PRRS in swine production

Everything you need to know about PRRS is one click away

www.msd-animal-health.com

If we have ascertained any piece of key information since the initial outbreaks of PRRS virus in swine production, it is that there are no magic tools for its control. Without a doubt, it is no exaggeration to say that this infection represents one of the biggest challenges for the sector, due both to the difficulty of its control and the economic impact that it poses.

With regard to control, the greatest difficulty lies in the fact that any effective PRRS control strategy is based on a comprehensive and multifactorial approach, which includes issues related to biosecurity, immunisation, management and monitoring.

Developing and strictly following a comprehensive and multifactorial program will help us to alleviate the economic impact and timeline of the disease. Once the objectives are defined, it is time to establish the strategy to follow. This aspect is, without doubt, the most complex one, since both the attention and the actions must be multifactorial, adapted to each situation and follow a systematic and well-founded approach. The decisions must have a solid technical base, but also consider economics.

What is Integrated PRRS Solutions

Integrated PRRS Solutions is a holistic tool that facilitates the integral approach of PRRS control, as well as technical and economic decision-making process.

What does this involve?

It consists of a combination of knowledge and services, offered under the umbrella of a website (https://www.integrated-prrs-solutions.com), which brings together a vast section of technical content prepared by renowned national and international experts, as well as a series of services, such as the Application of the Program Integrated PRRS Solutions (APP) and an Economic Simulator, prepared thanks to more than 15 years of experience in the control of PRRS. Prestigious researchers, such as doctors Cinta Prieto, Enric Mateu, Derald Holtkamp, Christina Natheus, Heiko Natheus and Jeroen Dewulf, widely address characteristics related to the disease, its economic impact, biosecurity management, and key aspects for the control of PRRS. All technical content can be explored on the web or downloaded in pdf format for easy reference later on.

Biosecurity audit

The Biosecurity audit is a very simple audit, very easy to prepare, but it includes the most relevant aspects regarding internal and external biosecurity linked specifically to the control of the PRRS virus. Through a numerical classification and a colour code the audit quickly identifies the points of improvement and evaluates their evolution over time.

Simulator of costs and benefits

The Simulator is a unique tool, patented by MSD, that allows producers to not only calculate the cost of the disease on a farm, but also the return on investment in the short, medium and long term of 12 different intervention strategies validated and contrasted scientifically. The Simulator has been developed by the team of doctors Christina and Heiko Natheus, of the University of Bern (Switzerland). The model consists of a program based on the introduction of productive data of the farm under the intervention, an epidemiological model that determines the biopathological influence of PRRS on that farm, and a very detailed economic model that incorporates prices and evaluates the impact of the disease and possible intervention strategies.

Application of Integrated PRRS Solutions

The APP program allows a systematic review of the status, with respect to PRRS, of a production system, based on six well-defined actions, which guide us through biosecurity, diagnosis and economic audits. The combined results form the basis for the development of a tailored intervention and action plan.

The Application of the Program Integrated PRRS Solutions is available for IOS and Android mobile devices, and can be found on the App Store or Google Play under the name 'MSD Integrated PRRS Solution' or by searching any of the keywords of its name.

The content of the website is complemented by a section dedicated exclusively to vaccination, one of the pillars for a successful control program of the PRRS virus. This section provides relevant information regarding Porcilis PRRS, as well as the benefits of its administration through the IDAL intradermal needleless vaccination system. It also has a very large section devoted to a technical bibliography.

From MSD Animal Health, and through the Integrated PRRS Solutions tool, we hope to facilitate professionals in the sector to face the PRRS virus control in a systematic and rigorous way, and therefore to contribute to the successful control of the disease.

MSD Animal Health

IDAL vaccination

A personal look at the use of IDAL vaccination in the field

www.msd-animal-health.com

We interviewed Isidoro Pérez Guzmán, Technical Manager of Agropecuaria Obanos, on his use of the IDAL vaccination device. "The main advantage for us is the efficacy, which is the same or better than conventional means. The IDAL system allows us to have easy, safe, effective administration, while decreasing the stress of the piglets and the sows," Isidoro told us.

The company

Agropecuaria Obanos is a swine production company located in the northwest of Spain (Navarra and Aragón). We have six farms with a total of 13,000 sows. The largest farm houses 2,500 sows.

