



## Evolution of reproductive performance in Spain

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### ● Background and objectives

The objective of this study was to describe the evolution during the last 10 years for the reproductive KPIs including total born (TB), born alive (BA), still born (SB), mummified (MM), weaning to first service interval (WFSI) and preweaning mortality (PVM) as well as predict performance for 2020 based on this trend, assessing the impact of farm size.

### ● Material and methods

Data from 260 farms and a total of 255,386 sows were used, obtained from the PigCHAMP Pro Europa SL database in the interval 2009-2018.

Time series analysis was performed by R software and using the Autoregressive Integrated Moving Average (ARIMA) model for forecasting.

Data were distributed in three groups depending on the number of sows: G1 (farms >1500 sows), G2 (farms <500 sows) and G3 (all farms).

### ● Results

In G3 TB increased from 12.4 to 15.3, BA from 11.4 to 13.7, SB from 0.9 to 1.2, MM from 1.0 to 2.3% and PWM from 11.5 to 13.2%. WFSI decreased from 6.7 to 5.8 days.

The worst values were registered in winter for SB, summer for MM and autumn for WFSI. TB, BA and PWM were better in spring. TB and BA showed no differences between G1 and G2 until 2014 but since then, G1 showed a significant increase ( $P < 0.05$ ) of 2.2 and 1.4 piglets per farrowing respectively.

Percentage of SB and MM kept stable in G2, while G1 showed an increase of MM up to 2.25% ( $P < 0.05$ ). For 2020, ARIMA model shows 85.2 FR, 88.3 AFR and 5.3 days WFSI.

### ● Discussion and conclusion

Reproductive performance of Spanish farms improved during the last 10 years. Big and small farms showed relevant differences for the main KPIs during that period. ■

The same setup of four batches was included after implementation of mass sow vaccination with RespiPorc Flu3. Virus was isolated and sequenced before and after vaccination. Furthermore, haemagglutinin inhibition test was performed on the sow sera before and after vaccination.

### ● Results

The results revealed that the mass sow vaccination delayed the infection time and decreased the viral load in piglets.

However, no effect on the number of infected animals or clinical signs was observed, and the number of long term shedders was significantly increased.

Furthermore, a decrease in the number of seroconverted pigs was discovered at the end of the study. Sequencing results revealed that the circulating strain had gained three mutations in the antigenic sites of the haemagglutinin protein after vaccination, which resulted in lower haemagglutinin inhibition titers in the sow sera.

### ● Discussion and conclusion

The results of this study present an explanation for the occasional lack of effect of sow vaccination.

Moreover, the results reveal that the use of influenza vaccination may result in selection pressure and lead to the emergence of escape variants. ■

## Transabdominal ultrasound examination of sows

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### ● Background and objectives

The number of weaned piglets/sow/year is an important economic parameter. A lot of farms work with hyper prolific genetics. In many cases in the same batch we can find different genetic lines.

The reproductive behaviour (such as weaning-to-oestrus interval, length of heat, ovulation time of these lines) may be different.

### ● Material and methods

A Hungarian large-scale farm (1,800 sows) uses a one-week-batch management: weaning on every Thursday, and heat detection and AI starts on Monday afternoon. The owner asked for support from MSD AH because of the increasing number of anoestrus, inactive ovaries and 'not-in-pig' sows.

After data analysis, farm audit, slaughterhouse examinations of genital tract, laboratory investigation and on-farm progesterone tests we realised that there is no anoestrus on the farm. After weaning we divided the sows into three groups, the old genetic line (12 sows, A), the new (17

sows, B) and the mix, FI (18 sows, C). We started to check the ovaries on Sunday morning by transabdominal ultrasound using a 4.5 MHz convex probe. The ovaries were checked every four hours until ovulation.

### ● Results

A decisive difference was found between the reproductive behaviour of the diverse genetic lines. 76% of the sows from B ovulated on Monday morning (most of them already on Sunday afternoon), while in A only 10% ovulated on Monday morning.

