The Entozoa.

By

Robert Erskine.
The Entozoa: their description; origin and development; causes, exciting and predisposing of their presence; the symptoms produced by them; and treatment for their removal.
The Entozoa

By the term "Entozoa" is meant those parasitic animals which infest the interior of the bodies of men and the lower animals. In this essay however I shall restrict myself to those found in the human body, noticing those which exist in the interior of the lower animals only when it is absolutely necessary. I shall likewise confine my attention to the true Entozoa, making no mention of those worms or animals having their proper life out of the body, but which in some curious cases have been found inhabiting it, as they cannot properly be classed under the Entozoa for reasons hereafter to be mentioned.

Of late years considerable advance has been made in our knowledge with regard to the development and metamorphosis which some of them undergo, but still generally speaking too little attention has been devoted to this subject.
subject, and consequently little is known of the origin and nature of many of them. It is not long since the idea of spontaneous generation taking place among them, though now completely exploded, was firmly maintained by the best authorities. The presence of these creatures in the intestinal canal has been known to physicians of all ages as the source of many diseased actions, and mention is made of them in the works of Hippocrates, Galen, Balsus and other ancient writers. Among modern authorities who have contributed to our knowledge of them may be mentioned Schulze, Steenstrup, Owen, Liebold, Bremer, Flüchenmeister, Nelson and others.

I shall divide my subject under the following five heads.

1st. Description of the Entozoa

2nd. Their Origin and Development

3rd. The Causes, exciting and predisposing, of their presence

4th. The Symptoms produced by them

and 5th. Treatment for their removal.

1st. Description of the Entozoa. The following division into three classes is one which I think will
include most or nearly all of the various genera found in the body. 1st Boceleminthia or hollow worms; 2nd Steleminthia or solid worms, and 3rd Hydatids or bladder worms.

1st Boceleminthia. These are the highest form of intestinal worm. They possess a distinct nervous system, an alimentary canal furnished with a mouth and anal opening, and distinct sexual organs. The following genera may be included under this class. Trichocephalus dispar; Ascaris lumbricoides; Ascaris vermicularis; Filaria medinensis; Strongylus gigas; and Trichinella spiralis.

The Trichocephalus dispar is about from one and a half to two inches long, and white in colour unless when tinged by its food. The extremity to which the head belongs is very small, but behind this a thick body suddenly bulges out, which is usually rolled up in a spiral form. The female is rather larger than the male. They are often found in considerable numbers in the caecum and large intestines. The Ascaris lumbricoides or large round worm is from 6 to 9 inches in length, of a light yellow colour, and resembles considerably the common earth-worm. They may however be distinguished from one another by the following.
The earth-worm is redder and less pointed at its two extremities. Its mouth also is a short longitudinal slit on the under surface of the head, whereas in the Ascaris lumbricoides this aperture is situated at the extremity, is triangular in form, and surrounded by three tubercles. The earth-worm has moreover little rows of bristles upon its under surface for locomotion, but in the other there is nothing resembling this. They are generally found inhabiting the small intestines.

The Ascaris Vermicularis, or small thread worm, is from 2 lines to half an inch in length, the former being the measurement of the male, the latter that of the female. It is white in colour, and resembles in structure the Ascaris lumbricoides. The habitat of this worm is the rectum, where they often abound in immense numbers.

The Filaria Medicinsis or Guinea worm is from 5 to 6 inches long, of a round and slender form, and white in colour. It lives in the subcutaneous axilar tissue, generally that of the lower extremities. The Strongylus gigas is from 5 inches to a yard in length, and half an inch in diameter. It is found inhabiting the kidney.
Trichina spiralis takes up its abode in the muscles of the human body. The affected muscles have a speckled appearance, and below the microscope each speck is found to consist of a cyst containing a minute cylindrical worm coiled up. It generally inhabits the superficial muscles, but is also met with in those of the eye, tongue, pharynx, and larynx.

2nd Stereelmintnia. In this class the sexes are on the same individuals. It includes the following genera: Bysticercus; Taenia; Bothriocephalus; and Echinococcius.

The Bysticercus is a single cyst-like body with a short retractile neck, and about half an inch in length. The head is furnished at its base with four suckers. It inhabits the intervascular muscular tissue of the muscles, but has also been found in the eye, the brain, the heart, and the choroid plexus. No generative organs have been found in them.

