

The diagnosis is readily made by the examination of the fæces, which contain, sometimes in great abundance, the characteristic lemon-shaped, hard, dark-brown eggs.

(c) *Eustrongylus Gigas*.—This enormous nematode, the male of which measures about a foot in length and the female about three feet, occurs in very many animals and has occasionally been met with in man. It is usually found in the renal region and may entirely destroy the kidney.

(d) *Rhabdonema Intestinale*.—Under this name are now included the small nematode worms found in the fæces and formerly described as *anguillula stercoralis* and *anguillula intestinalis*. This parasite occurs abundantly in the stools of the endemic diarrhoea of hot countries, and has been specially described by the French in the diarrhoea of Cochin-China. It occurs also in Brazil, and has been found in Italy in connection with the anchylostoma in cases of miner's anæmia. It is stated that the worms occupy all parts of the intestines, and have even been found in the biliary and pancreatic ducts. It is only when they are in very large numbers that they produce severe diarrhoea and anæmia.

Acanthocephala (Thorn-headed Worms).—The *echinorhynchus gigas* is a common parasite in the intestine of the hog and attains a large size. The larvæ develop in cockchafer grubs. Lambl found a small *echinorhynchus* in the intestine of a boy. Welch's specimen, which was found encysted in the intestine of a soldier at Netley, is stated by Cobbold probably not to have been an *echinorhynchus*. Recently a case of *echinorhynchus moniliformis* has been described in Italy by Grassi and Calandruccio.

IV. DISEASES CAUSED BY CESTODES

(Tape-worms; Hydatid Disease).

Man harbors the adult parasites in the small intestine, the larval forms in the muscles and solid organs.

I. INTESTINAL CESTODES; TAPE-WORMS.

(a) *Tænia solium*, or pork tape-worm. This is not a common form in this country. It is much more frequent in parts of Europe and Asia. When mature it is from six to twelve feet in length. The head is small, round, not so large as the head of a pin, and provided with four sucking disks and a double row of hooklets; hence it is called, in contradistinction to the other form in man, the armed tape-worm. To the head succeeds a narrow, thread-like neck, then the segments, or proglottides, as they are called. The segments possess both male and female generative organs, and about the four hundred and fiftieth become mature and contain ripe ova. The worm attains its full growth in from three to three and a half months, after which time the segments are continuously shed and appear

in the stools. The segments are about one centimetre in length and from seven to eight millimetres in breadth. Pressed between glass plates the ovarian rosette is seen as a central stem with about twelve or fifteen lateral branches. There are many thousands of ova in each ripe segment, and each ovum consists of a firm shell, inside of which is a little embryo, provided with six hooklets. The segments are continuously passed, and if the ova are to attain further development they must be taken into the stomach, either of a pig, or of man himself. The egg-shells are digested, the six-hooked embryos become free, and passing from the stomach reach various parts of the body (the liver, muscles, brain, or eye), where they develop into the larvæ or cysticerci. A hog under these circumstances is said to be *measled*, and the cysticerci are spoken of as measles or bladder worms.

The *tænia solium* received its name because it was thought to exist as a solitary parasite in the bowel, but two or three, or even more worms may occur.

(b) *Tænia saginata* or *mediocanellata*—the unarmed or beef tape-worm. This is a longer and larger parasite than the *tænia solium*. It is certainly the common tape-worm of this country. Of scores of specimens which I have examined, almost all were of this variety. According to Bérenger-Féraud it has spread rapidly in western Europe, owing probably to the importation of beef and live stock from the Mediterranean basin. It may attain a length of fifteen or twenty feet, or more. The head is large in comparison to the *tænia solium*, and measures over two millimetres in breadth. It is square-shaped and provided with four large sucking disks, but there are no hooklets. The ripe segments are from seventeen to eighteen millimetres in length, and from eight to ten millimetres in breadth. The ovarian rosette consists of a central stem with from seventeen to eighteen lateral branches, which are given off more dichotomously than in the *tænia solium*. The ova are somewhat larger, and the shell is thicker, but the two forms can scarcely be distinguished by their ova. The ripe segments are passed as in the *tænia solium*, and are ingested by cattle, in the flesh or organs of which the eggs develop into the bladder worms or cysticerci. Whether they develop in man or not is uncertain. No instance of the cysticercus of the *tænia saginata* has, so far as I know, been reported in man.

Of other forms of tape-worm may be mentioned:

(c) *Tænia elliptica* (*tænia cucumerina*). A small parasite very common in the dog and occasionally found in man, and the larvæ of which develop in the louse of the dog.

(d) *Tænia flavo-punctata*. A small cestode was found in the intestine of a child in Boston, and has since been met with in one or two cases.

(e) *Tænia nana* and the *tænia Madagascariensis* have been found only once or twice.

