# MSD Animal Health
# LATEST RESEARCH

***IPVS & ESPHM** - LEIPZIG, GERMANY*

***JUNE 4-7** 2024*

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# INTRODUCTION

The 27th International Pig Veterinary Society Congress (IPVS) & 15th European Symposium of Porcine Health Management (ESPHM) is taking place during ongoing debates about the sustainability of the agricultural and livestock industry. However, it is important to recognize that our daily work is crucial in feeding the world's growing population.

As in previous editions, MSD Animal Health is not only a gold sponsor of the congress but also a significant contributor to research, demonstrating our commitment to benefit the entire industry. This booklet serves as a testament to this commitment, showcasing all the scientific contributions presented during these days, with a particular focus on intestinal and respiratory health, as well as reproductive management.

Within this booklet, you will find studies that emphasize both the economic and environmental sustainability of the industry, using IDAL and *Lawsonia intracellularis* vaccination as reference points. The control of PRRS virus remains a concern for our customers and for us. Therefore, we have included studies addressing the control of highly virulent PRRSv strains. In addition, diagnostics continue to play a crucial role in health, prevention, and management. Therefore, we present innovative alternatives for the detection and monitoring of enteric and respiratory pathogens, as well as for reproductive management. Furthermore, we provide new insights into emerging pathogens such as Rotavirus, PCV3, and Sapovirus.

**This booklet truly reflects our dedication to the Science of Healthier Animals, and we hope that you enjoy reading it. The entire Swine team at MSD Animal Health wishes you an enjoyable and enriching learning experience during these days.**

*Sincerely Yours,*

**Stephan & Rubén**

Regional Associate Technical Director,
EURAM - MSD Animal Health

Global Technical Director Swine - PigCare
MSD Animal Health



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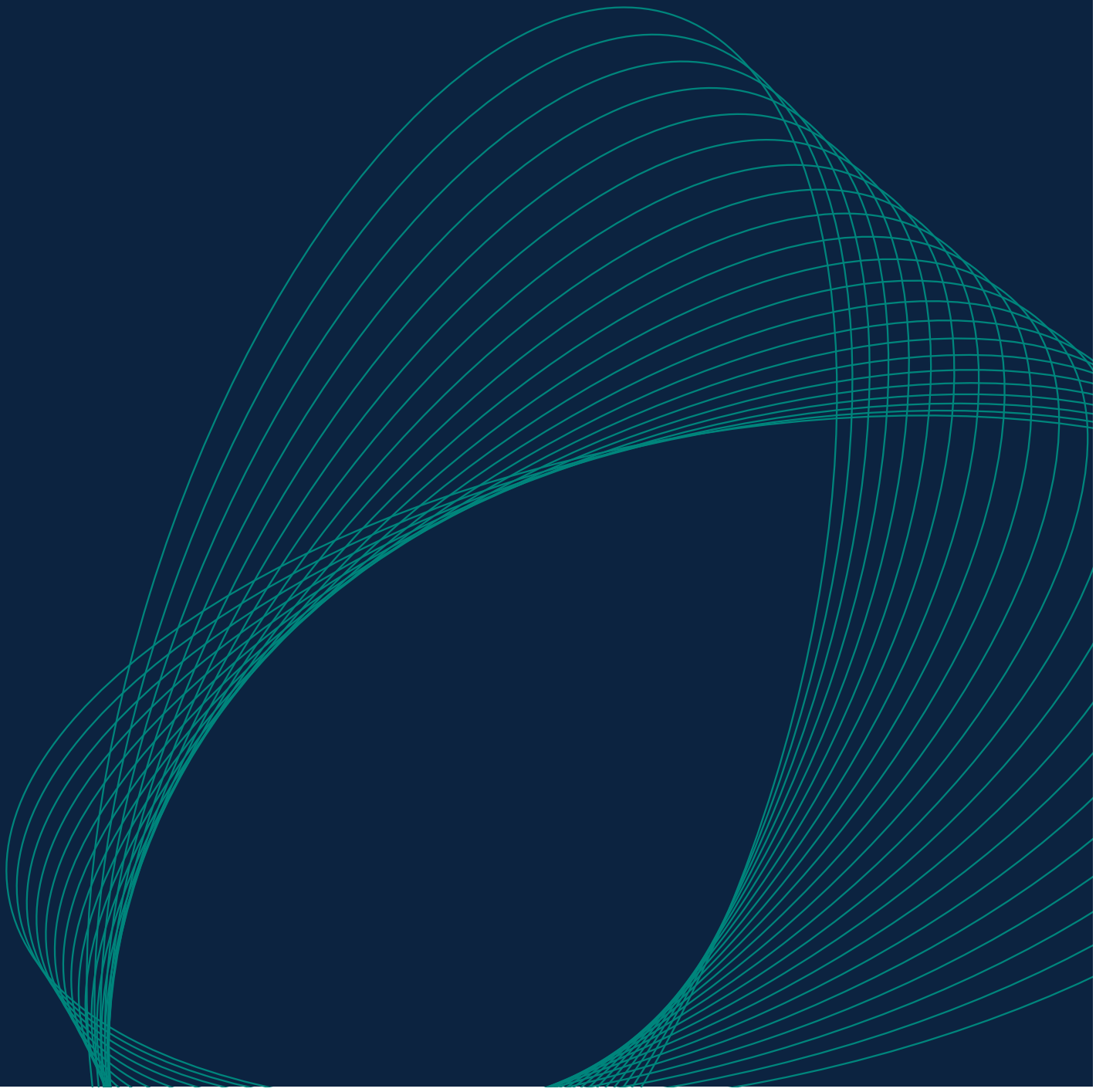
# Oral Presentations





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# Cost minimization analysis of intradermal and intramuscular administration of vaccines in Brazil

*Derald J. Holtkamp*[*1], Felipe Ibanez[2], Lucas Peixoto[2], Cesar Ferronato[2], Leonardo Rossi[2], Stephan von Berg[2]*

*[1]Department of Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames, Iowa. [2]MSD Animal Health, Munich, Germany*
**Corresponding author: holtkamp@iastate.edu*

## Background and Objectives

Intradermal (ID) administration of vaccines is an alternative to traditional routes of administration, such as intramuscular (IM) and oral that may result in lower costs for producers. Cost minimization analysis (CMA) is frequently used in human medicine to measure and compare the costs of different medical interventions when the efficacy of the outcomes is the same. The aim of this study was to apply CMA to compare ID and IM administration of three vaccines in growing pigs in a hypothetical 38,000 sow production system in Brazil.

## Material and Methods

Data to estimate the cost of vaccine storage, vaccination equipment, waste disposal and carcass trim loss was obtained from various sources and was representative of conditions in Brazil. It was assumed that three vaccines were administered. For the IM scenario, pigs were vaccinated intramuscularly with commercially available vaccines against porcine circovirus, *Mycoplasma hyopneumoniae* and orally against *Lawsonia intracellularis*. For the ID scenarios, pigs were intradermally vaccinated with all three vaccines.

## Results

Fewer resources were required under the ID scenario due to the smaller doses, vial sizes and packaging, and the elimination of needles and syringes. The cost of electricity to store the vaccines declined from US$3,773 annually with IM to US$1,078 with ID as fewer refrigerators were required. The amount of glass, plastic and cardboard waste generated declined from 16.5 metric tons annually with IM to 1.1 metric tons with ID. Pork trim loss declined from 26.8 metric tons with IM to 9.4 metric tons annually for the ID scenario. The total cost savings associated with the ID scenario compared to IM was US$65,776 annually or US$0.06 per pig marketed.

## Discussion and conclusion

The CMA analysis demonstrates the magnitude of resource and cost savings associated with ID administration of vaccines. The cost savings for individual producers will depend on the specific circumstances that vary between countries and producers. Other costs that may be relevant include the cost of the vaccine, labor for administration and medical insurance and lost workdays. Differences in the economic value of productivity differences may be relevant if data to support differences is available.

*Keywords: Cost minimization analysis, vaccines, intradermal*

# Experimental assessment of the efficacy of an MLV PRRS vaccine against challenge with highly virulent PRRSV-1 strain Rosalia

Universitat Autònoma de Barcelona

*Enric Mateu[1], Martí Cortey[2], I. Domingo[2], Marcial Marcos[3], Rut Menjón[3], Stephan von Berg[3], Marta Jiménez[3]*

*[1]Dep. Sanitat i Anatomia Animals, Facultat de Veterinària, UAB [2] Dep. Sanitat I Anatomia Animals, UAB., [3]MSD Animal Health, Munich, Germany*

## Background and Objectives

In 2020 a highly virulent PRRSV-1 isolate emerged in Spain. This strain rapidly spread and has become the predominant one in most new PRRS outbreaks in the North-eastern part of the country. The infection is characterized by abortion storms, sow mortality and mortality rates (>20%) in the affected nurseries (1).
The aim of the present study was to assess the efficacy of a MLV PRRS vaccine against the challenge with one of those highly virulent isolates.

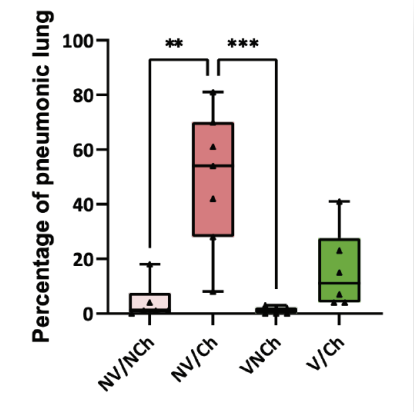
## Material and Methods

The study was conducted in 4 groups (G1-G4) of 13 four-week-old PRRSV-free pigs. After 1 week of acclimation groups G1 and G2 were intradermally vaccinated (V; Vaccinated) (Porcilis® PRRS, MSD Animal Health) whilst groups G3 and G4 only received the vaccine adjuvant (NV; Non-Vaccinated). Five weeks later, groups G1 (V/Ch; Vaccinated/Challenged) and G3 (NV/Ch; Non-Vaccinated/Challenged) were intranasally challenged with a highly virulent isolate (ON571708) (≥ $10^{5.4}$ TCID50/ml, 1 ml per nostril) and were followed for the development of clinical signs and lung lesions. Pigs from groups G2 (V/NCh; Vaccinated/Non-Challenged) and G4 (NV/NCh; Non-Vaccinated/Non-Challenged) were not challenged. Pigs were weighted before and after challenged to calculate weight gain and sampled periodically to determine viremia and nasal shedding as well as the development of humoral (ELISA) and cell-mediated immune responses (IFN-γ ELISPOT).

## Results

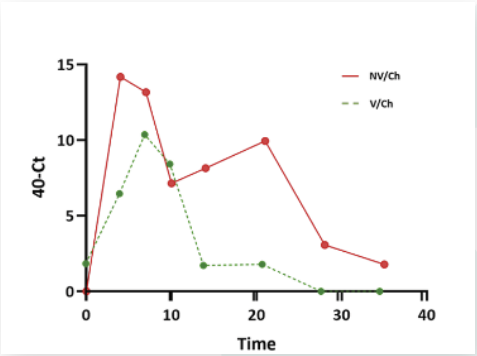
After the challenge, animals in the unvaccinated group (NV/Ch) developed high fever (up to 41.9°C) that was evident from day 4 until day 9 post-challenge (pc) while for vaccinated animals (V/Ch), fever >41°C was only seen on day 9 pc.
At day 10 pc, NV/Ch animals had extensive macroscopic lung lesions (49.1±25.2% vs. 15.7±14.5% of lung affected for NV/Ch and V/Ch, respectively) (Graph 1). At microscopic level, NV/Ch animals also showed more severe scores of interstitial pneumonia compared to vaccinated (V/Ch) pigs (3.1±0.8 vs 1.9±0.8, respectively).

*Graph 1. Macroscopic lung lesions 10 days post-challenge in Non-Vaccinated/Non-Challenged (NV/NCh), Non-Vaccinated/Challenged (NV/Ch), Vaccinated/Non-Challenged (V/NCh) and Vaccinated/Challenged (V/Ch) pigs.*




The area under the curve for the viremia of NV/Ch was significantly higher than the area for V/Ch (256.2 vs. 110.4 for NV/Ch and V/Ch, respectively) (Graph 2).
Nasal shedding was also reduced in V/Ch.
Vaccinated animals showed a significant anamnestic response in ELISPOT after challenge ($p<0.05$).
Weight gain after challenge (days 0 to 35 pc) was better for vaccinated pigs (32.9±12.8 vs. 26.2±6.1 Kg for V/Ch and NV/Ch, respectively; $p<0.05$).

*Graph 2. Areas under the curve (AUC) for viremia in challenged groups (red = NV/Ch; green = V/Ch)*




## Discussion and conclusion

In conclusion, vaccination with a MLV vaccine administered intradermally resulted in significant clinical, pathological, virological and zootechnical protection against the challenge with highly virulent Rosalia.

*[1] G.Martin-Valls et at, 2023. Introduction of a PRRSV-1 strain of increased virulence in a pig production structure in Spain: virus evolution and impact on production. Porcine Health and Management 9:*




Poster Code: VVD-OP-03

# Effect of improved feed conversion ratio by *Lawsonia intracellularis* vaccination on the carbon footprint

*Friederike von und zur Mühlen[1], Christine Renken[1], Robert Tabeling[1]*
*[1] Intervet Deutschland GmbH; MSD Tiergesundheit, Unterschleißheim, Germany*

## Background and Objectives

Due to the need for climate protection, pig production also faces the responsibility for reducing greenhouse gas emissions (GHG) and, therefore, improving the carbon footprint. The aim of this report was to evaluate the impact of an improved feed efficiency after *Lawsonia intracellularis* vaccination on the reduction of GHG-emission.

## Material and Methods

Performance data (i.e., feed conversion ratio; FCR) from field observations of 9 farms with a history of subclinical or clinical ileitis (Fig.1) was recorded in non-vaccinated (NV) and vaccinated (PL) (intramuscularly/intradermally Porcilis®Lawsonia/ID; at 3-11 weeks of age) batches. NV batches, used as historical control, were compared to PL vaccinated batches after implementing *Lawsonia intracellularis* vaccination to control ileitis.

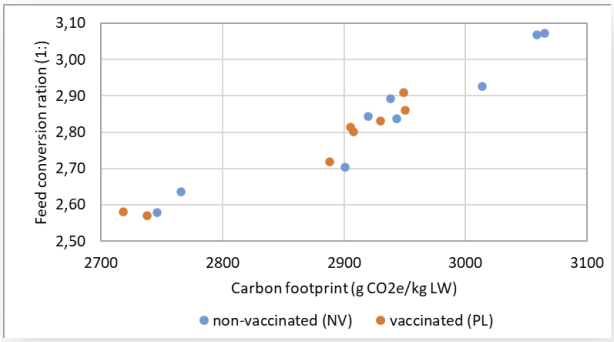
*Table 1: Performance data of the 9 observed farms before (NV) and after (PL) introduction of Porcilis®Lawsonia vaccination*

| | Animal number | ADG | Weight Gain | Mortality | FCR |
|---|---|---|---|---|---|
| NV | 64943 | 920.7 | 94.9 | 2.8 | 2.84 |
| PL | 21951 | 936.9 | 96.6 | 1.8 | 2.73 |

## Results

Using the average performance data for both groups (NV and PL, 96kg live weight (LW) gain; FCR 2,79), TEKLa calculated a mean amount of 2891 g $CO_2$-e/ kg LW. The model estimated that 1594 g $CO_2$-e/kg LW (53-58%) belonged to feed. The mean $CO_2$-e proportion for produced piglets (29 kg LW), manure/digestion and energy consumption were 28.2%, 22.0%, and 2.7%, respectively, whereas 8.0% was credited due to the reuse of the organic fertilizer. In PL-vaccinated pigs, a mean improvement of -0,11 was recorded for FCR (Table 1). The model showed that non-vaccinated group emitted on average 2928 g, whereas PL-vaccinated group 2853 g $CO_2$-e/kg LW. In the farm with the highest improvement in feed conversion after introduction of the *Lawsonia intracellularis* vaccination (FCR -0.27), a lowering of 182 g $CO_2$-e/kg LW was observed (6.23%) (Fig.2). The maximum deviation regarding $CO_2$-e excretion between the worst and best fattening group was 12.1%.

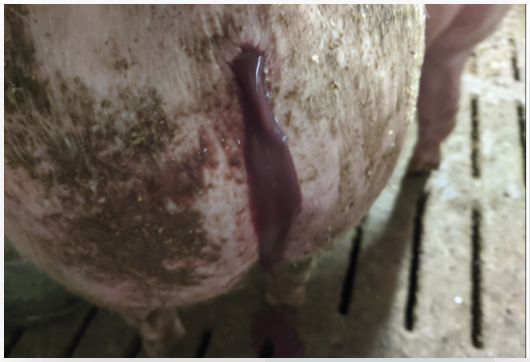
*Figure 2: Calculated carbon footprint per kg live weight in relation to feed conversion ratio in vaccinated (PL) and non-vaccinated (NV) pigs*

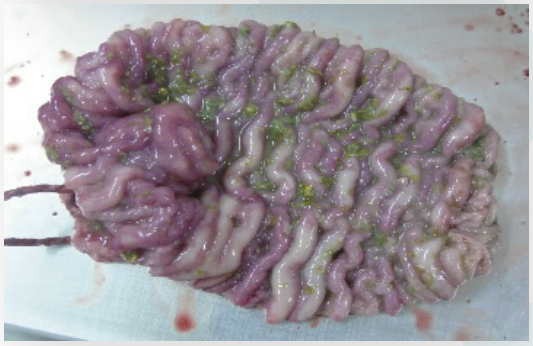



## Discussion and conclusion

Under the conditions of this report, TEKLa model calculation demonstrated a reduction of GHG-emission associated with improved feed efficiency in pigs vaccinated against *Lawsonia intracellularis*. This suggests that improved feed efficiency contributes to sustainability in pig production.

*Figure 1: Pigs in the farms suffered from different clinical forms (subclinical, acute, chronic) of ileitis.*





*[1]Mühlen et al., 2021, Praxisdaten zu Klinik und Leistung von Porcilis® Lawsonia geimpften Tieren in deutschen Betrieben, Tierärztliche Umschau. [2]Nieberding et al., 2022 Praktische Beobachtungen zum Einsatz einer intradermalen Lawsonia Impfung, Tierärztliche Umschau. [3]Tabeling et al., 2023 Impfung von Schweinen gegen Lawsonia intracellularis i.m. oder i.d. – Kalkulation der Effekte einer verbesserten Futterverwertung auf die N- und P-Ausscheidung sowie den CO2-Fußabdruck, Tierärztliche Umschau*

# Effect of improved feed efficiency by *Lawsonia intracellularis* vaccination on Nitrogen emission in fattening pigs

*Robert Tabeling, Friederike von und zur Mühlen, Christine Renken*
*Intervet Deutschland GmbH; MSD Tiergesundheit, Unterschleißheim, Germany*

## Background and Objectives

Nitrogen (N; elementary protein component) in adequate quantity and quality is essential for optimal growth and performance in pigs. Negative environmental impact, like subsequent eutrophication resulting from too high N-output e.g., by pig production, led to a regulatory limitation on Nemission for German agriculture. The objective of this report was to show the impact of improved feed efficiency after *Lawsonia intracellularis* vaccination in combination with ration design on the N-excretion in fattening farms.

## Material and Methods

Performance data (e.g. average daily gain, ADG; feed conversion ratio, FCR; Table 1) from field observations of 9 farms with a history of subclinical or clinical ileitis was recorded in non-vaccinated (NV) and vaccinated (PL) (intramuscularly/ intradermally Porcilis®Lawsonia/ID; at 3-11 weeks of age) batches. NV batches, used as historical control, were compared to PL vaccinated batches after implementing *Lawsonia intracellularis* vaccination to control ileitis.

*Table 1. Animal numbers and performance data of the 9 observed farms before (NV – Non-Vaccinated) and after (PL – Vaccinated) introduction of Porcilis®Lawsonia vaccination.*

| | Animal number | ADG | Weight Gain | Mortality | FCR |
|---|---|---|---|---|---|
| NV | 64943 | 920.7 | 94.9 | 2.8 | 2.84 |
| PL | 21951 | 936.9 | 96.6 | 1.8 | 2.73 |

N-excretion was modeled using the freely available program "Calculation of an individual stable balance" of the Lower Saxony Chamber of Agriculture (LWK NDS) (1). Effects of performance data on N emission were calculated with four crude protein (CP) levels in feed rations (CP %/kg; 88% dry matter: "universal" 17.0, "N reduced" 16.4; "N greatly reduced" 15.4; "N very greatly reduced", 14.4).

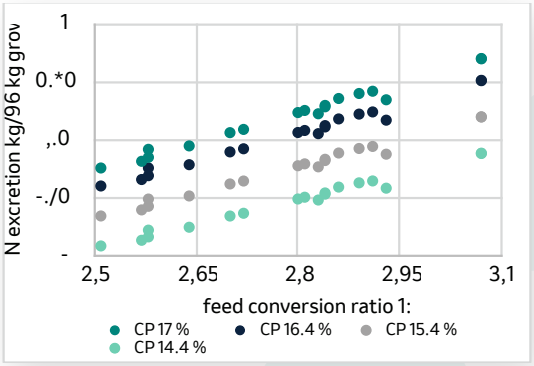
## Results

The mean reduction of N-excretion in PL vaccinated batches was 5.4-5.9% for all feeds when compared to non-vaccinated batches. The farm with the biggest improvement of FCR with PL vaccination (-0.27; -9.5%) showed a reduced N-excretion of 15.7% (Table 2). Between the non-vaccinated group with worst FCR and highest assumed CP content in feed (FCR 3.07; CP 17.0%; 57.9 g N/kg LW) and the PL vaccinated group with the best FCR and very greatly N-reduced feed (FCR 2.51; CP 14.4%; 32.6 g N/kg LW) a saving of 25.3 g N/kg LW (43%) was calculated. When this was related to the observed average weight gain of 96 kg/pig, the worst group emitted 5.6 kg N/ finishing pig, whereas the best groups showed 3.2 kg N/ finishing pig (Fig. 1).

*Table 2. Calculated effect of FCR change with Porcilis®Lawsonia vaccination on the N excretion (%) of fatteners fed with different N containing rations (CP 17.0-14.4%; 88% DM)*

| farm | FCR change | | Calculated change N excretion % | | | |
|---|---|---|---|---|---|---|
| | 1: | % | CP 17.0% | CP 16.4% | CP 15.4% | CP 14.4% |
| 1 | -0.16 | -5.21 | -7.55 | -7.68 | -7.92 | -8.21 |
| 2 | -0.27 | -8.79 | -12.6 | -12.8 | -13.2 | -13.7 |
| 3 | 0.02 | 0.74 | 0.91 | 0.93 | 0.97 | 1.01 |
| 4 | -0.03 | -1.06 | -1.32 | -1.34 | -1.39 | -1.45 |
| 5 | -0.10 | -3.41 | -3.60 | -3.67 | -3.79 | -3.95 |
| 6 | -0.07 | -2.71 | -5.52 | -5.63 | -5.86 | -6.14 |
| 7 | -0.06 | -2.27 | -3.33 | -3.40 | -3.54 | -3.70 |
| 8 | -0.27 | -9.51 | -14.3 | -14.6 | -15.1 | -15.7 |
| 9 | -0.03 | -1.04 | -1.27 | -1.29 | -1.34 | -1.39 |

*Figure 1. Calculated P excretion of fatteners (kg/96 kg growth) with different P containing rations (5.1 to 4.1 g/kg FM; 88% DM) and FCR observed on the farms before and after the introduction of the Porcilis®Lawsonia vaccination.*




## Discussion and conclusion

Under the conditions of this field observation and model calculation, it has been shown that N-emission from pig farms can be limited by reducing CP content in feed and increasing feed efficiency by *Lawsonia intracellularis* vaccination. This suggests that both are favorable and suitable tools to reduce N-emission, making pig production more sustainable.