The Taenia solium. This is a long, white worm varying in length from 5 to 10 feet, and in breadth from one line at its narrowest part to 4 or 5 at its broadest. The head, which is the most vital part, is small and
and flattened, and has on its centre a projecting papilla which is surrounded by hooks. Four suckers are also placed on the head, which according to some constitute the mouth by which nourishment is imbibed. The body is composed of numerous segments or joints let in to one another as it were, but not very firmly connected. Each segment is a perfect animal in itself as it possesses both male and female organs. The animal shortens by shedding its hindmost joints, then those which are anterior divide in two, and again into two, and thus new joints are formed. The joints when cast off possess a considerable power of motion, and will live for several days when placed under favourable circumstances. No special organs of sense have been found in these animals. The nervous system consists of a pair of ganglia situated in the head, and giving off two slender filaments which run down only however through a few of the first segments. The orifices of the sexual organs are placed at one side of each segment, and those apertures are arranged alternately on both sides of the body of the animal. In the
centre of each joint is an ovarium containing the ova. With regard to the analogy existing between this worm and the Cysticercus Belliniaeae found in the pig and some other of the lower animals, I shall defer this subject to the next division of my paper. The Bothriocephalus, or Taenia Lata, or broad tape-worm differs from the above in the following respects only. Its head is marked in the direction of its length by two foveae, and it has no hooks. It is also shorter, and its joints are shorter and broader, and adhere in a different manner. The orifices of the sexual organs are placed not on the edge of each joint but in the centre of its flat surface.

The Echinococcus. These small animalcules are found inhabiting the interior of a hydatid called the Echinocystis which occurs sometimes in the liver. They are transparent, colourless, oval-shaped, and about the one two hundredth of an inch in length. The head is a flat disc at the extremity of the neck, immediately behind this are four sectorial processes, then follows the body, at the extremity of which is a hook by which the animal attaches
attaches itself to the wall of the Accephalocyst. The head furnished with a number of hooks arranged in a circle on it, is capable of retraction within the body. They are found in almost every hydatid.

3d. Hydatids or bladder worms. These consist of a globular laminated sac enclosing a transparent fluid. They vary in size from that of a pea to a hen's egg. The sac lies in close contact with, but does not adhere to, an external capsule formed apparently by the pressure of the hydatid upon the texture of the organ in which it is imbedded. The liver is the organ where they most frequently occur, but they are occasionally met with in the spleen, brain, and cancellated texture of bone. They are nourished by imbition. Their inner surface is studded with numerous white particles, which are found under the microscope to be distinct echinococci, of which a description has already been given. The hydatids are divided into Accephalocystis Endogenae and the Accephalocystis Exogena. The former is the common hydatid of man. Its young are produced like buds on its inner surface, the progeny being sometimes successively included. The Accephalocystis Exogena rarely occurs in man,
but is most commonly found in the domestic animals. In this form reproduction occurs on the outer surface of its body.

2nd 2nd Their Origin and Development. The theories and opinions on this subject have been various and conflicting, but I shall consider only a few of them. Linnaeus supposed that the intestinal worms were really terrestrial or aquatic animals which had been accidentally swallowed while young or in the state of worm. This theory however is opposed by the fact that no creatures identical in structure with these worms are ever met with out of the body, except such as have come from man and the lower animals.

