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## Ascariosis in pigs: An overview

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### Abstract

Ascariosis, a socioeconomically important disease occurs in man and pigs caused by *Ascaris lumbricoides* and *A. suum*, respectively. The significance pathological and clinical changes caused by the different stages of the parasite attributed to major economic consequence resulting in production losses linked to reduce feed conversion efficiency and losses to the meat industries associated with the condemnation of 'milk-spot' livers. The pathogenesis, clinical signs, epidemiology, diagnosis, treatment, prevention and control strategies of the disease are discussed in the present communication.

**Keywords:** *Ascaris suum*, pig, milk-spot liver, control

### Introduction

*Ascaris suum*, also called the large pig roundworm or the large white worm occur in gastrointestinal tracts, is a species of parasitic roundworms that infects pigs and wild boars worldwide <sup>[1, 2]</sup>. Adults are found in the small intestine and transiently in the large intestine during expulsion of the worms. Although *A. lumbricoides*, a related species causes ascariosis in human being particularly in children <sup>[1, 2]</sup> yet some researchers have thus argued they are the same species <sup>[3]</sup>. *Ascaris* is the most prevalent endoparasite of swine cosmopolitan in distribution, being present in 50-75% of swine herds in most countries is considered one of the most economically important parasites <sup>[1]</sup>. Ascariosis may occur in any age group depending on the housing and management system but piglets or growing pigs are mostly affected <sup>[2]</sup>. Ascariosis of pig is of major economic significance due to production losses linked to reduce feed conversion efficiency and losses to the meat industry associated with the condemnation of 'milk-spot' livers <sup>[1, 2, 4, 5]</sup>. On the conventional pig farms ascariosis can be observed primarily in weaned and fattening pigs <sup>[5]</sup>. The larvae are mostly responsible for causing the clinical diseases in the hosts. Some clinically healthy pigs may also harbour a large amount of adult ascarids, which cause production losses <sup>[1]</sup>.

### Pathogenesis

The life cycle of the parasite plays a pivotal role in pathogenesis of ascariosis. The parasite life cycle may be divided in two distinct phases after the initial infection: (i) migration of parasitic larval stages through several tissues (intestinal mucosa, blood circulation, liver and lung/airways), namely larval ascariosis; and (ii) establishment of adult worms in the lumen of the small intestine, causing the despoilment of nutrients and secretion/excretion of parasitic products, which down modulate the immune response of the host and characterizing the chronic infection <sup>[6]</sup>. The larvae may cause much damage during the migratory period if the infection is heavy. The large numbers of migrating larval stages may cause a transient pneumonia, but it is recognized that many cases of so-called '*Ascaris pneumonia*' may be attributed to the other infections, or to piglet anaemia <sup>[1, 2]</sup>. Destruction of tissue and haemorrhage may occur in the liver, especially in the intralobular veins, but the most important lesions are produced in the lungs, where the larvae cause numerous small haemorrhages into the alveoli and bronchioles, followed by desquamation of the alveolar epithelium, oedema and infiltration of the surrounding pulmonary parenchyma with eosinophils and other cells <sup>[2]</sup>. In heavy infections death from severe lung damage may occur 6 to 15 days after infection. Nevertheless marked pathological changes are seen in the lungs and there are due to repeated

infections, the lesions of oedema, emphysema and haemorrhages being due to a hypersensitive state resembling asthma<sup>[1, 2]</sup>.

In the liver, the migrating L<sub>2</sub> and L<sub>3</sub> can cause 'milk spot' which appears as cloudy white spots of up to 1.0 cm in diameter, and represents the fibrous repair of inflammatory reactions to the passage of larvae in the livers of previously sensitized pigs<sup>[1, 2, 5, 6]</sup>.

The adult worms in the intestine cause little apparent damage to the mucosa, but occasionally, if the large numbers are present, there may be obstruction, and rarely a worm may migrate into the bile duct, causing obstructive jaundice due to biliary stasis or blockage of the bile ducts<sup>[1, 2, 6]</sup>. Ascarids may wander and enter the stomach and be vomited, or pass to liver. The adults may even perforate the intestine and produce peritonitis. The important effect of alimentary ascariasis is economic in young pigs, with poor feed conversion efficiency and slower weight gains, leading to an extension of the fattening period by 6 – 8 weeks<sup>[2, 3]</sup>.

### Clinical signs and symptoms

The clinical signs of the disease depend on the severity of the infection mostly in young piglets. Newborn pigs which become heavily infected may show signs of pneumonia, especially a cough and exudates into the lungs. In less severe cases the animals cough and their growth is stunted. Heavily infections with adult worms produce diarrhoea and this has a marked effect on their growth rate.

Heavily infested pigs may have up to twenty five worms blocking the small intestines and bile duct causing loss of appetite, vomiting, jaundice and death if the small intestine is ruptured<sup>[4, 5]</sup>. In mild cases there is reduced appetite, poor feed efficiency and slow growth. Growth rate and feed efficiency can be decreased by up to 10%<sup>[2, 3, 4]</sup>. In acute phase of infection, frequent coughing is mostly observed which is caused by the larval migration in the lungs of the host, thereby potentially exacerbating other diseases.

Clinical signs also include poor feed efficiency, colic, weight loss, rapid shallow breathing, unthrifty appearance, coughing, pneumonia, diarrhea and death. However, many hogs appear normal after having heavy parasitic infestation.