*[1] LWK NDS: Berechnung einer individuellen Stallbilanz; https: // w w w.duengebehoerde - niedersachsen . de/duengebehoerde / news / 33749_Berechnung_einer_individuellen_Stallbilanz; Retrieval date 10.07.2023*

# Pen oral fluids as an alternative to faecal sampling to detect low bacterial load of *Lawsonia intracellularis* in subclinical infections

*Rubén del Pozo Sacristán[1], Hanny Swam[2], Amy Elizabeth Taylor[3],*
*[1]MSD Animal Health, Madrid,Spain, [2]Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands, [3]University of Leeds, UK*

## Background and Objectives

Oral fluids (OF) have been demonstrated as a reliable sampling method to detect and semi-quantify bacterial load of *Lawsonia intracellularis* (LI) at group level using qPCR (1, 2). However, it is still unclear whether this sample type would be suitable to detect subclinical infections with low bacterial load. Therefore, the aim of this study was to evaluate whether pen OF could detect LI subclinical infections in a herd with a low bacterial faecal shedding.

## Material and Methods

For this aim, a herd with a history of subclinical LI infection was selected. A subclinical infection was defined by the absence of ileitis-like symptoms and by a low bacterial load (<$10^5$ copies/µL) of this bacterium in faeces quantified by qPCR (BactoReal Lawsonia kit, Ingenetix). A cross-sectional sampling was performed, including pigs sampled at 4, 7, 10, 13, 16, 19 and 22 weeks of age (woa). Fresh faecal samples were collected individually from the anus at defecation (minimum 2 pigs/pen of 10 pigs). OF samples were taken at the same time points on a pen basis. Both faecal and saliva samples were tested for LI by qPCR [results given in 10Log copies/µL (faeces) and Ct-values (saliva)]. The association between the number of positive specimens detected by both type of samples was calculated by Chisquare test and Cohen´s kappa. A Pearson correlation was performed to compare bacterial load in faeces and saliva.

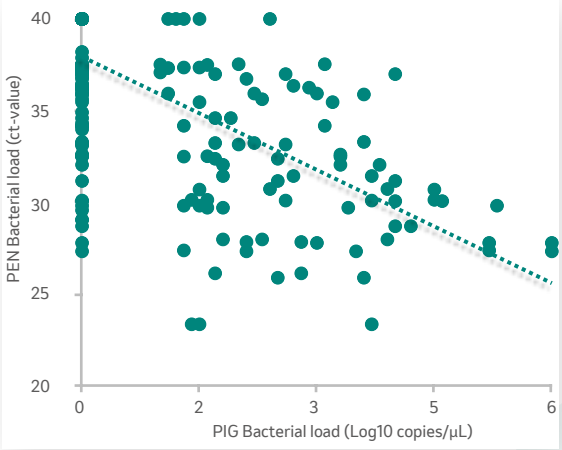
## Results

In total, 367 individual faecal and 120 pen OF samples were collected. A significant (P<0.001) moderate agreement (kappa=0.636) was found between the number of positive specimens detected by both type of samples. OF sampling identified correctly (sensitivity) 93.5% of all the pens with at least one sample pig with a positive faecal test. Only three pens tested negative while at least one positive pig (1.2-2.4Log10 copies/µL) was housed in there. A significant (P<0.001) moderate correlation (r=-0.626) CI[-0.684; -0.559] was detected for bacterial load between both type of samples.

*Table 1. Bacterial load of Lawsonia intracellularis agreement between Pen Oral fluids and Individual Faecal samples (Interrater Reliability Cohens Kappa test). K=0.636; P<0.001.*

| | | FAECES | | |
|---|---|---|---|---|
| | | NEG | POS | |
| ORAL FLUID | NEG | 55 | 3 | 58 |
| | POS | 19 | 43 | 62 |
| | | 74 | 46 | 120 |

*Figure 1. Correlation for Bacterial load at Pen vs Pig level (r=-0.626; CI[-0.684; -0.559]; P<0.001).*




## Discussion and conclusion

Under the conditions of this study, it was concluded that pen OF is an excellent alternative to faecal sampling to detect LI subclinical infections at group level, even in the face of low bacterial load.

*[1] Kamlage, et al. Investigation on the use of single or pooled faecal samples and comparison with group saliva samples for Lawsonia intracellularis diagnostic in Fattening Pigs. ESPHM 2021.*
*[2] Wertenbroek et al. Saliva sampling as an alternative method besides pooled faeces samples for measuring qPCR Lawsonia levels. ESPHM 2022.*

# Effect of amoxicillin, ceftiofur, doxycycline, tiamulin and tulathromycin on the antibody response of piglets vaccinated against *Lawsonia intracellularis*

*Eliane M.E Fonseca[1]*, Daiane G. Donin [2], Alice N. Jesus[2], Amanda G. Daniel[1], Bruna C.K. Gomes[1], César Feronato[1], Rafael Frandoloso[3], João X. Oliveira Filho[1]; Stephan von Berg[4], Geraldo C. Alberton[2]*

*[1]MSD Saúde Animal, [2]Federal University of Paraná (UFPR), [3]University of Passo Fundo (UPF) and [4]MSD Tiergesundheit, München, Germany.*
*eliane.engelsing@merck.com*

## Background and Objectives

The prophylactic and metaphylactic use of antimicrobials is commonly used in conjunction with the vaccination procedure in Brazil, and their effect can go beyond the antimicrobial boundary and affect the immune system (1; 2). The objective of this study was to evaluate the effect of different antimicrobials commonly used in the nursery phase on the antibody response induced by Porcilis Ileitis, an inactivated-based vaccine formulated with Lawsonia intracellularis.

## Material and Methods

A total of 144 weaned piglets were divided into 9 different groups **(Table 1)**. The piglets were vaccinated intramuscularly with a single dose (2mL) of Porcilis® Ileitis (Merck Animal Health, Madison, NJ, USA) at 30 days of life. Before (D0) and after vaccination (D7, D14, D21, D28, and D35), serum samples were collected and analyzed by Flow Cytometry Antibody Test (FCAT) to detect anti-*L. intracellularis* (Li) IgG. The comparison of anti-Li IgG levels at different moments was performed using the two-way ANOVA test (GraphPad Prism 9.0 software).

*Table 1. Description of the 9 different experimental groups of animals according to whether they received the vaccine against L. intracellularis associated or not with the use of antimicrobials.*

| Experimenta groups | Vaccine* | Antimicrobials | |
|---|---|---|---|
| G1 | unvaccinated | not treated | - |
| G2 | vaccinated | not treated | - |
| G3 | vaccinated | treated | ceftiofur |
| G4 | vaccinated | treated | tildipirosin |
| G5 | vaccinated | treated | tulathromycir |
| G6 | vaccinated | treated | amoxicillin |
| G7 | vaccinated | treated | doxycycline |
| G8 | vaccinated | treated | florfenicol |
| G9 | vaccinated | treated | tiamulin |

## Results

Anti-Li IgG levels on day D35 were significantly ($p < 0.001$) lower in animals that received ceftiofur (G3), doxycycline (G7) and tulathromycin (G5) compared to the group G2 that was only vaccinated. In contrast, amoxicillin (G6), florfenicol (G8), tiamulin (G9) and tildipirosin (G4) did not affect the antibody levels. The most intense negative effect (reduction of 41.15% in the IgG levels) was found in group G3, treated with ceftiofur.

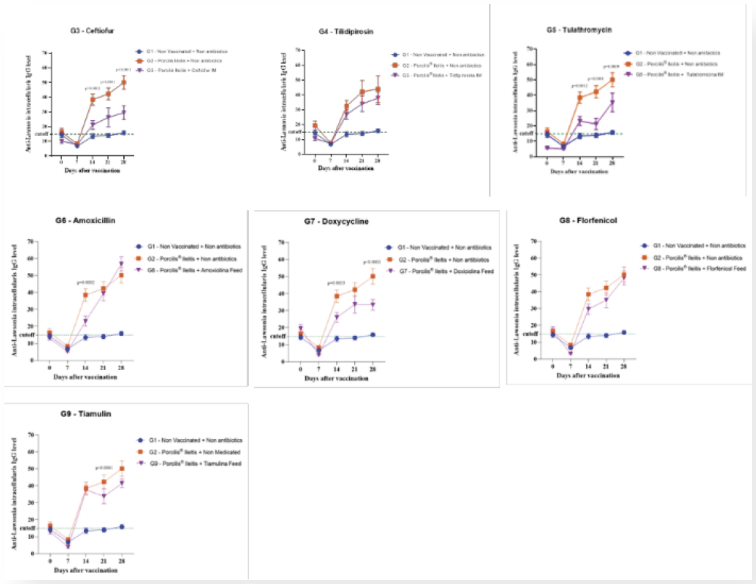



*Figure 1. Immunoglobulin G (IgG) levels for the Li antigen for G1- unvaccinated and without antimicrobials; G2 – vaccinated and without antimicrobials; G3 to G9 – vaccinated and with antimicrobials (G3 - ceftiofur; G4 - tilidipirosin; G5 – tulathromycin; G6 - amoxicillin; G7 - doxycycline; G8 – florfenicol and G9 – tiamulin). Significant difference between groups is indicated by p ($p<0.05$).*

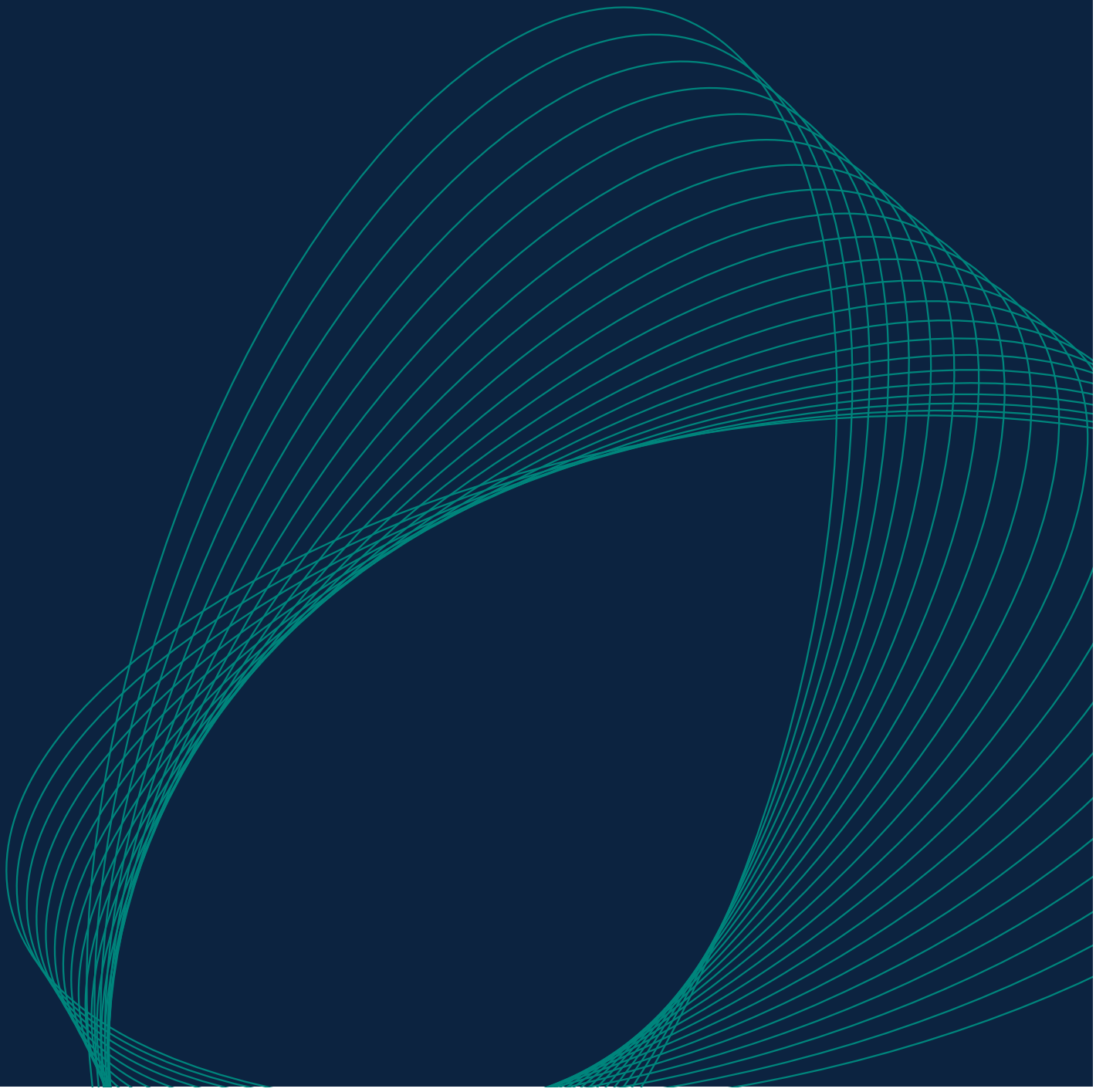
## Discussion and conclusion

Our results demonstrated that the use of some antibiotics during the development of the adaptive humoral immune response can affect the serological potency of immunogenic vaccines. This negative effect may be especially important in vaccines whose antibody response needs to reach its maximum level in the early stages of nursery phase (e.g. vaccines against *Glaesserella parasuis* and *Streptococcus suis*). Future studies need to be conducted to understand whether the reduction in antibody levels observed here is temporary or permanent.

*[1] POMORSKA-MÓL, M. et al. Effects of amoxicillin, ceftiofur, doxycycline, tiamulin and tulathromycin on pig humoral immune responses induced by erysipelas vaccination. Veterinary Record, v. 178, n. 22, p. 559-559, 2016.*

*[2] POMORSKA-MÓL, Małgorzata et al. Ceftiofur hydrochloride affects the humoral and cellular immune response in pigs after vaccination against swine influenza and pseudorabies. BMC Veterinary Research, v.11, p.1-8, 2015.*

# IntestiPig





MSD Animal Health

# Intradermal vaccination against *Lawsonia intracellularis* increased performance and reduced environmental impact due to antibiotic usage and emissions of N, P and $CO_2$

*Jan Kock[1], Christine Renken[2]*

*[1]Practitioner, Tierarztpraxis OM GmbH, Vechta, [2]Intervet Deutschland GmbH, MSD Animal Health, Unterschleißheim, Germany*

## Background and Objectives

*Lawsonia intracellularis* (Li) is present in most German pig farms and negatively influences health, performance, and resource-efficiency in pig production[1,2]. In addition to economic threats, the demands from politics and society towards a more sustainable pork production are increasing. The goal of this study was to evaluate the effect of an intradermal Li vaccination on performance and economic parameters, as well as the environmental impact due to antibiotic usage, emission of N, P and $CO_2$.

## Material and Methods

This case took place in a wean-to-finish pig farm in North-Western Germany with history of ileitis caused by Li. Piglets were vaccinated against PCV2, Mhyo and PRRSV (3 weeks of age, woa) and APP (7th and 11th woa). Performance data over two years (2020-2022) was recorded, i.e. feed conversion ratio (FCR), antibiotic usage. A historical control (3 fattening batches; oral vaccination against Li; n=9295) was compared to a subsequent period where pigs were vaccinated intradermally (ID) at 6 woa (3 fattening batches; intradermal vaccination; Porcilis®Lawsonia ID; n=9303). N and P excretion difference between groups was calculated with the official manual from the Lower Saxony Chamber of Agriculture using different standardized feed ratios by entering performance data to the model. The carbon footprint ($CO_2$-e) was calculated using the agricultural GHG Calculator "TEKLa" (based on a German-wide calculation standard) from the Lower Saxony Chamber of Agriculture[3].

## Results

According to the vet's and farm records, Ileitis-associated signs almost disappeared. Performance data showed an improved FCR in the intradermally vaccinated pigs (oral 2.65 vs ID 2.59) (Table 1), which means an economic benefit of 2.11 €/pig produced (mean feed price 288 €/t) (Table 2).

*Table 1. Performance parameters extracted from farm records.*

| | Oral vacc *(n=9595)* | Intradermal vacc *(n=9303)* | Difference |
|---|---|---|---|
| Mortality % | 2.05 | 1.75 | -0.29% |
| Slaughter weight kg | 125.00 | 124.44 | -0.56kg |
| Time to slaughter, d | 108.67 | 104.29 | -4.37 days |
| ADWG, g/d | 853.00 | 891.33 | +38.33g |
| FCR 1: | 2.65 | 2.59 | -0.06 |

*Table 2. Economic performance based on technical performance.*

| | Oral vacc | Intradermal vacc | Difference |
|---|---|---|---|
| Feed costs €* | 70.82 | 68.92 | -1.89 |
| Animal losses/ pig produced in € | 0.95 | 0.81 | -0.14 |
| Lost profit/ pig produced in € | 0.57 | 0.49 | -0.08 |
| Total reduction of costs/ pig produced in € | 72.33 | 70.22 | -2.11 |

**Feed costs in 2021 288 Euro/t; mean weight gain 92,78 kg/pig produced. Vaccination costs not included;*

Use of antibiotics due to clinical enteric disease was reduced (treatment days/pig: oral 4.4 vs ID 1.1; -75%, three oral batches compared to one ID batch; see figure 1), likewise emission of N (oral vs ID: range from -3.1% to -3.4%), P (oral vs ID: range from -3.2% to -3.7%) and $CO_2$ (oral vs ID: -1.5%) were lowered (Fig.2).

*Figure 1. Antibiotic use associated with ileitis (pleuromutilins and macrolides) on case farm in different batches.*

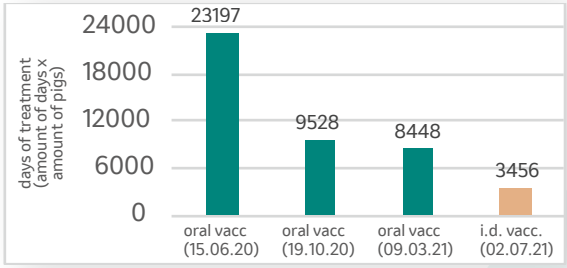
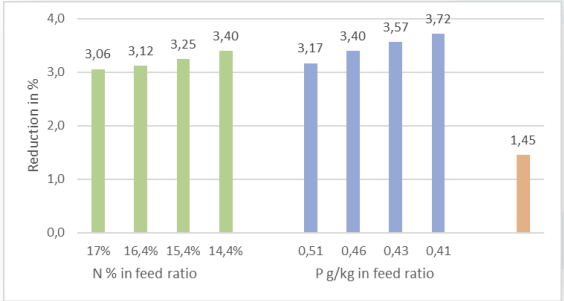



*Figure 2. Calculated reduction % on N, P and $CO_2$e in ID vaccinated groups vs oral vaccinated ones depending on the amount of nutrients in feed ratio.*




## Discussion and conclusion

Under the conditions of this field observation, intradermal Li vaccination led besides the clinical and economic benefits to more resource-efficient results. This study suggests that Li vaccination may be a valuable and sustainable tool in modern pig production.

*[1] Arnold et al., 2019, Prevalence of Lawsonia intracellularis in pig herds in different European countries, Porcine Health Management*
*[2] Mühlen et al., 2021, Praxisdaten zu Klinik und Leistung von Porcilis® Lawsonia geimpften Tieren in deutschen Betrieben, Tierärztliche Umschau*
*[3]LWK NDS: Berechnung einer individuellen Stallbilanz; https://www.duengebehoerde-niedersachsen.d e /duengebehoerd e /news/33749_Berechnung_einer_individuellen_Stallbilanz; Retrieval date 10.07.2023*

# Effect of improved feed efficiency by *Lawsonia intracellularis* vaccination on Phosphorus emissions in pig production

*Robert Tabeling, Friederike von und zur Mühlen, Christine Renken*
*Intervet Deutschland GmbH; MSD Tiergesundheit, Unterschleißheim, Germany*

## Background and Objectives

Phosphorus (P) is an essential element for pigs, especially for bone formation. Due to its ability to accelerate the eutrophication process, upper P limits are defined for German agriculture and pig farms must fulfil an individual nutrient management plan. The aim of this report was to illustrate the effect of the enhanced pig performance by *Lawsonia intracellularis* vaccination together with different feed rations (defined P content classes) on the P-excretion.

## Material and Methods

Performance data (e.g., average daily gain, ADG; feed conversion ratio, FCR; Table 1) from field observations of 9 farms with a history of subclinical or clinical ileitis was recorded in non-vaccinated (NV) and vaccinated (PL) (intramuscularly/ intradermally Porcilis®Lawsonia/ID; at 3-11 weeks of age) batches. NV batches, used as historical control, were compared to PL vaccinated batches after implementing *Lawsonia intracellularis* vaccination to control ileitis.

*Table 1. Animal numbers and performance data of the 9 observed farms before (NV – Non-Vaccinated) and after (PL – Vaccinated) introduction of Porcilis®Lawsonia vaccination.*

| | Animal Number | ADG | Weight Gain | Mortality | FCR |
|---|---|---|---|---|---|
| NV | 64943 | 920.7 | 94.9 | 2.8 | 2.84 |
| PL | 21951 | 936.9 | 96.6 | 1.8 | 2.73 |

P excretion was calculated using the freely available program “Calculation of an individual stable balance” of the Lower Saxony Chamber of Agriculture (LWK NDS) (1). Effects of performance data on P emission were calculated with four different P containing rations (g P/kg 88% dry matter: “universal feed” 5.1; “P reduced” 4.6; “P greatly reduced” 4.3; “P very greatly reduced” 4.1).

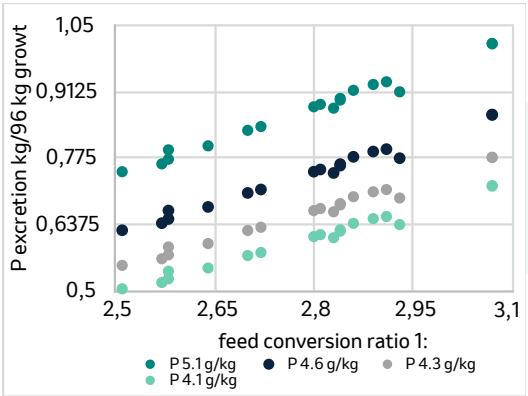
## Results

Calculation of the P excretion in PL vaccinated batches showed a mean reduction by 5.7-6.4% (P in feed 5.1-4.1 g) with a maximum of 17.1%, when compared to non-vaccinated batches (Table 2). On the farm (non-vaccinated batch) with the most unfavorable FCR and assumed highest P content in feed (FCR 3.07; 5.1 g P/kg FM), P excretion was 10.5 g/kg LW or 1012 g/ 96 kg weight gain. The most favorable calculated case (PLvaccinated FCR 2.51; 4.1 g P/kg FM) had a P excretion of 5.2 g P/kg LW or 503.9 g P/96 kg weight gain. The P excretion between these two scenarios has thus halved (Fig. 1).

