

NOTES ON THE COMMON PARASITES USUALLY FOUND IN THE BODIES OF FOOD ANIMALS.

By JAMES KING, M.R.C.V.S.,

Veterinary Inspector and Superintendent, Metropolitan Cattle Market.

(MEMBER.)

THE subject of Parasites and Parasitic Diseases is one of great importance. Few people seem to realize to what an enormous extent our flocks and herds are affected by their ravages, or the losses they cause to our farmers and meat salesmen. It is in the hope that others who have to deal with the examination of meat will interest themselves in the subject that I agreed to the request of the Committee of The Royal Sanitary Institute to write the few following notes.

If inspectors of slaughter-houses would make themselves better acquainted with the parasites affecting the food animals and the conditions they produce, not only would they be doing their duty in the interests of the public health as sanitarians, but they would also be doing a public duty in assisting to reduce the prevalence of parasitic disease and the losses annually caused thereby. Not only should an inspector be able to recognize disease when an animal is slaughtered: but he ought also to know how such disease is spread.

It is not the mature parasite which always causes the trouble, but its immature form, which is usually developed in the body of an animal of a different class from that in which the parent parasite exists. The animal which harbours the parasite is termed its host or bearer, and animals which serve the temporary purpose (i.e., when the parasite is in a certain stage of development) its intermediary host. The part in which the parasite lodges is called its habitat.

Parasites are found more abundantly in some localities than others. This is also the case at different seasons, more especially as regards fluke disease, this parasite being found more largely after a wet season, which favours the existence of the snail that acts as its intermediary host. Dry seasons also favour the development of external parasites.

Parasites are most prevalent in the neighbourhood of towns; the reason being that all excreta and dust from slaughter-house refuse, which we know teems with them or their ova, is used on pastures and other lands for manurial purposes; hence animals feeding on such lands are more liable to be attacked by parasites than on land distant from towns. Woods, long grass, and underwood form protection for them, and here you have hares and rabbits, which also become intermediary hosts. Such animals as the dog are very apt to become the subjects of tape-worms; being voracious it eats up everything in the shape of flesh food that it comes across, and this often contains the immature forms of tape-worm.

The sheep, again, is very easily affected by flukes, the reason being that it bites close to the ground, and picks up the immature form of the fluke; and as it is also associated with dogs, it is very liable to pick up the ova of tape-worms which have been evacuated by them, thus becoming the intermediary host of this and various other parasites to which the dog is subject.

Parasites may be found in any part of the body, even the brain and spinal cord, young animals being more largely affected than old ones. According to eminent authors, the development of parasites may be simple (that is, directly from the ova) or complex; and in some stages of development the young parasite has no resemblance to the parent, as is the case with hydatids or bladder-worms, which are simply immature tape-worms.

HOW SPREAD.

The parasites, their ova, or embryos, are passed out of the body by the usual excretory channels, and they are also liberated from the bodies of their hosts in the ordinary processes of putrefaction and the dressing of carcases. They may be conveyed from place to place by various means, such as by water, by birds and the feet of animals, or by hides, skins, hair and wool, the distribution of refuse and offal.

After being taken in by an animal suitable for their development, a great many of the embryos (particularly those of tape-worms) penetrate from the digestive tract to different parts of the body, where they become encysted and form hydatids. As such they remain until taken into the body of a suitable host, when they further develop into a tape-worm similar to that from which they originated.

In the various works on this important subject, they are classified as follows: 1st, Entozoa, viz., those that undergo transformation inside the body; 2nd, Ectozoa, those that undergo transformation inside or outside the body; 3rd, Epizoa, entirely inhabiting the outside of the body.

As meat inspectors, Entozoa is the class of most importance, and this is again sub-divided into several classes; but for our purpose it will be sufficient to divide it into three: Cestodes, or tape-worms; Trematodes, or flukes; and Nematodes, or round-worms.

CESTODES.

The cestodes include all tape-worms and their hydatids, or bladder-worms. Hydatids are cysts containing watery fluid, and are in reality tape-worms in a certain stage of development, and possessing a head or heads which correspond to the heads of the tape-worms, from which they originated, and by which they are recognised. So far as the tape-worm is concerned, it is of little importance to us, as it is seldom the cause of sufficient disturbance to render a carcase unfit for human food. Occasionally, however, especially in lambs, when the number is excessive, conditions are produced which justify condemnation of the carcase; but this is rare.