### Epidemiology

*Ascaris* eggs can remain infective for years in the soil, even in a temperate climate<sup>[4, 7]</sup>. The migration of *A. suum* larvae through the lungs may cause secondary bacterial infections and result in acute respiratory symptoms in pigs<sup>[4, 8]</sup>. Young pigs are chiefly affected but occurrence of the parasite in categories of the ages of swine throughout the world<sup>[1, 4]</sup>.

### Diagnosis

Diagnosis is based on clinical signs, necropsy and infections with the adult worm, on the presence in faeces of the yellowish-brown ovoid eggs, with thick mammillated<sup>[1, 2, 9]</sup>. Being dense, the eggs float more readily in saturated solution of zinc sulphate or magnesium sulphate than in the saturated sodium chloride solution which is used in most faecal examination techniques<sup>[1]</sup>. During the early stages of the disease the pulmonary signs will indicate the possible aetiological factor and larvae may be found in the sputum<sup>[4]</sup>. The migration of larvae of ascarids worm causes scars or white spots on the liver and these can be observed during necropsy of young pig or at the time of slaughtering of pig in the market<sup>[4]</sup>. Some serological test and molecular test have also the potential to diagnose the disease.

### Treatment

The imidazole and benzimidazole anthelmintics are the compounds of choice for ascarid infections in pigs. The intestinal stages are suitable to most of the anthelmintics in current use in pigs, and majority of these, such as the benzimidazoles, dichlorvos, or tetramisole are given in the feed<sup>[1]</sup>. In case of suspected *Ascaris* pneumonia injectable levamisole and ivermectin may be more convenient. The following anthelmintics can be used

1. Levamisole may be given by subcutaneous injection @ 7.5 mg/kg or by drench @ 8mg/kg bwt or offered in the feed @ 0.72 g/kg feed for herd treatment.
2. Tetramisole: @ 15 mg/kg bwt. Orally with feed; As feed additive, 5 kg are added to 500 kg of feed or @250 g/25 kg of feed.
3. Parabendazole: @ 30 mg/kg bwt. Orally
4. Fenbendazole: @ 5 mg/kg bwt orally
5. Cambendazole: is usually applied as a 'top dressing' to feed to give a minimal dose of 20 mg/kg.
6. Dichlorvos: @ 10 mg/kg for sows or 40 mg/kg for weaning pigs, usually mixed with feed.
7. Morantel tartrate: For weaners - @ 5mg/kg is recommended mixed in the feed given at 8 – 10 weeks of age. For older animals, e.g. sow and boars: @12.5 mg/kg in the feed is recommended.

It is an established phenomenon that pigs should be dewormed at the age of 6 to 8 weeks with above mentioned suitable anthelmintic depending upon the availability. Use of different dewormer again in 30 days is found advantageous if pigs are raised on dirt. Before entering the farrowing house to get rid of worm on their bodies, sows and gilts should be washed and cleaned. In parasitic control program sows and gilts should be dewormed at the age of 1 to 2 weeks before entering the farrowing house.

### Prevention and control

In the past, elaborate control systems have been designed for ascariasis in pigs, but with the appearance of highly effective anthelmintics those labour-intensive systems are falling into disuse. The chief problem in control is the great survival capacity of the eggs, but the housed pigs, strict hygiene in feeding and bedding, with frequent hosing of walls and floors, will limit the risk of infection. In pigs in free range the problem is greater, and where there is serious ascariasis it may be necessary to discontinue the use of paddocks for several years, since the eggs can survive cultivation. Monitoring and control of internal parasite in the herd is important to reduce the infection and detrimental effects. Though several anthelmintics are available, cleanliness, hygiene and general good management must be practiced to minimize losses<sup>[5]</sup>. A combination of all these practices will most effectively control internal parasites of swine. Parasite control programs may vary with the individual farm depending on their rearing system. It is good practice to treat in pig-sows at entry to the farrowing pen, and on farms where ascariasis is prevent young pigs should receive anthelmintic treatment at 5 – 6 weeks of age, and again 4 weeks later<sup>[1]</sup>. Contaminated pig pens can be rendered safe by the use of a solution of hot caustic soda or live steam<sup>[2]</sup>. Avoid ingesting soil that may be contaminated with human or pig faeces, including where human faecal matter ("night soil"), wastewater, or pig manure is used to fertilize crops. *Pochonia chlamydsoporia*, a fungus remained viable after passing through the gastrointestinal tract of swine, maintaining its

ability of destroying *A. suum* eggs hence this species of fungus may be used as biological agent to control ascariasis [10].

### Sanitation and management practices

1. Sows should be washed using mild soap solution and rinse with a mild antiseptic solution as soon as possible prior placing them in the farrowing house. Special attention should be given to udder and feet.
2. Farrowing pens should be cleaned and free of manure to prevent exposure of baby pigs to large numbers of worm eggs and parasite larvae.
3. Should avoid using of permanent pastures or dirt lots. Rotate permanent pastures yearly or renovate pastures periodically if temporary pastures are not available.
4. There should be well drained areas for lots and pastures. Should be avoided the formation of mud holes and overstocking lots and pastures.
5. There should be provision of adequate nutrition to minimize the effect of parasitism and to reduce the tendency of pigs to search and root for food.
6. Pigs raised on concrete have some advantage over those raised on dirt as their regular cleaning and sanitation practices are followed.
7. Should be avoided the raw feed or improperly cooked garbage or table scraps to swine.

### Conclusion

The worldwide distributed ascariasis in pig showing the various pathological changes and clinical signs and symptoms can be prevented by using suitable anthelmintics, maintenance of proper hygiene and good sanitation.

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