*Table 2. Effect of FCR change with Porcilis®Lawsonia vaccination compared to NV batches on the P excretion (%) of fatteners fed with different P containing rations (5.1 to 4.1 g/kg FM; 88% DM)*

| farm | FCR change | | Calculated change P excretion % | | | |
|---|---|---|---|---|---|---|
| | 1: | % | P 5.1 g | P 4.6 g | P 4.3 g | P 4.1 g |
| 1 | -0.16 | -5.21 | -7.78 | -8.21 | -8.55 | -8.82 |
| 2 | -0.27 | -8.79 | -13.0 | -13.7 | -14.3 | -14.7 |
| 3 | 0.02 | 0.74 | 0.95 | 1.01 | 1.06 | 1.10 |
| 4 | -0.03 | -1.06 | -1.36 | -1.45 | -1.52 | -1.57 |
| 5 | -0.10 | -3.41 | -3.72 | -3.95 | -4.13 | -4.28 |
| 6 | -0.07 | -2.71 | -5.72 | -6.14 | -6.47 | -6.74 |
| 7 | -0.06 | -2.27 | -3.46 | -3.70 | -3.90 | -4.06 |
| 8 | -0.27 | -9.51 | -14.8 | -15.7 | -16.5 | -17.1 |
| 9 | -0.03 | -1.04 | -1.31 | -1.39 | -1.45 | -1.50 |

*Figure 1. Calculated P excretion of fatteners (kg/96 kg growth) with different P containing rations (5.1 to 4.1 g/kg FM; 88% DM) and FCR observed on the farms before and after the introduction of the Porcilis®Lawsonia vaccination.*




## Discussion and conclusion

Under the conditions of this field observation and model calculation, it has been shown that the P excretion in pig farming can be reduced markedly by improving performance data with *Lawsonia intracellularis* vaccination and by modulating P content in the ration. This data suggests that *Lawsonia intracellularis* vaccination together with the feed design has a high potential for improving sustainability with particular interest for farms in very pig dense areas.

*[1] LWK NDS: Berechnung einer individuellen Stallbilanz; https://www.duengebehoerde-niedersachsen.de/duengebehoerde/news/33749_Berechnung_einer_individuellen_Stallbilanz; Retrieval date 10.07.2023*

# Impact of *Lawsonia intracellularis* vaccination on antibiotic usage in fattening farms

*Christine Renken [1], Robert Tabeling [1], Friederike von und zur Mühlen [1]*
*[1]Intervet Deutschland GmbH; MSD Animal Health, Unterschleißheim, Germany*

## Background and Objectives

The use of antibiotics as antimicrobial growth promoters in the EU was banned from 2006 onwards. Since then, only metaphylactic and therapeutic use of antibiotics is allowed. Due to the pressure put on further improvements in the prudent use of antibiotics in livestock production, national regulations on documentation and reduction plans have been put in place. The aim of this study was to evaluate the impact of *Lawsonia intracellularis* vaccination on reduction of antibiotic costs for enteric use.

## Material and Methods

Clinical data (ileitis-related signs), performance (feed conversion ratio; FCR), and antibiotic usage for enteric purposes (measured indirectly as treatment cost) were recorded in 8 farms with a history of subclinical or clinical ileitis. Pigs from non-vaccinated (NV) and vaccinated with Porcilis®Lawsonia (PL) (intramuscularly/intradermallya (IM/ID); at 3-11 weeks of age) batches were included. NV batches, used as historical control, were compared to PL vaccinated batches after implementing *Lawsonia intracellularis* vaccination to control ileitis. [1,2]

## Results

In all farms, ileitis-related signs were improved clinically after the start of PL vaccination. Mean FCR was 2.81 and 2.71 in non-vaccinated and vaccinated batches, respectively (Table 1). Average antibiotic treatment costs for enteric reasons (n=7 farms, excluding farm 7) were reduced by 68.3% (50.0- 95.2%) in vaccinated batches compared to non-vaccinated batches (Table 1; Fig.1). No group in-feed medication for enteric purposes was necessary anymore on these farms after the introduction of *Lawsonia intracellularis* vaccination. In one exceptional farm, enteric treatment costs were higher (factor 9.7) in vaccinated batches, as vaccination was administered at the beginning of fattening period, leaving no time for the onset of immunity before the pigs showed clinical ileitis-associated symptoms (3 days after vaccination) (Fig.2).

*Table 1. Difference in antibiotic treatment costs against enteric diseases on case farms after introduction of Lawsonia intracellularis vaccination i.m./i.d. (NV: n=60.992; PL: n=19.917)*

| Farm | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| FCR NV batches | 3.07 | 2.7 | 2.84 | 2.93 | 2.58 | 2.64 | 2.84 | 2.89 |
| FCR PL batches | 2.80 | 2.72 | 2.81 | 2.83 | 2.51 | 2.58 | 2.57 | 2.86 |
| Difference (%) in antibiotic treatment costs | - 60.0 | -95.2 | -72.7 | -63.6 | -89.0 | -48.2 | 9.7 times higher | -50.0 |

** Historical comparison of Lawsonia i.m./i.d. vaccinated batches to non-vaccinated batches (farm 4 simultaneous comparison).*

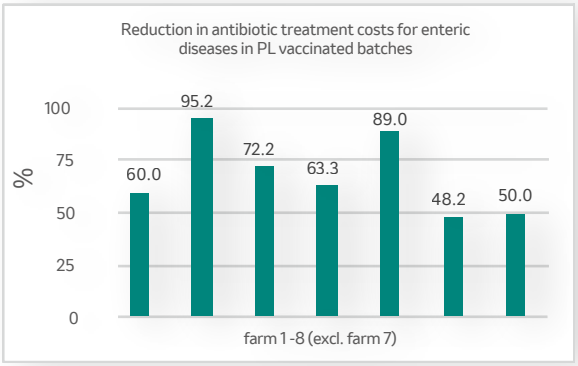



*Figure 1. Reduction (%) in antibiotic treatment costs in vaccinated batches (PL) compared to non-vaccinated (NV) batches.*

*Figure 2. Pigs in farm 7 showed acute ileitis-associated symptoms and lesions in pathology right after placement before onset of immunity and were therefore treated antibiotically.*

## Discussion and conclusion

Under the conditions of this report, *Lawsonia intracellularis* vaccination reduced ileitis-related clinical signs, improved FCR and led to a reduction of antibiotic costs for enteric purposes, as an indicator of antibiotic usage. This suggests that *Lawsonia intracellularis* vaccination may be a reliable tool for a more efficient and sustainable pig production.

*[1] Mühlen et al., 2021, Praxisdaten zu Klinik und Leistung von Porcilis® Lawsonia geimpften Tieren in deutschen Betrieben, Tierärztliche Umschau.*
*[2] Nieberding et al., 2022 Praktische Beobachtungen zum Einsatz einer intradermalen Lawsonia Impfung, Tierärztliche Umschau*



Poster Code: VPH-PP-07

# Ileitis vaccination: assessment of immuneresponse and clinical signs in pigs co-infected with *Lawsonia intracellularis and Brachyspira hyodysenteriae*

*S. Chagas[1], [2], P. Jensen[1], E. Paladino[1], L. Mendonça Pascoal[2], S. Von Berg[3], C. Gebhart[1], F. Vannucci[1]*

*[1]. University of Minnesota - College of Veterinary Medicine, St. Paul, MN, USA. [2]. Escola de Veterinária e Zootecnia, Universidade Federal deGoiás, Goiânia, GO, Brazil. [3]. MSD Animal Health, Munich, Germany*

## Introduction

*Lawsonia intracellularis* (LI) and *Brachyspira hyodysenteriae* (Bhyo) co-infections are reported in the field, but with limited information about their interaction.This study was conducted to assess the level of infection andimmune response (local and systemic) in pigs vaccinated forLI and co-infected with LI and Bhyo.

## Material and Methods

**GermanyV-CO group,n=21** (vaccinnated and co-infected withLI and Bhyo)

**P-CO group,n=18** (placebo and co-infected with Lland Bhyo)

**80 weaned pigs** (around 21 days old)

**V-Law group, n=21** (vaccinnated and infected with Li)

**NC group, n=8** (non-vaccinatedand non-challenged)

**P-Law group,n=12** (placebo andinfected with LI)

Vaccine: Porcillis® Ileitis (MSD Animal Health).Study design: Animals were challenged with LI 22 days aftervaccination (0 dpi) and with Bhyo 29 days after vaccination(7 dpi).Parameters analyzed: fecal score (1=normal feces to5=watery diarrhea), LI immunohistochemistry (IHC) of ilealfragments (0=negative to 3= diffuse presence of LI), serumIgG (IPMA).

## Results

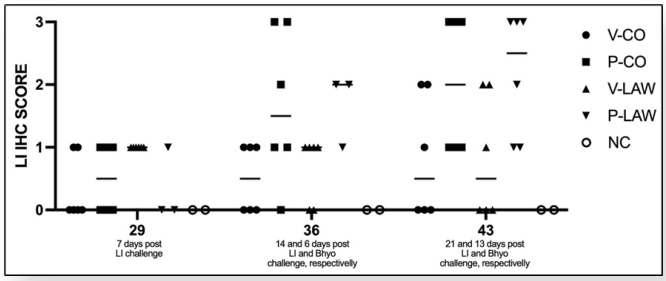



*Fig 1. IHC scores for LI per group and on 3 different time points. Each dot represents one animal.*

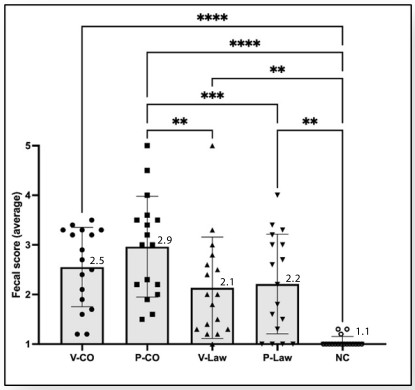



*Fig 2. Average fecal score. Each dot represents one daily average fecalscore of the group. Fecal score was observed three times per week, starting1 day after LI challenge up until 21 days after LI challenge. Significantdifferences are represented as follows: p<0.01(**), p<0.001 (***) andp<0.0001(****).*

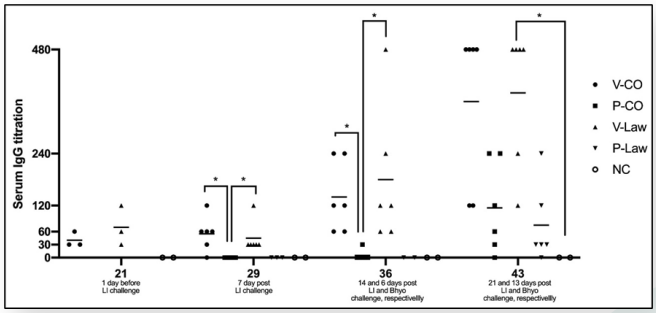



*Fig 3. Anti-Lawsonia intracellularis IgG titers on serum per group on 4 timepoints. Each dot represents one animal. The horizontal bars represent theaverage of each group. Significant differences are represented as p<0.05 (*).*

## Discussion and conclusion

- This represents the first study assessing impact of LI vaccination in pigs experimentally co-infected with Bhyo. This represents the first study assessing impact of LI vaccination in pigs experimentally co-infected with Bhyo.
- Co-infected and/or non-vaccinated animals showed higher fecal scores for diarrhea when compared to with LI only.
- IHC showed that the vaccine reduces LI gut infection in both co-infected and LI-groups. IHC showed that the vaccine reduces LI gut infection in both co-infected and LI-groups.
- Overall, Bhyo and LI have a synergistic effect in terms of clinical signs vaccine reduces gut colonization even co-infected animals

SCAN ME

sarahchagas94@ gmail.com

# Progression of the slaughter data in eleven French pig herds having implemented parenteral vaccination in replacement of other strategies against *Lawsonia intracellularis*

*Christophe Renoult[1], Jessica Rouillier[1], Isabelle Delaunay[1], Elisabeth Chabeauti[1], Karine Thirouard[1], Dominique Dagorn[1], Paméla Veugeois[1], Martial Rigaut[2], Florine Préault[2], Didier Duivon[2], Justine Trébault[2], Laurent Daluzeau[2], Florian Voisin[2]*

*[1]Selas Hyovet, 22640 Plestan, France - [2]MSD Animal Health, 49071 Beaucouzé, France*

## Background and Objectives

*Lawsonia intracellularis* (L.i.) is the aetiological agent of Ileitis, an enteric disease in pig causing economic losses to the pig industry. The aim of this study was to illustrate the performance of parenteral vaccination against L.i. as compared to other strategies in several pig farms with known ileitis under French conditions.

## Material and Methods

A group of the 11 first French conventional farms having implemented vaccination against L.i. with Porcilis® Lawsonia at weaning were included. All farms had a history of proliferative enteropathy and used identification of their pigs with the week of their birth. The differences in Live Weight at slaughter (LW), Age at slaughter, and Average Daily Gain (ADG) were calculated between the animals born during the 6 last months before the new prevention strategy, and the pigs born during the 6 months after. Comparison to contemporary slaughters was included for both periods. Wilcoxon rank sum test was used as statistical analysis.

## Results

Among the farms included, 6 did previously use oral vaccination, and 5 relied on nutrition or antibiotics as a former strategy against L.i. At slaughter, the individual data of 20.890 and 21.333 pigs were respectively recorded for the periods before and after.
Following the implementation of the parenteral vaccination:
- LW was significantly increased by 1,45 kg (Fig.1),
- Age at Slaughter was significantly reduced by 1,8 days (Fig.2),
- The Average Daily Gain was significantly increased by 14 g/d
(Fig.3) ($p<0,05$).
Comparing both periods (before vs. after), there was a significant reduction of the average difference between the included animals and the contemporary slaughters for LW (-1,67 vs. -0,71kg, $p<0,05$) and lean meat (+0,18 vs. -0,004%, $p<0,05$).

## Discussion and conclusion

Under the conditions of this study, which was conducted in 11 of the first French farms where parenteral vaccination against L.i. at weaning was chosen, the performance at slaughter was improved in comparison to previous strategies.
These results are arguments in favour of the use of Porcilis® Lawsonia in pig herds encountering Ileitis.
Practicality (choice of administration route and possibility to co-administrate with another vaccine) appeared as a convincing advantage for the farmers.

*Figure 1. Live Weight at slaughter (LW, kg) per farm (A to K) and per semester before/after implementing Porcilis® Lawsonia in replacement of a previous strategy (a=antibiotics, n=nutrition, v=oral vaccination).*

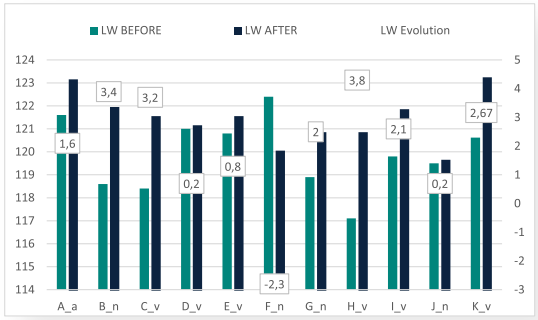



*Figure 2. Age at slaughter (days) per farm (A to K) and per semester before/after implementing Porcilis® Lawsonia in replacement of a previous strategy (a=antibiotics, n=nutrition, v=oral vaccination).*

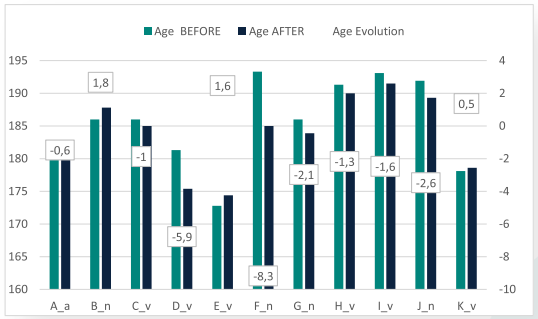
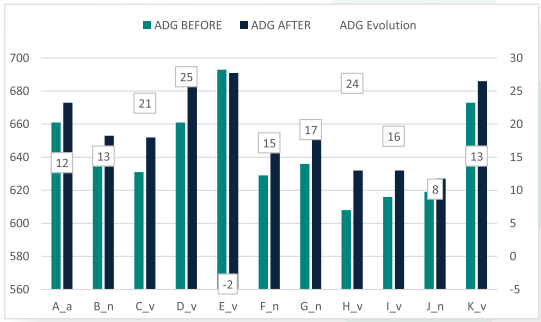



*Figure 3. ADG Evolution (g/day of life) per farm (A to K) and per semester before/after implementing Porcilis® Lawsonia in replacement of a previous strategy (a=antibiotics, n=nutrition, v=oral vaccination).*



# Association between growth and faecal shedding of *Lawsonia intracellularis* on pigs vaccinated and non-vaccinated against Ileitis

*Rubén del Pozo Sacristán[1], Hanny Swam[2], Stephan von Berg[3], Amy Elizabeth Taylor[4]*

*[1]MSD Animal Health, Madrid, Spain, [2]Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands, [3]Intervet Deutschland, Munich, Germany, [4]University of Leeds, UK*

## Background and Objectives

Ileitis is an enteric disease caused by *Lawsonia intracellularis*. This infection leads to a retardation in growth and subsequent reduction in performance. Therefore, its economic impact is of paramount importance nowadays in swine production. Vaccination of pigs in acutely or chronically infected farms has been shown as an excellent tool to reduce clinical and performance losses. However, subclinically infected pigs, despite not showing any clinical sign, are still colonized by a moderate number of bacteria and develop microscopic ileitis lesions in the gut, making the disease invisible to the eyes of the producer, but still negatively affecting the economic performance of the farm. Today it is unknown whether vaccination of those populations of subclinically infected pigs could positively impact performance. Therefore, the aim of this clinical trial was to investigate the association between growth and faecal shedding of *L. intracellularis* on pigs vaccinated intramuscularly or not vaccinated against this bacterium in a farm with history of subclinical ileitis.

## Material and Methods

A randomized, controlled, blind, side-by-side trial was performed in a herd with history of subclinical ileitis. At 4 weeks of age (woa), 240 piglets were allocated to Vaccination (V; n=120; vaccinated with Porcilis®Lawsonia mixed with Porcilis®PCV M Hyo) or Control (C; n=120; Porcilis®PCV M Hyo) group. Faecal samples (n=30/group) were taken (4, 7, 10, 13, 16, 19woa) from the same individual pigs directly from the anus at defecation. Bacterial load in faeces was assessed by qPCR (Ingenetix®). Daily feed intake and daily weights of the individual pigs were measured using pig performance testing technology (Pig Insight Asserva System for weaners/growers; Pig Performance Nedap ProSense system for fatteners). Average Daily Gain (ADG), Average Daily Feed Intake (ADI) and Feed Conversion (FCR) were calculated. The association between bacterial load and ADG, ADI and FCR for the 7 days prior to the peak of bacterial shedding was determined (linear regression). A multilevel mixed-effect linear model was also performed.

## Results

No bacterial shedding was detected before 16woa. The average bacterial load (log10 copies/µl) was very low in both vaccinated and control pigs at 16woa (V:0.19±0.13; C:0.20±0.14; P>0.05) and 19wk (V:1.17±0.27; C:1.48±0.27; P>0.05). Average AUC from 4-19woa was numerically lower for vaccinates (14.96±20.64 log10 copies/µl) than for controls (17.53±19.85 log10 copies/µl) (P>0.05) (Fig.1). There was a significant negative correlation between bacterial load in faeces and ADG of controls (R2=-0.193;P<0.05) (Fig.2), whereas there was no correlation in vaccinated pigs (R2=3.831e-4; P>0.05) (Fig.3). There was a significant negative correlation between bacterial load in faeces and ADI (R2=-0.111; P<0.05) of controls, whereas there was no correlation in vaccinated pigs (R2=0.006; P>0.05). There was a significant positive correlation between bacterial load and FCR (R2=0.136; P<0.05)) of controls, whereas there was no correlation in vaccinated pigs (R2=0.016; P>0.05). An increase in bacterial load was significantly associated with a decrease in ADG only in control pigs.

*Figure 1. Average Lawsonia intracellularis shedding in faeces in pigs vaccinated (green; n=30) and control (black; n=30) pigs.*

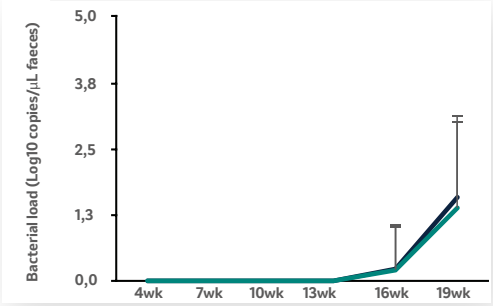



*Figure 2. Pearson correlation coefficient between average daily gain (ADG) and qPCR Law (Log10 copies/µL of faeces) in Control pigs (n=32).*

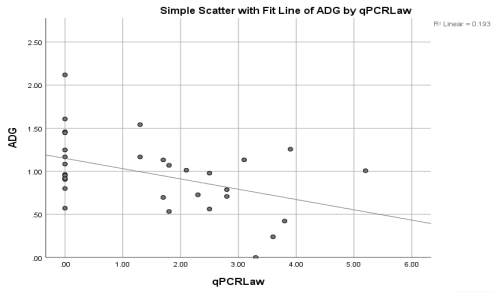
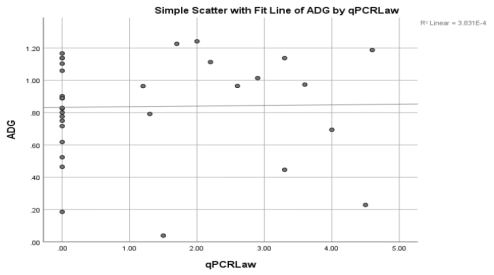



*Figure 3. Pearson correlation coefficient between average daily gain (ADG) and qPCR Law (Log10 copies/µL of faeces) in Vaccinated pigs (n=32).*




## Discussion and conclusion

An increase in *L. intracellularis* bacteria/gram of faeces was associated with a reduction in ADG 7 days prior to sampling at the peak of shedding (19woa). However, this association was dependent on vaccination status and was only seen in unvaccinated pigs against *L. intracellularis*.

# Reduction of *Lawsonia intracellularis* shedding, improvement of carcass quality and partial prevention of tail biting after intradermal vaccination against this bacterium

*Rubén del Pozo Sacristán[1], Hanny Swam[2], Stephan von Berg[3], Amy Elizabeth Taylor[4]*

*[1]MSD Animal Health, Madrid, Spain, [2]Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands, [3]MSD Animal Health, Munich, Germany, [4]University of Leeds, UK*

## Background and Objectives

Ileitis is an enteric disease caused by *Lawsonia intracellularis*. This infection leads to a retardation in growth and subsequent reduction in performance. Therefore, its economic impact is of paramount importance nowadays in swine production. Vaccination of pigs in clinically affected farms has been shown as an excellent tool to reduce clinical and performance losses. However, subclinically infected pigs, despite not showing any clinical sign, are still colonized by a moderate number of bacteria and develop microscopic ileitis lesions in the gut, making the disease invisible to the eyes of the producer, but still negatively affecting the economic performance of the farm. Today it is unknown whether vaccination of those populations of subclinically infected pigs could positively impact performance. The aim of this study was to assess the efficacy of an intradermal vaccination against *Lawsonia intracellularis* on a herd with a subclinical infection.