What differentiates us from other farms is that we produce heavily-muscled piglets from sows with Pietrain genetics. We also work with an auto replacement management and process 50% of the animals that we produce.

Experience with the IDAL system

In our production system, we try to wean piglets at around 21 days of age. This means that we need to wean piglets daily, moving new piglets into the nurseries between Mondays and Fridays. This continuous flow of new piglets produces an increased need for vaccination to prevent the spread of pathologies, such as Porcine Reproductive and Respiratory Syndrome Virus (PRRSV). For this reason, we thought that a needle-free vaccination system would increase the well-being of the piglets.

Further, we were looking to improve the safety of PRRSV mass-vaccinations in the adult sows to decrease pregnancy loss and reduce food consumption, which was especially high in the summer.

Finally, the intradermal vaccination and the immunological response at this level differentiates the IDAL system from other vaccines. In my opinion, the skin is a more interesting area than the muscle for the antigens exposure.

On our farms, we use the following vaccines with the IDAL system:

- Porcilis PRRS – We use this vaccine for the mass-vaccination of 6,500 sows every four months.
- Porcilis M Hyo ID ONCE – About four years ago, we started using this vaccine when the piglet is weaned at around 21 days of age. Approximately 165,000 piglets are vaccinated each year with this product.
- Porcilis PCV ID – We started using it in April of 2016. It has been applied to the production of nearly 4,000 sows, with the objective to avoid destabilisations during the post-weaning period.

Advantages of the IDAL system

The main advantage for us is the efficacy, which is the same or better than conventional needle and syringe vaccinations. The IDAL system allows us to have easy, safe administration, while decreasing the stress of the piglets and the sows.

Minimising the risk of broken needles in the carcase is also very important, and it is clear that this risk disappears with the IDAL system.

Good safety and efficacy begins with the absence of incidents or clinical suspicion of the pathologies. We are conducting a preventive program across all of these vaccines to measure this.

For example, we can see the efficacy of Porcilis M Hyo ID ONCE through lung lesion examinations in the slaughterhouse. Since we control 50% of the production, we know that there have been no significant lesions in the lungs compatible with enzootic pneumonia during the last year. Also, the efficacy of the vaccine is confirmed by the absence of culled pigs in the slaughterhouse and the improvement of the feed conversion ratios (FCR).

The good news for us is that we have achieved all of these results, while conducting an antimicrobial reduction program in the finishing facilities at the same time.

We started to vaccinate 2,500 sows for PRRSV in February 2014. Thanks to the collaboration of MSD Animal Health, we evaluated 21 piglets from 21 different litters of different parities every month. Every sample had a negative PRRSV PCR result at 45 days after the first mass-vaccination. The last control included simultaneous sampling of 63 animals: 21 suckling piglets and 21 piglets each at 15 and 35 days post-weaning, which were all PRRSV negative. The mortality of the fattening pigs is now less than 3%, while we have reduced antimicrobial use and improved FCR.

MSD Animal Health

Prevalence of ileitis

Widespread in swine herds of different production systems

by Roberto M. C. Guedes,Veterinary School, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.

www.msd-animal-health.com

Ileitis is widespread in swine herds of different production systems worldwide. This disease is present in every single country that has a significant commercial swine production industry. It was the most frequent cause of disease in grower/finisher pigs reported in the 2000 National Animal Monitoring System survey, occurring on more than one-third of all sites and reported on 75% of large sites (10,000 or more total inventory) (Highlights, 2002). Studies have shown that the prevalence of positive herds ranges from 15-100% in different countries, depending on the diagnostic test used.

Prevalence studies based on PCR tests using faecal samples usually demonstrate lower results, ranging from 15-68%. The lower sensitivity of PCR in faecal samples, due to the presence of PCR reaction inhibitors in the clinical material, as well as the intermittent faecal shedding of the bacteria, makes the serological tests more sensitive to diagnose ileitis. Serologic prevalence studies are much more numerous in the international literature, and demonstrate much higher prevalence results, ranging from 70-100%.

Most of the serologic prevalence studies conducted until 2005 used the indirect fluorescent test (IFAT). Since then, an immunoperoxidase monolayer assay and a commercial monoclonal antibody-based blocking ELISA (BioScreen Ileitis Antibody ELISA, Synbiotics Corporation, Lyon, France) became available. Based on a publication by Magtoto et al. (2014), both IPMA and the blocking ELISA were highly correlated with 100% specificity and 91% sensitivity.

