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THE SPREAD OF PROLIFERATIVE ENTEROPATHY (ILEITIS): HOW IT MOVES WITHIN AND AMONG PIG FARMS

INTRODUCTION

The main forms of porcine proliferative enteropathy (PPE) commonly seen in pig farms around the world are the chronic, subclinical and acute. Although each form can have different clinical signs, they are all caused by the same bacterium, *Lawsonia intracellularis*.

The incubation period for PPE — the time it takes from first infection until clinical disease occurs in a pig — is around 2 to 3 weeks. Consequently, PPE, commonly known as ileitis, is always seen in pigs after weaning. In neonatal suckling baby pigs, the major causes of diarrhoea include bacteria such as enterotoxigenic *E. coli*, *Clostridium difficile* and *Clostridium perfringens*, not PPE.

CHRONIC AND SUBCLINICAL PPE

On a typical pig farm affected with ileitis, clinical observations of chronic and subclinical cases of PPE generally include two main signs: one is diarrhoea and the second is reduced weight gain or “variation” in the weights of growing pigs. In the more severe chronic form, there is usually a measurable number of runted pigs. Diarrhoea and poor weight gain are often seen together in a group of pigs, but not necessarily in the same pigs.

Young pigs exposed to a low or moderate level of infection are much more likely to develop the chronic or subclinical form of the disease, not the acute form. The chronic and subclinical forms of disease are also called porcine intestinal adenomatosis (PIA) and usually occur in nursery pigs or grower or finisher pigs between 6 to 20 weeks old.

In affected pigs, diarrhoea is generally moderate. The stools are loose and pasty but normal in colour. In many cases, the faeces are sloppy and poorly formed, resembling cow faeces or wet cement. In more severe cases, the faeces may become more watery and have a liquid, sloppy texture. There may be some undigested feed material present. In the subclinical form of PPE, diarrhoea is less frequent and not as obvious to the eye.

In all cases, the faeces of infected pigs normally contain numerous virulent *L. intracellularis* bacteria. In some pigs, shedding can last up to 14 weeks, but generally lasts only 2 to 4 weeks.

Reduced weight gain, feed efficiency and the resulting poor performance in pigs affected by either subclinical or chronic PPE is an important form of economic loss. The subclinical form is merely harder to detect because poor performance is less apparent and there may be few actual “runt” pigs. Milder chronic cases and subclinical cases can be difficult to detect but can be relatively common in the group. Therefore, groups should be carefully inspected for apparent wasting of well-grown pigs and for irregular cases of diarrhoea and runt pigs. The records of post-weaned groups should be inspected to detect changes in average weight gain and feed conversion efficiency.

The reason why pigs can have intestinal lesions but not diarrhoea is because actual changes or lesions may be confined to the ileum but are not widespread in the colon. This results in reduced digestion and poor growth, but there is no diarrhoea because water levels in the faeces are normal.



In groups of pigs suspected of having ileitis, it is important to develop a good strategy for diagnosis. Faeces can be analysed for evidence of *L. intracellularis* DNA by the PCR method. In addition, many laboratories around the world can analyse blood and serum from pigs for specific antibodies to *L. intracellularis* with immunologic assays such as immunofluorescence or immunoperoxidase. Some farms develop a profiling system for ileitis; serum is collected from 15 pigs and tested at regular intervals — say at 8, 10, 13, 16 and 20 weeks of age. Having many negative samples can point to a group of susceptible pigs, which need to be monitored for a possible future outbreak.

THE SPREAD OF CHRONIC AND SUBCLINICAL PPE

The chronic and subclinical forms of PPE are especially common on traditional, single-site, farrow-to-finish farms that have all farm buildings on one property. These also happen to be the most common types of farms in Europe and Asia. There is a simple flow of pigs and infected faeces around the farm, and the disease passes from one pig to the next. Outdoor farms suffer as commonly as indoor facilities.

In some pigs, a more severe form of PPE can develop, with long-standing excretion of the organism and chronic lesions leading to obvious



Traditional farrow-to-finish single site farm with some breeding sows kept outdoors. Pig faeces containing *L. intracellularis* can move about easily on this type of farm.

runting of pigs. In fact, studies now indicate that the persistent form of PPE occurs in up to 10% of pigs infected with ileitis. Clinical outbreaks usually occur at the end of the nursery phase or during the starting weeks of the grower phase.