## Material and Methods

A randomized, controlled, blind, side-by-side trial was performed in a herd with a history of subclinical ileitis. At 4 weeks of age (woa), 240 piglets were allocated to Vaccination (V; n=120; vaccinated with Porcilis®Lawsonia ID mixed with Porcilis®PCV ID and concurrent with Porcilis®M Hyo ID Once; administered with IDAL® Twin) or Control (C; n=120; same PCV2 and *Mycoplasma hyopneumoniae* vaccines) group. Faecal samples (n=30/group) were taken (4, 7, 10, 13, 16, 19woa) from the same individual pigs directly from the anus. Bacterial load in faeces was assessed by qPCR (Ingenetix®). Ileitis-associated mortality %, treatment incidences, scour incidences and tail biting % were registered. At slaughter, carcass quality was assessed by recording carcass weight, back fat level (at P2 level; cm) and Lean Meat % (LM%). Kruskal-Wallis was performed to evaluate bacterial shedding and carcass characteristics analyzed using the mixed linear model procedure. Mortality, antibiotic treatment, signs of scour, or tail bitten animals were assessed by Chi-square analysis.

## Results

No bacterial shedding was detected before 13 and 16woa for controls and vaccinated pigs, respectively. A significant lower bacterial load (log10 copies/µl) was detected at 16wk in vaccinated pigs (V:1.70±0.66; C:3.31±1.65; P<0.05). Average AUC (bacterial shedding log10 copies/µl) from 4-22woa was significantly lower for vaccinates (20.72±25.93) compared to controls (40.23±39.10) (P<0.05) (Fig.1). Vaccinated pigs had a significantly lower prevalence of tail biting (31.67%) compared to control pigs (54.17%) (P<0.05) (Fig.2).

Vaccinated pigs had less back fat (10.5 vs 10.9 ±0.14 mm; P<0.1) and greater LM% (62.7 vs 62.1 ±0.12%; P<0.05) when compared to non-vaccinated pigs (Table 1). No significant differences were seen for the other parameters.

*Figure 1. Average Lawsonia intracellularis shedding in faeces in pigs vaccinated (green; n=30) and control (black; n=30) pigs (P<0.05).*

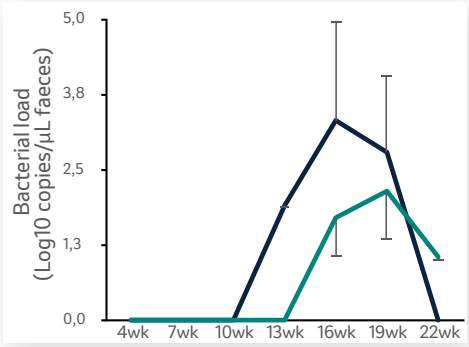



*Figure 2. Prevalence of tail biting in vaccinated and control pigs (P<0.05).*

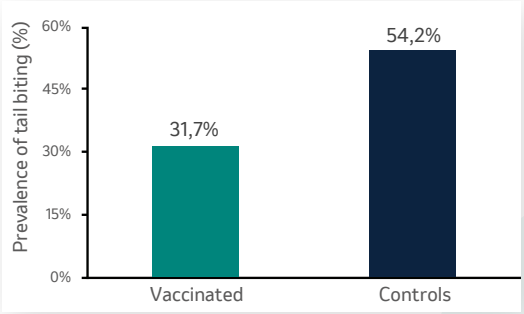



*Table 1. Clinical parameters and Carcass Quality in Vaccinated and Control pigs.*

| | Vaccinated | Controls | Difference |
|---|---|---|---|
| Mortality % | 0 | 0.8 | NA |
| Treatment incidences | 43 | 39 | NA |
| Scour incidences | 22 | 15 | NA |
| Tail biting % | 31.7% A | 54.2% B | -22.5 |
| Carcass weight (kg) | 115.6 | 113.7 | NA |
| Back fat (mm) | 10.5 A | 10.9 B | -0.4mm |
| Lean Meat % | 62.7% A | 62.1% B | +0.6 |

*A, B - Different superscripts within the same row, represent statistical differences.*
*NA – Not applicable, when no statistical differences were found.*

## Discussion and conclusion

In this study, a significant reduction of bacterial shedding and increase of carcass Lean Meat % was demonstrated after intradermal vaccination against *L. intracellularis*. This is the first scientific study that reports a partial prevention of tail biting after vaccination against *L. intracellularis*. Further research is needed to elucidate this finding.




Poster Code: WEL-PP-04

# Field efficacy trial of an inactivated injectable vaccine against *Lawsonia intracellularis* in the Philippines

*L.D.E. Ellerma [1], R. Del Pozo Sacristán[1] C. Lima [2], H. Lin [3], R. Magpantay [4]*

*[1]MSD Animal Health [2]Veterinarian, Sika Farm, Magalang Pampanga, Philippines. [3]MSD Animal Health Innovation Pte Ltd, [1] Perahu Road, Singapore [4]MSD Animal Health Philippines*

## Background and Objectives

*Lawsonia intracellularis* is the etiologic agent of ileitis in pigs. This disease is responsible for substantial economic losses worldwide. Vaccination and use of antibiotics have been the top control options for ileitis. The efficacy of an inactivated injectable vaccine against *L. intracellularis* when used in conjunction with antibiotics was evaluated.

## Material and Methods

A total of 386 piglets were used, which were assigned randomly to one of the two groups: TREATMENT (n=198), vaccinated with Porcilis® Lawsonia vaccine mixed with Porcilis® PCV Mhyo 2ml intramuscularly (IM) at 3 weeks of age and CONTROL (n=188), vaccinated against PCV & Mhyo. Both the CONTROL and TREATMENT groups received the same routine antibiotic and vaccination program and were housed in separate pens from nursery to slaughter to allow for feed consumption measurement and ear-tagged so that no comingling between vaccinated and non-vaccinated groups occurred. Average daily gain, Feed Conversion Ratio (FCR), % survivability and final weight gain were computed. On establishing the economic benefit of having an intact control program for Ileitis, current prices and cost assumptions were applied.

## Results

We found a positive ADG difference in the treatment group of 43 grams from wean to finish, which is equal to approximately 5.89 kg advantage on market weight compared to the control group. A 10 FCR points advantage was also observed in the treatment compared to control group. This advantage in FCR points contributed to at least 49% of the total net benefit gained in the study. Comparing the % survivability of the two groups, it was observed that animals that received Lawsonia vaccination has better survivability and robustness. In this study, the treatment group garnered a total of PHP292,702.95 (USD 5,210.41) net benefit over the control with a cost benefit ratio of 22.74.

*Figure 1. Average Lawsonia intracellularis shedding in faeces in pigs vaccinated (green; n=30) and control (black; n=30) pigs (P<0.05).*

| | ADG (kg) | Weaning weight (kg) | Transfer weight (kg) | Market weight (kg) | Days of feeding in finishing period (day) |
|---|---|---|---|---|---|
| T | 0.540 $^{a}$ | 7.59 $^{a}$ | 36.36 $^{a}$ | 73.98 $^{a}$ | 137 $^{a}$ |
| C | 0.497 $^{b}$ | 7.39 $^{a}$ | 31.16 $^{b}$ | 68.09 $^{b}$ | 137 $^{a}$ |

**Values with different superscript within the same column are statistically significant (P<0.05)*

## Discussion and conclusion

The study shows that Lawsonia vaccination can protect pigs from Ileitis and reduce economic losses associated. Significant differences in terms of production parameters (ADG, FCR and market weights) demonstrate this. In this scenario, the economic value gained was positive even if it is an add on to what routine antibiotic and vaccination program the farm currently has.

*[1].Vannucci, F. A. & Gebhart, C. J. (2014). Vet. Pathol. 51, 465–477.*
*[2]. Roof, M. et al. (2006). Anim. Heal. Res. Rev. 6, 173–197.*
*[3]. Park, S. et al. (2013) Clin. Exp. Vaccine Res. 2, 135–139.*
*[4]. McOrist, S. (2005). Proceedings of the 2nd Asian Pig Veterinary Society Congress. Pp 25-36*

# Zootechnical performance and return on investment in animals vaccinated against proliferative enteropathy on a commercial pig farm in Brazil

*J. Borges da Silva [1], B. Maria Ferreira Passos e Prado Marques [1], A. Gabrielle De Souza Daniel [1], E. Raele de Oliveira [2], L. Carlos Crestani [2], A. Paula Pavaneli [2], S. Von Berg [3].*

*[1]MSD Saúde Animal, [2]InsideSui Research Services, Insidesui, Patrocínio - MG, Brazil, [3]MSD Tiergesundheit*

## Background and Objectives

Proliferative enteropathy is an endemic disease caused by *Lawsonia intracellularis* with a prevalence of 75% in Brazilian pig farms. This disease has economic impact and can reduce daily weight gain by 20.8% and increase feed conversion by 20.4%. The vaccination has been shown to be an important tool for control this disease. The aim of this study was to evaluate the effect of vaccination in zootechnical and economic performance compared with non-vaccinated pigs in a commercial farm.

## Material and Methods

Piglets from a positive farm for *L. intracellularis* were divided in two groups, negative control (n = 120) and vaccinated group (n = 120). The animals were randomized in block design and Porcilis® Ileitis vaccine (2mL, IM at neck, Merck Animal Health, Madison, NJ, USA) was administered at 24 days old at vaccinated group. The animals were weighed individually at 63 (nursery exit), 120 (growing-finishing transition) and 156 days old (slaughter). Daily feed intake (DFI), daily weight gain (DWG), feed conversion ratio (FCR) and return on investment (ROI) were measured. Data were submitted to ANOVA using the Minitab 19 statistical program. Differences with $p < 0.05$ were considered statistically significant.

## Results

Lower FCR were observed for vaccinated pigs considering the interval between 120 and 156 days old (2.143 vs. 2.341; p= 0.005), and the entire evaluation period (1.940 vs. 2.015; p = 0.011). In addition, vaccinated pigs were 2.52 kg heavier at slaughter (p = 0.454, not significant). About economic analysis, vaccination results in a gain of R$ 37.50/pig and a ROI of 7.11 times the initial cost. The cost efficiency index (CEI, ratio between costs from both groups) shows an improvement of more than 26% for vaccinated pigs.

## Discussion and conclusion

According to the results, vaccination results in greater productive and economic efficiency. One potential explanation for these results comes from the type of diarrhea caused by *Lawsonia intracellularis*, which is malabsorptive. The bacteria act on enterocytes, leading to cell proliferation and consequently an increase in immature cells with worse absorptive capacity. Vaccination is a proven tool for improving both clinical and subclinical proliferative enteropathy.

*[1] Armbruster et al. 2013. Evaluation of Tylan in a finishing pig subclinical ileitis challenge model. AASV. Pp. 237-242.*
*[2] Baldasso et al. 2022. Serology by Flow Cytometry: a smart strategy to assess Lawsonia intracellularis circulation in pig farms. 26º Internacional Pig Veterinary Society (IPVS). p.356.*

# Screening for *Lawsonia intracellularis* in Dutch finishing farms with different clinical scenarios and technical results

*Nico Wertenbroek*[*1]*
*[1]MSD AH NL, The Netherlands; nico.wertenbroek@merck.com*

## Background and Objectives

Ileitis is a common intestinal disease in pigs caused by *Lawsonia intracellularis* (LI) and of economic significance in the pig industry worldwide[1]. On the farms it is present in 3 different clinical forms as subclinical-, chronical- and/or acute form of Ileitis. The aim of this study was to get insight on the infection patterns of LI and technical results of finishing pigs for the different clinical forms of Ileitis in Dutch pig farms.

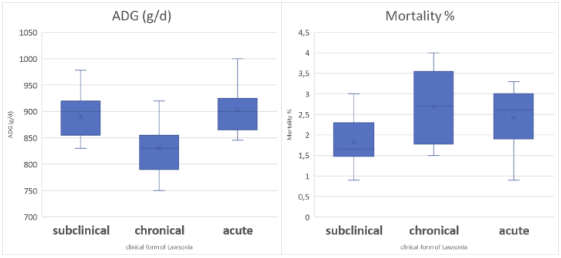
## Material and Methods

In the period of February till August 2021 vets who submitted saliva samples for qPCR Lawsonia[2] testing (in the BactoReal Lawsonia kit of Ingentix) at the CDS in Boxmeer, The Netherlands, were asked to fill in a small questionnaire about that farm. This survey included questions about subclinical – chronical – acute form of Ileitis according to the farm diagnostic history and assessment of the attending field vets, the technical performance data (ADG, FCR and mortality%), dry or wet feeding system and number of sows and finishing pigs on that farm site.
These collected data was crossed with the pooled saliva (3 samples pooled per age groups) results for detection LI (in Ct), with the four corresponding age group (10, 13, 16 and older than 19 weeks of age). Statistical analysis was done by Anova test with Minitab.

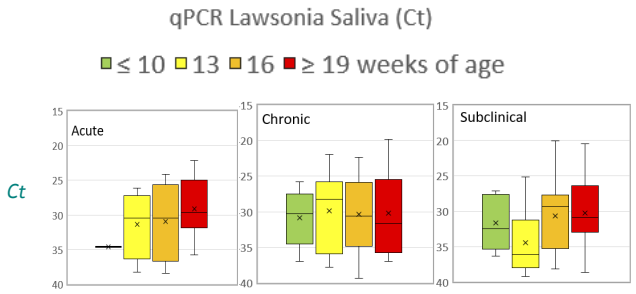
## Results

In total, 70 questionnaires and corresponding lab results were suitable for analysis.
From the pooled saliva samples (n=195) analyzed, it was observed that 88,6 % of the farms had at least one positive pooled saliva sample and 82% had a Ct value below 34 (moderate load). Of the 70 farms, 21 (30%), 21 (30%) and 28 (40%) farms were classified by the attending vet as Acute, Chronic and Subclinical form, respectively. The corresponding ADG were 903[a], 831[b] and 890[a] g/day, respectively; and mortality % 2,4[a] 2,7[a] and 1,8[b] (different superscript p<0,05). For FCR not enough data was present (n=16). No differences in prevalence of clinical forms of Ileitis were found between dry or wet feeding system.

*Graph 1 Box-Whisker plot for ADG and mortality for the corresponding clinical form of Ileitis*




*Graph 2: qPCR Lawsonia Saliva Ct for the positive samples by age group for respectively Acute – Chronic – Subclinical Ileitis*




## Discussion and conclusion

LI is highly present on Dutch finishing farms. Significant differences in ADG were seen on farms presenting chronic vs acute and subclinical form of Ileitis. High bacterial load (Ct<30) was detected on all 3 different forms of ileitis, in all age groups from 13 weeks and older, even in the absence of clinical signs or before the onset of clinical signs in case of acute ileitis. Creating awareness about the impact of *Lawsonia intracellularis* to a pig herd and as next step the control of Ileitis can result in higher technical performance of finishing pigs and better economical result[3,4].

*1. Jacobson. Vet J 2010, 184:264-268*
*2. Wertenbroek ESPHM 2022- BBD-PP-39*
*3. Leth Musse, Prev. Vet Med 212 (2023) 105837*
*4. Wertenbroek ESPHM 2023-BBD-PP-23*



Poster Code: BBD-PP-176

# Oral fluid as an alternative tool to detect *Lawsonia intracellularis* under field conditions

*S. Lopez [1], L. Daluzeau [3], D. Duivon [3], L. Eon [3], J.L. Sévin [2], F. Voisin [3]*

*[1]UNIVET SANTE ELEVAGE, rue Monge, 22600 Loudéac, France ; [2]Socavet, 75 boulevard de penthièvre, 22600 Loudéac, France ; [3]MSD Santé Animale, 49 Beaucouzé, France*

## Background and Objectives

*Lawsonia intracellularis* (LI) is still causing significant damage in pigs. Faecal samples are usually tested by qPCR as an ordinary measure of the bacterial load, and hence, of the infection pressure. Saliva sampling method is recently getting more attentions due to its advantage as being more user friendly by veterinarians (1,2). The same applies for FTA cards where genetic material present in saliva is fixed. **The aim of this study was to compare the sensitivity of qPCR when performed on saliva fixed in FTA cards, raw saliva, and fecal samples.**

## Material and Methods

Cross-sectional profiles were carried out on fatteners from 35 farms at 3 different ages. At each age, two chewing ropes were placed, and saliva collected, while 10 individual rectal swabs were taken from the same pigs. A drop of each saliva was then placed on an FTAcard spot. All in all, 210 FTA-cards spots, 210 oral fluids of raw saliva and 350 rectal swabs were all tested by qPCR for LI in the BactoReal Lawsonia kit of Ingenetix. PCR Cut-off was Cq=50. A Pearson Chi-squared test was applied to compare the qualitative PCR results (positive vs. negative) from the three methods. A two-factor analysis of variance model considering the effects of the profile (one age in one farm) and the method was applied to compare the PCR quantitative results.
The qPCR value (Cut off - Cq) = 50-Cq was used for the statistical tests and graphical presentation. In this way, the qPCR value increases as the quantity of LI detected in the sample increases, which is more intuitive.

## Results

The mean, median, minimum, and maximum ages at sampling were 121, 119, 72 and 182 days respectively. Percentage of positive results were 72, 55 and 42 for FTA-cards, raw saliva, and swabs respectively, and were significantly different (p=0.0002) (Table 1; Fig. 1). Average Cq was 40, 43 and 46 for FTA-cards, saliva's, and swabs, respectively, and were significantly different (p<0.0001) (Table 1; Fig.2). Cq median was 37, 44 and 50 for FTA-cards, saliva's, and swabs respectively.

## Discussion and conclusion

From a practical point of view, fecal swabbing is not easy when the pig has recently defecated. Pigs do not like to be swabbed in this way and frequently struggle. Saliva sampling, on the other hand, is minimally invasive for the animals and generally easy to perform. Transferring a drop of saliva to the FTA card requires a single-use pipette, a precise gesture, and a little extra time. Under the conditions of our study, the type of sample has a significant influence on the result of the PCR test for *Lawsonia intracellularis*. Individual fecal swabs appear to be much less sensitive than salivary samples. Saliva is known to be more sensitive as it may represent environmental infection pressure.
**The FTA card is the most sensitive method. Raw saliva is a good compromise between sensitivity and convenience.**

*Table 1. Percentage of LI PCR positivity, for the 3 types of samples.*

| | Sample size | % of positives | Average Cq |
|---|---|---|---|
| FTA - CARD | 210 | 72 [a] | 40 [d] |
| Raw saliva | 210 | 55 [b] | 43 [e] |
| SWAB | 350 | 42 [c] | 46 [f] |
| Stats | | Khi2 P = 0.0002 | Anova P < 0.0001 |

*Figure 1. Percentage of LI PCR positivity by sample type.*

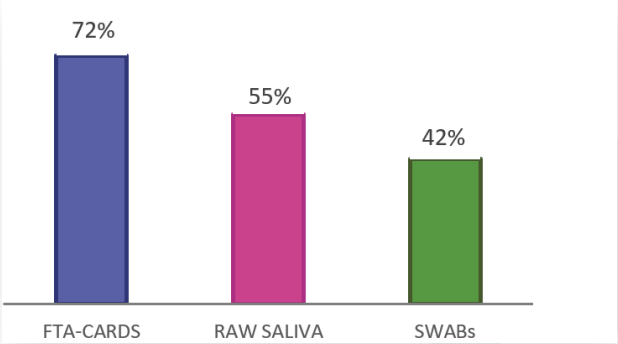
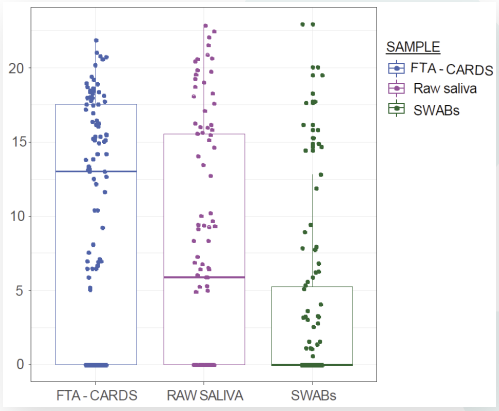



*Figure 2. Bacterial load of LI detected by PCR; distribution of results and medians by sample type.*
*Y axis value = (50 – Cq); each point represents an individual outcome.*




[1] Kamlage M., ESPHM Congress Proceedings, p 324.
[2] Wertenbroek N., 2022, ESPHM Congress Proceedings, p 263.

***Acknowledgements: R&D Service Lab (Lab. Tests, Boxmeer, The Netherlands) and KUZULIA (Stat. tests; Bourg-Blanc, France)***




Poster Code: BBD-PP-14

# Field comparison of *Lawsonia intracellularis* qPCR and elisa results, at farm level

*J.L. Sévin [1], L. Daluzeau [2], L. Eon [2], S. Lopez [3], F. Voisin [2], D. Duivon [2]*

*[1] Socavet, 75 boulevard de penthièvre, 22600 Loudéac, France ; [2] MSD Animal Health, 49 Beaucouzé, France ; [3] UNIVET SANTE ELEVAGE, rue Monge, 22600 Loudéac,France*

## Background and Objectives

*Lawsonia intracellularis* (LI) is still causing significant damage in pigs. Pooled faeces or saliva samples tested by qPCR are a tool to determine the bacterial load and infection pressure. Blood samples are very common, usable for a wide variety of tests and LI serologic tests are available. **The aim of this study is to evaluate the correlation between qPCR and ELISA serology at farm level.**

## Material and Methods

Cross-sectional profiles were carried out on 35 farms, on three successive batches of fatteners, at 3 successive ages (age1, 2 and 3). At each age, we took 10 individual blood samples and two chewing ropes were offered to the same pigs to sample two oral fluids (OFs). Finally, CDS (Boxmeer, The Netherlands) tested 210 saliva samples by qPCR for LI (BactoReal Lawsonia kit, Ingenetix) and 1050 sera by ELISA for LI (Svanovir Lawsonia kit, Svanova). qPCR Cut-off was Cq = 50. Quantitative results were Cq and inhibition percentage (Inh. %) for qPCR and ELISA respectively. They were compared using Principal Component Analysis and linear regression analysis. The qPCR value (Cut off - Cq) = 50 - Cq was used for the statistical tests and graphical presentation. In this way, the qPCR value increases as the quantity of LI detected in the sample increases, which is more intuitive.

## Results

Mean age of the age groups 1, 2 and 3 was 95, 121 and 146 days, respectively (about 14, 17 and 21 weeks). **At farm level, qPCR Cq at age1 and ELISA Inh% at age2 were significantly correlated (p=0.008; R2=21%). qPCR Cq at age2 and ELISA Inh% at age3 were also significantly correlated (p<0.001; R2=31%)**: see Table1 and Figure1.

