

the abdomen are removed by taking food. Probably the most constant symptom is the colicky pains felt in different parts of the abdomen; but they are not always present, are intermittent, and vary as much in severity as in situation. Constipation is more usual than diarrhoea, and they may alternate. Itching about the anus and nose is a common symptom, and is rarely absent from one or the other situation, but itching of the anus is more frequent. The nervous phenomena, strictly speaking, are very pronounced, consisting of affections of the special senses, pains and cramps in the extremities, choreic seizures, epileptiform attacks, hysteria, etc. In a few cases the patients experienced a horrible odor, purely subjective; others have disagreeable sensations excited by music; others have impaired vision, sometimes complete amaurosis, now affecting one eye, now the other; again, there are those who have, instead of itching, a sensation of hyperæsthesia or anæsthesia in certain parts of the body, a momentary loss of voice or of memory, persistent wakefulness, epistaxis, etc. The most important symptom is the passage of strobila, or, more frequently, proglottides. Each proglottis contains the sexual apparatus complete and a multitude of embryos, and has a power of motion when first detached from the strobila or tape-worm colony. It is then a segment—a moist, whitish, cool, quadrangular body, like a bit of stout white tape, but changing its shape constantly so long as the power of motion lasts. Inspected with an ordinary pocket lens, the uterus and ovisacs, with their lateral branches on one side, and the testicular bodies on the other side, can readily be seen. It is quite possible to differentiate between the *T. solium* and *T. saginata* by an inspection of the proglottides—the former being thinner, softer, and more transparent. The lateral branches of the uterus of the *T. solium* are from nine to twelve in number, and of the *T. saginata* fifteen to twenty, and the latter are much smaller.

**Treatment.**—There are two separate stages in the process of expulsion of the parasite—the preparatory treatment; the exhibition of the tæniacide. The preparation of the patient consists in the use of a laxative to remove mucus and other matters in which the *scolex*, or head, is imbedded, and to prevent accumulation of such matters by a low diet, which will leave almost no residuum. Sulphate of magnesia should be administered each morning for two mornings before giving the remedy—one or two teaspoonfuls at a time in sufficient water. The diet should consist of milk, steak, tea, and toast, for the day before and during the treatment. German practitioners cause the patient to take certain articles which experience has shown are highly disagreeable to the parasite—such as garlic, onions, and salt-herring—and accordingly they direct a plateful of herring-salad, a savory dish made up of those articles, agreeable enough to Germans, but highly distasteful to tape-worms! The medicine need not be given on

an empty stomach; the patient may take a cup of coffee before beginning the medicine. Many remedies have been proposed, and opinions are diverse as to their utility. Heller prefers kousso; Cobbold,\* extract of male fern; while Davaine does not indicate his preference; and Küchenmeister,† after an exhaustive examination of the almost innumerable methods, ancient and modern, declares his preference for the decoction of pomegranate. The author's experience, which has been not inconsiderable, is decidedly in favor of the pomegranate. The most successful treatment of tape-worm the author has any knowledge of, is that of an ignorant barber, who has a secret method which seems never to fail. He does not attempt any preparatory treatment, but administers his medicine (apparently, a decoction of pomegranate) in the morning, the patient fasting, and retires from the house with the worm and his fee in the afternoon.

Küchenmeister prepares his decoction of pomegranate as follows:  $\zeta$  iij of fresh bark, after macerating for twelve hours in  $\zeta$  xij of water, are concentrated to  $\zeta$  vj by a gentle heat, and this fluid is taken in three doses within an hour. He precedes the administration of the pomegranate by one day of fasting, and  $\zeta$  ij of castor-oil, taken the night before. He prefers to add to the pomegranate the ethereal extract of filix mas and extract of tansy,  $\mathcal{D}$  j— $\mathcal{S}$  ss of the former and  $\mathcal{S}$  ij of the latter.‡

Heller administers the kousso in a special manner—by the method of Rosenthal—which consists of compressed balls or disks coated with gelatine. Five drachms is the quantity required for a *T. solium*, and seven and a half drachms for a *T. saginata*. The gelatine-coated balls and disks are placed as far back on the tongue as possible and swallowed alone, or aided by some coffee. The tendency to vomit must be resisted—mustard applied to the epigastrium, small bits of ice swallowed, the recumbent posture maintained. Two hours after the last bolus, an ounce or two of castor-oil should be administered, the object being to expel the worm speedily and entire. Heller affirms that this method is highly successful, but Küchenmeister thinks kousso an uncertain remedy. The author's experience with it has been unfavorable—it expelled a large quantity of the worm, the segments, but not the head or scolex; but it was adminis-

\* "Entozoa," *op. cit.*, p. 233.

