 weeks. Sera was examined by qRT-PCR for PRRSV (types 1 and 2) and by ELISA for PRRSV Abs. Local and systemic reactions, performance parameters (BW, ADG), mortality, lung lesion scores (LLS) and pleurisy score (PS) were recorded.

Results

No significant local and systemic reactions were noticed in vaccinated piglets. Performance parameters were improved in vaccinated groups. Based on qRT-PCR Ct results (category 0 = negative, 1 = weak positive, 2 = positive, 3 = strong positive) the category 3 was more frequent in non-vaccinated groups at 7, 10 and 13 weeks. The comparison of ELISA and qRT-PCR results indicated that the ID or IM vaccination induces important seroconversion 2-5 weeks after vaccination. The mortality rate at finishing stage and overall during the study, as well as the respiratory problems (LLS, PS) were significantly lower in vaccinated groups.

Discussion & Conclusion

This study establishes that ID vaccination of suckling piglets is clinically safe and has beneficial effects on their protection against PRRSV viremia, equally or better than IM vaccination. In addition, evidences of ID vaccination benefits are the improved BW of finishers before slaughter, the reduction of respiratory problems, as well as the decreased mortality rate.

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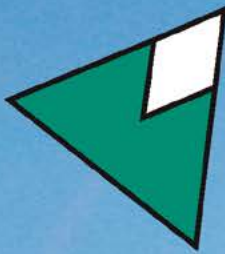
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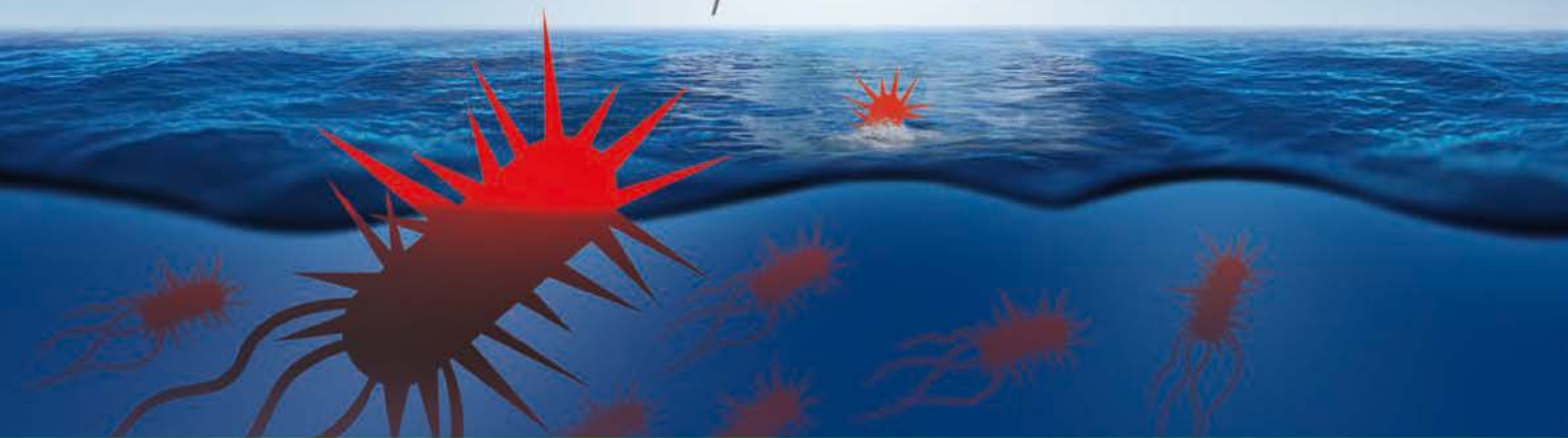
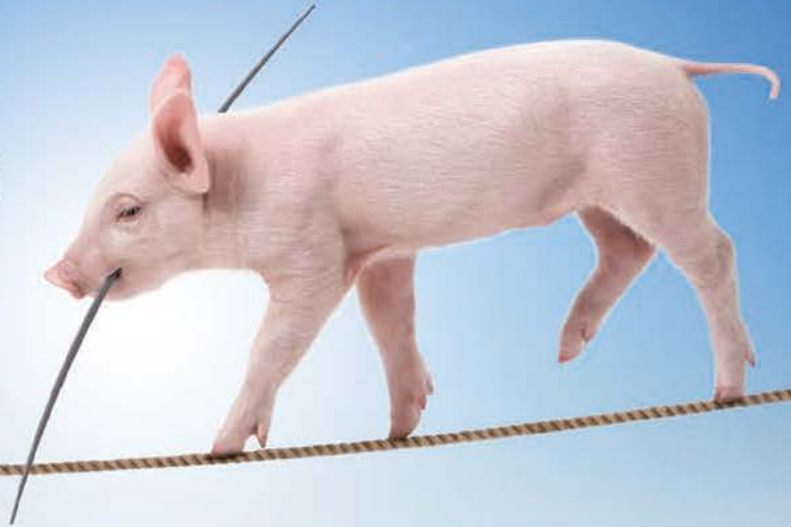
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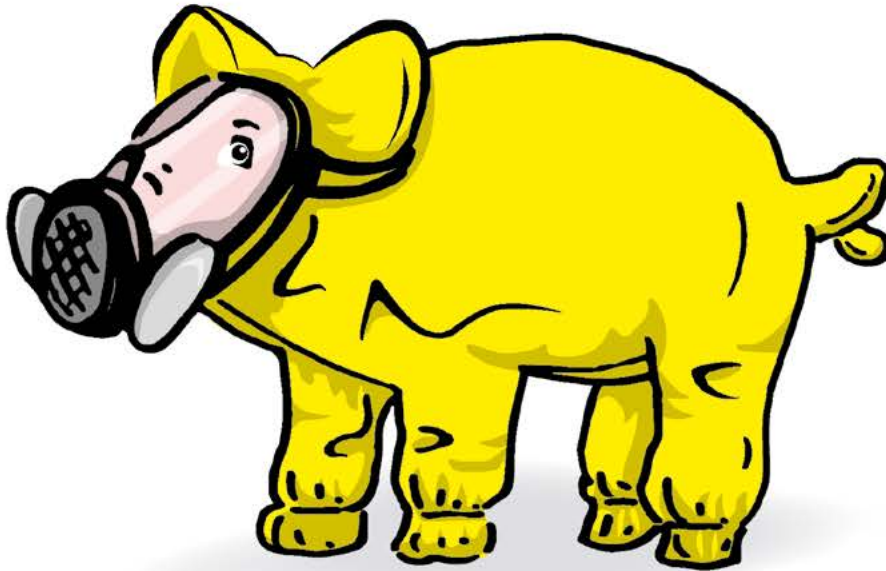
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1. Diseases of swine 10th edition, Jeffrey J. Zimmerman, Locke A. Kariiker, Alejandro Ramirez, Kent J. Schwartz, Gregory W. Stevenson. John Wiley & Sons, 15 feb. 2012