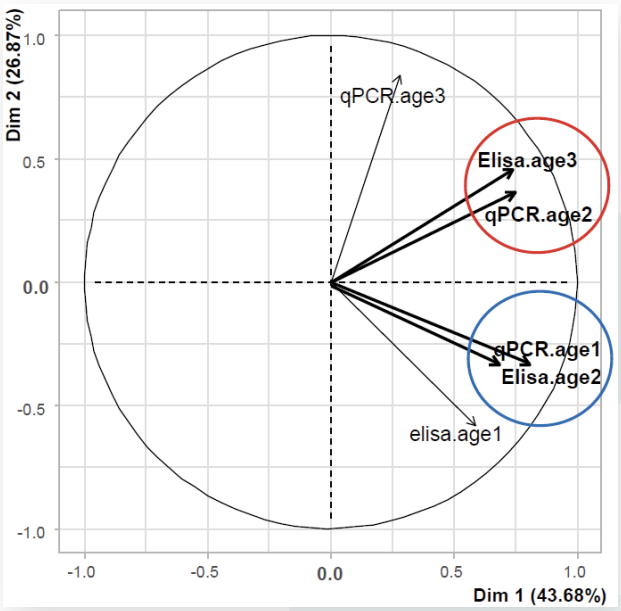
## Discussion and conclusion

**Under the conditions of this study, LI qPCR results of aproduction batch were correlated with ELISA results of the previous one (cross-sectional profile). To our knowledge, this is the first time that such a correlation at farm level is reported.** Previous studies have also described a good correlation between LI PCR and serology (1, 2, 3), but with 2 notable differences. They used the IFAT serological test. In addition, they compared the two methods within the same production batch, with a longitudinal profile.
**LI qPCR and ELISA appear to be complementary to practitioners, as the persistence of antibodies is longer than the excretion of LI by pigs.**

*Table 1. Linear regression analysis for LI qPCR and LI ELISA outcomes at age 1, 2 and 3*

| | | LI qPCR: value 50 - Cq | | |
|---|---|---|---|---|
| | | Age 1 (95 days) | Age 2 (121 days) | Age 3 (146 days) |
| LI Elisa: value = inh. % | Age 1 (95 days) | p < 0.001 | | |
| | Age 2 (121 days) | p = 0.008 | | |
| | Age 3 (146 days) | | p < 0.001 | |

*Figure 1. Principal component analysis for LI qPCR quantitative results versus LI ELISA outcomes. LI qPCR value = 50 - Cq. LI Elisa Value = inhibition percentage*




[1] Guedes, R.M.C. et al.; 2003; Vet. Microbiol. 91; 135 – 145.
[2] Knittel, J.P. et al.; 1998; Am. J. Vet. Res. 59, 722–726.
[3] Stege H. et al.; 2004; Veterinary Microbiology 104; 197–206

***Acknowledgements: R&D Service Lab (Lab. Tests, Boxmeer, The Netherlands) and KUZULIA (Stat. tests; Bourg-Blanc, France)***

# Relationship between *Lawsonia intracellularis* fecal load and growth performance in 25 french pig farms

*D. Duivon [1], L. Eon [1], L. Daluzeau [1], S. Lopez [2], J.L. Sévin [3], F. Voisin [1]*

*[1]MSD Santé Animale, 49 Beaucouzé, France ; [2]UNIVET SANTE ELEVAGE, rue Monge, 22600 Loudéac, France ; [3]Socavet, 75 boulevard de penthièvre, 22600 Loudéac, France*

## Background and Objectives

*Lawsonia intracellularis* (LI) is an important enteric pathogen in pigs with a worldwide endemic prevalence. Several recent publications have reported a correlation between LI fecal load and growth performance in pig-farms, even in the absence of clinical signs (1,2,3).

**The aim of this study was to evaluate the relationship between LI fecal load and technical performances during fattening in French pig farms.**

## Material and Methods

Two panels of farms with poor **(INF group)** or good **(SUP group)** growth performance were set up based on ADG and FCR. These farms were required to have no systematic antibiotic treatment, no history of ileitis nor vaccination against it. In each farm, 2 cross-sectional salivary samples were taken from 3 consecutive batches at age 1, 2 and 3. In total, 150 saliva samples were tested by qPCR for LI (BactoReal Lawsonia kit, Ingenetix, Cut-Off = 50). The qPCR value (Cut off - Cq) = 50 - Cq was used for the statistical tests and graphical presentation. In this way, the qPCR value increases as the quantity of LI detected in the sample increases, which is more intuitive. A mixed model was adjusted to estimate the impact of group and age on qPCR quantification value (Cq, with farm as a random effect). In addition, a two factors (group and fattening period) ANOVA model was adjusted to compare the Cq, using two periods: “start” (15 weeks and less) and “end” (20 weeks and more).

## Results

Eleven farms were enrolled in the INF group with average ADG and FCR of 681 g/d and 2.57, respectively. Fourteen farms were included in the SUP group with average ADG and FCR of 754 g/d and 2.39, respectively (table 1). Mean of ages 1, 2 and 3 were 95, 121 and 146 days respectively (approx. 13, 17 and 21 weeks). **The interaction between age and group had an effect on Cq: in group INF, Cq increased during fattening whereas it decreased in group SUP (p=0.017, see figure 1). At the beginning of fattening, mean Cq was 39 and 46 for groups INF and SUP, respectively. At the end of fattening, it was 47 and 43, respectively (p=0.014, see figure 2).**

## Discussion and conclusion

Under the conditions of our study, farms with poor technical performance had high levels of LI fecal load at the start of fattening, which then fell significantly. On the other hand, farms with good technical performance had low fecal load in the early fattening part, which then increased slightly.
**To our knowledge, this is the first time that such a difference in the dynamics of LI infection and its correlation with the growth performance of the farm has been described.**

*Table 1. Average performances for the 2 farm groups, between 8 and 115 kg liveweight*

| | 40% SUP (N = 14) | 40% INF (N = 11) | Difference |
|---|---|---|---|
| ADWG (g/day) | 754 | 681 | -70 |
| FCR | 2.39 | 2.57 | + 0.18 |

*Figure 1. Impact of age and group on LI fecal load assessed by qPCR (mixed model, p=0.017): Y axis= value 50 – Cq. Navy lines = 40% SUP group versus red lines = 40% SUP group Pale, narrow lines= regression line for each farm versus thick lines= average line for all farms in the group*

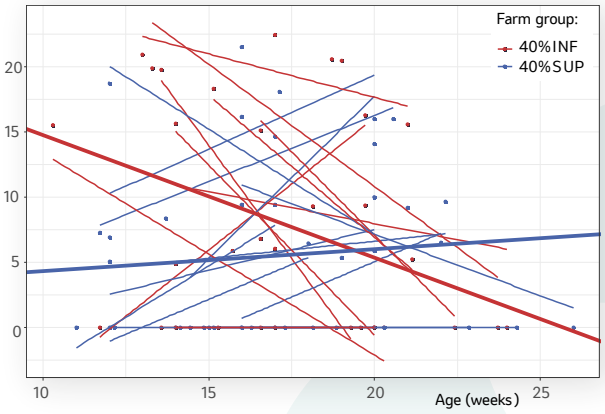
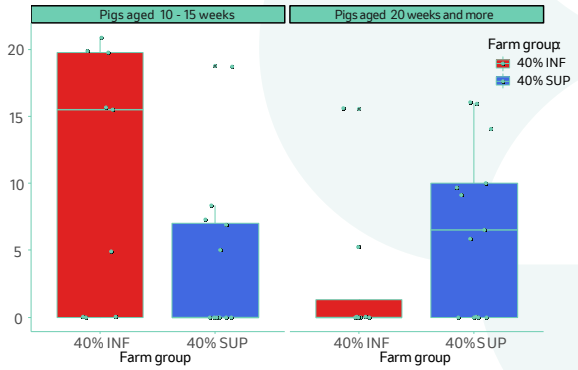



*Figure 2. Impact of age (beginning versus end of fattening) and group on LI fecal load assessed by qPCR (two factors ANOVA model, p=0.014)*




*1- Pedersen et al., 2012, Acta Veterinaria Scandinavica, 54-58*
*2- Johansen M. et al., 2013, Preventive Veterinary Medicine, 108, 63-72.*
*3- Armbruster G. et al., 2013, AASV annual meeting, 238-242*

***Acknowledgements: R&D Service Lab (Lab. Tests, Boxmeer, The Netherlands) and KUZULIA (Stat. tests; Bourg-Blanc, France)***

# Prevalence and excretion level of *Lawsonia intracellularis* and *Brachyspira pilosicoli* in Finnish grower-finisher pigs

*Sanna Nikunen[1], Elina Välimäki[2], Taneli Tirkkonen[3], Martti Hassila[4], Susanne Leth Musse[1]*

*[1] MSD Animal Health Nordics, Havneholmen 25, 1561 Copenhagen V, Denmark. [2] HKScan Finland Oyj, Lemminkäisenkatu 48, 20520 Turku, Finland. [3] Atria Oyj, Lentokentäntie 2, 65380 Vaasa, Finland. [4] Snellmanin Lihanjalostus Oy, Kuusisaarentie 1, 68600 Pietarsaari, Finland*

## Background and Objectives

Proliferative enteropathy is caused by *Lawsonia intracellularis* (LI), which is a common enteric pathogen found in pig production worldwide and, according to Finnish Food Authority*, also in Finnish pigs. However, a LI prevalence study has not been yet conducted in Finnish conventional pig herds.
In 2022, two studies were conducted with the objective to investigate (study 1) the prevalence and level of LI and *Brachyspira pilosicoli* (BP) as well as (study 2) the LI seroprevalence in Finnish grower and slaughter pigs, respectively.

## Material and Methods

In study 1, one faecal sock sample was collected from batches of pigs weighing 25-35 kg in 36 farms with a history of diarrhea outbreaks. No antimicrobial treatments were given at time of sampling. qPCR was performed (at L&F, Veterinary Laboratory, Denmark) to determine the bacterial shedding of LI and BP, having both qPCR tests a lower detection limit of 3 and 2 log(10) copies/gram feces, respectively.
In study 2, blood samples were randomly collected at 3 major Finnish slaughterhouses by during one-two working days (100 samples from 10 farms in one slaughterhouse; 150-155 samples from 15 farms in each of two slaughterhouses). Samples were analysed for LI antibodies by ELISA (Svanova®) at CDS, The Netherlands; cut-off value for positive samples at ≥30% inhibition.

## Results

Prevalence and mean excretion levels in positive fecal samples (median; range) were 61.1% and 5.13 (5.29; 3.04-6.05) for LI and 44.4% and 4.04 (4.17; 2.00-6.40) for BP, both log(10) copies/gram of feces. On average 217 pigs were sampled in each batch (median: 180; range: 40-588). In total, 405 blood samples from 45 farms were collected for LI seroprevalence. Farm seroprevalence was 100%, whereas pig prevalence was 93.6% (variation between slaughterhouses: 91.3-96.8%).

*Table 1. Lawsonia intracellularis and Brachyspira pilosicoli prevalence in pooled fecal samples from pigs 25-35 kg*

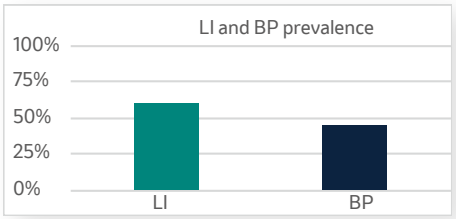



*Table 2. Lawsonia intracellularis and Brachyspira pilosicoli levels (Log10 copies/g) in positive fecal samples.*

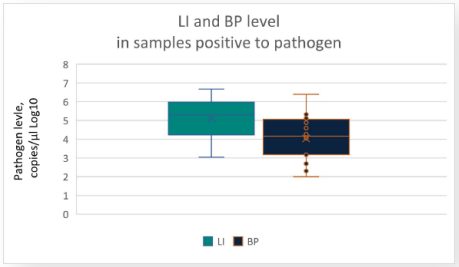
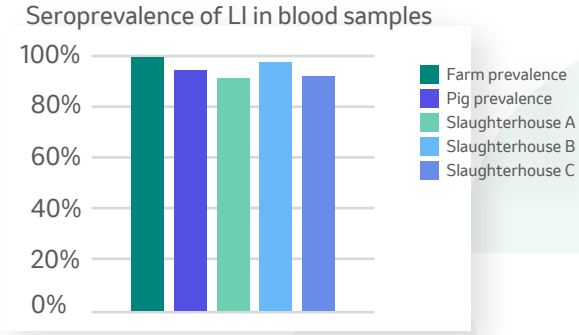



*Table 3. Seroprevalence of Lawsonia intracellularis in blood samples from three different slaughterhouses*




## Discussion and conclusion

Using faecal sock samples, both LI and BP were commonly found in Finnish grower pigs, though LI was more common than BP. Mean excretion of LI were found at levels known to cause proliferative lesions in the intestine and to potentially cause a loss in productivity. All finisher farms were seropositive for LI with a high prevalence, suggesting that infection becomes apparent during the grower-finisher period.

** Finnish Food Authority; Animal Diseases in Finland 2021. August 2022. foodauthority.fi*




Poster Code: BBD-PP-58

# Evaluation of different RT-qPCR tests to detect Rotavirus A and Rotavirus C in fecal samples

*Marcos-Cienfuegos, Marcial[1], Jiménez, Marta[1], Menjón, Rut[1], Martinez-Lobo, Javier[2,3], Castillo, Jaime[2], Prieto, Cinta[2]*
*[1]MSD Animal Health, Spain, [2]Facultad de Veterinaria, Universidad Complutense de Madrid, Spain, [3]ETSEAFiV, Universitat de Lleida, Spain*

## Background and Objectives

Among the nine species of *Rotavirus* (RV) genus described, RVA and RVC have been identified as important enteric pathogens in swine (1). Quantitative RT-PCR (RT-qPCR) has been described as the most sensitive technique for RV diagnosis (2). The aim of this study was to compare the performance of different RT-qPCRs techniques for the detection of RV in fecal samples.

## Material and Methods

A set of 61 fecal samples of known RV status, 50 of pig and 11 of human origin, were assayed using seven commercial kits and a combination of two in-house RT-qPCRs (Table 1). Two commercial kits detected RV generically, three were species specific for RVA and two for RVC. Nucleic acids were extracted using a commercial kit and the RT-qPCRs were setup following the manufacturer's instructions. AgPath-ID™ One-Step RT-PCR Reagents (Applied Biosystems™), was used for the in-house RT-qPCRs. Reactions were run in a 7500 Fast Real Time PCR System. Kappa Coefficient was calculated to determine the agreement between the techniques compared using a public access software (Working in Epidemiology, 2023).

*Table 1. Features of RT-qPCR tests used in this study.*

| Test | Type | RV species detected | Target gen |
|---|---|---|---|
| 1 | Generic | RVA, majority of RVB, RVC; some RVD, RVF, RVG | unknown |
| 2 | Specific | RVA | unknown |
| 3 | Generic | RVA, majority of RVB, RVC; some RVD, RVF, RVG | unknown |
| 4 | Specific | RVA | NSP3 |
| 5 | Specific | RVC | VP6 |
| 6 | Specific | RVA | unknown |
| 7 | Specific | RVC | unknown |
| 8 (in house) (3) | Specific | RVA | NSP3 |
| 9 (in house) (4) | Specific | RVC | VP6 |

## Results

RVA was detected by most techniques, with detection range between 94.9% and 100%. Notably, all human samples were positive by all techniques. In the case of RVC, only the two specific kits detected all RVC-positive samples. The in-house RT-qPCR detected 83.3% and the two generic kits 72.2% and 44.4%, respectively. Finally, all negative control samples were negative with all systems, except for one, which had a Ct-value of 36.2 with one of the kits specific for RVA (Table 2). The best agreement was observed between the two kits specific for RVC (100%, kappa coefficient = 1), followed by the agreement observed between two kits specific for RVA (97.9%, kappa coefficient = 0.951). On the contrary, the lowest agreement was obtained between one of the generic kits and the kits specific for RVA and RVC (79.2%, kappa coefficient = 0.362) (Table 3).

*Table 2: Summary of the results (expressed in positivity percentage) obtained with the different RT-qPCR systems used on samples with a known previous result.*

| KIND OF TESTS | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 | Test 8 (ih) | Test 9 (ih) |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLES | generic | Specific RVA | generic | Specific RVA | Specific RVC | Specific RVA | Specific RVC | Specific RVA | Specific RVC |
| RVA + | 94.9% | 100% | 97.4% | 96.6% | n.i. | 97.4% | n.i. | 94.9% | n.i. |
| RVC + | 72.2% | n.i. | 44.4% | n.i. | 100% | n.i. | 100% | n.i. | 83.3% |
| RV NEGATIVE | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 20.0% | 0% | 0.0% | 0.0% |
| n.i.: not investigated | | | | | | | | | |

*Table 3: Percentage of agreement (bottom of the table) and kappa coefficient (top of the table) obtained in the comparative study of RT-qPCR techniques.*

| | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 | Test 8 (ih-A) | Test 9 (ih-C) |
|---|---|---|---|---|---|---|---|---|---|
| Test 1 | | n.d. | 0.631 | 0.565 | | 0.534 | | 0.407 | |
| Test 2 | n.d. | | n.d. | 0.846 | n.d. | 0.864 | n.d. | 0.871 | n.d. |
| Test 3 | 86.9% | n.d. | | 0.362 | | 0.401 | | 0.495 | |
| Test 4 | 89.6% | 93.8% | 79.2% | | n.d. | 0.951 | n.d. | 0.903 | n.d. |
| Test 5 | | n.d. | | n.d. | | n.d. | 1.00 | n.d. | 0.813 |
| Test 6 | 88.5% | 95.1% | 82.0% | 97.9% | n.d. | | n.d. | 0.915 | n.d. |
| Test 7 | | n.d. | | n.d. | 100.0% | n.d. | | n.d. | 0.812 |
| Test 8 (ih-A) | 83.6% | 95.1% | 83.6% | 95.8% | n.d. | 96.7% | n.d. | | n.d. |
| Test 9 (ih-C) | | n.d. | | n.d. | 91.7% | n.d. | 91.8 % | n.d. | |

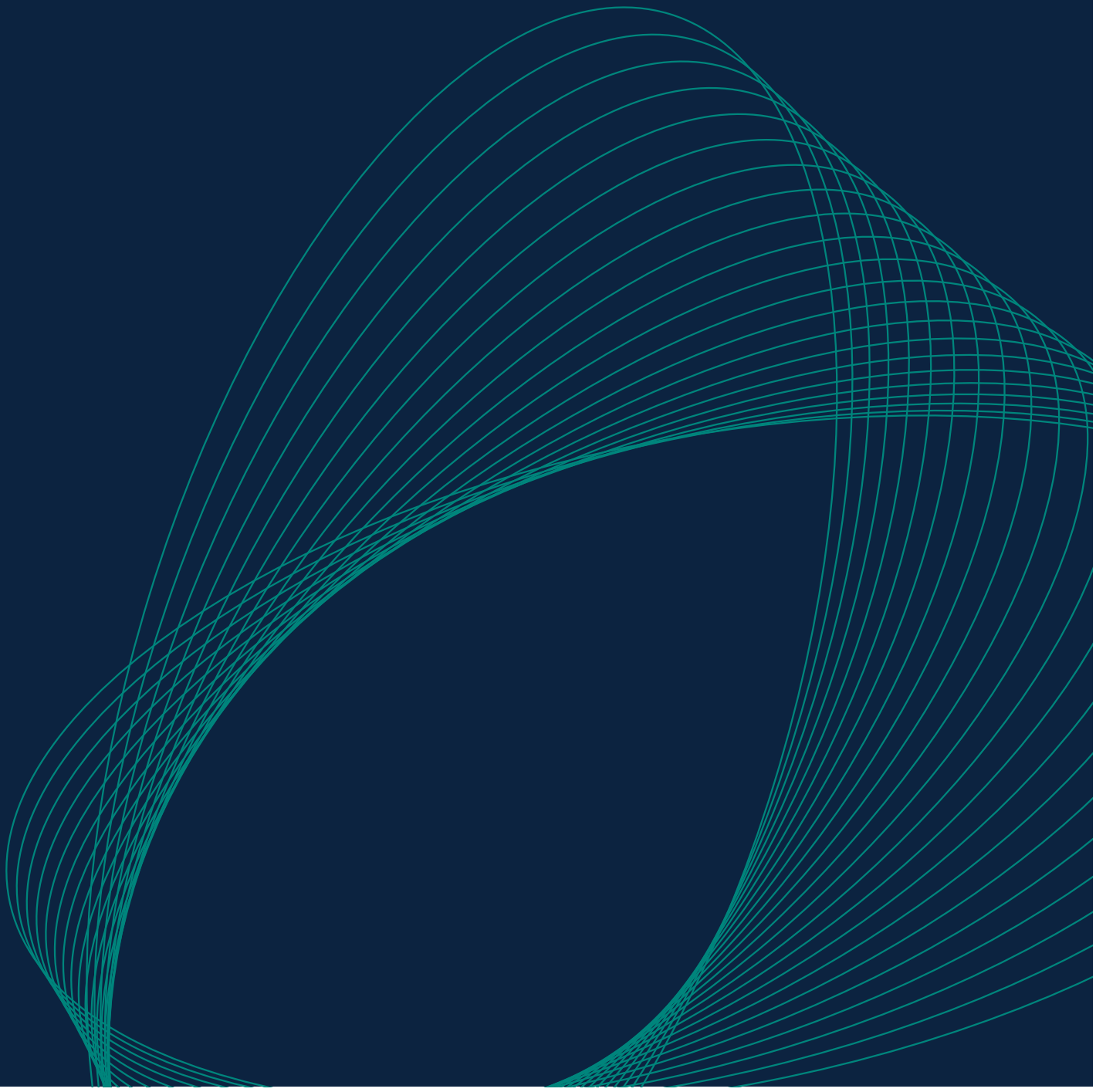
*n.d.: not determined.*

## Discussion and conclusion

Under the conditions of this study, the detectability of RVA and RVC in fecal samples differed among the different RT-qPCRs available. In general, the species-specific assays were the most accurate. However, for the detection of RVC, generic kits had a poor sensitivity.

*(1) Desselberger, U (2014). Rotaviruses. Virus Research, 190: 75-96. (2) Crawford, SE, Ding, S, Greenberg, HB, Estes, MK (2023). Rotaviruses, in Howley, PM, Knipe, DM: Fields Virology VOLUME 3: RNA Viruses, Wolters Kluwer, Seventh Edition, 362-413. (3) Zeng, SQ, Halkosalo, A, Salminen, M, Szakal, ED, Puustinen, L, & Vesikari, T (2008). One-step quantitative RT-PCR for the detection of rotavirus in acute gastroenteritis. Journal of Virological Methods, 153(2): 238–240. (4)Marthaler, D, Homwong, N, Rossow, K, Culhane, M, Goyal, S, Collins, J, Matthijnssens, J, & Ciarlet, M (2014). Rapid detection and high occurrence of porcine rotavirus A, B, and C by RT-qPCR in diagnostic samples. Journal of Virological Methods, 209: 30–34.*

# ResPig





MSD Animal Health

# Efficacy of PRRS vaccination and management strategies to control high pathogenic PRRS infection in nursery pigs: a case report

*C. Laza[1], M. Menjon[2], M. Marcos[2], M. Jiménez[2]*

*[1]Caldesporc SL, Spain, [2]MSD Animal Health, Spain*

## Background and Objectives

A new highly pathogenic (HP) PRRSV1 strain emerged in Spain in 2020 (Genbank ON571708). Up to date, there is limited information about the efficacy of commercial vaccines against this strain (1). The aim of the study was to determine if a combination of piglet PRRS vaccination and management measures could be an effective and profitable approach to control HP PRRSV1 in nurseries.