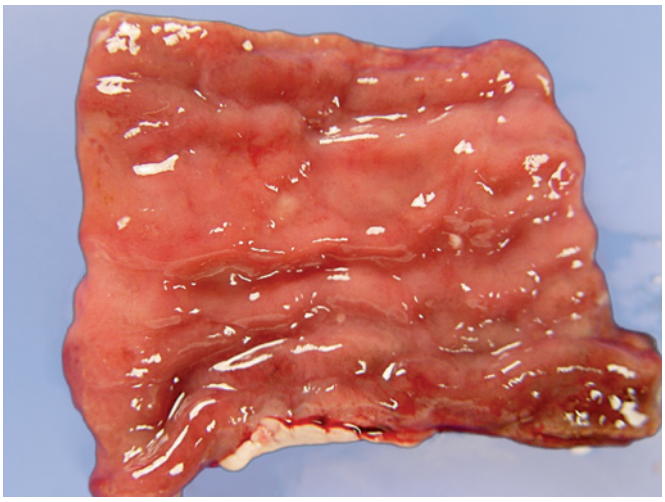
As a result, considering the sensitivity of the most frequently used serological tests (IPMA and blocking ELISA), we have to assume that virtually all swine herds are positive for Lawsonia intracellularis infection. Not all herds have the disease for one reason or another; however, all veterinarians and producers have to be aware about the potential damage it might cause.

For instance, they might have to deal with acute problems when facing outbreaks of the haemorrhagic clinical form of the disease or they might have more chronic problems, when dealing with the diarrhoeal presentation.

The economic impact of ileitis to the swine industry is estimated to be very high. It was estimated to cost the Australian pork industry AUS $25 per sow per year, £2-4 million per year in the United Kingdom, and $20 million annually in the United States.

Simulations of the economic impact of ileitis on pig production in Australia, using the AUSPIG decision support system, have estimated the costs associated with chronic and acute (haemorrhagic) cases to range from AUS $15-141 per sow per year, respectively, depending on the clinical severity of the disease, incidence of infection and the type of medication strategy used to treat and control the disease.

There have been some ileitis eradication program attempts, mainly in European countries. They were based on medication, movement to new facilities, followed by another round of medication. These attempts had good results regarding improvement in growth performance and reduction of antimicrobial usage.



Inflammation of the ileum showing an increased size of the mucosal folds.

However, in every single eradication attempt, the herd was reinfected up to 24 months later. There have been several advances in the understanding about the epidemiology of the disease, such as the role of rodents as biological vectors of the bacterium.

Nevertheless, considering the unknown aspects about the epidemiology of the disease, the chances of reinfection are very high, mainly considering the possibility of outbreaks, as we know so little about the course of reinfections in herds free of Lawsonia intracellularis.

Taking in consideration factors such as:

- The high bacteria load in faeces of clinically and subclinically affected pigs.
- That excretion in faeces may last for up to 14 weeks.
- The low infective dose of L. intracellularis in pigs (10^4 micro-organisms).
- The survival time of at least two weeks in the environment.
- The role of rodents in maintaining the infection and transmission to pigs.

It comes as no surprise that swine herds have such a high prevalence of the disease. As a result, prevention is the key element to minimise losses.

Presentation of ileitis

Clinical signs

by Roberto M. C. Guedes, Veterinary School, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.

www.msd-animal-health.com

The forms of presentations of ileitis in pigs are haemorrhagic or acute, chronic and subclinical.

Acute form

The acute form affects young adults from 4-12 months of age, usually replacement gilts or hogs close to market age. It is characterised by an acute haemorrhagic syndrome with profuse bloody diarrhoea or sudden death. Black tarry faeces are often seen at the beginning of the clinical presentation, or in mild cases when the animal is recovering.

In severe cases, some animals may either die with no faecal alteration, just a marked skin and visible mucosa pallor, or have a profuse bloody diarrhoea for a few days before death. Around 50% of clinically affected animals die and the remaining animals will recover in a few weeks. This acute form is more frequently seen as a severe outbreak in a batch of animals, but sometimes isolated animals, in a barn that is facing a chronic ileitis problem, may be observed with bloody diarrhoea. Pregnant gilts are sometimes affected and may abort 5-6 days after the onset of clinical signs.