† "On Animal and Vegetable Parasites of the Human Body." By Dr. Frederick Küchenmeister. Sydenham Society edition, vol. i, p. 171.

‡ The active principle of pomegranate—*pelletierine*—is now generally preferred. In a communication to the "Bull. Gén. de Thérap.," July 15, 1879, Dr. Bérenger Ferand reports comparative trials with the tannate and sulphate of pelletierine, prepared by M. Ch. Tanret, the discoverer. He finds the tannate more efficient. The dose is from five to fifteen grains, administered fasting, the diet the previous day consisting of milk and bread. The remedy is followed by compound tincture of jalap, or castor-oil, or sulphate of magnesia. Tanret has put on the market, as a proprietary medicament, a concentrated fluid extract, which is sold under his name. The author has found it to be an efficient remedy.

tered in a decoction, the patient swallowing a great mass of leaves, stems, and flowers, so that vomiting could hardly be resisted. The method by fern consists in the administration of the so-called ethereal extract—the oleoresin—in 3 ss doses, fasting. It is most pleasantly taken in perles or capsules. If of good quality, and given after suitable preparation in an efficient dose, it is a successful remedy—according to Cobbold, the best of the group of tæniafuges. The seeds of the common field pumpkin is a homely but very efficient remedy, which deserves to rank among the best of the class. The fresh seeds are rubbed up into an emulsion by the addition of some water, the woody fiber separated by a coarse sieve, and the mixture drunk fasting. Usually no purgative is required, but one should be given if the bowels do not act promptly. The failures are due, simply, to the difficulty of retaining a sufficient quantity. A great many cures have been effected by turpentine; it is, indeed, one of the most efficient of tæniafuges, but the natural repugnance to swallowing such a dose, the powerful effects produced by it, and the subsequent ill results, are such as to hinder its employment, and to restrict it to the cases which have resisted other means. Large doses, acting promptly as a cathartic, are not so injurious as the smaller doses which pass off by the kidneys. From one to two ounces of turpentine and as much castor-oil are administered together. Pelleterine has been used with increasing success since its discovery, but considerably larger doses are required than were at first supposed to be necessary. Preparation of the patient is not essential. Recently chloroform has come into use and is warmly commended, numerous successful cases having been reported. It is given in from 3 ss to 3 ij, mixed with twice its quantity of glycerin. It may be inclosed in capsules, or given in an emulsion. The former plan is probably more effective. The stools should be carefully and minutely inspected, for the medicine is not successful if the scolex is not expelled. The head with its row of hooklets, its suckers, etc., can be recognized by the naked eye, but an ordinary pocket lens will bring out all parts with sufficient distinctness to render an inspection positive. If the scolex is not found, and is retained, in six weeks to three months the segments or proglottides will be passing again.

*Bothriocephalus latus* is usually classed with tape-worms, and clinically properly so, but, zoologically considered, it is not a tape-worm. Its *habitat* is the small intestine—its scolex attached to the mucous membrane of the duodenum by its suckers. It is found more frequently in the adult and in the female. Its size is greater than that of tænia; its segments are not detached at maturity, and do not maintain an independent life. Detached parts of considerable extent are expelled at long intervals. It is ordinarily, but not invariably, soli-

NOTE.—A combination of the most active tæniafuges, consisting of pomegranate, fern, koussin, etc., is prepared by several pharmacists—among them Wyeth & Brother, of Philadelphia—and sold as a proprietary medicine.

tary. According to Odier, who has observed many cases at Geneva, the bothriocephalous causes swellings of different parts of the abdomen, irregular stools, nausea, vertigo, palpitations, night terrors, etc. There may be no symptoms at all, and, when symptoms do occur, are about the same as those already described for tænia. The expulsion of the bothriocephalus is accomplished more readily than is the tape-worm. Koussou rarely fails. The oleoresin of filix mas is also successful. Kameela has been found efficient. In fact, any of the remedies already referred to as tæniafuges may be used against this worm. In Switzerland, the secret remedy of Peschier, supposed to be fern, is much used.

#### NEMATODA—ASCARIS LUMBRICOIDES—ROUND WORMS.

General Considerations.—The lumbrici are found under all conditions of climate—in cold, in warm, in moist, and in dry climates. They sometimes appear so generally as to become epidemic. In certain epidemics of dysentery, worms in large numbers appeared in the evacuations. But these observations, made in the last century,\* are

open to suspicion, for in those times the pathological importance of worms was much greater than now. It is true, even now, under certain local conditions, that worms are very common—so much so as to constitute an epidemic, and, in some epidemics of fever and of dysentery, great numbers of worms appear in the intestinal tract. The chief mode of propagation is by drinking-water. The ova of the round worm resist freezing and a very high temperature, and are surrounded by such a strong envelope as to oppose successfully ordinary destructive influences, and live for years. It follows that, in country places, where human excreta easily gain access to drinking-water, numbers of people may be simultaneously affected, or in quick succession. Filthy habits of a people—of a community of negroes, for example—contribute greatly to the propagation of lumbrici, by the dissemination of ova through articles of food and drink.