By Tuesday morning, 100% of the sows from B ovulated, while only 66% from A had. C was in the middle between A and B. B had a shorter weaning to oestrus interval.

### ● Discussion and conclusion

The traditional heat detection method worked for A, but not for B. Some changes are needed in the protocol and in the timing.

Ultrasound check of the ovaries was a very useful, non-invasive on-farm tool to support the effectiveness of reproduction. ■

## Mutations in antigenic sites of the haemagglutinin protein

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### ● Background and objectives

In Europe, the most widespread method for controlling influenza A virus infections in piglets is implementation of sow vaccination programmes to secure delivery of maternal derived antibodies to the newborn piglets.

However, recent studies have questioned the effect and benefit of maternal derived antibodies. The objective of the study was therefore

to investigate the effect of mass sow vaccination in a herd experiencing an outbreak with a new subtype.

### ● Material and methods

Four batches of pigs were included before implementation of mass sow vaccination. Each batch consisted of four sows and five ear tagged piglets from each sow. Blood samples and nasal swabs were collected from both sows and piglets, along with recordings of clinical signs.

## Use of an on-farm progesterone detection kit

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### ● Background and objectives

A correct gilt oestrus stimulation and detection is key for the optimal reproductive performance of a farm. Gilts not showing oestrus should be treated specifically and to do it properly it is necessary to know if animals are prepuberal or if there is a problem in heat detection.

Levels of progesterone are variable depending on the physiological status and can be used to determine the phase of the reproductive cycle.

The objective of this study was to demonstrate the efficacy of an on-farm commercial kit (Ovu-check) to determine the level of progesterone in gilts, to determine if they have cycled or not.

### ● Material and methods

The study was conducted in 48 gilts located on three farms.

All were coming from the same multiplier unit and introduced in different breeding farms at six months of age.

From seven months onwards, all animals were stimulated with direct contact with boars and heat detection was done once per day.

One month later none of the study gilts had shown oestrus. Individual blood samples were collected and its level of progesterone was evaluated with Ovu-check, an immunoenzymatic ELISA that determines progesterone level via colorimetric changes.

### ● Results

Only 20.8% of the gilts (10/48) had a high level of progesterone in serum samples (>5ng/ml), indicating the presence of active corpora lutea.

The most probable situation was that these animals were in luteal phase and therefore had cycled before, although heat had not been detected by the farmer.

In contrast, 79.2% of the gilts had very low levels of progesterone (<2.5ng/ml), indicating absence of active corpora lutea, and it is likely that these animals had never cycled.

### ● Discussion and conclusion

Ovu-check is a useful tool that can give information about the cycle status in an easy and quick way, allowing the most appropriate decision to be taken to improve reproductive performance. ■

## Colostrum immune transfer evaluation in pigs

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### ● Background and objectives

Immune transfer via the colostrum in the pig can be investigated using a total IgG test in early life. However, the effectiveness of the different types of IgG for the immune response remains unknown.

This is the reasoning behind looking at antibodies specific for one particular disease. The purpose of this study is to evaluate the maternal transfer of influenza specific antibodies.

### ● Material and methods

In 10 farms, piglets were blood sampled at one day of life (n=496) for total IgG dosage (RID) and at three weeks of life (n=495) for Haemagglutination Inhibition (HI) test for six different Influenza serotypes. The colostrum of 59 corresponding sows was also sampled and the same HI test was performed on them. All farms were either supposed positive for an infection with influenza and/or were vaccinating the sows with a trivalent

influenza vaccine. HI test results are presented in 2-fold dilution (I=20 in HI test; 10 = 10240).

### ● Results

First results regarding H1avN1 show that all but one colostrum sample were positive. Titers varied from three to 10; those of the piglets from zero to seven. HI titers of the piglets were not linked with total IgG level at day one.

At day one, 10% of piglets have less than 20mg/ml of total IgG and around 40% of these die before three weeks. At three weeks, 18% of piglets had a zero H1avN1 titer. The main criterion for the variation in the piglets' titer at three weeks was the colostrum titer of the sow. Piglets that were cross-fostered in the first 24 hours had lower values.

