

Understanding the paradox of worm infections in pigs

The prevalence and economical impact of worm infections are frequently underestimated in daily pig practice despite their tremendous effects on the technical performances of pigs and the farmer's revenues.

The absence of specific clinical symptoms in the field and the restrictions for a correct diagnosis are considered to be the main reasons.

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Faecal egg counts and liver lesion scorings are two popular diagnostic tools but very often not interpreted correctly. The outcome of these diagnostic methods is inversely correlated to the total degree of exposure to worm infections. Although adult worms in pig herds and white liver spots at slaughter are not observed, pigs may be suffering from a high infection pressure.

This paradox increases economical losses and pig health issues to a higher extent than expected at first sight. The apparent contradiction

(Fig. 1) originates from the typical life cycle of *Ascaris suum*.

Egg counting is not a valuable tool to measure the total level of exposure to worms correctly. First, the immune response in highly infected pens results in a low egg excretion.

An intake of a large number of eggs will induce a high immune reaction against the migrating L3 larvae in the liver, resulting in only very few adult stages in the small intestines.

Accordingly, a low number of Eggs Per Gram of faeces (EPG) is excreted into the surroundings. This gives an opposite diagnostic evidence.

Second, eggs are massively excreted in case of a lower infection pressure as there is a lower build-up of immunity. Sometimes young fatteners are housed in cleaned pens with a low infection pressure.

Paradoxically, the limited uptake of eggs induces a low immunity response and all larvae develop to adult worms, leading to an enormous egg excretion and the conversion into highly infected pens.

Liver lesions fade rapidly with time and heal up to a maximum of 5-6 weeks after the last passage of the L3 larvae and damage. Thus, livers affected with white spots only indicate a recent larval migration within

the last 5-6 weeks before slaughter.

The absence of white spots at slaughter does not mean that pigs have not been highly infected previously.

Exposure results in the development of an intestinal immunity, which prevents the migrating larvae from reaching the liver and inhibits the formation of liver white spots. Hence, highly infected farms show a low number of white spots at slaughter.

Affected livers only indicate that worms are present on the farm but the scoring system is not related to the total exposure. Farmers as well as veterinarians often assume that pigs are not suffering from worms as adult worms are only occasionally observed in the farm and liver lesions are seldom noticed in highly infected herds. This paradox clearly underlines the lack of awareness in the field and makes correct interpretation difficult.

Benefits of a deworming strategy

From an economical point of view, *Ascaris suum* is the most important endoparasite worldwide. The prepatent period (time between the intake of embryonated eggs and the re-shedding of eggs) is six weeks.

This interval is the basis for an adequate deworming strategy, which improves the technical results significantly by increasing the daily weight gain and decreasing the feed conversion rate and mortality. In combination with better classified carcasses, less rejected livers and a reduction of secondary infections the profitability can increase by up to €9 for each slaughtered pig (Table 1).

Even in well managed pig farms with indoor housing, improved management techniques and biosecurity tools, pigs still show a very high prevalence of worm infections although farmers do not frequently observe adult worms. The clinical symptoms caused by worms are mostly vague and unspecific.

Pigs with patent infections, even with large numbers of adult worms, normally appear clinically healthy.

However, when inspecting the evisceration room in the slaughterhouse, enormous amounts of adult worms can be seen on the floor.

Unfortunately, the feedback of the slaughterhouse is sometimes also disappointing.

The negative consequences of the paradox are often underestimated:

● Long surviving eggs provoke continuous re-infection

Female adult worms in the small intestine grow up to 40cm or more and can produce up to 200,000 eggs a day, resulting in a high environmental contamination. Pigs excrete worm eggs intermittently and mainly during periods of stress.

The *Ascaris* eggs shed in the environment have a very sticky outer coating and are resistant to all kind of disinfections. These eggs can survive for five years in the surroundings. Internal (high pressure cleaning, disinfection) and external (purchase of pigs) biosecurity tools will not eliminate an infection pressure and consequently, pigs will always be re-infected from the surroundings.