Chronic form

The chronic form of ileitis affects postweaning pigs from 6-20 weeks of age. These pigs present a grey-to-green, pasty-to-liquid transitory diarrhoea. Mucus or blood are not observed in chronic ileitis. The diarrhoea may last for 7-10 days. After that, the great majority of the animals will recover, however, there is negative impact in growth performance rate in affected animals that will reflect in an uneven batch of pigs and a delay in the slaughter age. Despite the diarrhoea, many pigs maintain their appetite with no marked reduction in feed consumption; however, feed conversion efficiency of the whole batch is severely compromised. Some pigs might get some degree of anorexia, keeping their interest in the food but not eating. Pigs that develop necrotic enteritis due to secondary bacterial infection have a dramatic loss of body condition and persistent diarrhoea.

Table 1. Clinical and performance parameters, and gross and histological findings in pigs administered with varying doses of L. intracellularis (Paradis et al, 2005 - ASSV).

Groups	Inoculum dose[1]	Gross lesions[2]	IHC[3]	Faecal score[4]	ADG[5]	FCR[6]
A	SPG	0.00^{a7}	0.00^{a}	0.08^{a}	0.40^{a}	1.63^{a}
F	3.2 x 10^{4}	0.08^{ab}	0.67^{b}	0.18^{a}	0.25^{b}	2.07^{b}
E	3.8 X 10^{5}	0.13^{ab}	0.63^{b}	0.43^{a}	0.23^{b}	2.10^{b}
D	2.2 X 10^{6}	0.33^{b}	0.78^{b}	0.37^{a}	0.24^{b}	2.24^{bc}
C	7.2 x 10^{7}	0.25^{ab}	0.66^{b}	0.93^{b}	0.19^{b}	2.51^{bc}
B	2.4 x 10^{8}	0.25^{ab}	0.62^{b}	1.34^{b}	0.16^{b}	2.92^{c}

[1] L. intracellularis count received by each pig.
[2] Proportion of pigs with gross lesions consistent of ileitis.
[3] Proportion of pigs with evidence of L. intracellularis infection by ileal immunohistochemistry.
[4] Faecal scores: 0 – Normal; 1 – Moderate; 2 – Severe diarrhoea.
[5] Average daily gain.
[6] Feed conversion rate.

Subclinical form

The subclinical form of ileitis might be the most common one. It is characterised by the impact in the growth performance rate, but no evident diarrhoea is observed. Paradis et al (2005) have demonstrated the existence of subclinical disease using different concentrations of L. intracellularis in the challenge inoculum. This study showed without diarrhoea, shedding the bacteria in the faeces and a negative impact in average daily gain and feed conversion rate (Table 1).

Timing of occurrence

Chronic and subclinical forms of ileitis have different timings of occurrence depending on the antimicrobial programme used in the nursery. With the banning of growth promoters and restriction over preventive antimicrobial use in Europe, there was a change in the kinetic of L. intracellularis infection with earlier presentation of ileitis in late nursery due to the faster increase of the pressure of infection in the postweaning period. In contrast, in the Americas, chronic and subclinical ileitis occurs after the pigs are transferred to the grow-finishing unit.

Clinical signs of the chronic form and the subclinical form of ileitis often pass unnoticed by the producer, resulting in significant economic loss due to the reduction of growth performance and negative impact in the feed conversion rate. As a result, a careful inspection by the consulting veterinarian for apparent wasting of growing pigs due to anorexia and diarrhoea in an uneven batch of animals should be performed and often followed by sample collection for laboratory confirmation of the disease. Moreover, a detailed examination of the records of postweaning pigs should be conducted in order to detect performance issues.

Lawsonia intracellularis

Pathogenesis

by Roberto M. C. Guedes, Veterinary School, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.

www.msd-animal-health.com

As an obligate intracellular bacterium, Lawsonia intracellularis has specific mechanisms of infection and propagation in the host. The oral route is via infection and naïve pigs from different ages are susceptible. However, infection is usually observed in late nursery and in growing-finishing phases. Sporadically, young adults (replacement animals) develop an acute haemorrhagic form of the disease. There is no definitive explanation as to why some animals develop this acute form of the disease.

The infective dose is around 10^3 micro-organisms and intestinal microbiota is essential for the development of the disease, as gnotobiotic pigs are not infected when inoculated with pure culture of L. intracellularis. Studies using dual infection with PCV2 or Salmonella sp associated with L. intracellularis in commercial pigs have been conducted, but no evident synergic effect was demonstrated.