What concerns us most is the condition produced by the hydatids, and also the possibility of human beings being infected by the consumption of the organs and tissues in which they exist. It is therefore our duty to be able to recognize the hydatids, and to know the tape-worm they produce. As I previously stated, I intend only to describe shortly a few of these hydatids commonly met with in the ordinary course of meat inspection in slaughter-houses.

The most common hydatid we meet with is one known as the *Echinococcus Veterinorum*. This is the hydatid of the tape-worm *Tenia Echinococcus*, which inhabits the intestines of the dog. These cysts may be localized in any organ of the body (very often in the lungs and kidneys), but most largely in the liver. I have also found them in the muscular tissue. They vary in size from that of a pin's head to that of a large orange, and often, when cut into, you will find that the larger ones contain other cysts of different sizes. On this account they are called the "pill-box" hydatids. If you examine these cysts you will usually find in the fluid contents a number of little yellowish-white bodies, resembling grains of sand. Each of these is said to be an *Echinococcus*, capable of developing into a tape-worm. In the case of the liver, they sometimes exist in such numbers as almost to displace the whole of the tissue. I have seen the livers of cows, so affected, weighing as much as 80 lbs. In such cases the carcase will be found, as in other parasitic diseases, to be pale and dropsical, and should be condemned as unfit for human food. Of course it does not follow that all carcasses should be condemned, as a great many animals are affected by

this parasite while showing no effects; the carcase being in good condition after slaughter; but great care should always be taken to remove all affected organs out of the reach of dogs, and to have them destroyed.

Cysticercus Torniocolis.—This is the hydatid of the tape-worm *Tenia Marginata*, which also inhabits the intestines of the dog. It is found in the abdominal cavity of sheep and pigs, often in large numbers, and usually attached to the omentum and mesentery, where they are suspended in a fold of peritoneum. These cysts vary in size from that of a pea to a tennis ball, and differ considerably from the *Echinococcus Veterinorum*. When you examine them you will find a white spot in the centre; this is the head, which a little pressure will cause to protrude. It is the most harmless of all the hydatids. Hundreds may exist in one animal without showing any apparent effect, the reason being that they do not interfere with the functions of the different organs as does the *Echinococcus*, which is always found in the organs, but the *Torniocolis* is found outside or on the surface of them. In pigs they are often found attached to the diaphragm and lying on the liver, when they cause depressions, and may be mistaken for *Echinococcus*; but with a little care they can be removed, and on close examination will be found to contain a head and long neck, which is characteristic of this parasite. It is very rare that a carcase is condemned on account of it.

Cenurus Cerebralis.—The cystic form or hydatid of the tape-worm *Tenia Cenurus*, which also inhabits the intestines of the dog, and is the one which gives rise to the condition known as "sturdy" in sheep. It is usually lodged in the brain. If the head of the sheep which has suffered from the effects of this parasite be carefully opened, it will be found that the gradual growth and pressure of the cyst will have displaced the brain substances in the part where it was lodged. This parasite is mostly found in young sheep. If the animal is slaughtered as soon as the symptoms are discovered the carcase will be found in good condition, and, with the exception of the head, may be passed; but if the sheep is allowed to live any length of time it will gradually become emaciated, and should be condemned as an emaciated carcase.

Cysticercus cellulosus.—The hydatid of *Tenia solium*, a tape-worm which inhabits the intestines of human beings. This cyst is found in the connective tissues of the muscles of the pig throughout the body. It is somewhat flask-shaped, and varies in size from that of a millet-seed to a small pea. During life its presence may be detected by an examination of the tongue, on either side of which rows of what appear to be little blisters may be observed. After slaughter of the pig, in the exposed muscular

tissue you will notice numbers of small blebs, like grains of rice, which can easily be taken out with the point of a small knife. The muscles are usually pale and flaccid in appearance. The carcase does not set well, and quickly decomposes, and should be condemned. Occasionally you will find that the cysts have undergone calcareous degeneration, and when the flesh is cut, a grating sensation is felt, as if cutting through sand. Happily, this disease is now becoming very rare. About eight or nine years ago it used to be very common amongst Irish pigs, which was no doubt due to the method of feeding, but now it is very difficult to find a specimen. Out of nearly eighty thousand pigs which were inspected, after slaughter, in the Metropolitan Cattle Market during 1904, not one was found affected with "measles" (the trade term for the disease).

