INTESTINAL PARASITES BELONGING TO THE
CLASS NEMATODA.

Abstract of Three Lectures delivered at the Royal College of Surgeons on February 20th, 22nd, and 24th.

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THE lectures commenced with a short historical account of the views concerning intestinal parasites. This was followed by a brief description of the general anatomy of the nematodes. A general review of the life-histories of the parasitic species was then given. First, those forms which are only occasionally parasitic, being free living animals for the greater part of their lives, were mentioned; after which came a description of those species which pass their larval stages in damp earth or water, but which must enter the intestine before they can grow up into sexually mature adults. Next those forms were described which are obliged to pass their larval condition in the bodies of intermediate hosts in order to reach the stage of development which is necessary if they are to grow up into adults in the intestine of their final hosts. Fourthly, mention was made of some species which show an alternation of generations in their life-histories; as a rule, in these cases the intestinal parasite produces, by parthenogenesis, young animals, which grow up outside the body of the host into sexually mature adults; these in their turn give rise to embryos, which, after they have been swallowed by their host, develop into another asexual generation. Finally come the species which pass the whole of their lives inside the bodies of their hosts, either in the intestine or elsewhere, and which in consequence are neither free living for any part of their existence, nor require any intermediate host for their development, the eggs being able to develop into mature adults in the body of the host if they are swallowed immediately, or after an interval, after they have been passed.

The second lecture commenced with a description of the *ascaris lumbricoides*. The experiments of Grassi and Lutz, by means of which it has been conclusively proved that no intermediate host is necessary for the development of this parasite, were described at some length. It appears from the results obtained by Lutz that it is necessary for the eggs to be still covered with their albuminous coating when swallowed by the host if they are to grow into adults in the intestine.

The symptoms said to have been caused by the presence of ascarides in the intestine were mentioned, but it was shown that, although these parasites may undoubtedly cause obstruction in rare cases, yet, as a rule, hardly any or no symptoms are caused by them. Apparently the usual vehicle for infection is drinking water. Occasionally, however, food may be infected when the hands are soiled with mud or earth containing the eggs. This view is supported by the fact that ascarides occur most frequently in rainy seasons, and also that they are most prevalent in persons living on the borders of lakes and in swampy districts. Further, cases have frequently occurred in which direct infection through polluted drinking water has been shown to be exceedingly probable if not quite certain.

The *ascaris lumbricoides* usually inhabits the small intestine of man. It has, however, been also found in the bile ducts and, after perforation of the intestine, in the peritoneal cavity, etc.

The *ascaris mystax* of the cat and dog very much resembles the *ascaris lumbricoides*, both in appearance and life-history. It is, however, somewhat smaller, and, in addition, possesses characteristic wing-like appendages to its head. The eggs of both species are exceedingly resistant, both to cold and drying, and can retain their vitality for years, being able to develop, when suitable conditions are provided for their growth, even if several years have elapsed since they were laid. That the life-history of the *ascaris mystax* is similar to that of the *ascaris lumbricoides* has been proved by Grassi by means of feeding experiments upon dogs.

The *ascaris megalocephala* is one of the largest of the ascarides; it has never been found in man, but is exceedingly common in the horse. Here, again, no intermediate host is necessary, and the vehicle of infection seems, in the majority of cases, to be drinking water.

The *trichocephalus dispar*, or whip worm, which inhabits the cæcum and small intestine of man, is about 2 inches in length. The males are smaller than the females, and, like those of most parasitic nematodes, have bent up tails, which are provided with spicula. This parasite has been credited, though on very insufficient evidence, with being the cause of beri-beri. There seems no doubt, however, that when present in large numbers it may give rise to intestinal catarrh.

The anatomy and life-history of the *oxyuris vermicularis* or thread worm, were next described. Here again it has been proved by feeding experiments, made in this case by Cobb, that no intermediate host is necessary for the development of this worm, the eggs being able to develop into mature adults in the intestine of the host if they are swallowed directly after they have been laid. The natural habitat of the parasite is the cæcum, or lower part of the ileum.

The third lecture was devoted to the consideration of those species which produce grave diseases in their hosts. The most important of these, the *anchylostomum duodenale*, was first described as to its anatomy and life-history. Although no intermediate host is necessary, the eggs are not able to develop into adults in the intestine if they are swallowed immediately after they have been laid. It is necessary for them to first develop in muddy water or upon damp earth, into rhabditiform larvæ, which, after moulting two or three times, at last reach a stage in which they can develop no more until they have entered the intestine of man. Moreover, the eggs die if the temperature of the water or earth is too low, and this accounts for the fact that although occasional cases of *anchylostomiasis* have been observed in Northern Europe, the disease has never been endemic except in warm climates.