Boerhaave brought forward the idea, that aquatic or terrestrial animals accidentally entering the body from without, might, as a result of the new conditions under which they were placed, increase greatly in size, and undergo some metamorphosis. This opinion is disputed by the following facts. The true intestinal enteron occupy special parts of the alimentary canal; each species has its peculiar habitat; and certain species infest
certain animals and these propagate: whereas those worms of external origin generally die as soon as they are received into the digestive organs, or as in the case of the gadfly in the horse's stomach, after having been converted into larvae, and being ready to undergo their final metamorphosis they are expelled from the body along with the excrement. There have been some singular instances where larvae of beetles and of the common fly have been discharged living from the bowels of human beings, the ova doubtless of these insects having been previously accidentally swallowed. Still however these are spurious worms, and differ from the true Entozoa in this that the alimentary canal is not their only but their accidental and unusual dwelling place. The true Entozoa have been met with even in the intestines of the foetus in utero, and in the eggs of carnivorous animals. The next theory advanced was that the Entozoa were produced by Spontaneous generation. This explanation was considered conclusive for how otherwise it was thought could these animals be found inhabiting such inconceivable places as the anterior chamber of the eye, the voluntary muscles,
the brain, the kidney &c. This opinion was
strengthened and appeared capable of demonstration
by the fact being observed that whenever a vegetable
infusion was placed under certain conditions as
regards light, air, and temperature, from it in a
short time myriads of animalcules were called
into existence. The same infusions invariably
produced the same animalcules, and the lowest
form of the Infusoria were those which appeared
first. The results were the same although the
water was boiled or distilled. Now however
the difficulties attending the explanation of the
production of these Infusoria have disappeared,
and a satisfactory reason can be given. Their
modes of propagation have been investigated,
and it is known that the perfect Infusoria and
their germs or ova are almost innumerable,
and appear too almost incapable of destruction.
A single drop of water is said to contain many
millions of a certain animalcule. If this drop
be evaporated these creatures do not perish but
become dry and preserve their latent life in
the air and dust to be again revived when
those conditions necessary to their active existence
occur. They have a most remarkable power
of
of resisting destructive agencies. The experiments of M. Schulze of Berlin are most satisfactory, and entirely adverse to the theory of spontaneous generation. It is known that the access of air, which undoubtedly contains infusoria or their own floating in it, is necessary to the production of animalcules in vegetable infusions. Having boiled an infusion well he placed it in a vessel to which air could only be admitted by passing through tubes, the one containing strong sulphuric acid, the other caustic potash. Another experimenter passed a vegetable infusion also boiled through iron tubes heated to redness. In both these cases no infusoria were produced, though a rapid development of them took place in similar infusions when such precautions were observed. These experiments having been so successful in overthrowing the idea of spontaneous generation occurring among the infusoria, doubts of the truth of this theory began to arise with regard to the entozoa, and investigations were set on foot. It was at length discovered that the entozoa particularly, and their embryo forms possess a special boring apparatus, by means of which they are able to
make their way through the solid tissues of
the body with wonderful facility, producing little
or no disturbance in their progress, and leaving
no traces of their operation behind them. The
numbers too of the ova of these creatures are
immense, and the power of the entozoa in
resisting destructive agencies is even greater
than the infusoria. Some of these worms remain
alive after being boiled a considerable time,
others are brought to life after being frozen for
several weeks, and their ova have still greater
power of self preservation. These and similar
facts respecting their numbers, indestructibility,
and powers of penetrating animal tissues, appear
sufficient to explain the production of the entozoa
without having recourse to the theory of spontaneous
generation. It might also be asked, why, if they
ever arise spontaneously, should they be furnished
with a generative apparatus. The belief now
then is that none of the different kinds of entozoa
are parentless animals, and that they somehow
find their way into the body they inhabit from
without. Some of the entozoa pass
through several phases of existence in different
animals before they arrive at the perfect state.
In the solid tissues of many herbivorous animals are found some curious parasitic animals, which from the structure of their head have always been ranged in the neighbourhood of tape-worms, although their bodies instead of being drawn out to a great length and divided into numerous segments are composed almost entirely of a simple bag of fluid. These worms were long regarded as forming a distinct order of parasitic animals, but experiments have shown that when they are administered to certain carnivorous animals with their food, the head attaches itself and gradually develops the long jointed body of a true tape-worm. The observations were first made upon the cystic worms which inhabit the brain of the mouse and rat; these when given to cats were found to produce in their intestines Taenia of the species usually inhabiting these animals. Experiments have since been instituted, and various cystic worms administered to different animals, and these have been afterwards found in the intestines of these certain corresponding tape worms. These cystic worms however will only undergo this transformation in peculiar animals. When a reverse experiment is performed...
and segments of tape worms are given to
herbivorous animals, a development in their tissues
of the corresponding cystic worms has invariably
taken place. We may then consider it as a
fact that the ova of the cestoid worms are not
as a general rule developed in the same
species of animal which is infested by the Taenia.