Ileitis can be reproduced in pigs using pure culture of L. intracellularis or diseased mucosa of infected pigs as inoculum. The bacteria can be detected in faeces of infected pigs 2-3 days after inoculation. The majority of experimentally inoculated pigs shed the bacteria from 7- 21 days post inoculation, which coincide with the peak of the infection. Some animals can still be shedding L. intracellularis up to 10-12 weeks after inoculation.

Virulence factors

Virulence factors of L. intracellularis are not yet known. Its main pathogenic mechanism is infection of and induction of hyperplasia in enterocytes. Inflammation is not a major feature associated with the infection, even though inflammation and superficial necrosis are often observed mainly due to secondary bacterial infection. Attachment and entry into epithelial cells of the intestines were believed to occur only in immature enterocytes of the small intestine crypts. However, Boutrup et al (2010ab) have demonstrated that enterocytes from the apex of the villi are also infected in early stages of the infection.

Specific adhesins or receptors for L. intracellularis have not been characterised yet. However, attachment and cell entry appear to require specific bacterium-host cell interaction. The process of invasion does not depend on L. intracellularis viability as formalin fixed organisms could still be internalised by eukaryotic cells. But it is possible that the single unipolar flagella present in L. intracellularis is involved in intestinal colonisation. The mechanism of escape from the membrane-bound vacuole into the cytoplasm and avoiding the damaging effects of phagolysosomal fusion is also observed in several other species of intracellular bacteria, such as: Shigella, Listeria, Rickettsia spp. and Clostridium piliforme.

Enterocyte proliferation

The mechanism of induction of cell proliferation, an important feature of ileitis, has not been explained yet. Temporary reduction of apoptosis induced by L. intracellularis infection was suggested as a possible mechanism involved in enterocytes proliferation. However, two different recently published studies have shown that L. intracellularis infected crypts have actually more apoptotic events than non-infected ones, demonstrating that reduction of apoptosis is not likely an explanation for enterocyte proliferation. So far, the mechanism of induction of enterocyte proliferation caused by L. intracellularis remains unsolved.

Enterocytes seem to be the only cell type infected by L. intracellularis. Bacteria antigen has been demonstrated in tonsils, lamina propria of intestines, mesenteric lymph nodes and liver. However, the presence of the bacteria in the tonsil crypts are likely due to environmental contamination and not infection, while in the other tissues and organs it is assumed to be digested bacteria in macrophages. In contrast, Boutrup et al (2010b) using fluorescent in situ hybridisation, have demonstrated the presence of viable L. intracellularis in the cytoplasm of mononuclear cells in the lamina propria of the small intestine. They hypothesised that the bacteria could survive in macrophages, which could help infection propagation not only by the apical portion of enterocytes but also via the basolateral surface.

L. intracellularis seems to initiate infection in the small intestine, mainly jejunum and ileum, and then progress to the large intestine, where infection and lesions can be observed from the caecum to the rectum. As a result, despite being commonly called 'ileitis', infection and lesions can be found in both small and large intestines.

Diarrhoea and reduction of growth, common features of different presentation forms of ileitis, were explained by hyperplasia of immature enterocytes and consequent villous atrophy, which are characteristic histologic findings of the disease. However, Vannucci et al (2010) have demonstrated that even infected intestines with no clear villous atrophy showed reduced absorption of glucose, potassium and chloride. As a result, the malabsorption observed in ileitis is not only due to villous atrophy but also to the possible molecular and protein membrane alterations induced in infected hyperplasic enterocytes.

In conclusion, L. intracellularis pathogenesis involves intricate and complex mechanisms to avoid acid digestion in the stomach, to evade the lysosomal digestion mechanism of enterocytes, to induce enterocytes proliferation, blocking its differentiation during maturation, and, consequently, resulting in modifications of the expression of outer membrane proteins, malabsorption and reduction of growth.

References are available from the author on request: guedesufmg@gmail.com

Lawsonia intracellularis

Potential impact of antimicrobial restriction

by Roberto M. C. Guedes, Veterinary School, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.

www.msd-animal-health.com

Nowadays, the trend for the reduction of antimicrobial usage is a reality in the majority of countries with relevant swine production. There are already specific rules of antimicrobial use in regions such as North America, more specifically in the United States, and very soon the same will happen in South America, mainly in Brazil. This scenario started to gain momentum with the ban of all growth-promoting antimicrobial usage in food animals in Sweden in 1986, followed by the European Union ban of avoparcin in 1997 and bacitracin, tylosin, spiramycin and virginiamycin in 1999.