The symptoms of the disease were next entered into, and a historical account given of it. The connection of the parasite with the disease, which had been variously described as *mal d'estomac*, *cachexie aqueuse*, *tropical or Egyptian chlorosis*, *mal de cœur*, etc., was first discovered by Griesinger in 1854. Numerous observers have recorded the frequency with which the *anchylostomum duodenale* has been found in cases of beri-beri, and although it seems certain that the parasite is not the cause of the disease, yet there is very little doubt but that it plays a very considerable part in producing the extreme *anæmia* so frequently present.

The *dochmius trigonocephalus* of the dog, the *strongylus contortus* of the sheep, and the *strongylus convolutus* of the ox all produce in their respective hosts diseases very similar in their symptoms and results to that produced in man by the *anchylostomum duodenale*. The life-history of the *strongylus armatus* of the horse is peculiar in some respects. The adult condition is passed in the large intestine of the horse, the eggs passing out with the *fæces*. As with the *anchylostomum duodenale*, the larval stage is passed in water or damp earth, after which development takes place, not in the intestine of their host, but in the mesenteric arteries. Apparently the larvæ, immediately on reaching the intestine, commence to bore their way through its walls and make their way into the mesenteric arteries, where they give rise to aneurysmal dilatations, in which the larvæ remain for some little time. It seems, however, that they never grow up into adults in these vessels, but make their way by some means or other into the large intestine of their host, where they become sexually mature.

The *heterakis maculosa* is a parasite which inhabits the intestine of the pigeon, producing frequently a fatal disease in its host. Unterberger has shown that the eggs of this nematode require to be kept for about seventeen days under suitable conditions outside the body of the host before they are capable of further development in his intestine. If they are swallowed by him earlier they produce no effect. If, however, the necessary interval has been allowed to elapse, ova commence to appear in the *fæces* about three weeks after infection has taken place.

The experiments made by Grassi on the *spiroptera sanguinolenta*, which inhabits the alimentary canal of the dog, were next described. These experiments show that for this parasite an intermediate host is necessary, which is in this case the Eastern cockroach. Apparently dogs become affected by eating this insect.

The life-history of the rhabdomena strongyloides (anguillula intestinalis, anguillula stercoralis) is a peculiar one. The anguillula intestinalis lives in the intestines of man, and gives rise—probably by parthenogenesis—to ova, which develop into sexual animals. These were for a long time considered to form a separate species, being known as anguillula stercoralis; but it has been shown that if the embryos produced by them are swallowed by man, they grow up into the asexual intestinal form. Thus here we have an alternation of generations—sexual and asexual. The evidence for and against the view that Cochin China diarrhoea is caused by the presence of this parasite was entered into, and the conclusion arrived at was, that although this worm may undoubtedly give rise to enteritis, yet it cannot be considered to have any causal relation to the disease first mentioned.

The lectures were concluded by a summary of the anatomy and life-history of the trichina spiralis, and the effects produced by it upon its host.

THE CHOLERA SURVEY.

WE understand that the general medical survey of the English ports by the Medical Staff of the Local Government Board is making substantial progress. During the past month, in addition to the special general inquiry made by Mr. Jenner Fust and Dr. Barry with respect to the port sanitary administration of the river Mersey, detailed inspections have been made of the ports of Amble, the river Blyth, the river Tyne, Sunderland, Hartlepool, and the river Tees, by Mr. T. W. Thompson; of the ports of Wisbech, Wells, Yarmouth, and Lowestoft, by Dr. Monckton Copeman; of those of Colchester and Maldon by Dr. Reece; of Portsmouth, Cowes, Littlehampton and Newhaven, by Dr. Theodore Thomson; and of the ports of Poole, Weymouth, Dartmouth, Kingsbridge, and Plymouth, by Dr. Bulstrode.

We believe that it is contemplated to shortly revisit these ports for the purpose of conferring with and advising the several sanitary authorities as to the treatment of the defects, where such defects exist, in their sanitary armour. At the present rate of progress we may assume that all the more important ports of England and Wales will be visited in the course of the present month. When the work of port inspection is completed, we trust that the inspectors will be sent to the inland sanitary districts to see how far these are prepared to resist the importation of cholera, and to advise accordingly.

There can be no two opinions as to the value of these conferences between the local authorities and the experienced officers of the Local Government Board, and we congratulate that Board on having undertaken betimes this important work.

THE CHOLERA.

ILLUSTRATIONS OF THE WATER THEORY AT MARSEILLES AND ST. PETERSBURG.

