Parasitic worms – a challenge in organic pig production

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Organic pigs have more intestinal parasites than conventional pigs. Yet, the contamination with parasite eggs and can be reduced by management procedures, the research project PAROL concludes.

The research project PAROL (Organic RDD) has examined the occurrence of parasites in starter pigs (12-16 weeks), fattening pigs (22-26 weeks) and sows on five organic herds. Three intestinal parasitic worms were detected; the large round worm (main focus of the project), the nodular worm and the whip worm. Environmental contamination was mapped and potential control measures examined.

Nodular worms

This parasite is only 1 cm long and was most common in the sows. This is because this parasite somehow evades the pig´s immune system. Pigs therefore accumulate this parasite over time.

Pigs are infected by tiny parasite larvae that develop from eggs excreted to the environment via the pig´s faeces. The larvae are fragile so very dry, hot or cold weather will kill them quickly. Persistence of the parasite in a herd depends on continued excretion of eggs by pigs. It is therefore also reasonably easy to control. One year pasture rotation schemes substantially reduce pasture infectivity, if combined with antiparasitic treatment during the cold winter months.

Large round worms

This 15-30 cm long worm was the most common. A single female worm can produce up to two million eggs per day. This was reflected in the contamination of both pastures and stables (Table 1). Most of the eggs are known to die, especially outdoors. However, the results showed that a few eggs can survive for at least 13 years in the soil.

The younger pigs (starter and fattening pigs) were the most infected. This is because pigs develop immunity against the parasite over time. This is illustrated by the generalized infection model in Figure 1 generated in the project. It is clear, that it is the growing pigs that are the most severely affected. This is a problem as the parasite may cause condemnation of livers at slaughter, reduced feed conversion and potentially reduce the effect of vaccines.

Whip worms

This 5 cm long worm is transmitted via very resistant eggs that also survive for many years. Each female lays very few eggs that develop very slowly. This explains why pig infection levels and prevalences were very low, though the parasite was present in all five farms. This is fortunate as it is the most pathogenic of the worms and high acute infection levels can cause pigs to die.

Parasite control

The high occurrence and resistant eggs make the large round worm the most challenging to control. This was therefore the focus of the second part of the project. Control of whipworms should follow the same guidelines as described for the large round worm below.

Pastures

Piglets on all farms were exposed to the large round worm eggs on the farrowing pastures. Most farms had semi-permanent pastures. Rotation schemes of 1-3 years being too short to allow for natural mortality to ensure "clean" pastures. Especially paddocks for weaned and fattening pigs should be considered a hazard. This is due to the high prevalences, egg excretion rates and stocking rates in these age groups. One study at the university farm indicated that maximum pasture infectivity is reached 2-3 years after contamination. Ploughing of the pastures did not seem to be able to reduce infection levels in pigs.

Apart from long-term (e.g. min 5 years) rotation schemes, there are currently no ways to sufficiently inactivate eggs in the soil. In highly infected herds it may be necessary to treat pigs when they are moved to the stable.

Stables

Only a very small proportion of the large round worm eggs in the bedding material were infective to pigs (Table 1). Still, as there were millions of eggs, enough were infective for the pigs to be continuously exposed. So much so that 87% of the fatteners was positive for liver white spots (due to migrating larvae) at the abattoir. Bedding material may help parasite eggs to survive, but the amount of litter appeared to be less important. The project could not confirm previous suggestion that deep litter deep litter is particularly problematic.

Parasite eggs were found not just on the pen floor, but also on walls and inventory. The results also indicated that sprinklers placed close to areas with straw and manure may dilute urine and faeces. This may reduce the negative impact of ammonia and improve egg survival and development.

Lack of cleaning between batches of pigs was identified as a risk factor. Ideally all manure and straw should be removed and pens washed 1-2 times a year. The pens should then be allowed to dry out, preferably using a gas burner, as heat kills the eggs. Even small amounts of faeces and straw severely reduced the effect of disinfectants.

Composting

For all five farms it was estimated that 81 % of the eggs were dead due to unfavourable conditions (high ammonia, high temperature and/or low humidity) in the litter. The remaining eggs were still viable and millions of eggs could potentially develop if ploughed into the soil with the manure.

The project therefore examined composting of straw with solid manure. The outcome was that if the material is too hot touch (70^{o}C) the eggs will be dead. Alternatively, composting at 50^{o}C for up to one week will also kill the eggs. At 25^{o}C, slurry should be stored for one year, but at lower temperatures this is not enough to inactivate all the eggs.

Monitoring

To determine a herd´s parasite status, faecal samples should be examined. This should be done for 10 starter pigs, 10 large fattener pigs and 10 sows. This will give a good overview before determining if control measures are need and where.

Table 1. Mean number of infective (and total number) of large round worm eggs in soil or bedding material

	Infective eggs/g dry material (total eggs/g dry material)		
	Sows and piglets	Starter pigs	Fatteners
Pasture			
Farrowing	0.7 (1.0)	-	-
Weaning	-	2.3 (8.5)	-
Pen area			
Resting (clean)	-	0.7 (73)	1.4 (135)
Intermediate	-	6.8 (326)	6.3 (555)
Latrine (very soiled)	-	9.2 (1732)	2.6 (1033)