The manner in which the embryo Taenia
finds its way from the stomach of its host
through the various tissues of the body until
it reaches the particular organ in which its
development is to be carried on has been
investigated by Professor Van Beneden. He
states that the embryos of a taenia found in
the intestines of a common frog were furnished
with six spinous organs, of which two were
straight, and the four others slightly hooked
at the extremity. By an action of the four
hooked spines, very similar to that of the
arms of a man when swimming, the little
creatures were enabled to push themselves
through the broken tissues of their parent; the
two straight spines assisting to pierce a passage,
and no draft maintaining them in their position
whilst the hooks were brought up for a fresh stroke.
In this manner he observes they would have no difficulty in penetrating any tissues, or in reaching any part of the body appointed for their further development. It was suggested by Dr. Nelson in 1852 that the cysticercus cellulosae found in the bodies of “measly pigs” is matured in the human body into the Taenia solium. The raw pork which is eaten by so many farm labourers in this country, must sometimes contain in it the cystic larva of the Taenia solium. The other tape worm the Bothriocephalus latus is rarely met with in this country, but is very common in Switzerland, Russia, and Poland. It is believed to be the fully developed form of certain cystic endozoa infesting some marine or fresh water animals found in the lakes of these countries.

The causes, exciting and predisposing, of their presence.

1st Exciting. Having abandoned then the idea of spontaneous generation we must come to the conclusion that the endozoa or their ova are introduced into the human body, where they find the only conditions which admit of their development. The entrance may be effected by means of the food and drink, in which they may be accidentally
swallowed, and then find their various habitats. The tapeworm is said to occur most frequently in pork-eating communities, and more especially is this the case where the meat is eaten raw, and not subjected previously to the influence of heat, by means of which the cystic worms might otherwise be destroyed. It is however believed by some authorities that the tapeworm may also in addition be propagated by the ova voided by animals, and that these entering the human alimentary canal by means of the food or drink, may be there matured into taeniae. As an instance of this it is said that this worm frequently infests the natives of India, who of course as is well known eat no flesh. The Entozoon found inhabiting the eye, brain, kidney or are doubtless carried thither by the blood, into which they had found their way.

Professor Owen thinks that the Entozoon found in the liver may possibly reach its appropriate dwelling place by the ductus choledochus. It is said that the soldiers in India believe that the Filaria medinensis or Guinea-worm can be communicated from one person to another like the itch insect. The young of this worm creep in through the skin without producing any pain.
As regards the Ascaris vermicularis, besides the usual way of their entering the body by means of the food and drink they may be possibly communicated from one person to another in another manner. It is well known that these little worms often crawl out of the rectum so as to be found in the clothes or in the bed of the patient in the morning, and in females they find their way into the vagina, and in males even sometimes into the urethra, in both cases of course causing great irritation and suffering. Now among the children of the poor, whom these worms infect to a great extent, besides so many being huddled together in one bed, very little regard is often paid to the due changing of the bed clothes and night dresses, and thus from one member of the family who may be afflicted with them the Ascarides may be conveyed directly to the others. This appears to me to account for the fact which I have noticed of some members of a family, who, upon enquiry, I learned slept all in one bed, being infested with these worms, while others who were partaking of the same food and drink along with them, but who slept apart or in a different room, remained altogether free.
from the disease. 2nd Predisposing.

As predisposing causes may be set down all those articles or agencies which deprive the intestinal canal of its tonicity, and render its secretions unhealthy and depraved, probably thus furnishing the conditions necessary to the presence of the Entozoa. Bad bread; impure water; the flesh of diseased animals; crude vegetables; unripe fruit; indigestible substances; an excess of food over the powers of digestion or may be instanced as examples of this. They occur too more frequently in persons of sedentary habits, of a weak, sere, and state of health, or of surfeiting tendencies. It must be admitted that the ova of these Entozoa must occasionally find their way into the food and be swallowed by very many persons, but only in a few comparatively speaking do they remain in the body and develop themselves. This may perhaps be explained by saying that an unhealthy state of the intestinal canal favours or is the cause of the retention and propagation of the Entozoa. This will account for the fact of children being so plagued with them, as their intestinal canal at the periods of dentition and afterwards from the indiscriminate sort of food
food which they often indulge in, is frequently in a state of irritation and its secretions often unhealthy.

The symptoms produced by them. Many of the symptoms can scarcely be depended upon as pathognomonic, and the only distinct evidence is to be obtained by examining the evacuations, in which they or portions of them are most likely to be voided, still however there are some tolerably accurate. Of these may be mentioned picking of the nose; itching about the anus; grinding of the teeth, and starting during sleep; a capricious appetite; colicky pains; and swelling of the belly; and irregular bowels. I shall now consider the symptoms proper to each species of the Entozoa, taking those animals in the order in which they were described. 1st Flaps: Boleleminthia. Diocephalus dispar. This worm is often found in considerable numbers even in the intestines of healthy persons, and there are some authorities who go the length of supposing that they infest the intestines of all human beings. Their presence does not appear to give rise to any
symptoms or produce any annoyance, so that medical interference is seldom required.