(f) *Bothriocephalus latus*. A cestode worm found only in certain districts bordering on the Baltic Sea and in parts of Switzerland. So far as I know it has not been found in this country except in a few imported cases. The parasite is large and long, measuring from twenty-five to thirty feet or more. Its head is different from that of the *tænia*, as it possesses two lateral grooves or pits and has no hooklets. The larvæ develop in the peritonæum and muscles of the pike and other fish, and it has been shown experimentally that they grow into the adult worm when eaten by man.

Symptoms.—These parasites are found at all ages. They are not uncommon in children and are occasionally found in sucklings. W. T. Plant refers to a number of cases in children under two years, and there is a case in the literature in which it is stated that the tape-worm was found in an infant five days old.

The parasites may cause no disturbance and are rarely dangerous. A knowledge of the existence of the worm is generally a source of worry and anxiety; the patient may have considerable distress and complain of abdominal pains, nausea, and sometimes diarrhoea. Occasionally, the appetite is ravenous. In women and in nervous patients the constitutional disturbance may be considerable, and we not infrequently see great mental depression and even hypochondria. Various nervous phenomena, such as chorea, convulsions, or epilepsy, are believed to be caused by the parasites. Such effects, however, are very rare.

The *diagnosis* is never doubtful. The presence of the segments is distinctive. The ova, too, may be recognized in the stools. It makes but little difference as to the form of tape-worm, but the ripe segments of the *tænia saginata* are larger and broader, and show differences in the generative system as already mentioned.

The *prophylaxis* is most important. Careful attention should be given to two points. First, all tape-worm segments should be burned. They should never be thrown into the water-closet or outside. And second, the meat should be cooked throughout, in which way alone larvæ are destroyed. Possibly it is owing to the fact that in this country pork is, as a rule, better cooked than beef that the *tænia saginata* is the most common form. Certainly in the market and at the abattoirs one more commonly sees measly pork than measly veal. In the examination of a thousand hogs in Montreal there were seventy-six instances of cysticerci. The measles is more readily overlooked in beef than in pork, as in the former it has not such an opaque white color.

Treatment.—For two days prior to the administration of the remedies the patient should take a very light diet and have the bowels moved occasionally by a saline cathartic. The practitioner has the choice of a large number of drugs. As a rule, the male fern acts promptly and well. The ethereal extract, in two-drachm doses, may be given fasting, and followed in the course of a couple of hours by a brisk purgative. This usu-

ally succeeds in bringing away a large portion, but not always the entire worm.

A combination of the remedies is sometimes very effective. An infusion is made of pomegranate root, half an ounce; pumpkin seeds, one ounce; powdered ergot, a drachm; and boiling water, ten ounces. To an emulsion of the male fern (a drachm of ethereal extract), made with acacia powder, two minims of croton oil are added. The patient should have had a low diet the previous day and have taken a dose of salts in the evening. The emulsion and infusion are mixed and taken fasting at nine in the morning.

The pomegranate root is a very efficient remedy, and may be given as an infusion of the bark, three ounces of which may be macerated in ten ounces of water and then reduced to one half by evaporation. The entire quantity is then taken in divided doses. It occasionally produces colic, but is a very effective remedy. The active principle of the root, pelletierine, is now much employed. It is given in doses of one fourth to one half of a grain, and is followed in an hour by a purge.

Pumpkin seeds are sometimes very efficient. Three or four ounces should be carefully bruised and then macerated for twelve or fourteen hours and the entire quantity taken and followed in an hour by a purge. Of other remedies, kousso, turpentine in ounce doses in honey, and kamala may be mentioned.

Unless the head is brought away, the parasite continues to grow, and within a few months the segments again appear. Some instances are extraordinarily obstinate. Doubtless it depends a good deal upon the exposure of the worm. The head and neck may be thoroughly protected beneath the valvulæ conniventes, in which case the remedies may not act. Owing to its armature the *tænia solium* is more difficult to expel. It is probable that no degree of peristalsis could dislodge the head, and unless the worm is killed it does not let go its extraordinarily firm hold on the mucous membrane.

II. VISCERAL CESTODES.

Whereas adult *tæniæ* cause little or no disturbance and rarely, if ever, prove directly fatal, the affections caused by the larvæ or immature forms in the solid organs are serious and important. There are two chief cestode larvæ known to frequent man—(a) the *cysticercus cellulosæ*, the larva of the *tænia solium*, and (b) the *echinococcus*, the larva of the *tænia echinococcus*.

I. Cysticercus Cellulosæ.—When man accidentally takes into his stomach the ripe ova of *tænia solium* he is liable to become the intermediate host, a part usually played for this tape-worm by the pig. This accident may occur in an individual the subject of *tænia solium*, in which case the mature proglottides either themselves wander into the stomach or, what is more likely, are forced into the organ in attacks of prolonged