● Liver lesions

Only 1-2 days after infection the L3 larvae arrive in the liver. The migration provokes white spots (also called milk spots) which are initially lymphoid accumulations but mild fibrosis can also occur.

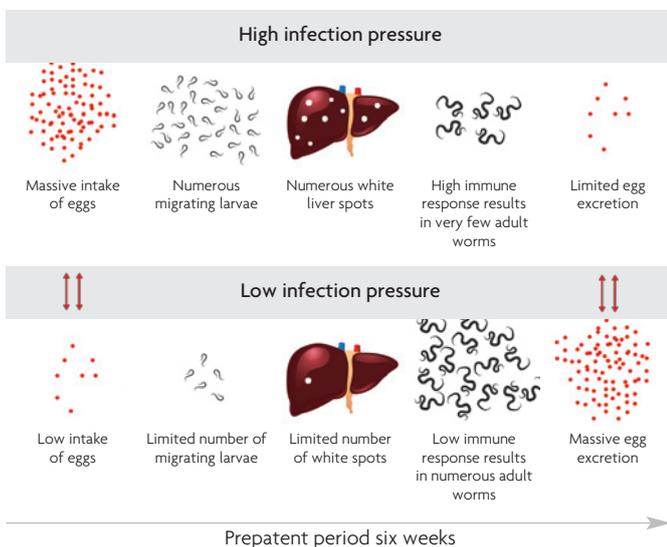
Reports of more than 30% of all livers in the slaughterhouse showing white spots are not unusual. Immunity build-up is mainly due to these migrating L3 larvae. Affected livers are rejected totally or partially in the slaughterhouse and the financial impact is estimated to be €1.5 per liver. Sometimes, when doing an on farm necropsy white spots can also be observed, illustrating the presence of worms.

● Respiratory infections

From 4-5 days after infection L3 larvae start to migrate to the lungs where another change into L4 larvae takes place. These larvae climb through the bronchi and trachea and are swallowed at the level of the pharynx. The larval migration through the lungs induces frequent

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Fig. 1. The paradox of worm infections.



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coughing and these larvae play an important trigger role in Porcine Respiratory Disease Complex. Other lung pathogens take profit of the initial tissue damage caused by the migrating larvae.

Mycoplasma, PRRS and influenza viruses are often triggered by concurrent worm infections but also bacterial infections such as Actinobacillus pleuropneumoniae, Pasteurella multocida and Haemophilus parasuis result in more pronounced clinical signs.

The applied antimicrobial treatments or vaccination programmes frequently do not show the expected results if worm infections are not controlled simultaneously. Logically, a deworming strategy supports the efficacy of the administered antimicrobial leading to a better and controlled use of antimicrobials. This management practice is always gaining more and more importance in the modern pig industry.

● Competition for nutritional ingredients

To ensure an optimal productivity in sows and the best performances in fatteners, all amino acids, vitamins and minerals enclosed in a well balanced feed formulation should be fully available for the pigs.

As the endoparasites deprive the host of essential nutrients due to a lower absorption in the small intestines, the daily weight gain decreases and the feed conversion is negatively influenced. A close monitoring of the feed consumption and average daily weight gain benefits the profitability significantly. Feed costs represent more than 70% of the total production cost of pigs and even minuscule changes in the feed consumption have a substantial impact on the economical margins.

Strategic deworming improves the average daily weight gain up to 5% and lowers the feed conversion rate also up to 5%. More growth increases the total number of pigs brought to the market enormously by a faster rotation of batches. The presence of larvae and adult stages in the intestines is also a predispos-

Improved technical performances		€
Feed conversion ratio	5% down	3.6
Average daily weight gain	5% up	2.1
Mortality and dropouts	25% down	1.6
Better classification of carcasses	3% up	0.1
Less condemnation of livers		
Cost of rejected liver		1.5
Reduction of medication cost		
Respiratory and intestinal infections	down	
Immune response	up	0.4
Efficacy of vaccinations	up	
RESULT (INCOME GAIN/FATTENER)		> 9

Table 1. Estimation of the economical benefits of a deworming strategy.

ing factor for economical important intestinal diseases like ileitis, salmonella and brachyspira infections.