Cysticercus bovis (or Beef Measles).—The hydatid of *Tenia medio-canellata*. This disease resembles very much the disease in pigs. It is said to be very common in India, but is very seldom seen in this country. I have seen only one case.

As in pork and beef, we have also the mutton measles, i.e., *Cysticercus ovis*, but I have not seen a specimen, and I am not aware that it is known what tape-worm gives rise to it.

Cysticercus pisiformis.—The hydatid of *Tenia serrata*, commonly affecting sporting dogs. The cyst is about the size of a pea, and is usually found attached to the omentum of rabbits and hares. You will often notice when disembowelling these animals that numbers of these cysts are attached to the omentum, and occasionally to the diaphragm. They do not seem to have any effect on the rabbits, but should be carefully kept out of the reach of dogs and destroyed.

Another cyst which is found in rabbits is *Cysticercus serialis*. It is the immature form of another tape-worm of the dog, i.e., *Tenia serialis*, and is larger and more important than the previous one. It is found under the skin and between the muscles, varying in size from a hazel nut to a pigeon's egg. It can often be discovered in a live animal by passing the hand along the back, when you feel slight elastic enlargements. In the carcase, after the skin has been removed, they will be found throughout the body in the connective tissue between the muscles. Such a rabbit is unfit for food, and should be condemned. The muscles are usually pale and flabby.

The foregoing are hydatids most commonly met with during the course of inspection in slaughter-houses. There are others, but not of so much importance to food inspectors.

At the commencement of these notes I said that very few of our larger

food animals were the subject of the tape-worm, but in the autumn, when young sheep are being slaughtered, a great many will be found affected with a tape-worm known as *Tenia expansa*, specimens of which can often be obtained measuring three to four yards. In the majority of sheep they seem to do little or no harm, but there is no doubt that if care were taken to examine the bowels of many of the lambs that are condemned through being emaciated (or being, as the farmers say, "bad doers"), it would be found that this tape-worm was the cause.

TREMATODES.

Trematodes are flat worms, commonly known as "flukes." The one of greatest importance to us is the common fluke, *Distoma hepaticum*, but which is now known as *Fasciole hepaticum*, the former name being applied under the supposition that it had two mouths. This parasite resembles very much the fluke or flounder fish, and is found mostly in the liver of sheep, its habitat being the bile ducts. It is also common in cattle, occasionally present in the horse, and is said to be also found in man. It attains a length of about three-quarters of an inch, but occasionally larger specimens may be seen. In cutting into the liver affected, you will find specimens varying in size from one-eighth of an inch up to the length afore-mentioned. They are of a slaty colour when freshly taken from the liver. This parasite is the cause of very great losses to our farmers and anxiety to inspectors. It is sometimes found in the lungs of both sheep and cattle, but there does little harm, as it soon becomes encysted. The wall of this cyst is usually calcareous; when cut into, it is found to contain a peculiar chocolate-coloured fluid. These cysts are usually found at the lower end of the lungs, and cannot be mistaken for anything else, as no other cyst contains this peculiar coloured fluid. Fluke disease (or, as it is usually termed, "liver rot") occurs most largely during the spring following a wet autumn. This is due to the fact that for the development of the parasite, and also for the existence of its intermediary host (the fresh-water snail), moisture is necessary. It will be noticed on examining the livers of sheep and cattle which have been invaded by flukes, that the bile ducts stand out on the surface, and owing to this such livers are termed by butchers "pipey" livers. Many of them on being cut into are hard and gritty, owing to their having become calcareous. It will also be noticed that many of the bile ducts become dilated and form pouches, which are usually filled with the parasites.

In the early stages, or when sheep are first infected with this parasite,

the irritation it produces in the bile ducts seems to increase the flow of bile; and on account of this the sheep seems to thrive rapidly, and if slaughtered at this stage, the carcase will be found in good condition. When the parasites are present in excessive numbers they are very apt to cause jaundice, and as time goes on they eventually cause cirrhosis of the liver, thus preventing the organ fulfilling its proper function, and the animal gradually becomes emaciated and dropsical. The appearance of the carcase is described as being pale, wet, and flabby, it is innutritious, and certainly unfit for the food of man.

NEMATODES.