Just after the ban there was a substantial increase in the therapeutical use of antimicrobials, but over time producers and veterinarians had to learn how to work with this new condition. For instance, in Denmark, DANMAP data have demonstrated that the ban of non-essential antimicrobials in food animal production systems is working without major consequences for animal health.

Anyhow, the impact of the antimicrobial growth promoters and restrictions on antimicrobial usage over pig performance, mainly considering enteric diseases, is controversial, but many studies have been demonstrating significant concerns regarding ileitis.

The literature brings several examples of how banning antimicrobial growth promoters in the European Union affected the kinetics of infection of different diseases in pigs. By far, the most challenging condition has been the post-weaning diarrhoea caused by Escherichia coli and Lawsonia intracellularis in pigs.

However, there was a clear age difference for the occurrence of these two infections. E. coli infection would affect post-weaned pigs up to 6-7 weeks of age, while L. intracellularis infection would affect 7-week-old pigs or older. It is important to consider that pigs stay longer in the nursery in Denmark, as they have to reach close to 30kg before leaving to growing-finishing facilities.

As a result, the antimicrobial growth promoter ban clearly induced a shift of L. intracellularis infection, allowing a faster dissemination of the infection in the nursery and earlier clinical presentations of the disease before the growing-finishing phase.

An increase of age and weaning weight and the use of zinc oxide in the feed had a positive effect over E. coli infections. However, E. coli is still associated with L. intracellularis in weaned pigs. Nutraceuticals, prebiotics, probiotics or symbiotics have not proven to be suitable substitutes to antimicrobials for controlling ileitis. In addition, there is no consistent information related to the use of raw materials or ingredients, different formulations or diet quality and reduction of ileitis or of the bacterium infection.

Consequently, L. intracellularis infection remains a challenge to control and very often requires prescription of preventive antimicrobial usage, justified by the historical occurrence of the disease in specific herds. A metaphylactic approach might be an option, however, attempts to determine the ideal moment to start medication have not been conclusive.

Currently, a close clinical observation of the animals regarding the consistency of the faeces and the percentage of affected animals associated with qPCR results for L. intracellularis in faecal samples can be an important tool in order to define the correct moment to intervene.

Based on results from the University of Minnesota, Cts equal or below 31 associated with clinical indication of ileitis are considered indicators of the necessity of treatment. However, the time elapsed between clinical observation, sample collection and getting the results back might be a limitation.

Prevention is always better than treatment for better control of any disease. L. intracellularis eradication protocols have been tested in the past, and some succeeded in some herds up to two years with substantial improvement in growth performance; however, every single herd was reinfected.

The conclusion on eradication is that more epidemiological information is needed. Consequently, we have to consider vaccination as an important strategy against L. intracellularis infection. Fortunately, there are two vaccines in the market for controlling ileitis using different approaches, oral modified live or injectable bacterin. Vaccines might be interesting alternatives to overcome the expected increased incidence of ileitis in the coming years due to antimicrobial restrictions.

References are available from the author on request: guedesufmg@gmail.com

Lawsonia intracellularis

Economic losses associated with ileitis

by Professor Derald J. Holtkamp, Iowa State University, College of Veterinary Medicine, Ames, Iowa, USA.

www.msd-animal-health.com

Lawsonia intracellularis (L. intracellularis) is the causative agent of porcine proliferative enteropathy, or ileitis, a disease affecting pigs worldwide. The major source of economic losses associated with ileitis arise from productivity losses.

Pigs affected by ileitis grow slower and convert feed to weight gain less efficiently. Slower growth is measured by a reduction in average daily gain (ADG) and less efficient conversion of feed to gain is measured by an increase in the feed conversion ratio (FCR). The disease may also result in an increase in the percentage of pigs culled, and in some cases cause mortality, resulting in an increase in the culling and mortality rates.

The value of productivity losses and increased animal health costs in pigs affected by ileitis in the finisher were estimated to be US$4.65/ per pig marketed.