### ● Discussion and conclusion

These preliminary results reveal interesting details about the transfer of immunoglobulins from sows to piglets regarding six influenza subtypes and its variation factors. ■

## Population-based methods for PRRS monitoring

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### ● Background and objectives

Population-based sampling methods in breeding herds have been developed, significantly aiding veterinarians to track activity of PRRSV and other pathogens more efficiently. The purpose of this abstract is to summarise key findings of applications of some of these new methods, including processing fluids (PF) for 3-5 days-old piglets, and family oral fluids (FOF) for due-to-wean pigs.

### ● Material and methods

Several bench-top and field research studies have been done to assess the feasibility of PF and FOF for PRRSV monitoring in breeding herds. This report summarises the major findings, highlighting the field applications of such tools.

### ● Results

PF were first reported in 2016, and based on the November 2018 report from the Swine Disease Reporting System. PF represents 9.5% of specimen submissions for PRRS testing by RT-PCR in the US swine industry (50% from all suckling pigs submission). When there was a single

viraemic pig in a room, there was 90%, 80%, and 60% probability to detect PRRSV by qPCR when pooling PF from 25, 47 and 70 litters respectively.

PF-based monitoring is great to screen for PRRSV RNA or antibodies in piglets of 3-5 days of age that are tail-docked and castrated.

To confirm disease status prior to weaning, FOF-based sampling detects PRRSV even at low prevalence (<2%). Farrowing rooms testing PCR-negative on PF may not test negative on weaning pigs.

### ● Discussion and conclusion

PF and FOF sampling are easier, more practical, and offer better herd sensitivity than bleeding pigs.

When PRRSV is at low prevalence in breeding herds, there is an intermittent pattern of detection of the virus with PF, FOF, or blood samples between farrowing rooms, and across weeks, demonstrating the need to sample as many rooms and crates as possible over time to increase confidence that PRRSV has been eliminated before reintroducing naïve gilts. ■

## Anthelmintic efficacy of new treatment for pigs

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### ● Background and objectives

Worm infections in pigs have an enormous impact on the average daily weight gain, feed conversion and mortality rate, if not well controlled.

Ascaris suum is the most important endoparasite worldwide. The larval migration enhances respiratory and enteric infections and provokes white spots on the liver.

Furthermore, worm infections negatively influence the immune response after an infection or vaccination. The eggs are massively excreted and the environmental infection pressure can only be significantly lowered by consecutive anthelmintic treatments, based on the prepatent period of six weeks.

The efficacy of a new, easy to use fenbendazole nanosuspension (Pigfen 200mg/ml oral suspension) against adult and larval stages of Ascaris suum was investigated.

### ● Material and methods

Weaned pigs (n=100), shown to be negative for worms before challenge, were artificially infected for three consecutive days with approximately

150 Ascaris suum eggs per day at the start of the study. Counts of L4 larvae, L5 larvae and adult worms were performed on an equal amount of treated and control pigs.

Pigfen 200mg/ml oral suspension was administered at 2.5mg fenbendazole/kg bodyweight/day for two consecutive days in the drinking water on day 7-8, 14-15 or 44-45. Six days after the end of the treatment, necropsies were performed to count respectively the L4 larvae, L5 larvae and adult worms in the small intestines or lungs. The percentage reduction, based upon geometric means, was determined.

### ● Results

Counts of adult worms, L4 and L5 larval stages showed a reduction of 100, 99.3 and 100% respectively in the treated groups.

### ● Discussion and conclusion

This study confirmed the excellent efficacy of Pigfen 200mg/ml nanosuspension at a target daily dose of 2.5mg fenbendazole/kg bodyweight for two consecutive days against adult and development stages of Ascaris suum. ■

# Frequency of porcine circovirus 3 detection

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## ● Background and objectives

In 2015 a novel porcine circovirus (PCV), named as PCV-3, was found by next generation sequencing methods from animals with different disease conditions. Although its pathogenicity has not been clearly established yet, it has been linked with reproductive and respiratory disorders.