Infected pigs can shed *L. intracellularis* for about 2 weeks after first infection and they can shed it for many weeks. Ileitis is then spread when one pig contacts the faeces of an infected pig and ingests some of the *L. intracellularis* bacteria into its mouth and gut. The bacteria enter the wall of the pig intestine, start an infection and then multiply. Once the infection develops in the intestine, *L. intracellularis* re-enters the pig faeces and moves to the next pig. The cycle of disease has been reproduced the same way many times in weaned pigs of various ages that were given an oral pure culture challenge with *L. intracellularis*. Pigs of different ages up to 18 months old can develop the disease.

Since the incubation period is 2 to 3 weeks in most individual animals, a slow build-up of disease in a group can occur over a month or more after the disease is first introduced to one pig in the nursery or grower areas. In some infected pigs, however, there can be large numbers of *L. intracellularis* in the faeces, causing rapid exposure of many pigs among a group. Once one of them becomes infected, a more obvious “outbreak” occurs. Other vectors, such as birds or rodents, appear to have little influence on *L. intracellularis* infections on infected farms.

Chronic and subclinical ileitis may be treated and controlled with an effective water medication such as soluble tiamulin or with an in-feed premix formulation. Premix antimicrobials shown to be effective against PPE are valnemulin, tiamulin and lincomycin.

On most of these farms, chronic and subclinical

PPE occur after maternal antibody levels start to decline after weaning. Antibodies eventually decline to a level where pigs become susceptible to *L. intracellularis* infection. This occurs at around 4 or 5 weeks old, and often coincides with the time that pigs are mixed into the farm nursery and in the early growing period. After the 2- to 3-week incubation period, some pigs develop disease, start to excrete the bacteria and spread it to other pigs. Infection occurs in many pigs after weaning and builds up in the grower and finisher areas (see Charts 1 and 2).

It then declines to a low but detectable level in gilts and older breeding animals.

SPREADING ACUTE HAEMORRHAGIC PPE

The acute haemorrhagic form of ileitis is a much more dramatic and severe type of disease compared to chronic and subclinical PPE. Cases are usually seen in the finishing or fattening period or in young adult pigs in breeding groups. Affected pigs are usually 3 to 12 months old. It is common to see a number of cases together, usually soon after some specific event in the group of pigs, such as moving them to a new building, moving them to a new pen, introduction of new breeding animals to the group, isolating the animals in testing or breeding stalls, transporting the group on trucks and so on.

Many pig experts suggest that the acute form of the ileitis, also known as proliferative haemorrhagic enteropathy (PHE), is becoming more common and visible among pig operations around the world. It seems to be particularly common in Belgium, The Netherlands, Canada and the United States.

Acute PPE also has been reproduced by oral challenge of pigs with *L. intracellularis*. Studies suggest that the acute form is more likely to develop in “older” naïve pigs exposed to a relatively high oral challenge dose of bacteria. The pigs are at least one, two or several months

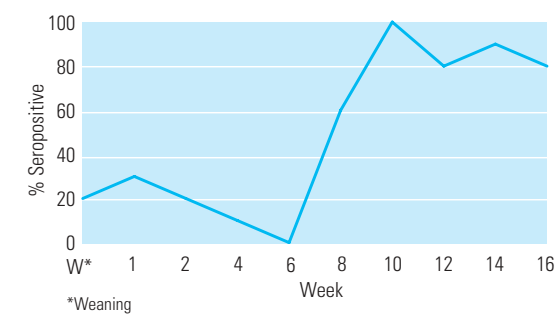


Chart 1 illustrates the percentage of pigs in the group with positive ileitis antibody levels in their blood. Maternal antibodies are still present in some pigs at weaning, but disappear in all pigs one month after weaning. Serum antibodies rapidly appear again around 8 weeks after weaning because many pigs have become infected at 4 or 5 weeks post-weaning and developed fresh antibodies to infection.

