Ileitis Epidemiology

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Ileitis or Porcine proliferative enteropathy (PPE) is widespread in swine herds in different production systems (30-93% of farms are infected) and in all parts of the world[1,2,3,4,5]. Serologic studies have shown that the prevalence of *Lawsonia intracellularis* positive herds range from 60 to 90% in different countries[6].

The economic impact of ileitis on the swine industry was estimated to be very high, with values ranging from $20/sow/year in Australia[7], to $20 million/year in the United States[8].

Despite its importance, we still do not know much about the epidemiology of *L. intracellularis*, especially regarding the sources of infection, the resistance of the bacteria in the environment and the possible biological vectors that could spread the infection between farms.

As an example, even though there were a few successful attempts to eradicate the disease carried out by Danish vets, every single time there was a recontamination of the herd within 12 to 24 months.

Our intention regarding this issue is to discuss some aspects related to what is known about the epidemiology of ileitis.

ENVIRONMENT SURVIVAL

Information about the survival and resistance of *L. intracellularis* in the environment is scarce.

A unique study[9] has shown the viability of *L. intracellularis* in pig faeces at temperatures between 5 and 15o C for at least two weeks. In the same study, when looking at the susceptibility to different disinfectants, it was established that *L. intracellularis* showed full susceptibility to quaternary ammonium disinfectants (3.3% cetrimide), a lower susceptibility to a 1% povidone-iodine solution, but it was not susceptible to a 1% potassium peroxymonosulfate solution or to a 0.33% phenolic mixture as shown in pure cultures of the bacterium. In another study[10] Stalosan F® in both powder and suspension forms was able to inactivate over 99% of *L. intracellularis* after 30 min of exposure.

Considering that faeces from infected pigs are the main source of new infections in susceptible animals[11], the reduction of the pressure of infection in the environment would likely diminish the infective dose for pigs, possibly allowing exposure but not disease manifestation.

SOW TO PIGLET TRANSMISSION

Sow to piglet transmission has always been speculated as a reasonable method of transmission, but there is no evidence that would justify medicating pre- and post-farrowing sows to reduce faecal shedding.

FOMITES AND BIOLOGICAL VECTORS

Fomites such as boots and biological vectors such as birds and mice are often depicted in marketing flyers about the cycle of infection of *L. intracellularis*. If the fomite is contaminated with infected faeces, this assumption is quite reasonable. However, attempts to infect passerines such as sparrows, showed an insignificant epidemiological relevance[12].

As a result, adequate cleaning and disinfection between batches of pigs is recommended, but there is no need to use bird-proof nets in swine herd facilities to avoid *L. intracellularis* infection. Many wild animal species have been shown to shed *L. intracellularis* in faeces, but none of them are relevant to pigs.

Mice, on the other hand, have been recently shown to be infected by the faeces of pigs affected with ileitis and to transmit the bacteria to susceptible piglets through faeces *(Figure 1)* [13]. Consequently, future *L. intracellularis* eradication attempts will definitely need to add rodent control among the measures to keep the herd negative for more than two years.

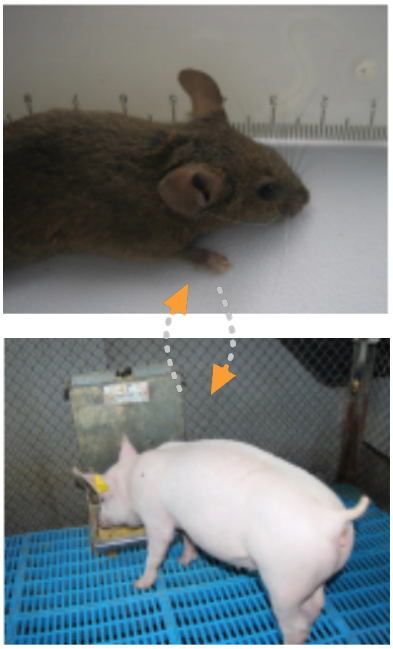

Figure 1. Mice to pigs and pigs to mice transmission of *Lawsonia intracellularis* have been experimentally demonstrated (Gabardo et al., 2017).

CONCLUSIONS

It is no surprise that the prevalence of ileitis in swine herds around the world is high. Based on the previously mentioned survival rate of the bacteria in the environment (at least two weeks), the amount of bacterial shedding in the faeces of infected pigs (up to 10^8 per gram of faeces)[14], the duration of the faecal shedding for up to 12 weeks[15, 16] and the low minimal infective dose of *L. intracellularis* that is sufficient to infect and induce shedding in exposed animals (10^3 *L. intracellularis* organisms per pig) *(Table 1)*, it is easy to understand how ubiquitous the bacterium is in swine herds.

Consequently, until we better understand the disease epidemiology and have enough knowledge to keep herds free of *L. intracellularis* for longer after the implementation of eradication programs, we will still have to deal with the disease by using different measures to control it.

TABLE 1. *Pattern of infection of pigs inoculated with varying dose of L. intracellularis (Collins et al., 2001).*

Groups	Estimated *L. intracellularis* dose	Days pi when 80% pigs are PCR positive	Days pi when 80% pigs are IFAT positive
1	Not inoculated	0	0
2	2.0 x 10^3	26-54 days	56-70 days onwards
3	2.0 x 10^5	19-33 days	56-70 days*
4	2.0 x 10^7	14-28 days	35-49 days
5	2.0 x 10^{10}	7-44 days	21-70 days onwards

+ pi: post-inoculation

**Only 2 of 5 pigs developed a detectable serological response*

1. Chang et al., 1997
2. Kim et al., 1998
3. Chiriboga et al., 1999
4. Stege et al., 2000, 2004
5. Biksi et al., 2007.
6. Lawson et al., 2000
7. Lawson and McOrist, 1993
8. Bronsvoort et al., 2001
9. Collins et al., 2000
10. Wattanaphansak et al., 2008
11. McOrist and Gebhart, 2006
12. Viott et al., 2013
13. Gabardo et al., 2017
14. Smith and McOrist, 1997
15. Guedes et al., 2002
16. Guedes and Gebhart, 2003
17. Collins et al., 2001

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