Reduced ADG and poorer FCR

In general, the impact on ADG and FCR is greater in younger pigs and increases as the challenge dose increases. For experimental challenge studies where pigs were younger than 42 days at the time of challenge the reduction in ADG ranged from 37-79% and FCR increased from 37-194%. However, experimental challenge studies where pigs are 42 days and older more closely represent the timing of infections in the field. In studies where the pigs were 42 days or older at the time of challenge the reduction in ADG ranged from 3-19%. The impact on FCR was only reported in one of the studies on older pigs where it was reported to increase by 7%.

The reported impact on ADG and FCR from case-control and experimental challenge studies in older pigs arguably provides estimates that most closely represent losses experienced in production settings. The range of the impact on affected pigs in the finishing phase of production in the studies where the pigs were 42 days or older at the time of challenge were:

- Reduction in ADG: 3-19%
- Increase in FCR: 7%

Mortality and culls

In more severe forms of the disease, mortality may also occur, especially later in the growing phase. In a case-control study, the wean-to-finish mortality rate was 5.4% in negative farms and increased by 1.3% to 6.7% in positive herds, a 24% increase. The cull rate may also increase as more severely affected pigs may fail to grow fast enough to reach weights that are accepted by primary markets.

Based on results from a single case-control and several experimental challenge studies, the estimated value of productivity (ADG, FCR and mortality) losses caused by ileitis in the finishing phase ranged from US$5.98 to US$17.34 per pig marketed.

Economic value of estimated productivity losses

To estimate the value of changes in productivity caused by ileitis, an economic analysis was done using a production and economic model. Three scenarios were modelled: 1) Unaffected by ileitis, 2) Affected by ileitis using the lower bound of estimates from the case-control and experimental challenge studies on pigs 42 days or older and 3) Affected by ileitis using the upper bound of estimates from the case-control and experimental challenge studies on pigs 42 days or older. For the Unaffected by ileitis scenario, the baseline value for ADG was 0.90kg/day, 2.950 for FCR and 4.0% for mortality. The lower and upper bounds for the reduction in ADG were 3 and 19%. Due to the limited number of studies reporting FCR, the 7% increase was used for both the lower and upper bound scenarios. The mortality rate for the lower bound was unchanged from the Unaffected rate of 4.0% and increased to 5.0% for the upper bound, an increase of 24.0%, based on the results from the Fourchon study.

Variation

In groups of pigs affected by ileitis, pig-to-pig variation in average daily gain occurs as some pigs may be affected more than others. System constraints contribute to the economic consequences associated with variation. Constraints common to most producers arise from limited fixed resources, such as building space, and management-imposed constraints on such things as the flow of pigs in the system. The number and size of facilities places a limit on the number of animals and the time that animals can stay in each facility.

Increased animal health costs

The cost of animal health interventions, such as vaccines, anti-microbials, veterinary services and diagnostics, are not directly caused by ileitis but rather occur in response to the disease. Money spent on these interventions must be weighed against the benefit of reducing the impacts of the disease described above. A cost-benefit analysis can provide valuable information to help producers and veterinarians decide which interventions to use.

Conclusions

The major source of economic losses associated with ileitis arise from productivity losses caused by the disease. In the finishing phase, where the losses due to ileitis are most significant, pigs affected by ileitis will have a lower ADG, an increase in FCR and occasionally an increase in mortality and culling rates. Other economic losses arise from increased pig-to-pig variation in average daily gain, which makes it more difficult to feed and market pigs, adding to the cost of the disease.

Lawsonia intracellularis

PHE ileitis outbreak in finishing pigs

www.msd-animal-health.com

A swine finishing site with two, 1200 head barns (AI/AO by barn, single source) started experiencing a 'bloody diarrhoea' outbreak with two sudden deaths on one day and four the next. This occurred in market weight pigs in Barn 1 one week prior to them being sold. There were no feed antibiotics in the diet and the ileitis vaccine history was unknown to the barn manager.

Clinical signs

The pigs had both bloody and non-bloody diarrhoea with a wide variation of consistency and colours present. Melena (tarry black diarrhoea without mucus) was also observed in some pigs. Multiple pigs were mild to moderately gaunt and a consistent cough was also present. Barn 2 pigs were 4-5 weeks younger and had no evidence of diarrhoea, although coughing was present.

Post-mortem examination

A moderately gaunt, weak pig with loose orange-red coloured faeces was humanely euthanised for post-mortem examination. The small intestine contained 5.5m of severely thickened mucosa with superficial necrosis typical of PIA (Porcine Intestinal Adenomatosis) – the basic underlying lesion of ileitis.