## Material and Methods

The study took place in a PRRS positive but stable, vaccinated 1300-sow farm (site 1+2). In December-2021, a reproductive PRRS outbreak took place. PRRSV was detected and orf5 sequencing showed it was homologous to strain ON571708 (also known as Rosalia strain). Emergency sow vaccination (blanket vaccination, once, with Porcilis® PRRS, MSD Animal Health, intradermal application) was performed, followed by management changes with the most relevant measures including:

- Implementation of herd-closure for 4 months
- No adoptions policy
- All-in-all out (AI-AO) management

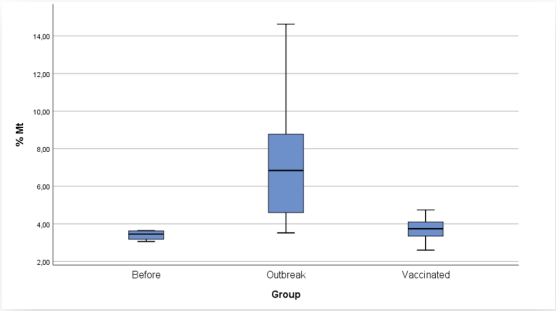
Additionally, production was moved from 2- to 3-week batch system.

By July 2022, all reproductive parameters were back to levels prior to the outbreak, and piglets' flow was PRRSV negative. However, nursery's mortality was still higher than expected.

In August 2022 it was decided to vaccinate piglets at 2 weeks of age (Porcilis® PRRS) with intradermal application for 1 year. Management strategies were maintained.

Effect of vaccination on mortality and medication costs was determined by comparing pre- and post-vaccination batches. PRRSV presence was tested by PCR on oral fluid samples at the end of the nursery phase. Statistical analysis (ANOVA and Kruskall-Wallis test) was performed on monthly mortality and medication cost data, taking the batch as the observational unit.

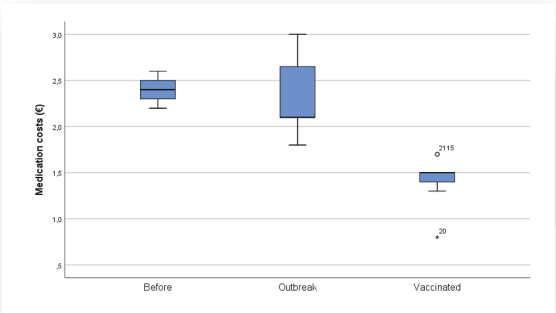
*Figure 1. Mortality rate in nursery*




## Results

Mortality in the nursery was significantly reduced from 7.39% in non-vaccinated to 3.73% in vaccinated batches ($p<0.005$), reaching similar mortality values as before the PRRS outbreak (3.4%; non-significant differences) (Figure 1). Medication costs related to antibiotic usage were also significantly reduced by 0.91€ ($p<0.005$), reaching even lower values than before the PRRS outbreak (Figure 2). At the end of the nursery PRRSV was detected in only one oral fluid sample by PCR, presenting very high ct values (ct 32).

*Figure 2. Medication costs in nursery*




Regarding profitability, calculated based on the reduction of mortality and medication costs, an extra benefit of piglet vaccination and management measures of 1.96€/piglet was obtained, including the cost of vaccination.

## Discussion and conclusion

In this trial, emergency vaccination and adjustment of management helped to control the disease. Piglet vaccination was shown to be an effective and profitable combination to improve production parameters, as well as to reduce virus presence in nursery, after an outbreak of a HP PRRSV1 strain.

*[1] E. Mateu et al. 2024. IPVS-ESPHM*

# A practical approach to control PRRSV subclinical infection by data management and routine PRRSV monitoring following PRRS vaccination

*Bram Goesten[1], Friederike von und zur Mühlen[2]*

*[1]LH Vet Group, TPB Blumberg, Seddine See, Germany, [2]Intervet Deutschland GmbH; MSD Tiergesundheit, Unterschleißheim, Germany*

## Background and Objectives

PRRSV causes reproductive failure in sows and is well known for decreasing the reproductive performance in pig herds. Its clinical presentation may range from acute outbreaks to a subclinical infection (*i.e.* reduction in alive born piglets and piglet viability)[1]. In this field case, it was aimed to investigate whether intradermal vaccination of sows and gilts would improve reproductive performance in a farm with a subclinical disease caused by PRRSV infection.

## Material and Methods

The field case took place in a herd of 4.500 sows in east Germany. PRRSV routine monitoring (PCR) was performed in 30 sows (pooled by 5) on a quarterly basis. From 2022 onwards, all pooled samples were tested PRRSV negative. In March 2023, one of the pools was tested positive (Ct=23.45) in the absence of clinical signs or low performance of sows. However, suckling piglets suffered from neonatal diarrhea. To avoid spreading of PRRSV and secure sow performance, Porcilis® PRRS was intradermally applied to gilts and sows from April 2023 and onwards (Pic.1). PRRSV load was monitored every three months with serum samples collected from sows (n=30) and processing fluids from newborn piglets using PCR. In addition, historical reproductive parameters were available on farm and were used to monitor the effect of these interventions in two periods: historical data before (January- June 2022) and after (April-September 2023) vaccination. The presence or absence of neonatal diarrhea in piglets was recorded at group level.

*Picture 1. Sow vaccination with IDAL*

## Results

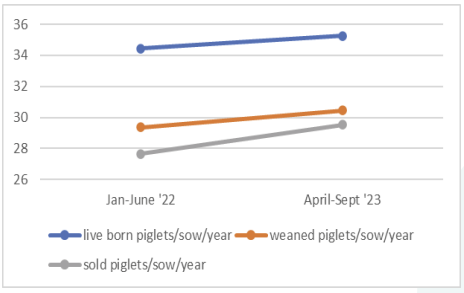
After virus detection and subsequent PRRS vaccination, PRRS related clinical disease was not observed. After implementation of intradermal vaccination, no further virus was detected by PCR.

*Table 1. Sow performance in historical comparison*

| | Abortions | tbp | dbp | mummies |
|---|---|---|---|---|
| | (%) | (n/litter) | | |
| Jan - Jun '22 (PRRSV neg/no vaccination) | 2.1 | 16.3 | 1.6 | 0.3 |
| Apr - Sep '23 (PRRS vaccination) | 1.7 | 16.5 | 1.3 | 0.2 |

Distinct production parameters improved compared to the historical period of the previous year (Table 1; Fig.1): abortion rate -0.4%, total born piglets (tbp) +0.2/litter, stillborn piglets (dbp) -0.3/litter, mummies -0.1/litter. After vaccination, diarrhea in suckling piglets was hardly seen anymore.

*Figure 1. Sow and piglet performance in historical comparison*




## Discussion and conclusion

The outcome of a PRRSV infection can cause a wide spectrum of clinical signs. In this farm, a subclinical course with focus on impaired piglet viability was observed. Only with the combination of routine monitoring and detailed data management was it possible to detect subclinical course and to potentially prevent a shift to a severe clinical outbreak. An improvement of reproductive performance was observed after implementation of PRRS vaccination by intradermal application.





*[1] Zimmerman et al., 2019, Porcine Reproductive and Respiratory Syndrome Viruses (Porcine Arteriviruses), in: Diseases of Swine, 11th Edition*

# Evaluation of impact on productivity data following PRRSV1 ('Horsens') infection in Danish sow herds

QVIST PAWLOWSKI, MIA[1]; BLACH NIELSEN, GITTE[1]; MUSSE, SUSANNE LETH[1]
[1]MSD Animal Health Nordics, Havneholmen 25, 1561 Copenhagen V, Denmark.

## Background and Objectives

In July 2019, a recombinant PRRSV1 variant ('Horsens') was isolated in Denmark derived from 2 different MLV-PRRS1- vaccines. The herd of origin was located near a boar station (supplying semen to Danish sow herds) that subsequently became infected.[1] Consequently, PRRSV sperm transmission occurred, and several sow herds were infected. The aim of this case study was to evaluate the impact on productivity data following PRRSV1 ('Horsens') introduction via semen in Danish sow herds.

## Material and Methods

Retrospectively, productivity data before and after infection with PRRSV1 ('Horsens') were compared for four sow herds (number of sows: average 1706; range: 1000-2500) with known time of infection and the virus strain confirmed by full-genome sequencing. All four herds were PRRSV-negative before the outbreak. Immediately after the outbreak, all herds implemented the same control strategy (e.g., sow and piglet vaccination using MLV-PRRS1 vaccine (Porcilis® PRRS) and strict McRebel procedures). Average productivity parameters concerning Farrowing rate % (FR%), Number of live born piglets (LB) and Pre-weaning mortality % (PM%) were extracted from herd databases for both 6- and 12-months periods both before (t=-6; t=-12) and after (t=6; t=12) PRRSV infection following the herds for a duration over 1 and 2 years, respectively. Change over time for each productivity parameter was evaluated by comparing the periods before and after time of infection. Unfortunately, only 2 herds had data concerning PM%. For each parameter, the corresponding economic consequence for the year in question was estimated based on calculations provided by Danish Agriculture & Food Council/ SEGES.

*Table 1. Change in production parameters in periods of 6 and 12 months, respectively, before and after PRRS-infection with PRRSV1 variant ('Horsens') in 4 Danish sow herds.*

| | Change over time t=-6 to t=6* | Change over time t=-12 to t=12 * | Economic impact** |
|---|---|---|---|
| Farrowing Rate, % | -4.84 (-1.24;-6.35) | -3.35 (-0.41;-7.91) | -10.30 (-1.26;-24.26) |
| Liveborn/ sow, number | -2.10 (-2.79;-0.53) | -0.50 (-0.92;1.53) | 9.20 (-50.54;84.05) |
| Pre-weaning Mortality, % | 9.26 (8.88;9.63) | 4.29 (2.38;6.13) | -40.62 (-22.70;-58.50) |

***average (min; max)**
****Economic impact of the change in productivity parameter for the 12-months change, EUR/sow/year**

## Results

Average productivity for intervals of 12 and 6 months for FR% were 92.3 (t=-12) and 92.2 (t=-6) before and 88.9 (t=12) and 87.4(t=6) after diagnosed PRRSV infection; for LB 17.7 (t=-12) and 17.7 (t=-6) before and 17.2 (t=12) and 15.6 (t=6) after diagnosed PRRSV infection; and for PM% 14,7 (t=-12) and 15,7 (t=-6) before and 19,0 (t=12) and 24,9 (t=6) after diagnosed PRRSV infection, respectively. The average economic impact (EUR/sow/year) for the 12-month periods comparison was -10.30 for FR%; 9.20 for LB; and -40.62 for PM%. Average changes in productivity figures including range and economic impact are shown in Table 1. Fluctuations in the productivity parameters given by monthly registrations for periods of 12 months before and after time of diagnosed PRRSV infection are illustrated in Figure 1-3.

*Figure 1. Farrowing rate in Herd 1-4 in months relative to time of diagnosed PRRSV infection, which equals t ime 0 .*

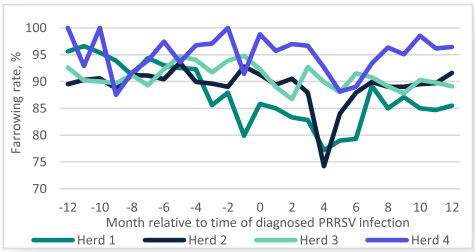



*Figure 2. Liveborn piglets per litter in Herd 1-4 in months relative to time of diagnosed PRRSV infection, which equals time 0.*

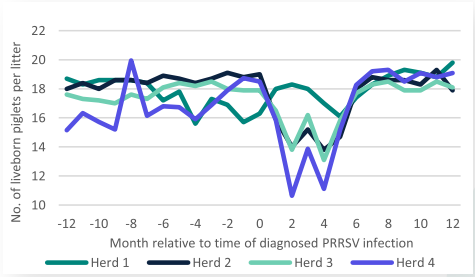
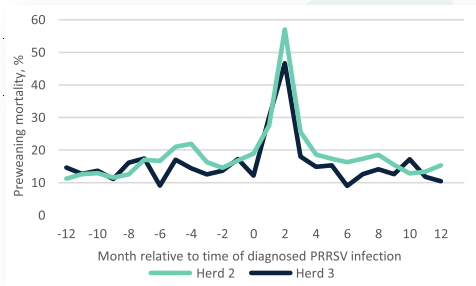



*Figure 3. Pre-weaning mortality (%) in Herd 2-3 in months relative to time of diagnosed PRRSV infection, which equals time 0.*




## Discussion and conclusion

This study found acute and severe impact on the evaluated productivity parameters following PRRSV1 outbreak. With the chosen management strategy and implementation of vaccination, the parameters returned to the level before the outbreak after 6-12 months although having caused a clear financial loss. However, large variations existed between herds both in the impact and duration of infection.

[1] Kristensen CS, Christiansen MG, Pedersen K, Larsen LE, 2020 : Production losses five months after outbreak with a recombinant of two PRRSV vaccine strains in 13 Danish sow herds. Porc Heal Manag 6(1):4-10. doi:10.1186/s40813-020-00165-z




Poster Code: VVD-PP-78

# Alternatives to traditional blood sampling to monitor PRRSV circulation at farrowing: A comparison between whole blood samples, blood swabs, tongue fluid and tail fluid 1/2

*Xavier Sola[1], Jill Thomson[2], Serena Sanahan[3], Rubén del Pozo Sacristán[4]*

*[1] Holmefield Farm Services Limited, UK, [2]SAC Consulting Veterinary services Limited, UK, [3]MSD Animal Health, Milton Keynes, UK, [4]MSD Animal Health, Madrid, Spain*

## Background and Objectives

The aim of this study was to find an efficient and practical means of detecting PRRSV around farrowing to help monitor PRRSV stability in British pig farms with the smallest possible budget (only one PCR test). For this aim, two studies were carried out. Study 1 aimed to determine the most sensitive method for detecting PRRSV at batch level by comparing whole blood, blood swabs, tongue fluid and tail fluid. Study 2 aimed to compare the most sensitive method (obtained from study 1) with blood samples collected from individual animals.

## Material and Methods

A total of 16 herds with a history of PRRS participated in the study. For study 1, whole blood (n=5), blood swabs (n=5), tongue fluid from dead piglets (Figure 1) and tail fluid after processing were collected in each farm from piglets belonging to the same farrowing batch. Samples were pooled by sample type for PRRS PCR (Virotype PRRS RT PCR test, Indical). McNemar's statistical test was used for comparing collection methods. For study 2, blood samples and tongue fluid from the same individual dead piglets were collected and analyzed by PRRS PCR. Cycle thresholds (Ct-values) were compared between both sample types for each pig using paired t-test.

*Figure 1: Resulting fluid obtained from one tongue after freezing and thawing (Study 2)*

## Results

In Study 1 tongue fluid obtained from dead piglets was found to be the most sensitive sample to detect the presence of PRRSV at batch level (Table 1).
In Study 2, no significant differences were detected in Ct-values between blood and tongue fluid from the same individual pigs (Table 2).

*Table 1: Types of samples (and Ct values) collected in each farm, including a brief description of reason for testing (Study 1)*

| FARM | Ct blood | Ct blood swabs | Ct tails | Ct tongues | Reason for testing |
|---|---|---|---|---|---|
| 1 | - | - | - | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 2a | - | - | - | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 3 | - | 31.84 | 37.94 | 33.62 | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 2b | - | - | 39.64 | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 4 | - | - | - | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 5a | 30.31 | 23.21 | 24.61 | 26.06 | Ill-thrift and increased piglet mortality |
| 6 | - | - | - | - | Ill-thrift |
| 7 | - | 24.9 | 38.7 | 28.3 | Increased stillborn |
| 8 | - | - | - | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 5b | - | - | - | - | Abortions and early farrowings in the batch |
| 9 | 20.23 | - | 34.13 | 27.63 | Abortions and early farrowings in the batch |
| 10 | 37.93 | 36.21 | 35.1 | 30.37 | Abortions and early farrowings in the batch |
| 11 | 24.45 | - | - | 31.46 | Ill-thrift and increased piglet mortality |
| 12 | 21.1 | 22.93 | 30.75 | 25.23 | Abortions and early farrowings in the batch |
| 13 | - | - | - | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 14 | - | - | - | 28.36 | Recent positive 2 week old piglets |
| 15 | - | - | - | - | Recent history of PRRS - No obvious clinical issues at the time of sampling |
| 16 | - | - | - | 33.74 | Lethargic, inappetent sows with signs of respiratory disease |

*a, b – refers to two different samplings to the same farm over time.*

# Alternatives to traditional blood sampling to monitor PRRSV circulation at farrowing: A comparison between whole blood samples, blood swabs, tongue fluid and tail fluid 2/2

*Xavier Sola[1], Jill Thomson[2], Serena Sanahan[3], Rubén del Pozo Sacristán[4]*

*[1] Holmefield Farm Services Limited, UK, [2]SAC Consulting Veterinary services Limited, UK, [3]MSD Animal Health, Milton Keynes, UK, [4]MSD Animal Health, Madrid, Spain*

*Table 2 : Cross tables comparing frequencies of positive and negative samples in tongues vs other 3 other types of sample (Study 1)*

| BLOOD | Positive Tongue | Negative Tongue | P=0.0455 |
|---|---|---|---|
| Positive Blood | 5 | 0 | |
| Negative Blood | 4 | 9 | |

| BLOOD SWAB | Positive Tongue | Negative Tongue | P=0.0455 |
|---|---|---|---|
| Positive Blood Swab | 5 | 0 | |
| Negative Blood | 4 | 9 | |

| TAIL | Positive Tongue | Negative Tongue | P=0.3173 |
|---|---|---|---|
| Positive Tail | 6 | 1 | |
| Negative Tail | 3 | 8 | |

## Discussion and conclusion

The results of this study indicate that tongue fluid can be a reliable and non-expensive means of testing for the presence of PRRSV and to help determine PRRSV stability in small-to-medium sized farms. However, in the study, we encountered reluctancy from some of the farmers to collect tongues. Cutting the tip of the tongue is an extra task that some farm staff find time consuming and unpleasant.

The use of the resulting tails from the process of tail docking can be a more convenient but a less sensitive alternative. Collecting only 5 bloods or 5 blood swabs can be an option when there are clinical signs associated with PRRS and prevalence is expected to be high, but when prevalence is expected low, they lack sensitivity.

The concession in test costs may increase the risk of losing detection power. But screening dead animals, one may think that the monitoring possibilities are limited. However, targeting dead or ill piglets improves sensitivity by sampling a subpopulation of animals that are more likely to harbour PRRSV.

# Porcine circovirus 3 (PCV-3) associated disease in an Iberian farm in Spain

A. Cobos[1,2,3,4], M. Sibila[1,3,4], E. Huerta[1,3,4], M. Pérez[1,3,4], M. Marcos[5], R. Menjón[5], M. Jiménez[5], L. Gálvez[6], J. Segales[1,2,3]

[1] Unitat Mixta d'Investigació IRTA-UAB en Sanitat Animal, Centre de Recerca en Sanitat Animal (CReSA), Campus de la Universitat Autònoma de Barcelona (UAB), Bellaterra, 08193 Barcelona, Spain. [2] Departament de Sanitat i Anatomia Animals, Facultat de Veterinària, Campus de la Universitat Autònoma de Barcelona (UAB), Bellaterra, 08193 Barcelona, Spain. [3] WOAH Collaborating Centre for the Research and Control of Emerging and Re-Emerging Swine Diseases in Europe (IRTA-CReSA), Bellaterra, Barcelona, Spain. [4] IRTA Programa de Sanitat Animal, Centre de Recerca en Sanitat Animal (CReSA), Campus de la Universitat Autònoma de Barcelona (UAB), Bellaterra, 08193 Barcelona, Spain. [5] MSD Animal Health, Spain [6] Veterinary clinician, Spain

## Background

Porcine circovirus 3 (PCV-3) has been associated to reproductive (PCV-3-RD) and post-natal diseases. However, their diagnosis is largely limited and their real prevalence and impact on swine production are unknown. PCV-3-RD has been reported in intensively reared pigs, but not yet in extensive production systems.

**Therefore, the aim of this study was to characterize a case of PCV-3-RD in an Iberian semi-outdoors sow farm.**

## Clinical Case Description

- Farrow-to-nursery farm
- 420 Iberian sows (self-replacement)
- 3-week batch (60 sows per batch)
- PRRSV-free

**Reproductive problem affecting mainly gilts**

↓ Numbers of piglets per litter
↑ In stillborn and mummified fetuses →
↑ In return-to-estrus andmummified fetuses
↑ In weak born piglets that becomepoor-doers

**Diagnostic**

| | | |
|---|---|---|
| Litter 1 | Fetus 1: Weak born<br>Fetus 2: Stillborn → |  |
| Litter 2 | Fetus 3: Weak born →<br>Fetus 4: Mummified<br>Fetus 5: Mummified |  |

- Gross examination
- Complete histopathological evaluation
- Immunohistochemistry (IHC) against PCV-2 and PRRSV
- In situ hybridization (ISH) against PCV-3
- qPCR against PCV-3 in tissue pools

## Results

*Table 1. Summary of diagnostic investigation results*

| Piglet | Gross lesions | Histological lesions | PCV-3 genome copies/ mL | PCV-3 ISH | PCV-2 IHC | PRRSV IHC |
|---|---|---|---|---|---|---|
| 1 | - | Systemic periarter | $10^9$ | +++ | - | - |
| 2 | + | Systemic periarteritis and nonsuppurative endocarditis and myocarditis | $10^9$ | +++ | - | - |
| 3 | - | Mesenteric periarteritis | $10^4$ | + | - | - |
| 4 | - | - | $10^4$ | - | - | - |
| 5 | - | - | $10^4$ | - | - | - |

## Results

*Table 1. Summary of diagnostic investigation results*

| Piglet | Gross lesions | Histological lesions | PCV-3 genome copies/ mL | PCV-3 ISH | PCV-2 IHC | PRRSV IHC |
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| 3 | - | Mesenteric periarteritis | $10^4$ | + | - | - |
| 4 | - | - | $10^4$ | - | - | - |
| 5 | - | - | $10^4$ | - | - | - |

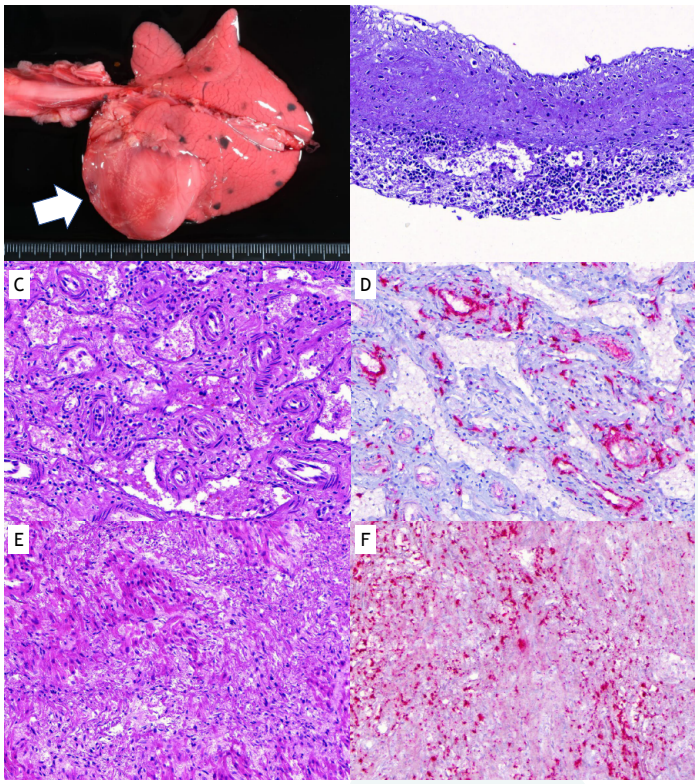



*Figure [3]. Gross and histopathological lesions of piglet [2]: Cardiomegaly with multifocal reddish areas (A), non-suppurative endocarditis (B), mesenteric periarteritis (C) and positive PCV-[3] ISH (D), non-suppurative myocarditis (E) and positive PCV-[3] ISH(F).*

## Conclusion

- PCV-3-RD was diagnosed by means of clinical signs, characteristic histopathological lesions (systemic periarteritis and non-suppurative myocarditis) and high viral loads within them.
- This is the first case reporting PCV-3-RD in Iberian semi-outdoor reared sows, mainly affecting gilts. Althought rarely considered, PCV-3 can cause disease in extensive productive systems.