Ascaris lumbricoides. The symptoms which this worm produces are slough stools; itching of the nose; swollen belly; disturbed sleep; pallid countenance; foetid breath; depraved appetite; and thirst. It is said that they have sometimes managed to ascend from their usual habitat in the small intestines into the stomach and oesophagus, occasioning there great pain, nausea, and vomiting, and even inducing convulsions.

Ascaris Vermicularis. This little worm though so small and insignificant looking often produces great irritation and annoyance to the patient. It gives rise to great itching, heat, and discomfort about the anus; tenesmus; picking of the nose; and disturbed sleep. Though it is usually children who suffer from them, yet adults may be infested too, and in these cases it is often very difficult indeed to get rid of them by medicine. Two young men, the one about 20 years of age, the other a year or two younger, fell under my notice, and were very much plagued by them. They complained...
complained of the symptoms mentioned above, which, they said, invariably came on each night after they had been in bed for a short time. They were generally exempt from the annoyance during the day, except when their bowels happened to be constipated, and then anything which heated the body, such as sitting near the fire, taking a cup of warm tea, or brisk exercise would induce the distressing itching and discomfort. The worms which came from these patients did not appear larger, or to differ in any respect from those found in children. I heard of the case of a woman in the country who had the usual symptoms of the presence of these worms, but who had never looked for them in her stools, being treated by her medical attendant for some peculiar affection of the rectum. After submitting to a long and tedious course of treatment, and being nothing the better, she consulted another practitioner who soon discovered her complaint, and the usual remedies being given she was in a short time relieved of her tiny tormentors: Filaria medinensis, or the Guinea worm. This worm remains for a considerable time
in the areolar tissue without producing inconvenience, or giving rise to any symptoms. At length after it has attained its full development, and when the period of reproduction arrives, it seeks to perforate the skin. If it is injured then a milky juice exudes from it, which upon being placed under the microscope shows myriads of young worms. It first gives rise to an itching sensation in the skin, which is followed by the appearance of a small vesicle, succeeded by an inflamed swelling like a boil. This swelling then breaks and discharges its contents, and through the opening the head of the worm gradually protrudes, so that it may be easily seized. Sometimes a considerable amount of fever attends this process. If the worm is broken in the operation of being extracted, acute inflammation and extensive suppuration ensue, and even in some cases mortification.

Strongylus gigas. This animal gives rise to no distinct symptoms, but those generally produced are pain in the loins, haematuria, retention of urine, and great suffering in its passage out of the body, which
may take place either through the urinary channel, or by abscess and ulceration through the back. 

Trichina spiralis. The presence of these minute creatures in the muscles, contrary to what one would imagine, does not appear to give rise to any pain, muscular debility, or emasculated movements.

2 Stereelmorhia, cysticercus. One species, the cysticercus cellulosa, inhabits the interfascicular areolar tissue of the muscles. It is however rare in man, but occurs frequently in the pig, giving rise to "measly pork". This worm has been met with also in the brain, the heart, and the eye. In the latter situation it may give rise to severe attacks of ophthalmia.

Taenia. The symptoms produced by the tape worm are the following: pains in the abdomen; craving for food; emaciation; itching about the anus, and at the nose; nausea; sometimes loud borborigmi; and general debility and lassitude. Sometimes the symptoms of its presence are not very striking, and its existence is unsuspected till joints are passed in the stools. I heard of the case of a young soldier who had
served with his regiment during the campaign in the Crimea, and who on the passage home was so ill that he was given over by the surgeon as a case of incurable consumption. He was much emaciated, had palpitation of the heart, and presented several of the symptoms of Phthisis. The medical man however whom he consulted upon his arrival in this country, saw reasons to suspect the presence of tapeworm, and prescribed accordingly. His suspicions were verified by the discharge of a large tapeworm, and in the course of a few days, the medicine being repeated, another but smaller one was also expelled. Under a tonic treatment the patient rapidly got better, and recovered his strength again.

I am unable to say whether in this instance the worm was the Taenia solium or the Bothriochephalus latus. Echinococcus hominis. These small animalcules as before stated are found inhabiting a member of the next class. 3rd Hydatids.

