Non-medical control of parasitic worms in pigs

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Parasitic worms that live in the stomach and intestines of pigs are generally found to have a higher prevalence in organic production systems compared to the intensive indoor herds. One reason for this may be that the use of solid floors combined with different types of bedding and outdoor runs or pastures in the organic systems offers better conditions for development and survival of the free-living infective parasite stages (microscopic eggs and larvae). In addition, it seems that roughage may favour the establishment of some parasites. Infections normally "only" cause reduced feed conversion and growth, but may in more severe cases result in unthriftiness and even the death of infected animals.

Though the infections may be effectively controlled through the preventive use of drugs, this is not in accordance with the current regulations and especially not with the organic ideology. Fortunately, there are non-medical control measures that may be incorporated into the normal management practises. However, at present it is difficult to formulate a specific control programme that combines two or more of the control measures because the effectiveness of most of the individual elements has at the most only been partially tested.

To provide some degree of protection against the introduction of more parasites into a herd it is obviously recommended that any new animals that are imported into the herd should be parasite free and that visitors are provided with clean footwear. But if the parasites are already present there are several potential possibilities for controlling the transmission of parasites to the pigs. Past results indicate that it may be important to maintain a moderate stocking rate although this does not seem to be as important as for ruminants due to the difference in foraging behaviour. In Denmark, it is common practise to give sows nose-rings to protect the pasture vegetation by reducing the animals rooting behaviour and this may in turn reduce the uptake of parasites. Co-grazing of sows with heifers has been shown to improve growth of the sows which may in part be due to the removal of some free-living parasite stages by the heifers. However, the last two approaches do not target parasite infections that are already established in piglets, weaners and fatteners.

An entirely different approach that is presently being investigated and that may be used for all age groups above weaning age is feed composition. It has so far been shown that an increase in easily fermentable carbohydrates may reduce infection levels of some parasites. In addition, it is in theory also possible to identify and feed the animals with "bioactive" plants that contain secondary metabolites that have an anti-parasitic effect. A third feed additive is predatious fungi that germinate and feed on parasite larvae in the faecal deposits. Unfortunately this method has not yet been tested against egg transmitted parasites although it may reduce pasture infectivity of the less important larval transmitted parasites.

Because deep litter systems and pastures offer good conditions for parasite transmission it is important to change the deep litter often and not to use permanent pastures. The latter is well recognised among farmers but little is known of how long pigs should be kept away from an infected pasture and what effect ploughing and re-sowing the pastures may have on long term survival and transmission patterns of parasite eggs and larvae. Ploughing may have an immediate

effect by reducing availability of eggs and larvae by transferring them deeper down into the soil. It is however not known if this may decrease or increase long-term survival and this problem is therefore one of the focal points in a current DARCOF II project (MANORPIG).

The experimental work began in the spring of 2001 when 6 identical farrowing pastures were naturally contaminated with the three most common parasitic worms in Danish pigs; *Ascaris suum* (the large round worm), *Oesophagostomum dentatum* (the nodular worm) and *Trichuris suis* (the whip worm). The survival (or pasture infectivity) of free-living eggs (*Ascaris* and *Trichuris*) and larvae (*Oesophagostomum*) is then estimated by parasites free pigs and soil samples every spring and autumn 2001, 2002 and 2003. Three pastures were ploughed in the winter of 2002 and re-sown in the following spring. This was repeated again in 2003. In 2001, a second study was carried out to describe the infection patterns in six litters of pigs born and raised on contaminated pastures.

The results show that *Oesophagostomum* may be considered to be less of a problem than the other 2 parasites as it did not survive on the pastures for more than one season. Even within the first year survival was poor and consequently there was only a low accumulation of this parasite in the six litters.

The majority of *Trichuris* eggs did not become infective until 2002, but there was a considerable pasture infectivity and transmission of *Ascaris* by the autumn of 2001. However, by the autumn of 2002 the number of infective *Ascaris* eggs had further increased and the latest results show that *Ascaris* was still present in very high numbers on the pastures in the spring of 2003. This may indicate that heavily *Ascaris* contaminated pastures should not be used for pigs for at least 2 years after the initial year of contamination. Results for *Trichuris* for 2003 are still pending but it is expected that the number of both infective *Ascaris* and *Trichuris* eggs will start to decline at some point due to natural mortality. However, continued studies of the pastures will show how many years the pastures may still be highly infectious to pigs and when it will be acceptable to turn pigs out again. Ploughing reduced the number of accessible *Ascaris* eggs in 2002, especially in the spring whereas there seems to be no clear effect in the spring of 2003. The reason may be that the parasite eggs survive better deep in the soil than in the surface and that recurrent ploughing brings them up to the surface where they can be picked up by pigs. Lastly it was shown that if pigs are born in an *Ascaris* infected environment they will become infected at a very early age so they may re-contaminate the pastures a second time within the first year.

Overall, the preliminary results indicate that the differences in survival and infection pattern of various parasite species means that control strategies may have to be designed according to which parasites are present in a given herd.