# Comparison of immune response after intradermal and intramuscular vaccination against PRRS, PCV2 and *M. hyopneumoniae* (Myho) in a finishing herd

N.H. Nguyen [1], D.N. Tran [2], H. Lin [3], O. Romanov [2], T. Thi Bich [2], L.D.E. Ellerma [4], R. Del Pozo Sacristán [4]

[1]Department of Infectious diseases and Public health, Faculty of Animal sciences and veterinary medicine, Nonglam University, Linhtrung ward, Thuduc city, Hochiminh city, Vietnam. [2]MSD Animal Health, Vietnam [3]MSD Animal Health Innovation Pte Ltd, 1 Perahu Road, Singapore
[4]MSD Animal Health

## Background

PRRSV, PCV2 and Mhyo are pathogens within porcine respiratory disease complex (PRDC). Vaccination is a key tool to control PRDC. Vaccination by intramuscular (IM) injection has been applied for many years. It has limitations such as: stressing the animal, affecting the quality of meat, risking iatrogenic disease transmission. Intradermal (ID) vaccination is an alternative way of application. This study compares the immune response and zootechnical performance after intradermal vaccination against PRRSV, PCV2, and Mhyo (ID Group) and intramuscular injection (IM Group), in finishers under standard farming conditions in Vietnam.

## Material and Methods

In total, 200 five-day old pigs were randomly assigned to two different groups: Group 1 (ID-G; n=100) and Group 2 (IM-G; n=100). At 14 days of age, piglets were vaccinated against PRRSV; ID-G intradermally with PRIME PAC® PRRS using IDAL 3G and IM-G using a PRRS MLV vaccine intramuscularly. PCV2 and Mhyo vaccination: at 21 days of age; ID-G was vaccinated intradermally using IDAL 3G TWIN with Porcilis® PCV ID and Porcilis® M HYO ID ONCE vaccine while IM-G was vaccinated intramuscularly with a combined PCV2 and Mhyo vaccine. Pigs were weighed individually at 24, 35 and 175 days. Zootechnical parameters such as ADWG and Mortality rate were also recorded separately. Blood samples were collected (20 pigs/group) at 10, 70, 105 and 54 days and evaluated for antibody response for PRRS, PCV2 and Mhyo.

*Table 1. Vaccines used in the study.*

| Vaccine | ID Group | IM Group | Age |
|---|---|---|---|
| PRRS | PRIME PAC™ PRRS[1] 0.2ml | PRRS MLV IM Vaccine 2ml | 14 days |
| PCV2 | Porcilis® PCV ID[1] 0.2ml | Combined PCV2+Mhyo Vaccine 1ml | 21 days |
| Mycoplasma hyopneumoniae | Porcilis® M HYO ID ONCE[1] 0.2ml | Combined PCV2+Mhyo Vaccine 1ml | 21 days |

## Results

Performance of both groups showed no statistical difference (P>0.05) for both ADWG (ID-G: 0.637; IM-G: 0.636) and Mortality rate (ID-G: 4%; IM-G: 4%). Antibody titers for PRRSv revealed marked increase for both groups post vaccination but there was no statistical difference between two groups. Mhyo and PCV2 antibody titers for ID group were significantly higher compared with the IM group.

*Table 2. Impact on production parameters.*

| Group | Average weight at selling (Kg) | Days to market (day) | ADG (Kg/day) |
|---|---|---|---|
| ID | 103.22 ± 20.37 a | 175.18 ± 24.19 a | 0.637 ± 0.140 a |
| IM | 103.17 ± 19.76 a | 177.35 ± 19.31 a | 0.636 ± 0.131 a |

**Values with different superscript within the same column are statistically significant (P<0.05)*

*Table 3. Antibody titers of piglets before and after vaccination*

| Time of sampling | PRRSV (vaccinate at 14 days of age) | | M. hyopneumoniae (vaccinate at 21 days of age) | | PCV2 (vaccinate at 21 days of age) | |
|---|---|---|---|---|---|---|
| | ID Group | IM Group | ID Group | IM Group | ID Group | IM Group |
| Before vaccination | | | | | | |
| 10 days | 0.641 ± 0.512a | 0.476 ± 0.392a | 0.725 ± 0.603a | 0.655 ± 0.661a | 6.423 ± 1.521 a | 6.152 ± 1.478a |
| After vaccination | | | | | | |
| 70 days | 1.591 ± 0.845a | 1.589 ± 0.841a | 0.153 ± 0.197b | 0.077 ± 0.130a | 6.978 ± 1.328 b | 5.775 ± 1.015a |
| 105 days | 1.557 ± 0.539a | 1.429 ± 0.630a | 0.107 ± 0.143b | 0.021 ± 0.051a | 6.508 ± 1.138 b | 5.632 ± 0.847a |
| 154 days | 1.030 ± 0.599a | 1.250 ± 0.602a | 0.493 ± 0.445a | 0.468 ± 0.461a | 5.565 ± 1.320 a | 5.197 ± 1.782a |

**Values with different superscript within the same column are statistically significant (P<0.05)*

## Discussion and conclusion

The study showed that intradermal route of vaccinating animals with PRRSv, PCV2 and M. hyopneumoniae was able to show similar response with that of intramuscular route. Administering vaccines via this route has additional benefits associated with needle-free vaccination such as reducing stress and improving farm biosecurity.

[1].Dalmau A, Sánchez-Matamoros A, Molina JM, Xercavins A, Varvaró-Porter A, Muñoz I, Moles X, Baulida B, Fàbrega E, Velarde A, Pallisera J, Puigredon A and Contreras-Jodar A, 2021. Intramuscular vs. Intradermic Needle-Free Vaccination in Piglets: Relevance for Animal Welfare Based on an Aversion Learning Test and Vocalizations. Front. Vet. Sci. 8:715260. doi: 10.3389/f-vets.2021.715260.
[2].Madapong, A., Saeng-chuto, K., Tantituvanont, A., Nilubol, D., 2021. Safety of PRRSV-2 MLV vaccines administrated via the intramuscular or intradermal route and evaluation of PRRSV transmission upon needle-free and needle delivery. Sci Rep 11, 23107.
[3].Salman, M., Lin, H., Suntisukwattana, R. et al. Intradermal needle-free injection prevents African Swine Fever transmission, while intramuscular needle injection does not. Sci Rep 13, 4600 (2023). https://doi.org/10.1038/s41598-023-31199-2

# Tonsillar scrapping as an alternative tool for APP monitoring in live pigs: a case report

*Daniel Neyer[1], Vitus Buntenkötter[1], Isabel Hennig-Pauka[2], Philipp Könighoff[3]*
*[1] Tierärztliche Gemeinschaftspraxis An der Maiburg, Bippen, Germany*
*[2] Field Station for Epidemiology, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany*
*[3] Intervet Deutschland GmbH; MSD Animal Health, Unterschleißheim, Germany*

## Background and Objectives

Lung tissue from dead pigs is usually used for *Actinobacillus pleuropneumoniae* (APP) diagnostic, but sometimes with negative results in subclinical infection. APP detection in living pigs is difficult and serological examination will be negative prior to seroconversion after infection. For APP monitoring in positive herds tonsillar scrapings are appropriate samples[1] because tonsils are frequently colonized by APP[2].
The aim of this case was to verify if the pigs were colonized with APP already in the nursery of a farm with mortality due to APP.

## Material and Methods

In 2023, several fattening pigs died in a German fattening farm due to App Serotype (ST) 2. To determine whether nursery pigs were the source of infection, lungs of dead nursery piglets were examined for APP with negative results. To determine whether nursery piglets were already colonized with APP, tonsillar scrapings were sampled cross-sectionally from 20 piglets from two age groups ((4-weeks (A); 10-weeks (B)). During sampling, the piglets were fixed to the lower and upper jaw with a Bühner band so that the vet could scrape the tonsils with an interdental brush (Fig. 1&2). Tonsillar swaps were pooled by 5 (Pool A1, A2, B1, B2) and analyzed by rt-PCR. Pool B2 was further analyzed by capsular gene multiplex PCR (serotype1-19) for direct serotyping.

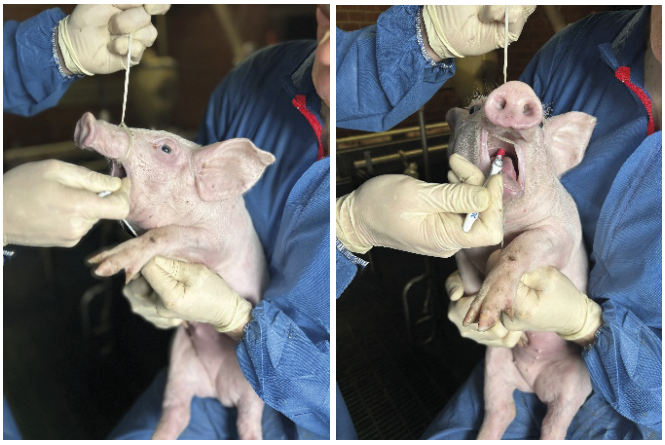


*Figure 1&2 : Fixed piglet during the collection of a tonsillar scraping*

## Results

All pools of tonsillar swaps were positive by PCR (ct-value): A1 = 37.4; A2 = 37.8; B1 = 28.1; B2 = 24.0.
The capsular gene multiplex PCR resulted in APP ST 12.

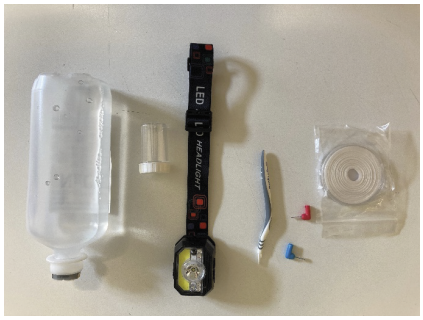


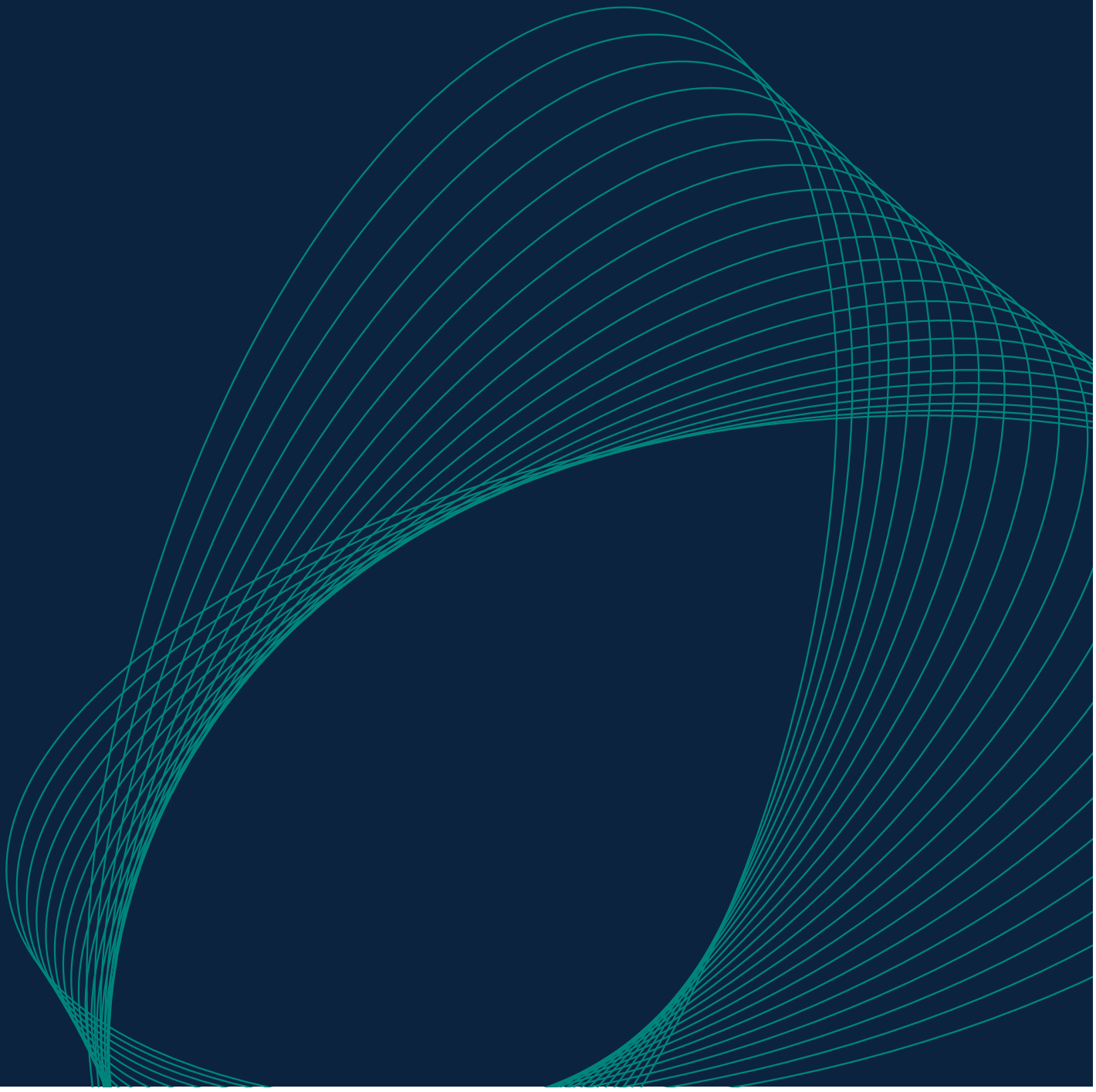

*Figure 3 : Equipment overview for sampling*

## Discussion and conclusion

Under the conditions of this clinical case, tonsillar scraping was a useful tool for monitoring APP in living pigs and assessing colonization after weaning3. APP ST 12 found in tonsillar swaps of nursery pigs can been involved in APP outbreaks4 but has not been found in the dead fattening pigs in this case report.
This suggests that the infection of the fattening pigs with ST 2 could not be deduced so far to an infection in the nursery period, although the sample size is too small to reject the assumption.

*[1] T. Tobias, T, et al. Detection of Actinobacillus pleuropneumoniae in pigs by real-time quantitative PCR for the apxIVA gene. The Veterinary Journal 193.2 (2012): 557-560.*
*[2] A. Müllebner, et al. Actinobacillus pleuropneumoniae triggers IL-10 expression in tonsils to mediate colonisation and persistence of infection in pigs. Veterinary immunology and immunopathology 205 (2018): 17-23.*
*[3] E. Sassu, et al. Update on Actinobacillus pleuropneumoniae—knowledge, gaps and challenges. Transboundary and emerging diseases 65 (2018): 72-90.*
*[4] I. Hennig-Pauka, et al. Identification of Actinobacillus pleuropneumoniae (ap) serotypes from recent clinical cases in german swine herds. Proceedings ESPHM 202*

# SowCare





MSD Animal Health

# Sow vaccination against Glässer´s disease conferred clinical protection in their offspring, in the presence of viral coinfections

*Aída Miralles[1],[2], Juan Seva[1], Marta Jimenez[3], Marcial Marcos[3], Rut Menjón[3]*
*[1] Departamento de Anatomía y Anatomía Patológica Comparadas, Facultad de Veterinaria, Universidad de Murcia, Spain. [2] CEFU, S.A., Alhama de Murcia, España. [3] MSD Animal Health, Spain.*

## Background and Objectives

Glässer's disease generates a great productive impact on the swine industry. Lately, its incidence has increased in the first weeks of life where, associated with PRRSV or Influenza, it complicates the resolution of infections. Worldwide, the most prevalent serotypes are 4 and 5. Serotyping is the most used subtyping method for *Glaeserella parasuis*, being of great relevance for vaccination strategy. The objective of this study was to assess the clinical protection of passive immunization of piglets by sow vaccination against Glässer's disease.

## Material and Methods

This study was carried out on a production farm housing 1450 sows (site 1) and 5700 weaners (site 2), with a history of Glässer´s disease confirmed by clinical signs (high incidence of arthritis, meningitis, and sudden deaths), polyserositis found at necropsies of death piglets and detection by PCR of serotypes 5 and 12 of *Glaesserella parasuis*. Viral coinfections were also detected at 3 weeks of age by RT-qPCR in lungs (PRRSv ct-value 17; Influenza ct-value 26). Sows were vaccinated with an inactivated Glaesserella parasuis serotype 5 vaccine (Porcilis® Glässer) at 70 and 100 days of gestation. Overall piglet mortality and Glässer´s-associated mortality (death piglets with respiratory distress and polyserositis) data were recorded for a total period of 26 weeks, divided in two periods: before (group A; 13 weeks; n=11522) and after vaccination (group B; 13 weeks; n=11880) (Fig.1). Data was analyzed using the Mann-Whitney U test.

## Results

The Glässer's-associated mortality of suckling piglets (site 1) was significantly (P=0.001) reduced after vaccination (group B: 0.45 %) compared to the period before vaccination of sows (group A: 2.14%) (Fig.2). When considering other causes of mortality, a numerical decrease was also observed for crushed piglets in group B (0.88% less mortality).

The overall mortality in site 2 showed highly significant differences (p=0.004) between group A (3.40%) and group B (1.77%). Glässer´s-associated mortality in weaned piglets was 1.03% and 0.16% in group A and B (P=0.004), respectively (Fig.3).

*Figure 1. Necropsies performed on suckling (A-D) and weaned (E-H) piglets.*

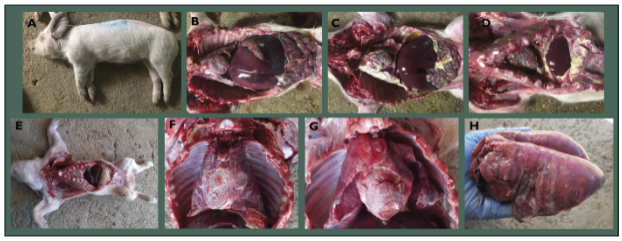



*Figure 2. Glässer's associated mortality of suckling piglets (P= 0.001)*

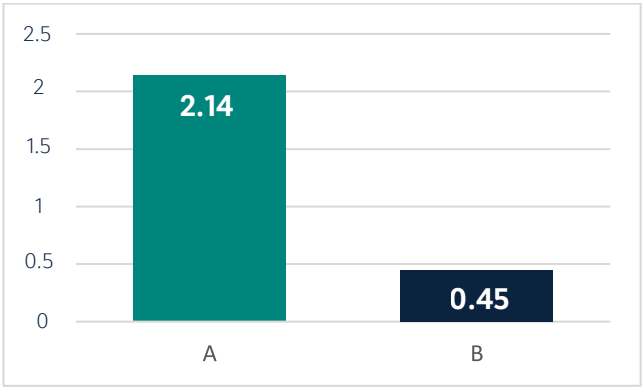
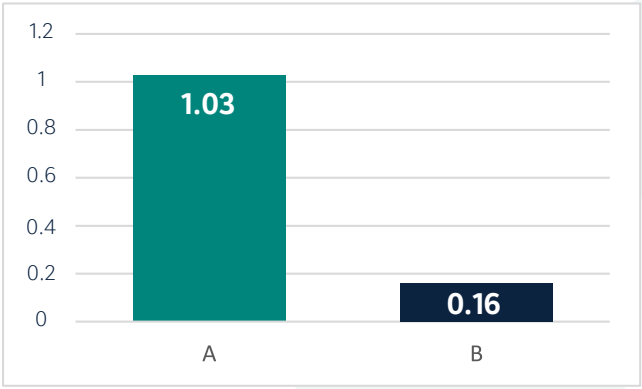



*Figure 3. Glässer´s-associated mortality in weaned piglets (P=0.004)*




## Discussion and conclusion

Under the conditions of this study, sow vaccination had an apparent effect on reduction of Glässer´s-associated mortality in piglets, suggesting a clinical protection (homologous and heterologous serotypes) even in the presence of viral coinfections.

*[1] Aragon V. et al. Glässer's Disease. Diseases of Swine, Eleventh Edition. 2019, 54: 844-853*
*[2] Bak H. et al. Protection of vaccinated pigs against experimental infections with homologous and heterologous Haemophilus parasuis. Vet Rec. 2002 Oct 26;151(17):502-5*
*[3] Finestra A et al. Efficacy of PorcilisÆ Glässer vaccination of sows to control H. parasuis serotype 15 infection in young piglets. 5th Asian Pig Veterinary Society Congress, March 2011.*

# MAT-Seroconversion of sows after basic immunization against different *Leptospira* serovars 1/2

*Sebastian Mascher[1], Sophia Mück[1], Astrid Pausenberger[2], Astrid Ullerich[3], Katrin Strutzberg-Minder[3]*
*[1]Tieraerzte Team Tiefenbach GmbH, [2] MSD Animal Health, [3]IVD GmbH Innovative Veterinary Diagnostics*

## Background and Objectives

In case of fertility problems due to suspected Leptospiral infections, Microscopic Agglutination Test (MAT) is a standard diagnostic tool to determine infection in a sow herd but without the possibility to differentiate between infected and vaccinated animals[1]. MAT titers of 1:100 and above are considered positive (OIE 2021). Single, low Bratislava MAT titers are not unusual in unvaccinated German sow herds and not necessarily connected to clinical problems, while other serovars can rise to remarkable heights following a field infection[2]. After introduction of a commercial vaccine in 2018 the interpretation of MAT-results for different serovars is challenging especially after vaccination. This study aims to show courses of MAT-seroconversion after basic immunization in two commercial farms to support field vets in drawing the right conclusions from laboratory results.