Anthelmintic treatment supports the control of these enteric infections. Compared to untreated pigs, more pigs are classified in the highest lean meat classes after a period of consecutive treatments, also resulting in an added value.

Moreover, deworming improves the immune response of pigs after infection with other pathogens or vaccination and reduces the mortality rate as well as the number of dropouts.

Diagnosis

The above mentioned restrictions for liver lesion scorings and egg counts reveal the difficult interpretation for a correct diagnosis.

A serodiagnostic test of heavy pigs close to slaughter reflects the total degree of exposure to worm infections during the whole fattening period.

Deworming strategy

To lower the infection pressure in fattening units sufficiently, repeated

treatments batch after batch are needed. The interval between consecutive anthelmintic treatments depends upon the spectrum of activity: the narrower, the shorter the interval becomes.

Optimal results can only be achieved with molecules active against all different stages (eggs, intestinal and migrating larval stages and adult worms) and all species of nematodes.

Anthelmintics of the avermectine class have no activity against the migrating larvae. Levamisole (which may be toxic) and other active compounds such as febantel also show a low spectrum. These products do not interrupt all infectious stages in pigs and should consequently be administered more frequently.

Huvepharma recently launched Pigfen 40mg fenbendazole/g premix and oral granules with a complete spectrum of activity. Deworming fattening pigs with Pigfen every six weeks (Fig. 2) covers the prepatent period and guarantees the highest efficacy, if continued over consecutive rounds.

The situation in sows is different because of partial immunity after infection. Therefore, the advised interval for treatment of sows is three months. Group housing facilitates the transmission of eggs.

Deworming sows reduces the horizontal transmission of eggs to their progeny in the farrowing houses and is a must to reduce the infection level in fattening herds.

In summary, Pigfen is advised in:

- Fatteners: every six weeks from 10 weeks of age onwards.
- Gilts: on arrival and repeated treatments every six weeks.
- Sows and boars: every three months.

Microgranulation

In the past, anthelmintic premixes and oral granules were typically formulated as powders, in which the active ingredient was simply mixed with a carrier such as lactose. Pigfen is different and unique in this aspect because fenbendazole is captured in microgranules, in turn, encapsulated in bigger granules. This microgranulation results in extra benefits compared to standard powder formulations:

- Better homogeneity in feed: ensured efficacy as all pigs receive the exact required dose every day.
- Low dust content: highest safety by minimising the risk of carry-over and cross-contamination.
- Better flowability: easy administration, also with automatic dosing devices.
- Better stability: can be used in pelleted feed and stays stable during storage.

Conclusion

The paradox of Ascaris suum infections needs to be well understood when looking to liver lesions at slaughter or counting the eggs in faeces and makes a correct interpretation indispensable.

The absence of clinical symptoms at farm level and white spots at slaughter do not exclude worm infections at all. Indeed, highly infected pig herds show no liver lesions when livers are infected at an early age but healed in the meantime, resulting in a false negative diagnosis.

Worm infections are omnipresent and the economical impact is highly underestimated.

Therefore, a deworming strategy with the microgranulated formulation of Pigfen 40mg/g at a total dose of 5mg fenbendazole/kg bodyweight every six weeks over consecutive rounds is a basic principle for good farm management and a must on every farm.

This total dose can be divided over several days (for example seven days at 0.71mg/kg bodyweight/day) or administered as a single dose treatment. It guarantees optimal technical performances and the best return on investment together with the highest safety. ■

Fig. 2. Deworming strategy: every six weeks for fatteners.