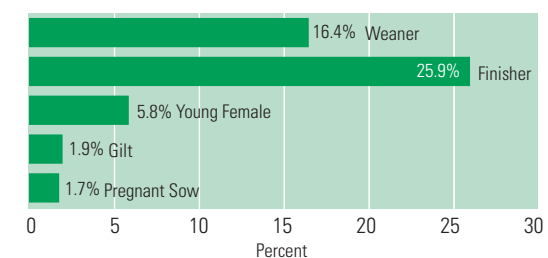


Chart 2 illustrates a similar course of events on a typical single-site farm, but with the test measure being detection of *L. intracellularis* excreted in the faeces of a group of pigs. The number of pigs with faeces positive for ileitis bacteria rises among pigs in the grower and finisher groups. It then reduces, but not to zero, as pigs become older and enter breeding areas. On these farms, serum or faeces testing can detect some positive breeding animals.

post-weaning and have not been previously exposed to the disease, in contrast to younger pigs that are exposed to a low or moderate level of infection that are more likely to develop chronic or subclinical PPE. In other words, there may be an age-related susceptibility.

Pigs can remain naïve until they are older if they receive continuous antibiotic medication that reduces early exposure to *L. intracellularis*. In controlled challenge studies with groups of pigs that had received oral antibiotics until 18 weeks of age, pigs were still highly susceptible and many developed severe acute haemorrhagic PPE after antibiotics were stopped and an oral chal-

“...studies now indicate that the persistent form of PPE occurs in up to 10% of pigs infected with ileitis.”

lence with *L. intracellularis* was administered. Natural outbreaks of acute disease, therefore, may partly reflect changes in the use of antibiotics.

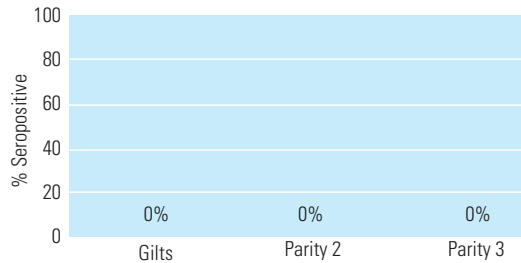


Chart 3 shows typical blood testing results in clean, isolated breeding animals, such as those from "multiple-site" farms. No positive breeding pigs detected.

The other factor that may help explain an increase in acute haemorrhagic PPE is the increase in age separation among pigs on modern pig farms. This can have marked benefits for reducing pneumonias, but seems to affect the immunity of pigs to PPE.

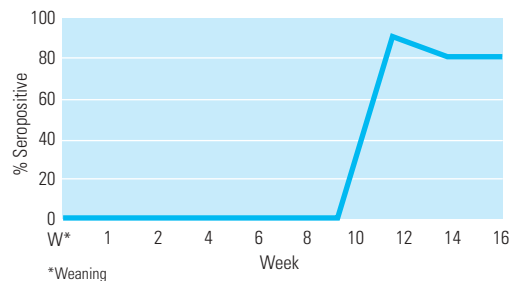


Chart 4 shows typical blood testing results in grower and finisher pigs from a "multiple-site" farm. Positive serology indicating recent exposure occurs late in the finishing pig period.

On modern farms, especially the so-called "high health" and/or "multiple-site" farm operations, the breeding herd is very clean and may be well separated from growing pigs. In many of these farms, it has been found that breeding pigs are in fact negative for PPE (Chart 3). This is in contrast to single-site farms, where up to 30% of the breeding herd may be exposed to PPE. In studies of large multiple-site operations in

America, virtually no positive breeding pigs were found among many hundreds tested.

An important consequence is that exposure to *L. intracellularis* among the offspring (piglets) of these clean breeding animals is delayed until later in the finishing period (Chart 4). The lack of exposure until these pigs are 4 or 5 months old makes them much more susceptible to the acute form of disease.

Exactly where this later infection comes from in finishers is not absolutely clear, but it is probably from infected faeces remaining in some part of the farm itself, such as the slurry pit, recycled water from drainage pits, faeces material on boots, clothing, pens or walkways. This would explain the consistent nature of later infection. If rodents or birds or other vectors were involved, then the infection would be rarer and more sporadic.

The question of whether sows can transmit the infection to their piglet offspring is not fully clear yet, but it seems likely that this happens on some occasions, though not regularly. Therefore, medication of sows to limit infection is not likely to have a major impact.

Once a pig becomes infected with the acute haemorrhagic form of disease, the faeces contain very large numbers of *L. intracellularis*, which are clearly visible on smears. The result is rapid exposure of many pigs in the group. To minimise the spread of acute PPE, early cases should be isolated and treated with effective antibiotics, such as tiamulin injectable. As with chronic and subclinical PPE, acute PPE also can be treated with premix formulations of valnemulin, tiamulin or lincomycin. The environment where cases of acute PPE occurred should be thoroughly cleaned to reduce the bacterial load for the next pigs.