## Material and Methods

Breeding sows of two commercial piglet producing farms A and B in Southern Germany were immunized twice with Porcilis® Ery+Parvo+Lepto. During the following six months before the next booster vaccination, every four weeks blood samples (12 vaccinated; 6 non-vaccinated sows) were taken to determine MAT titers against various Leptospira serovars.

## Results

Pace, extent, and duration of MAT titers differed between serovars, with the maximum consistently reached four weeks after the second vaccination. Graphics (fig. 1a and b) show the number of MAT titers ≥ 1:100 within the two vaccinated sow groups of n=12 each on the sampling timepoints BP1-7. Maximum of seroconversion was determined 4 weeks after the second vaccination. Courses of seroconversion induced by the serovar Bratislava occurred in all samples with the highest titers as opposed to Pomona with only few low titers. MAT-Titers of other investigated Serovars were lying between Bratislava and Pomona. Apart from the Australis serogroup (serovars Bratislava and Australis), all other MAT titers were almost back to the baseline level two months after the second vaccination.

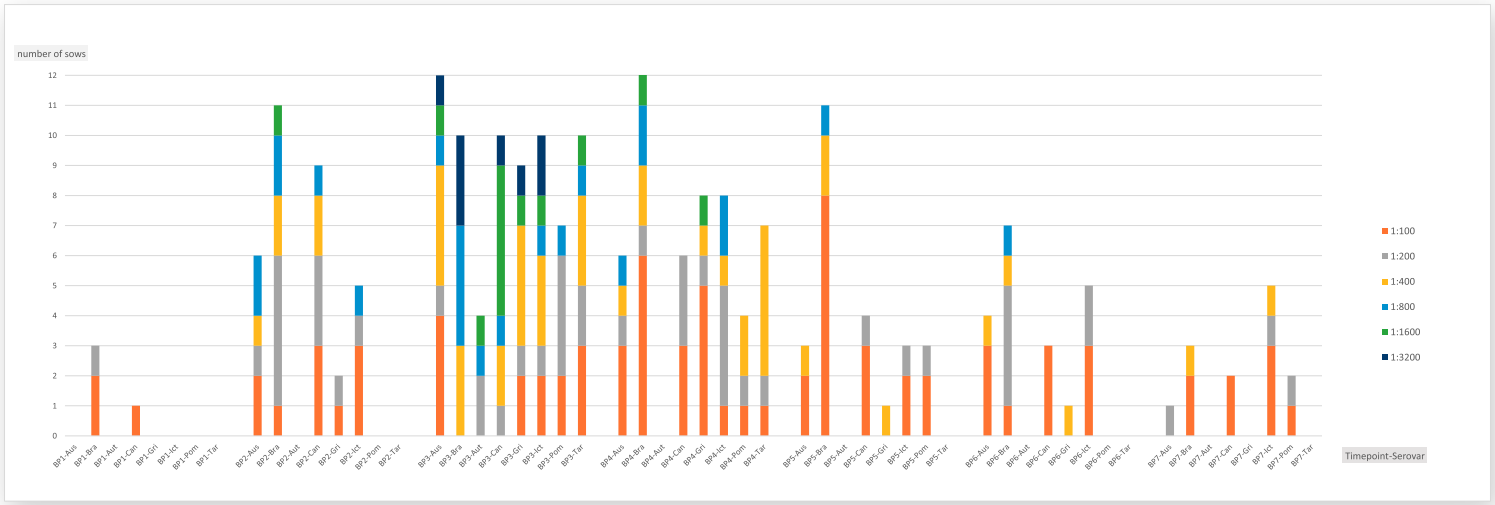
## Discussion and conclusion

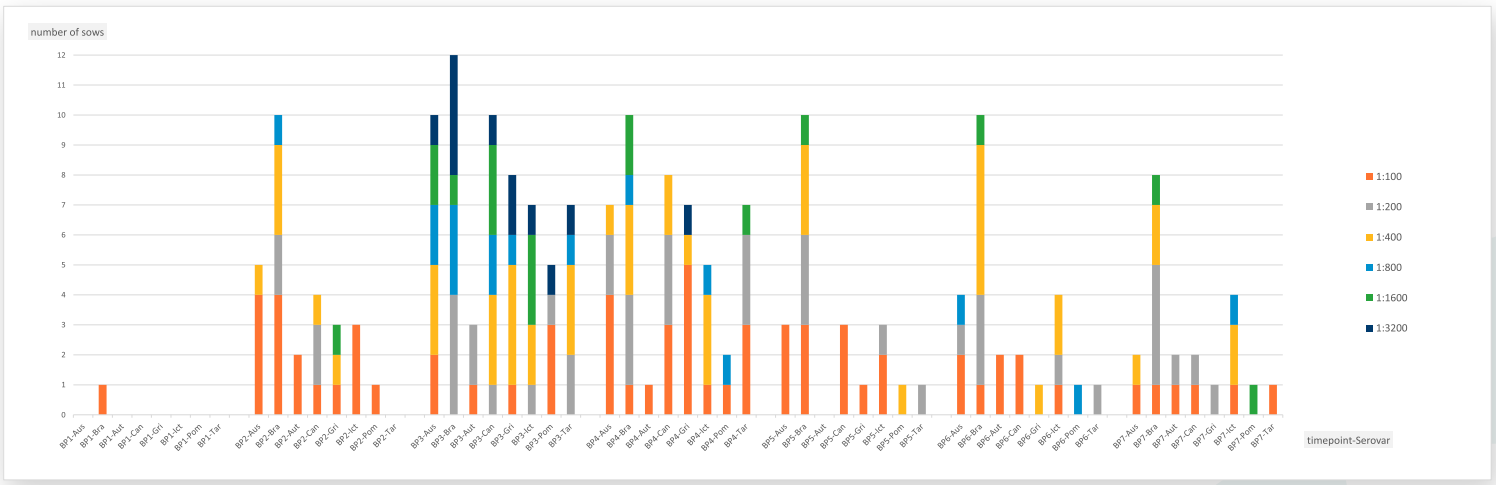
Data from this study indicate that MAT results from blood samples taken more than eight weeks after basic immunization can be interpreted like results from unvaccinated herds. As the Australis serogroup, i.e. the serovar Bratislava, is endemic in Germany and field contacts are present, seroconversion after Bratislava-vaccination can in many farms be interpreted as a booster effect of a former field infection. In contrast, the serovar Pomona is rarely diagnosed in Germany and Pomona-MAT-seroconversion after vaccination stays low and short. The further development of MAT-titers after multiple booster vaccinations should be investigated separately. Though seroconversion is not connected to protection neither in vaccinated nor in unvaccinated herds the results of this study can help field practitioners in interpreting MAT lab results.

# MAT-Seroconversion of sows after basic immunization against different *Leptospira* serovars 2/2

*Sebastian Mascher[1], Sophia Mück[1], Astrid Pausenberger[2], Astrid Ullerich[3], Katrin Strutzberg-Minder[3]*
*[1] Tieraerzte Team Tiefenbach GmbH, [2] MSD Animal Health, [3] IVD GmbH Innovative Veterinary Diagnostics*

**Figures 1 a and 1 b: number of MAT-titers ≥1:100 from vaccinated sows (n=12) in farms A and B on different timepoints**



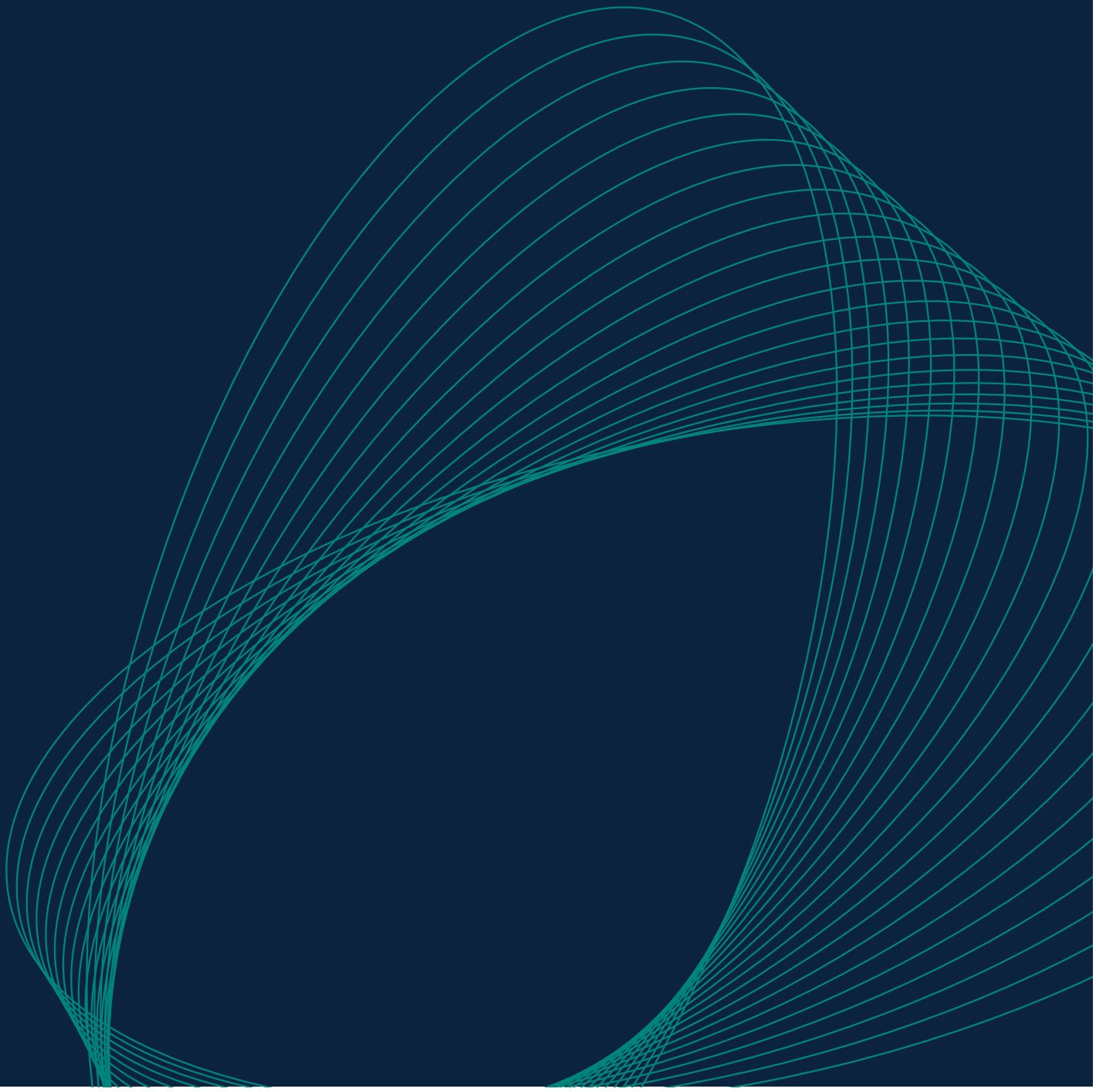

Timepoints: BP1: 1st vaccination BP2: 2nd vaccination BP3 –BP7: samples taken every 4 weeks
Serovars: Aus=Australis; Aut=Autumnalis; Bra=Bratislava; Can=Canicola; Ict=Icterohaemorrhagiae; Gri=Grippotyphosa; Pom=Pomona; Tar=Tarassovi

*References: 1: Arent und Ellis Leptospirosis in 11th ed Diseases of Swine 2019; 2: Saravi et al. Re Sci Tech 8(3) 1989*



Poster Code: IMM-PP-17

# ReproPig





MSD Animal Health

# Validation of the Progesterone kit for the determination of progesterone in serum at field level using samples from a study evaluating the efficacy of altrenogest treatment for oestrus synchronization in gilts

P. Sánchez-Giménez [1], C. Mata[2], M. Marcos[3], M. Jimenez[3], R. Menjón[3]

[1]AGROPOR SL, [2] PROVESA SL, [3] MSD Animal Health (Spain)

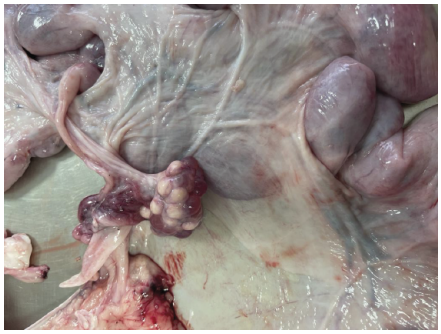
## Background and Objectives

Presence or absence of progesterone (P4) in gilts is useful to check cycle status specially with a specific hormonal treatment, such as induction or synchronization. Until now, it took a few days between blood collection, sending it to the corresponding laboratory, preparing the assay dilution and receiving the results in the field (PNT-HOR-30409; ELFA reference technique).
The objective of this study was to determine the validity of a rapid serum P4 detection kit to evaluate the efficacy of a treatment with altrenogest for synchronization of oestrus in gilts, directly on the farm.

## Material and Methods

A blood sample was obtained (n=30 gilts) before starting an 18-day treatment with altrenogest (Regumate®).
Sera from each sample was separated and divided into two aliquots. One aliquot was sent to a laboratory for P4 determination with an analytical method PNT-HOR-30409 (ELFA reference technique; ng/mL) and the other aliquot was tested by the MSD progesterone kit. After treatment, a blood sample was collected again, and P4 testing repeated as described above (n=40 gilts).
For the rapid serum P4 detection kit, 5 drops of serum were added to a well and the result read 15 minutes later. Interpretation of this field kit is based on P4 concentration:>10ng/mL and <10ng/mL will test as positive and negative, respectively.
The statistical correlation between the two methods was tested by a two-by-two comparison, using Phi (values -1 to +1).

*Figure 1. Gilt at puberty (blood included in this study, + in the progesterone kit)*



## Results

There was a highly significant association between the results of progesterone of both tests:

- Pre-treatment (n=30): lab results (17- & 13+) vs kit (16- & 14+): Phi=0.818 (p<0.001) (Fig.2).
- Post-treatment (n=40): lab results (38+ & 2-) vs kit (38 + & 2-): Phi=1.000 (p=0.001) (Fig.3).

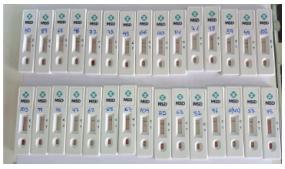


*Figure 2. Pre-treatment progesterone kit results*

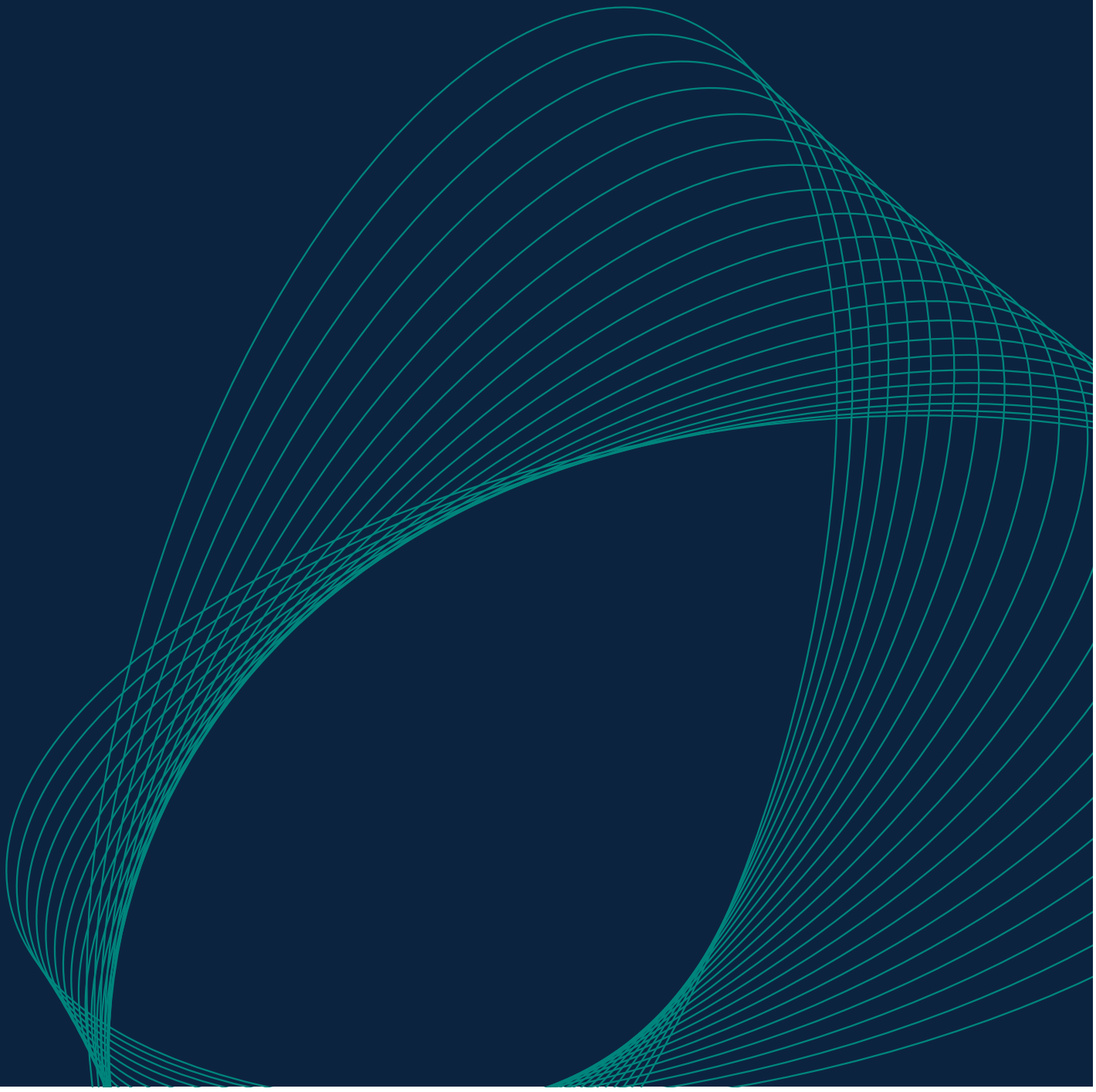
*Figure 3. Post-treatment progesterone kit results*

## Discussion and conclusion

This quick test has proved to have a high correlation with the results of the quantitative gold standard assay, allowing producers to obtain, at farm level and in just a few minutes, a qualitative assessment of serum progesterone levels. In this case, it was used to assess the presence or absence of progesterone, before and after treatment, to determine if the treatment had been correct and effective or not. For treatment with altrenogest for oestrus synchronization, the gilts must be positive for P4 before starting treatment (puberty), and must be negative after treatment, which indicates completion of the luteal phase.

[1] Mur P. Uso de altrenogest en nulíparas. Repropig No8. 2020
[2] Eliasson L. Relationships between puberty and production traits in the gilt. Oestrous symptoms at puberty. Anim Reprod Sci. 1991;25:255–64.
[3] Vela A. et al. Determination of puberty in gilts: contrast of diagnostic methods. Porcine Health Manag. 2022;8

# Miscellaneous





MSD Animal Health

# Is Sapovirus an Emerging Disease in Canada?

*Francisco de Grau, MVZ, EPA, DVM, DVSc[1]; Carol Malgarin, MV, PhD[1], Stephan von Berg, DVM[2].*

*[1]Merck Animal Health, Kirkland, QC, Canada, [2]MSD Animal Health, Munich, Germany*

## Background and Objectives

Sapovirus (PSaV)) has been detected worldwide in symptomatic and asymptomatic pigs, and as part of mixed diarrheic infections with other viral, bacterial, or protozoal pathogens. An increased number of diarrhea cases in piglets ten days of age or older were reported in Iowa in 2019. Piglets were negative for significant pathogens, and Sapovirus was the only etiological agent identified (Shen et al., 2021).

The first Sapovirus case related to pigs born in Canada was in wean piglets exported to Iowa in 2022; it was not until recently that a Sapovirus case was reported in Ontario affecting nursery pigs by the Animal Health Laboratory (AHL) in Guelph (DeLay and Ojkic, 2023).

## Material and Methods

In 2023, our Animal Health Canada team received 516 laboratory case reports from lactating piglets exhibiting diarrhea. Tissue, fecal, and fecal? swab samples were collected, and from these, 289 (56 %) viral sequences were positively identified for Rotavirus VP7 while only 24 (8%) were identified for Sapovirus VP1 (ORF1).

The Sapovirus positive samples came from scouring piglets born to sows vaccinated against Rotavirus and negative for other common enteric pathogens. Diarrhea occurs around ten days of age, causing mortality and weight loss. The PCR testing was performed at the AHL in Guelph, and VP1 sequencing was completed at the Iowa State University Veterinary Diagnostic Laboratory. The only pathogen found in high viral concentration (CTs < 20) and histological lesions causing atrophic enteritis was Sapovirus.

## Results

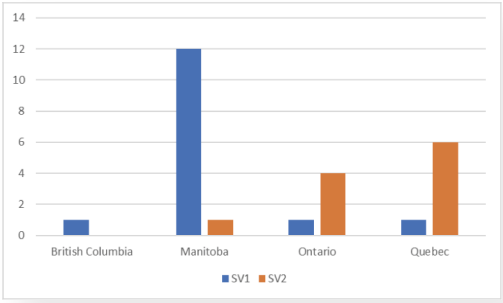
To date, Sapovirus has only been identified in four Canadian provinces (British Columbia, Ontario, Manitoba, Quebec). So far, the genogroups found in Canada are G III, SVP1 and SVP2. The homology among SVP1 strains is 96.87 % to the US strains and 96.85 % among Canadian strains, and for SVP2, 95.84 % to US strains and 96 % among Canadian sequences. Homology across the US and Canada for the SVP1 strains is 96.9%, and 96% for the SVP2 strains.

## Discussion and conclusion

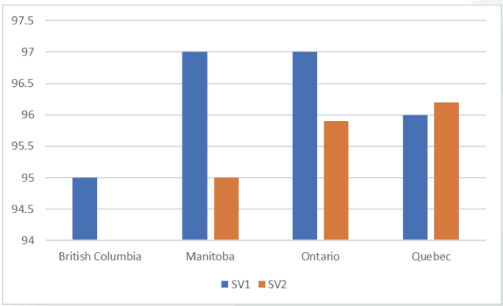
Since the first Canadian case was diagnosed during the 2022 outbreak in Iowa, PSaV has been identified in 24 cases of chronic diarrhea as the sole causative pathogen. This suggests that the prevalence of PSaV may be higher than currently understood, and PSaV should therefore be included in the diagnostic workout of pig diarrhea.

*[1].Shen H, Zhang et al., (2022). Genetic characterization of porcine sapoviruses identified from pigs during a diarrhoea outbreak in Iowa, [2019]. Transbound Emerg Dis. May;69(3):1246-1255.*
*[2].DeLay J, Ojkic D, (2023). Porcine sapovirus: An emerging pathogen contributing to swine diarrhea. Animal Health Laboratory, University of Guelph, Guelph, ON. AHL Newsletter 2023;27(1):15.*

*Graph 1. Sapovirus Genotypes identified on scouring* piglets by province.




*Graph 2. Homology among genotypes of Sapovirus by province.*



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