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WORMS IN PIGS

By F. C. WILKINSON, B.V.Sc., Veterinary Surgeon

THE large roundworm (Ascaris lumbricoides) is the only one of the 16 known worm parasites of pigs that has any serious effects upon the pig industry in this State. This parasite is widely spread in most of the areas where pig-raising is practised, and is the cause of much of the stunted growth seen in young pigs, as well as some deaths.

These roundworms are usually found in the small intestine and generally average six to ten inches in length. They are creamy-white in colour, cylindrical in shape, tapering to a point at both ends.

Some idea of the damaging effects of worm infestation upon the growth of young pigs may be gathered from experimental evidence which showed that for each roundworm found in a pig's intestines at five months of age, the pig weighed at least 1 lb. less than its litter mates which were kept worm-free.

LIFE-CYCLE

The life-cycle is quite complicated but interesting and of more than just academic interest, because from an understanding of the life-cycle comes the realisation of the cause of much of the damage by the parasite and the basis of the all-important control programme.

The adult female worm is a prolific egg layer and may produce up to 200,000 eggs daily. These are microscopic in size and are passed on to the ground in the droppings of the pig. The eggs once on the ground, develop to an infective stage in ten days or longer, depending on how suitable the conditions are. Eggs developing at the stage of containing an infective larva, are extremely resistant to varying climatic conditions and may remain alive for several years. If however, they are exposed to direct sunlight under hot dry conditions, then they are unlikely to survive for more than a few weeks.

The infective eggs, that is those with a larval parasite coiled up within the shell, do not develop further until they are swallowed by a pig. In older pigs they are taken up in the food or water, whilst in the case of young pigs, they are usually sucked from the teats of the sow during feeding. Upon reaching the small intestine of the pig, the eggs hatch and the larvae are set free. They burrow into the wall of the intestine and reach the blood vessels where they are carried in the blood stream to the liver, and then through the...
heart to the lungs, where they escape into the air sacs of the lung and undergo further growth and development. After about 7 to 23 days from the time of infestation, the larvae migrate up the trachea (windpipe), are swallowed, and pass once again to the small intestine. This time they remain and grow to maturity in eight to nine weeks.

Important points to be drawn from the life history are—

1. The enormous number of eggs produced by the mature female worm.
2. The eggs once on the ground are not infective until ten days have elapsed.
3. The extreme resistance of the eggs in the surroundings of a pig sty, where they may remain infective for years.
4. The damage to the liver and more especially the lungs by the migrating larvae.

SYMPTOMS

The symptoms depend on the severity of infection and the age of the pigs. Older animals can harbour large numbers of worms yet they rarely suffer any ill-effects. In new-born pigs which become heavily infected, they develop what is commonly referred to as "thumps." They go "off colour," pant violently, crawl into dark places and commonly die within a week of being infected.

Weaners may tolerate fairly heavy lung infections, as long as they are well fed and warmly housed, but if the conditions should suddenly deteriorate, secondary infection with bacteria can lead to a severe outbreak of pneumonia with much coughing, and possibly severe mortality. In addition, if the infective agent of virus pneumonia is present in the herd, it will cause more damage in those lungs where the larvae of roundworms are present, than in those which are free of larvae.

In young pigs harbouring the adult worm in their intestines, growth of the pig is seriously impaired. They remain stunted and unthrifty, while the coat is rough, and the pig has a pot-bellied appearance.

DIAGNOSIS

When the presence of roundworms is suspected, the diagnosis may be confirmed by the slaughter and post-mortem examination of an animal showing typical symptoms. The worms will be found in the small intestine (runners) which extends from the stomach to the caecum ("blind gut"). This portion of the intestine should be freed from its attachments and opened with scissors. The parasites, when present, will not be overlooked on account of their large size. Occasionally, worms which have wandered from their natural site in the small intestine may be found in the stomach or in the bile ducts of the liver.

Both liver and lungs may show evidence of the injury inflicted by the larval worms during their migration. The surface of the liver may show the presence of whitish areas about \( \frac{1}{4} \) in. in diameter which are popularly known as "milk spots." The lungs may show more or less extensive solid pneumonic areas which contrast sharply with the spongy normal lung tissue which surrounds them.

When a post-mortem examination cannot be performed, a diagnosis can usually be established by examination (in the laboratory), of a sample of the droppings for the presence of worm eggs.

TREATMENT

Two extremely efficient drugs, sodium fluoride and piperazine, are available for the removal of the adult worms from the intestines of the infected pigs. No drugs however, are available to kill the larvae of the parasite during their migratory phase through the liver and lungs.

Sodium Fluoride.—When sodium fluoride is employed according to the following dose rates and mixed as prescribed, obeying the precautions noted, it is very efficient and cheap to use.