Therefore, the objective of the present study was to assess the frequency of PCV-3 in cases of respiratory and digestive disorders compared to healthy animals.

## ● Material and methods

A total of 315 swine serum samples from different farms were analysed for PCV-3 detection by conventional PCR. The samples were obtained from 4-week to 4-month-old pigs clinically affected by respiratory disorders (n=129) and diarrhoea (n=126). A group of healthy age-matched animals (n=60) served as a negative control.

Pigs with respiratory clinical signs had a wide variety of pulmonary lesions including catarrhal-purulent bronchopneumonia, interstitial

pneumonia, fibrinous-necrotising pneumonia and/or pleuritis. Animals with enteric clinical signs had histopathological findings of villi atrophy and fusion, catarrhal enteritis and/or catarrhal colitis.

## ● Results

The presence of PCV-3 DNA was confirmed in 19 out of 315 analysed samples (6%). Such percentages of detection were 6.2% (8 out of 129) and 5.6% (7 out of 126) in pigs displaying respiratory and digestive disorders, respectively.

No apparent association was observed between frequency of infection and type of histopathological lesion.

The frequency of PCV-3 PCR positive among healthy pigs was 6.7% (4 out of 60).

## ● Discussion and conclusion

PCV-3 was found in serum of the three groups of animals in similar percentages. The lack of different frequency of detection of this virus at a systemic level does not point out a potential association of PCV-3 with respiratory or enteric disorder occurrence. ■

# Integrated system captures movement records

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The pig and pork production industry is highly networked and mobile – with various types of movements occurring numerous times per day within farms, between farms, across production systems and throughout production networks.

Production systems experience movements of pigs, semen, feed, supplies, assets and personnel – within farm sites, between farm sites, and among non-production sites (feed mills, truck washes, offices, warehouses).

All movements inherently carry with them varying levels of disease introduction and transmission risk by animals, people and/or fomites within and among farm sites, with often serious consequences on animal productivity and business performance. The objective of this

project was to design, develop and evaluate an integrated measurement system to capture movement records to enable the more objective assessment of movement-related risks of disease introduction and transmission.

A large multi-farm system and production network was enrolled in the project. At each participating site, zones were outlined inside and outside of each barn. A risk level was assigned to each zone. Location beacons were installed within each zone.

Significant assets (trucks, trailers, feed carts, robots, power washers, semen coolers) were tagged with asset beacons. All system personnel received beacon sensors. Cellular routers with attached gateways were installed at key sites. Sensor-captured data is automatically

transmitted in real-time to a cloud-based platform where data can be viewed and analytics done using available visualisation components, dashboards and reports.

Internal farm site as well as site-to-site asset and personnel movement events were recorded. Also, pig, semen, feed, asset and personnel exit movement events were recorded

among sites within the production system and movements ex-system within the production network.

This integrated system holds promise as a means for the simultaneous recording of various forms of relevant movements, enabling an improved understanding of disease introduction and circulation risks in near real-time. ■

# The influence of a 16-hour delay in solid feed

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A large proportion of newly weaned piglets start consuming solid feed only after weaning is complete. Moreover, weaning day is stressful. Piglets may associate this stress with ingesting pelleted feed, thus reducing consecutive feed intake.

An experiment was therefore designed to study the effect of delayed provisioning of solid feed on feed intake and performance of piglets. In total, 144 piglets (8.1±1.1kg, mean±SD), weaned at four weeks of age, were tested. They were assigned to 24 pens, blocked per sex (castrated male or female) and weight group.

Littermates were assigned to different pens. Prior to weaning, piglets received a commercial creep feed. Per body weight class and per sex, each pen was randomly assigned to one of the two treatments: control (C) and delay in feed provisioning (F). For the control treatment, the pelleted (6mm) feed was already present in the feeders when the piglets arrived in their

pens (13:00-14:00). In the F pens, the feed was provided the next morning (08:00). Feed and water were provided ad libitum.