Antibiotic treatment

Clinically, the farm was in an acute Porcine Haemorrhagic Enteropathy (PHE) ileitis outbreak. Aggressive treatment with antibiotics is mandatory to reduce further mortality and mitigate clinical signs.

- Injectables: Lawsonia intracellularis is not a zoonotic pathogen. It does not cause a febrile response and is only an intestinal disease (no septicaemia or bacteraemia). Therefore, it is safe to ship infected pigs to market. A few injectable antibiotic options for ileitis treatment are tylosin, tiamulin, and lincomycin with proven efficacy in randomised controlled ileitis challenge trials.
- Water medication: Whenever clinical ileitis is diagnosed, effective water antibiotics are warranted. Water medication is absorbed more rapidly than feed medication. Ileitis trials have shown a statistically significant decrease in clinical signs within three days of water treatment initiation compared to non-treated controls. Also, reduced feed intake (ADFI) is the first and most sensitive clinical sign of ileitis, therefore, feed medication is more often used for prevention and control. Choices for efficacious water antibiotics against Lawsonia intracellularis in scientific trials are tiamulin, tylvalosin, lincomycin, and tylosin.
- Feed medication: Since all pigs were to be marketed within three weeks, in feed medication was not initiated in this barn. However, it was recommended to treat prophylactically to Barn 2 pigs to control the likelihood of lateral transmission of Lawsonia bacteria via contaminated boots and equipment from Barn 1.

Follow-up visit (fourth day)

In Barn 1 no further pigs had died from PHE ileitis, however, there were still numerous pigs with blood tinged and loose diarrhoea that required injectable antibiotics. An untreated pig with melena (pig 2) and another 'cull' pig with normal faeces (pig 3) were selected for post-mortem examination. Pig 2 had more than 4.5m of small intestine with clotted blood in the lumen of the intestine over a grossly thickened PIA mucosa. This PIA lesion with blood clots is pathognomonic for ileitis. Pig 3 was necropsied to determine why it was 45kg lighter than its pen-mates. The faeces was normal and formed, however, gross PIA ileitis lesions of 0.5m were present in the terminal ileum and jejunum indicative of subclinical ileitis. Also, chronic extensive pneumonic lesions were present in the lung parenchyma.

Discussion

The PHE acute, bloody form of ileitis still occurs quite commonly in mid-to-late finishing pigs and young breeding stock. Even with efficacious antibiotics and vaccines available to control clinical signs, neither can prevent Lawsonia intracellularis infections or eliminate the Lawsonia carrier pig. Typical economic loss of $4-7 per pig from mortality, poor performance, light-weight and cull pigs and treatment costs occur. The severe gross PIA lesions evident in those pigs necropsied take at least 21-28 days to develop so it is likely this infection had been present for 4-6 weeks causing significant performance loss. Post-mortem examination to diagnose PHE by observing the classic blood clotting, and PIA lesions is often enough to confirm an ileitis diagnosis. However, in peracute PHE the gross lesions are not always evident, so fixed or fresh terminal ileum and suspect lesions should be sent for a confirmatory diagnosis via immuno-histochemistry (IHC) or intestinal PCR, respectively. Other pathogens should also be analysed for possible mixed enteric infections. Further diagnostics on normal faecal samples could also have been analysed in this case to determine the extent of subclinical ileitis via PCR analysis. The degree of PCR faecal shedding as measured by cycle threshold values is highly correlated to both PIA lesions and performance (ADG). Aggressive treatment with both injectable and water antibiotics are mandatory in these acute PHE cases. Ileitis mortality was only 1% in this case, but can range up to 5-6%. Whenever clinical ileitis is present, it is just the 'tip of the iceberg'. The majority of 'normal' pigs that do not have clinical diarrhoea are often subclinical Lawsonia intracellularis carriers with PIA lesions, faecal shedding, and subsequent poor performance similar to Pig 3.

Implications

All farms should be on an ileitis control programme because the disease is sub-clinically prevalent in over 90% of swine herds and clinically prevalent in over 30% of those farms. Ileitis control programmes with timely antibiotic pulses, ileitis vaccines, or both, are necessary to control clinical and subclinical ileitis. If any evidence of clinical diarrhoea or subclinical faecal shedding is found on routine monitoring of pig-flows, then the control programme should be re-evaluated.