Parasites are a hazard for all pigs but those kept in more extensive conditions and in permanently occupied areas are more likely to build-up significant worm populations that can become a burden to the animals. Slatted accommodation particularly operated on an all in all out basis tends to prevent build-up of worms.

All worms affecting pigs are host specific and have a life cycle in which adults produce eggs, which develop and hatch into larvae outside the host animal. These larvae go through a number of transitional phases that sees them re-enter the pig and progress to the adult stage. Some degree of migration within the body may occur prior to the developed larvae reaching its target destination.

For practical purposes we can restrict this discussion to a small number of worms found commonly in UK pigs.

**Types of worms**

1. **Strongyles**
   a) **Enteric worms**
   Two worms are found in pigs, which are classified as strongyles.

   - Oesophagostomum dentatum - the nodular worm that affects the large intestine of the pig, thus affecting digestion, feeding on blood and nutrients from the host.
   - Hyostrongylus rubidus - the stomach worm that can produce ulceration. (Fig 1.)

   Both of these worms have a direct life cycle in that no other animals are involved in the life cycle. The eggs produced are relatively fragile and will die if dehydrated. (Fig 2.)

   The full cycle for egg production to adulthood is 4-7 weeks although there is some variation with temperature and moisture levels - warm conditions favour maturation of larvae to infective forms. Egg excretion may increase from sows prior to farrowing, providing a rich source of larvae to infect young piglets.

   **Fig 2: Strongyle egg found in sow faeces**

   These two worms have traditionally been linked to the "thin sow syndrome" and any animal suffering poor body condition should be suspected of being infected and treated accordingly. Moreover, immunity to these two worms is poor and as such repeated exposure and build-up of eggs and larvae within the environment will simply progressively increase the burden on the pig, irrespective of age.

   b) **Lungworm**

   Metastrongylus apri is unique amongst UK pig worms in that it has an indirect life cycle, which requires the larvae that hatch from the eggs (coughed up from the lungs of the pig, swallowed and excreted in faeces) to infect the earthworm to enable it to develop into an infective stage.

   Consumption of infected earthworms, which are known to survive in soil for three years or more, results in the larvae penetrating the wall of the pigs’ gut and migrating to the lungs where they mature to complete the life-cycle.

   **Fig 1: Coffee granule appearance of gastric mucosa due to partial digestion of blood**

   Both of these worms have a direct life cycle in that no other animals are involved in the life cycle. The eggs produced are relatively fragile and will die if dehydrated. (Fig 2.)
Fig 3: M apri within the airways of the pig.

It is thus obvious that lungworm is only seen in situations where there can be access to earthworms. This will include outdoor situations, pigs housed on earth floors and occasionally in pigs on deep straw systems that are allowed to build-up over a long period of time. (Fig 3.)

Coughing is the principle clinical sign in pigs affected with lungworm, as well as loss of weight and a predisposition to secondary pneumonia.

2. Ascaris

The large roundworm, Ascaris suum, is responsible for the development of "milk spot liver" in growing pigs (fig 4).

Fig 4: Classic moderate milk spot liver

Again, the life cycle is direct with a small number of adult worms capable of producing, intermittently, vast numbers of eggs which mature and hatch in the environment at a rate determined by temperature, before re-infecting pigs. The mature larvae, once swallowed, penetrate the gut wall and migrate around the body typically through the liver (leading to milk spot lesions) and from there into the lungs. They are then coughed up, swallowed and return to the gut where they mature to adults within ten weeks of eggs being shed.

There are a number of key features with Ascaris:

The eggs are virtually indestructable and can survive in the ground for many years, covered by a sticky coating (fig 5).

Fig 5: A. suum egg shed in faeces

Immunity to adult worms can develop but a sow may live in balance with the parasite - harbouring no more than a handful of adult worms that are all a rich source of eggs.

Milk spot lesions are temporary, resolving in 6-8 weeks and tend to peak in incidence in late summer/autumn, as the warmth of summer favours acceleration of the life cycle.