<table>
<thead>
<tr>
<th>Live Weight of Pigs (lb.)</th>
<th>Number of Pigs to 1 oz. of Sodium Fluoride</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>21-40</td>
<td>7</td>
</tr>
<tr>
<td>41-60</td>
<td>4</td>
</tr>
<tr>
<td>61-80</td>
<td>3</td>
</tr>
<tr>
<td>81-100</td>
<td>2-1/3rd</td>
</tr>
<tr>
<td>101-150</td>
<td>2</td>
</tr>
<tr>
<td>151-200</td>
<td>1(\frac{1}{2})</td>
</tr>
<tr>
<td>over 200</td>
<td>5/6ths</td>
</tr>
</tbody>
</table>
Prior to treatment, the pigs should be graded into small groups (up to ten animals) of even size, and the amount of sodium fluoride to be administered in their feed computed on a weight basis by reference to the above table.

This should be accurately weighed and thoroughly mixed in an amount of food which will be consumed during the course of the day.

An allowance of one pound of the treated food mixture per 25 lb. liveweight will be found adequate.

On this basis, seven weaners averaging 35 lb. would receive one ounce of sodium fluoride in about 10 lb. of food material. This amount will usually be consumed during the day, but should any remain uneaten it should be mixed with the evening feed. The drug will be taken readily in a mixture of crushed wheat and meat meal, which should always be fed dry, but any other meal mixture will be found equally satisfactory. It should never be given with wet mash or as a drench, as toxic effects are liable to follow.

In the treatment of large pigs, sows and boars, the dose of sodium fluoride should be divided, half being given in the morning, and the balance in the evening. In the case of such animals the food is often consumed rapidly, and the ingestion of a full dose of sodium fluoride in a short space of time may provoke violent vomiting. This does not occur when the dose is divided.

It is usual to starve the pigs overnight (allowing no food on the previous evening) prior to treatment, but this procedure is probably unnecessary.

Following treatment, worms do not usually make their appearance in the droppings for two to three days, and may continue to be passed out until the eighth or ninth day.

The efficiency of sodium fluoride for the expulsion of round worms from the small intestine of the pig is of a high order. In the treatment of small groups of pigs experimentally, it frequently reaches 100 per cent. and under field conditions, it can usually be relied upon to expel 85 to 90 per cent. of the parasites.

When the drug is given in medicinal doses, apart from the passage of soft faeces and mild vomiting in a few cases, no ill-effects need be expected. Amongst large numbers of pigs included in field trials no deaths resulting from treatment have been recorded. The gradual consumption of the treated food apparently provides an adequate safeguard against the toxic effects of sodium fluoride, and in addition should an excessive amount of the drug be consumed, vomiting is induced, so providing a further safeguard.

The evidence now available indicates that sodium fluoride, when given in the recommended dosage is a safe and highly effective drug for the treatment of worms in pigs.

**Piperazine.**—Piperazine is manufactured in many different forms by various manufacturers. The dosage varies with the form of piperazine and so varies with the different proprietary lines. The dosage however for the most efficient treatment in each case, is clearly written in the instructions.

Advantages of piperazine are that:

1. It has a very low toxicity and is free from side-effects such as vomiting.
2. It may be given in wet or dry feed or in the water.
3. Fasting before or purging after treatment is not required.
4. The drug is very palatable and readily eaten by the pig.

One important point when administering piperazine is that for maximum efficiency, the drug should be given in a small amount of food or water so that it is consumed over a period of only two to three hours. Worms can be seen in the droppings about 24 hours after administering the drug.

Other drugs which have been used such as santonin, oil of chenopodium and phenothiazine are far less efficient than sodium fluoride or piperazine and should definitely not be used.

In general, it will be found necessary only to treat weaners and slips and this should be practised as a routine procedure on properties where infection is known to exist. The treatment should be carried out in a temporary enclosure and the pigs should then be transferred to fresh ground within ten days of treatment and before any eggs passed by them can become infective.
PREVENTION AND CONTROL

Due to the large number of eggs produced by the adult female worm and the long life of these eggs under the normal condition found around a pig sty, the soil soon becomes heavily contaminated with infective worm eggs. Consequently young pigs, which are highly susceptible, are exposed to infection from the time of birth. While treatment will remove the adult worms from the intestine it can have no effect on the larval stages of the worm which seriously damage the lungs and liver during their migration. Thus the important preventive measures are those concerned with the protection of young pigs from birth. A very satisfactory system is known as the MacLean County System.

The following procedure is adopted—

The sow is treated with piperazine or sodium fluoride before farrowing. A few days before the farrowing is due to occur, the floor and walls of the farrowing pen are thoroughly cleansed by washing with a boiling 5 per cent. lysol solution (8 oz. to the gallon of water) applied with a hard broom. Immediately before being placed in the farrowing pen the sow is washed with a warm solution of soap and water, all mud and litter being removed; particular attention being paid to cleaning of the udder and teats. This will remove any worm eggs which may be adhering to the body of the animal. Within ten days of farrowing, the sow and her litter are carted to a clean field or a field which has been sown with a green crop and has not been occupied by pigs within the past year.

Under this system, young pigs may be carried to the age of four or five months without becoming seriously affected. Thereafter the animals, which are no longer highly susceptible may be transferred to yards for fattening.

THE COW

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