When a hydatid tumour forms in the liver its growth is generally slow. When
small it only gives rise to a sensation of weight, but when of considerable size may cause ascites and aedema of the legs by compressing the portal vein or vena cava. It may burst into the peritoneum, causing fatal peritonitis, or into the lung, or into the intestines, or through the abdominal walls. In the two latter cases the contents will be entirely discharged, and the patient will get well, but when it opens into the lung, the constitutional disturbance is so severe, that he generally dies. It is said that a hydatid tumour sometimes gets well by the secretion of a thick, putty-like matter within its sac, owing either to the destruction, or at all events causing the destruction of the hydatids. Sometimes they occur in the cancellated texture of bone, and by their accumulation cause the walls of the bone to expand so as to form a tumour of greater or less size. Attenuation and giving way of the walls then taking place the hydatids may escape into the surrounding tissues, causing suppuration there and discharge of themselves. In
the long bones the occurrence is likely to lead to fracture under very disadvan-
tageous circumstances indeed.

\textbf{V\textsuperscript{th}} Treatment for their removal.
The indications for this are \textbf{1}\textsuperscript{st} to cause the expulsions of the worms; \textbf{2}\textsuperscript{nd} to improve the general health, and restore the alimentary canal to a proper state so as to guard against their recurrence.

\textbf{1}\textsuperscript{st} To cause the expulsion of the worms.

Commencing again with the 
\textbf{\textit{Boolelmintha}} we have first the \textbf{\textit{Tricocephalus}}, which however as it neither causes annoyance nor gives rise to any symptoms by which its presence may be known seldom leads the patient to have recourse to medical interference. It may however generally be easily removed by two or three doses of a brisk aperient, as a combination of equal parts of calomel and jalap, followed by a full dose of castor oil.

\textbf{\textit{Acaris lumbricoides}}. The most appropriate remedies for expelling this worm are \textbf{\textit{Anthelmintics}} followed by aperients. \textbf{\textit{Anthelmintics}} may be divided into 2 classes: \textbf{1}\textsuperscript{st} those which
act mechanically and thus destroy the worm, as cowhage, metallic tin and zinc; and 2nd, those which act by poisoning it as the root of the male fern, or of the fousso; the pomegranate bark; the claws of bitters, as wormwood, rue, and cannongia; also turpentine, common salt, and asafoetida. The following is highly recommended for the destruction of this worm; a tablespoonful of turpentine followed within two or three hours by an equal dose of castor oil. For children of course proportionately smaller doses must be given. Dr. Watson approves highly of steel, and directs that the patient should be purged from time to time by calomel and jalap, and then the sulphate or the triturated tincture administered three times a day. Others have tried half drachm doses of common salt every morning, and found it very successful.

Ascaris Vermicularis. The treatment in this case should consist of a combination of aperient medicines with purgative or antihelminthic vermata. For children equal parts of calomel and jalap, and for adults calomel and colocynth, followed in either case by a dose of castor oil, make a suitable aperient.
The enemata may consist of a solution of one or two ounces of common salt in a pint of water; or half an ounce of the macerated tincture of lion in half a pint of water; or the simple infusion of quassia; or an ounce of oil of turpentine in gruel. This plan of treatment generally expels great numbers of the worms, and the patient is relieved from his tormentors, but if one or two, as is often the case, chance to be left behind, owing to their great and rapid powers of reproduction, in a short time the patient is almost as bad as before. I found this to be the case with the two young men mentioned before, for though they were decidedly relieved for a short time, yet it was not long before they began again to complain of the presence of these worms. So difficult indeed is it to get rid of them completely, that some practitioners have avowed as the result of considerable experience, that there is really no possible way yet known by which they may be entirely eradicated. Of late two different plans of treatment have been brought forward, and declared by their respective proposers to be very successful. The one is that of Dr. Buid who advises vegetable charcoal and common
common salt. He gives a small teaspoonful of the latter, not in solution, but with a little piece of bread or biscuit the first thing in the morning. This dose is for an adult, but for children half the quantity may be given. The salt thus taken, he thinks, is decomposed and the chlorine liberated before it enters the general circulation, and thus comes more immediately in contact with the thick mucus which forms the mucus in which the ova of all worms are deposited, and in this manner destroys them. Immediately after breakfast from 20 to 30 grains of purified vegetable charcoal mixed with a little sugar and a very little water should be taken; and this quantity repeated after the three principal meals daily. In a fortnight's time this treatment is generally successful, although the charcoal may be continued advantageously for a longer period. He says that from this treatment he has seen incalculable benefit, and in many instances a perfect cure effected. The other plan of treatment is that of M. Bourgeois d'Etamps, who orders a small piece of mercury ointment
to be introduced on the end of the finger into the rectum, and passed as high up as possible. All itching to at once cease, but it is advisable to repeat the introduction three or four times. He has great faith in its efficacy, and states that it succeeds where all other remedies fail. In some cases perhaps it might be a good plan to dissolve some of this ointment in oil, and then inject it into the rectum, for it is well known at any rate that oil often allays the itching.