In many cases there will be no clinical sign of Ascaris infection until the burden of infection becomes high. Slower growth, weight loss and poor feed utilisation will occur but in extreme cases jaundice and liver failure can occur, and coughing may be a feature in young pigs in those recently infected as migration of larvae through the lungs progresses. In very heavy infections blockage of the gut and death can occur.(Fig 6)

Fig 6: A suum blocking the intestine

3. Trichuris

The whipworm Trichuris suis also has a direct life cycle with the adult worm living in the large intestine of growing pigs, feeding on the gut wall and in heavy infection producing enough damage to cause a bloody mucoid scour not unlike swine dysentery (fig 7).
Fig 7: Bloody mucoid scour - Swine dysentery or Trichuris?
Like the Ascaris egg, Trichuris eggs shed in the faeces of the pig are highly resistant to destruction (fig 8) although they can be washed away from the environment relatively easily.

Fig 8: T suis eggs with typical opercula at either end.** (Janssen AH is not part of Elanco Animal Health)
The full life cycle is temperature dependent and takes up to three months. The clinical picture, however, can be seen within a month of exposure to infective larvae. Trichuris can be very difficult to treat, causing continuous or repeated bouts of disease and weight loss in pigs kept in infected accommodation.

Sponsor Content
Worming
Two classes of chemicals are available for the worming of pigs.
- Avermectins - given either by injection or orally in feed. (These products also treat ectoparasites such as mange and lice.)
- Benzimidazoles - these are only available in oral format and only treat worms. In the absence of mange and lice, worming with benzimidazoles (Flubenol: Elanco Animal Health and Panacur: MSD Animal Health) is sufficient and cheaper, although there may be a case for varying the class of anthelmintics used to reduce the risk of resistance build-up. Products are available for incorporation into feed, addition to water supply and for individual oral dosing of pigs - a very useful format for the smaller population.

Both classes of wormer are highly effective in treating pig worms and efficacy of Benzimidazoles against strongyle worms has been shown to be close to 100% unlike the situation in sheep worms where resistance is a major problem. In all cases, meat-withholding times apply but these are typically shorter in all cases for products administered orally.

In occasional situations where an extremely high worm burden has built up in the pig worming can actually be harmful leading to mass killing of worms that can damage tissues of the body. Severe respiratory or enteric disease (coughing and scouring) can result depending on where the worms reside.

Worming Programmes
Worming programmes need to be tailored to the individual circumstances of the farm but some general guidelines can be given.
- For sows, worming at least twice yearly is wise and in small populations this may best be done two to three weeks prior to farrowing (coinciding with the need to treat for mange, pre-farrowing). On permanently occupied ground, additional worming may be appropriate - up to four times a year.
- For lungworms, worming every four weeks is needed with, ideally, a move to clean ground or accommodation after the first treatment.
- For growing pigs exposed to Ascaris, worming two or three times during the growing stages may be necessary to avoid build-up of infestation.
- Where Trichuris is identified as a problem, regular repeated worming at a higher dose than normal is necessary and veterinary advice should always be sought.

Fig 9: worming of pigs kept extensively should ideally be accompanied by a move to clean ground.***

Management
As important as therapeutic or prophylactic worming, attention to the husbandry of the pig is necessary. Worms are the result of faecal-oral recycling and thus hygiene plays an important role. Regular removal of faeces from paddocks and moving to clean ground are vital to avoid parasite build-up and in housed animals, regular washing and disinfection are needed. Use of detergents will help remove Ascaris eggs but their destruction can only be reliably achieved either by burning (flame gun) or lime washing. In both cases, there are serious health and safety considerations for the operator.

For the smaller pig keeper, especially in backyard situations, pigs may occupy uncleanable ground for many years, with the land becoming ‘pig sick’. It may, in some cases, be necessary to totally abandon pig keeping on such ground where Ascaris or Trichuris have occurred. If lungworm is known, removal from the ground for three years is necessary; in cases of enteric strongyles a year’s break may suffice.

To avoid build-up of disease in the first place, regular and routine worming following a specific programme advised by the veterinary surgeon is essential in smaller herds, taking into consideration the need to treat for mange and lice as well.

There is no significant cross over between worm parasites of the pig and those of ruminants when species are mixed. However, the principles of land management to reduce worm burdens in all species are similar.

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