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Suvaxyn PRRS MLV lyophilisate and solvent for suspension for injection for pigs. Composition (per dose): Modified live PRRSV*, strain 96V19S: $10^{2.7} - 10^{5.3}$ CCID₅₀** (**Porcine respiratory and reproductive syndrome virus** Cell culture infectious dose 50%). **Indications for use:** For active immunisation of clinically healthy pigs from 1 day of age in a porcine respiratory and reproductive syndrome (PRRS) virus contaminated environment, to reduce viraemia and nasal shedding caused by infection with European strains of PRRS virus (genotype 1). **Onset of immunity:** 28 days after vaccination. **Fattening pigs:** Duration of immunity: 26 weeks after vaccination. In addition, vaccination of seronegative 1-day-old piglets was demonstrated to significantly reduce lung lesions against challenge administered at 26 weeks post vaccination. Vaccination of seronegative 2-week-old piglets was demonstrated to significantly reduce lung lesions and oral shedding against challenge administered at 28 days and at 16 weeks post-vaccination. **Gilts and sows:** Duration of immunity: 16 weeks after vaccination. In addition, pre-pregnancy vaccination of clinically healthy gilts and sows, either seropositive or seronegative, was demonstrated to reduce the transplacental infection caused by PRRS virus during the third trimester of pregnancy, and to reduce the associated negative impact on reproductive performance (reduction of the occurrence of stillbirths, of piglet viraemia at birth and at weaning, of lung lesions and of viral load in lungs in piglets at weaning). **Contraindications:** Do not use in herds where European PRRS virus has not been detected by reliable diagnostic methods. Do not use in boars producing semen, as PRRS virus can be shed in semen. Do not use in seronegative pregnant sows in the second half of gestation because the vaccine strain may cross the placenta. The administration of the vaccine to pregnant seronegative sows in the second half of gestation may have an impact on the reproductive performance. **Precautions:** Special warnings for each target species: Vaccinate healthy animals only. Special precautions for use in animals: Care should be taken to avoid the introduction of the vaccine strain into an area where PRRS virus is not already present. Vaccinated animals may excrete the vaccine strain for more than 16 weeks following vaccination. The vaccine strain can spread to in contact pigs. The most common spreading route is via direct contact, but spreading via contaminated objects or via the air cannot be excluded. Special precautions should be taken to avoid spreading of the vaccine strain to unvaccinated animals (e.g. seronegative pregnant sows in second half of gestation) that should remain free from PRRS virus. It is advised to vaccinate all target pigs within a herd from the earliest recommended age onwards. Newly introduced PRRS virus-naïve animals (e.g. replacement gilts from PRRS virus-negative herds) should be vaccinated prior to pregnancy. Special precautions for storage: Store and transport refrigerated (2 °C - 8 °C). Do not freeze. Protect from light. Special precautions for the disposal of unused veterinary medicinal product or waste material derived from the use of such products, if appropriate: Any unused veterinary medicinal product or waste materials derived from such veterinary medicinal product should be disposed of in accordance with the local requirements. **Marketing authorization numbers:** EU/2/17/215/001-003. **To be supplied only on veterinary prescription.** Zoetis Belgium SA