*Filaria medinensis*. The worm must be very cautiously and patiently extracted, being wound upon a small quill as it protrudes. During the inflammatory stage suppuration should be promoted by puncturing.

*Strongylus gigas*. The only treatment that appears serviceable in this case would be electricity, with perhaps camphor administered internally.

*Trichina spiralis*. These worms as before stated do not appear to affect the functions of the muscles or injure the health, but if it were possible to be aware...
aware of their presence during life in the body the treatment recommended for the Strongylus gigas would be applicable.

Sterelmintha. Cysticercus.

Bemher and the volatile oils may be tried with a view of poisoning them. The one which is sometimes found occupying the anterior chamber of the eye may be removed by section of the cornea.

Taenia. The treatment for removal of the Taenia solium is also applicable to the Botrocephalus. The most successful remedy appears to be the ethereal extract of the root of the male Shield-Fern given in a dose of from 18 to 24 grains. No purgative medicines are required after it. The essential oil of the male fern is also given as a successful remedy in the dose of one drachm. Oil of turpentine in the dose of half an ounce followed in two hours by an ounce of castor oil is also very efficacious, though it occasionally produces disagreeable stranguary. The above remedies should be given on an empty stomach, and a good way of administering them is to give a purgative on the previous evening, and then
to follow up on the morning with the anthelmintic. While the medicines are being administered no food should be allowed except a little beef tea.

Hydatids. The hydatid tumours as before stated occur more frequently in the liver than in any other organ. Two medicines, Jodide of Potassium and common salt have been suggested as likely to prove serviceable in stopping the growth of these tumours. When we are sure that the tumour is adherent to the abdominal walls a cure might be effected by puncturing the sac. When the tumours occur in bone and in flat ones such as those of the cranium by exciting suppuration they are usually discharged along with the secretions. In long bones the tumours are very likely to lead to fracture. Treatment will vary according to the extent and site of the disease. The bone may be exposed by incision, and the hydatids and altered fleshy tissue gouged away. If the tumour is very large however, and the surrounding bone in a bad state it may be necessary to proceed to amputation, if in the extremities.

2nd. Means to be employed to improve the general health, and restore the alimentary canal
to a proper state, so as to guard against their recurrence. I mentioned in a former place that doubtless the cause of the retention and subsequent development of the ova of the Entozoan might be found in a want of tone of the intestinal canal and a depraved state of its secretions. To remedy this state of matters then we must look to the quality and quantity of the food taken, and see that the latter be duly regulated according to the requirements of the system. No raw or under-cooked food should be allowed, and unripe fruit and vegetables should be forbidden. The water should be clean and wholesome, and if taken from a well in the vicinity of which sewers run, or from a river flowing through a town and receiving from it all its impurities, it should be passed through a filter or boiled previous to being used. The bowels should be kept in a good working condition by occasionally administering a pill of aloes combined with extract of hyoscyamus, and tonics may be given especially the mineral acids in infusion of quassia. For children a combination of soda and rhubarb, or small doses of mercury and chalk with rhubarb will be found to be attended with great benefit in correcting the
secretions. It is said that persons who take plenty of salt with their food are rarely troubled with worms. In India where the Guinea-worm prevails it is reported that the Brahmins are entirely exempt from attacks of it owing to their constant habit of taking doses of Asafoetida as a preventative. Oiling the uncovered parts of the body has been suggested as a defence against this worm. When the disease prevails among bodies of men the sick should be separated from the sound and compulsory cleanliness enjoined.

In families where the small Ascarides infest some of the members, I would recommend, that these sleep apart from the others, and employ frequent ablution.