They received natural daylight and supplemental artificial light between 7h30 and 15h30.

The F pigs showed a higher feed intake the first three weeks of the experiment (455 vs 430g/day, P=0.003), which was still apparent for the entire experiment (4-9 weeks: 594 vs 569g/day, P=0.046). This resulted in higher bodyweights three weeks after weaning in the F vs C pigs (16.1 vs 15.6kg, P=0.005).

However, at the end of the experiment at nine weeks, no significant difference was observed (23.9 vs 23.4kg, P=0.285). Feed efficiency did not differ significantly between the groups (P=0.456 for the entire experiment).

Further research is needed to elucidate the causative factors for the observed differences and to further explore the practical implications of our findings. ■

# Cystoisospora suis oocysts in steatorrhoeic piglet samples

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Detection of oocysts is a hallmark of the diagnosis of coccidiosis, including suckling piglet cystoisosporosis.

However, in practice rapid and simple detection is often severely hampered by the high fat content of suckling piglet samples.

In steatorrhoeic samples the formation of lipid bubbles can lead to misdiagnosis of oocysts (false positive results) and centrifugation leads to formation of fat plugs that can entrap oocysts and completely

prevent their recovery from the suspension (false negative results).

Several options are available for circumventing these problems.

In faecal smears, oocysts can be detected with increased specificity by staining or by autofluorescence. Staining of smears requires additional steps increasing examination time and many stains are toxic and inconvenient to handle.

Autofluorescence examination can be conducted without staining or labelling of the sample but requires

suitable fluorescence equipment (light bulb, filters).

Equipment for fluorescence microscopy can easily be adapted. In a direct comparison of paired samples, autofluorescence microscopy proved to be more sensitive than carbolfuchsin staining.

The calculated sensitivity of autofluorescence for 0.1g of faeces is 10 oocysts per gram of faeces (OpG). Autofluorescence microscopy of faecal smears permits only semiquantitative evaluation of samples. For determination of oocyst concentrations in a faecal sample a modified McMaster

technique can be used which was originally developed by Christensen and Henriksen (1992) and adapted to small amounts of faeces.

It requires 0.5g/sample and has a detection limit of 333.3 OpG when two McMaster chambers (=300µl) are counted. The use of a combined sugar-salt solution and the removal of debris by inverted punch-sieving greatly reduces the formation of lipid droplets in the McMaster chamber. Both methods can be used on individual as well as litter-collected samples to detect initial infection and to determine treatment efficacy. ■

## Tail bites in free-range based finisher pig systems

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### ● Background and objectives

Free-range pig production systems offer low stocking densities and access to open air, straw and rooting materials. Nevertheless, in some free-range finisher pig herds (where tail docking is prohibited), tail biting is a serious problem. The study aimed to identify housing and management related risk factors in both the weaning and the growing period associated with tail bites.

### ● Materials and methods

13 free-range finisher herds (seven organic and six conventional) supplied with weaners from six sow herds were visited during cold periods in 2017-18. Owners in supplier and finisher herds were interviewed about management routines.

Pen-related risk factors were registered and pigs at 20-50kg were examined for light and severe tail lesions. Risk factors were evaluated in univariable logistic models including pen-ID as random effect.

### ● Results

Some 84% of the examined conventional pigs and 93% of

organic pigs had intact tails. Severe lesions were seen in 3% of organic and 10% of conventional pigs.

Conventional production system (OR: 9.9, 95% CI: [1.4; 68.8], P=0.02), high stocking density at weaning (OR: 0.44 per 0.1m<sup>2</sup>/pig, 95% CI: [0.28; 0.7], P<0.001) and feeding space at weaning (OR: 19.1 per 2cm less space/pig, 95% CI: [3.4; 108.2], P<0.001) were pointed out as significant risk factors for tail lesions.

### ● Discussion and conclusion

The study showed that tail lesions were low-prevalent in the early rearing phase of free-range pigs. However, since we saw associations between weaning environment and tail lesions it seems evident that management conditions in this phase of life matter.