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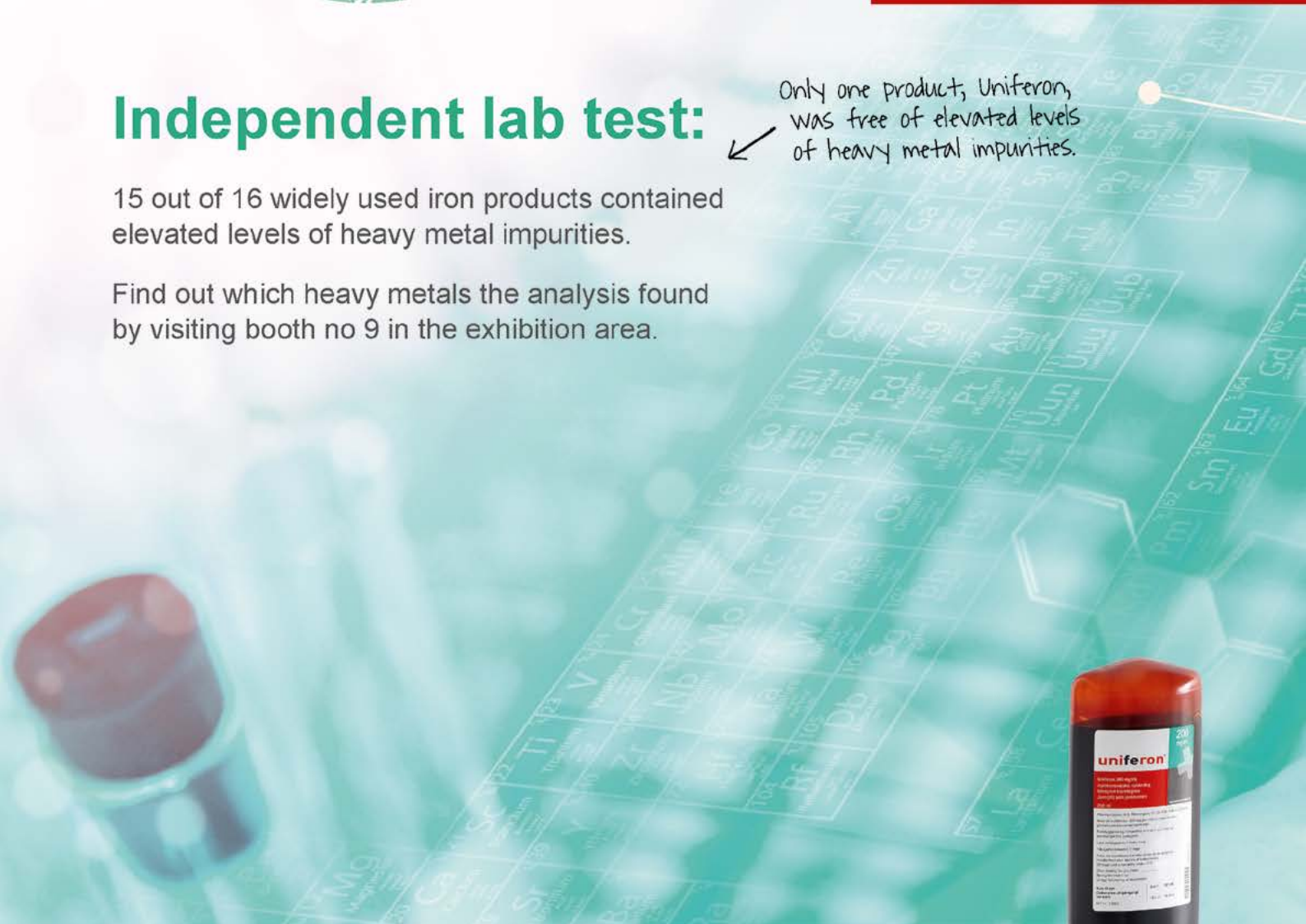
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