For our purpose the most important to us of this class of parasites are those which inhabit the bronchial tubes: these are small round worms which cause considerable trouble, and are found most largely in the calf and sheep, but occasionally in the pig. In the different animals they have different names, although some are of opinion that it is the same parasite in all. The one in the sheep is known as *Strongylus filaria*; in calves, *Strongylus micrurus*: and that in pigs, *Strongylus paradoxicus*. They produce what is known as verminous bronchitis. They vary in length from an inch to two inches, and as they inhabit the tracheæ and bronchial tubes they are a source of continual irritation, causing animals to be constantly coughing. This condition is very prevalent in young animals, and is known as "hoose." If during lifetime the parasites are present in excessive numbers, they produce the conditions already mentioned as being common to all parasitic affections, a wet and flabby condition of the carcase. In the lungs will often be found consolidated patches. Unless the carcase shows signs of emaciation and fever, it is usual to condemn the lungs only.

There is another parasite found in the lungs of sheep, known as *Strongylus rufesens*. It is very much smaller than the above, and exists more in the substance of the lung. The eggs or embryos are deposited almost immediately under the pleura, forming little nodules which are usually of a greyish-yellow colour. This condition is found in adult animals, and is very common; it is called by many "pseudo-tuberculosis" of the sheep. It will be found that the lungs of at least 60 per cent. of all sheep slaughtered are affected by this parasite. It does not seem to have any effect on the carcase, as it will be noticed that the majority of the sheep are in good condition after slaughtering. This condition of the lungs has been mistaken for tuberculosis, but that disease seldom affects sheep, the writer having found only three cases in those animals during the whole of his experience.

Trichina spiralis.—This is a very small worm which, for its complete development, requires also to find its way into two different hosts. The embryo, or immature worm, is usually found coiled up in the muscular tissue of the pig. This disease is very common in Germany, but fortunately it is rarely seen in this country, only two cases having come under my notice, one being an English pig, and the other a ham from the United States. In newly-dressed carcasses the condition is very difficult to recognise without a good lens; it appears like little grains of yellow sand throughout the muscular tissue, each of these is in reality a small calcareous cyst, which contains immature trichinae. In the case of the ham, however, it is recognisable with the naked eye. This is no doubt due to the contraction and drying of the tissues during the process of curing. When such pork or ham is eaten, we are informed that the calcareous shell of the cyst is dissolved by the action of the digestive juices, and the embryonic worm liberated; and in the intestines in the course of two or three days they reach maturity, and are known as Bowel Trichinae. These give rise to enormous numbers of young trichinae, which burrow out from the intestines, enter the muscular tissue, and again become encysted. In this condition they are harmless, until again taken into the body of another host.

Gut Tumours.—Gut tumours, or pimply guts: terms used by gut dealers for a condition found in the intestines of sheep and cattle. This condition is reported on fully by Cooper Curtice, in his excellent report on the parasitic diseases of sheep to the American Bureau of Agriculture in 1890, in which he states that it is produced by a small worm, which he names *Esophagostoma columbianum*. This parasite is very common in United States sheep, rendering the gut useless; and it has been found that about seventy-five per cent. of the sheep imported to this country from the United States and Canada are subject to this disease. Recently great numbers of British Cattle and sheep have become affected with this parasite. The mature worm is about three-quarters of an inch in length, and is found in the intestines. The embryo, or immature worm, burrows into the intestinal wall and becomes surrounded by greenish-yellow cheesy matter, forming small tumour-like enlargements in the small intestines. As the gut of sheep and cattle is largely used for making sausage casings, it will be seen how necessary it is that careful inspection should be made of it as well as of other edible parts of the carcass. This condition is the cause of very great loss to the gut dealers and contractors, as, when cleaning, those little tumours often leave a hole and render the gut useless as a sausage skin. It is possible that if a

little extra care were exercised by the cleaners when dealing with such gut, the tumour would be left on. This I know to be the case, as I have myself seen in the window of a shop not far from the centre of London beautiful smoked sausages with rather suspicious dark spots on the outer casing. It may be interesting to readers to know that precautions are being taken in Germany, under the German meat inspection laws, to prevent the importation of such skins into that country; all barrels containing gut being opened at the port of landing, and when found to be infected with the parasite, destroyed, and the consignor charged with the cost of destruction.

My opinion is that the disease is spread among cattle and sheep in this country owing to the careless way in which this gut is dealt with in abattoirs. It is usually thrown with the manure, which is sent out without being treated in any way to farms, and the parasites and their ova conveyed to the land on which our food animals graze.