DR. FELIX REGNAULT¹ calls attention to one fact in relation to the etiology of the last outbreak of cholera in Marseilles, namely, the water supply of that town. He believes that the water is undoubtedly, in part at least, responsible for the outbreak, as it is of very questionable quality. Marseilles gets its water mainly by a conduit from the River Durance. This channel runs 85 kilometres before it reaches the town, which it enters at a place called La Gavotte. From this point it has only 6 kilometres more to run before reaching its destination, and in its course it forms the well-known cascade of the Palais Longchamps. During this last short course it becomes extremely polluted, owing to its passage through a densely populated neighbourhood, and its being entirely accessible to pollution. It passes through about twenty corn mills, two oil factories, serving as motive power, and, moreover, serves to wash the corn, after which it returns to the channel, and is used for drinking purposes. Regnault reminds readers of the bacteriological researches made in 1890 by Rietsch, Professor in the Marseilles Medical School, who examined the water taken at different places from the channel, and found that the water, until it reached La Gavotte, contained in 1 cubic centimetre less than 300 microbes, namely, less than

the allowed maximum, but at Longchamps he found that it already contained from 1,500 to 5,000. Although it was not made out what part of that number were pathogenic, yet the possibility of there being many such is great in Dr. Regnault's opinion; in view of the fact that the corn washed in the mills above mentioned is brought from Russia, the Levant, and India, in which countries the corn is partly trodden by human feet instead of machinery being employed. It is disgusting to think that this water, in which that dirty corn is washed, should be drunk by the inhabitants of Marseilles. In addition to this, the old part of the town draws some of its water from the Huveaune—a little river charged with the filth of many villages, and containing 10,000 colonies in one cubic centimetre. The writer suggests that the Huveaune should not be used for drinking purposes at all, and that the mills should be furnished with a separate supply of water.

Sodoloff,² reporting on 944 cholera patients treated in the Banteri Hospital of St. Petersburg during the epidemic of last year, says that most of them, according to their own statements, became ill through drinking unboiled water or kwass (a national beverage made of rye bread, with or without malt), or from having eaten doubtful food. As to the special importance of impure water in the etiology of cholera, one interesting and, from a practical point of view, very grave fact has been observed in St. Petersburg at the very outbreak of the epidemic. The first and fatal cases occurred in a suburb called the Vyborg Side amongst the hands employed at the well-known mills of Koneg and Lessner. The sanitary authorities, searching for the source of the disease and finding that the water used by these people was supplied from the Great Nevka, a little tributary of the Neva of questionable purity, ordered the water pipes to be closed and Pasteur's filters to be used. After that the disease ceased, and no further case of cholera occurred among the mill hands. The author says that, after this observation, which in its lucidity is equivalent to an experiment, he has no doubt as to the part played by impure and unboiled water in the spread of cholera. Nothing is said as to the examination of the water for comma bacilli.

THE PROVISIONS OF THE OATHS ACT IN ITS SANITARY ASPECT.

WE are requested to publish the following correspondence between the Home Secretary and the Chairman of the Parliamentary Bills Committee of the British Medical Association:—

To the Right Hon. H. H. Asquith, Q.C., M.P., Secretary of State for Home Affairs, the Home Office, Whitehall, S.W.

February 9th, 1893.

SIR,—My attention as Chairman of the Parliamentary Bills Committee of the British Medical Association has been directed to certain difficulties attending the application of the provisions of the Oaths Act, 1888, which have caused grave annoyance to many members of the medical profession.

It will be within your recollection that, at the instance of the British Medical Association and other bodies and individuals interested in public medicine, a section was inserted in the Oaths Act for the direct purpose of avoiding, as far as possible, the distinct risk of the communication of infectious disease in the process of "kissing the book," to which attention has been urgently directed in recent years by many medical men.

The section declares in express words that "if any person to whom an oath is administered desires to swear with uplifted hand in the form and manner in which an oath is usually administered in Scotland he shall be permitted so to do, and the oath shall be administered to him in such form and manner without further question;" and the Parliamentary Committee has been advised that under this provision every person to whom any oath is about to be administered is absolutely entitled without reason given, and especially without being questioned as to his religious belief, to elect to be sworn in the Scottish form.

Attention having been called in the JOURNAL of this Association and elsewhere to the advantage of the new procedure, many persons connected with the medical profession have objected to the ceremony of "kissing the book," and claimed to be sworn with uplifted hand, stating in many cases expressly that it was for sanitary reasons only.

I hear with surprise that, in spite of the express provisions of the Act, a considerable number of magistrates and coroners have refused to allow the adoption of the statutory usage. In some cases we are informed that they have insisted on some less objectionable copy of the Bible being procured, while in other cases they have practically forced witnesses to affirm.

The Committee is anxious to afford protection to members of the medical profession, upon whom in many cases a public criticism of their religious belief may inflict considerable hardship; but they would, of

¹ *Médecine Moderne*, February 22nd, 1899

² *Bolesnichaja Gazetta Botkina*, No. 1, 1893.