The study emphasised the importance of a low stocking density – even in systems with a markedly lower density than traditional indoor systems. We suggest to further scrutinise the background of conventional systems constituting a risk factor for tail biting. ■

## Do weaners have gastric ulcers?

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### ● Background and objectives

Investigation of gastric ulceration (GU) are primary performed in abattoir studies of finisher pigs and slaughter sows. GU is often associated with an increased fluidity of the gastric content due to finely grounded and pelleted diets.

Although weaners are normally fed pelleted diets ad libitum, little is known about the prevalence of ulceration in this age group.

The purpose of this study was to investigate if healthy weaners fed pelleted diets ad libitum have gastric ulceration. ■

### ● Material and methods

The study consisted of 200 clinically healthy weaners from 10 Danish farms with weaners fed ad libitum on finely ground commercial diets (geometric mean diameter = 554.2).

In each farm, 20 weaners with an average weight of 22kg (min-max: 12-37kg) were randomly selected and euthanised. GU assessment was based on the Danish score system, with scoring of alterations in the pars oesophagea. A healthy stomach was scored with index 0; index 1-5 present minor to severe parakeratosis and minor to severe erosions; ulcer-index 6-8 present minor to severe ulcers, scar-index 6-8 present minor to severe scars and scar-index 9-10 present oesophageal stenosis. ■

### ● Results

We observed that 35.5% of weaners had ulceration, scar or stenosis in the pars oesophagea with a large between-farm variation (min-max: 0-85%). The prevalence of ulcers, scars and stenosis was; 20, 32 and 3.5%. Minor ulcers and scars were the main observation in this study.

### ● Discussion and conclusion

Ulceration of the pars oesophagea is present in some Danish herds with weaners fed commercial diets ad libitum. These results demonstrate that pigs can develop alterations in the pars oesophagea prior to the fattening period. The herds used in this study are considered high risk herds for GU and are not representative for all Danish herds. ■

## Impact of PCV2 co-infection on replication level of PRRSV

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In pig herds, PRRSV is often associated with PCV2, this co-infection being one key factor leading to postweaning multi-systemic wasting syndrome (PMWS). Worryingly, association of a PRRSV modified live vaccine of Type 2 (MLV2) with PCV2 infection was also shown to induce PMWS.

In a French pig farm presenting a clinical presentation of PMWS, we identified a MLV1-like strain in coinfection with PCV2. Through an in vivo experiment, we aimed at evaluating the impact of PCV2 co-infection on virulence level of these MLV1-like and parental MLV1 strains.

### ● Material and methods

Five groups of six SPF piglets were respectively inoculated with one of the two PRRSV strains or with PCV2 (MLV1; MLV1-like; PCV2 groups) or co-inoculated with both virus at the same time (MLV1/PCV2; MLV1-like/PCV2 groups). One day after inoculation, six contact piglets were added to each inoculated groups. All animals were clinically monitored daily. Blood and nasal swabs were collected twice a week to monitor PRRSV seroconversion and PRRSV genomic viral load. During necropsy,

tissue samples were collected for viral quantification.

### ● Results

No clinical signs were detected, whatever the group. Viral loads from MLV1-like and MLV1-like/PCV2 groups were higher in sera, nasal swabs and tonsils in comparison with MLV1 and MLV1/PCV2 groups.

No difference was found between MLV1 and MLV1/PCV2 groups; whereas co-infected animals with MLV1-like/PCV2 showed increased viraemia and shedding compared to pigs from MLV1-like group.

Accordingly, seroconversion was detected early for single or co-infected animals with MLV1-like strain. Finally, PRRSV transmission from inoculated to contact pigs was faster in MLV1-like and MLV1-like/PCV2 groups.

### ● Discussion

Our study showed that the MLV1-like PRRSV-1 strain was able to replicate at a higher level, presenting increased excretion and transmission in comparison to the MLV1 strain.

No impact of PCV2 was demonstrated on MLV1 viraemia, whereas PCV2 seemed to promote MLV1-like replication. ■

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