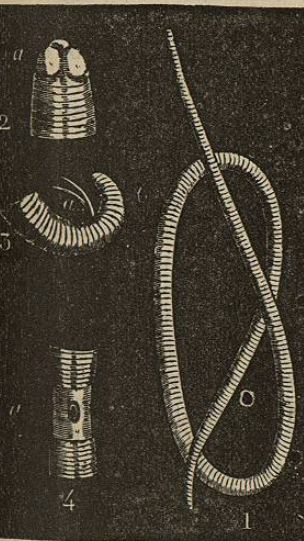


FIG. 10.—*Ascaris lumbricoides*.—1, complete worm; 2, head; 3, tail of the male; 4, middle of the body of female.

The number of ascarides existing at one time in the intestinal canal

\* Davaine, *op. cit.*

is various: there may be one, two, or three worms, or they may reach five hundred or thousands. When very numerous, they may be grouped in rolls or bundles, distending the whole or a part of the intestine, or occluding it. Their place of sojourn is in the small intestine. They occur in early life chiefly, although Heller asserts the contrary, and are not common under one year and after twenty. Females are more subject to them than males, and feeble, lymphatic, and strumous persons more than the robust. Poor aliment, a vegetable diet, and fermented drinks favor their development. Autumn is the season of their greatest prevalence. From their origin to the end of their existence rarely does more than a year transpire, but our knowledge on this point is not very definite.

**Development.**—The lumbricoid worm (Fig. 10) is cylindrical in shape, reddish-brown or brownish-yellow in color, and tapers at both extremities; but the cephalic extremity is larger, and contains at its summit three lips or papillæ, having the mouth between them. The male is smaller than the female, and is distinguished by the tail being always turned toward the abdomen like a hook. The ova, which exist in almost incredible numbers, are oval in shape, have an extremely tough, double shell, and dark, granular contents. The eggs when expelled are slow to develop, several months, sometimes years, being required. "They do not lose their power of development for several years, and the young embryo, while in the shell, also retains its vitality for years." The subsequent steps in the development of lumbrici are at present quite unknown.

**Symptoms.**—When few in number, as is the rule, the host being in good health, there are no symptoms of any kind produced by them. When very numerous, disorders of digestion, of nutrition, and of the nervous system, are caused; but these results are not peculiar to the round worm, and have been alluded to in connection with the tape-worm. The usual symptoms are colicky pains about the umbilicus; tumefaction of the abdomen; capricious appetite, now insatiable, now wanting; occasional nausea and vomiting; sometimes diarrhœa and stools containing mucus mixed with blood; whey-like urine; itching of the nose and anus; bluish coloration of the lower eyelid, dilatation and sometimes inequality of the pupils; emaciation; irregularity of the pulse; choreic and hysterical seizures; restless nights, terrors, and grinding of the teeth in sleep, etc. No confidence can be placed on the diagnosis of worms when all of the foregoing symptoms are present, for they are much more frequently produced by other causes. Hence, the diagnosis must be largely conjectural unless worms are passed from time to time. One or more may be found in the stools, and not rarely worms are brought up from the stomach, and excite gagging and strangling until disengaged from the fauces. If the symptoms above mentioned persist after the ocular demonstration of the presence of worms, they are probably due to this cause. Chorea and epileptiform attacks,

in girls of eight to fifteen, may be due to the presence of worms, and cease on their removal—of which numerous examples have fallen under the author's observation. Occasionally obstruction of the intestine has been caused by a bundle of worms—either within the abdomen, or in a herniary protrusion. Requin narrates a case, the obstruction occurring at two points—in the small intestine; at the middle of the transverse colon.

Ascarides crawl up into the pharynx, the Eustachian tube, the nares, and the larynx. Aronssohn has collected several cases, Davaine others, of death happening suddenly with symptoms of suffocation due to worms crawling into the larynx. Thirty-seven cases are reported (Davaine) of lumbrici in the biliary passages, in the substance of the liver, or in the cavity from rupture of the duct. The most usual position for them is the common duct, which they obstruct, jaundice results, and ultimately serious derangement of the liver ensues. Hepatic abscess is also a result, but, very rarely, of the lodgment of a worm which has passed up into the body of the liver, and excited suppurative inflammation. In some rare cases a worm has been discharged by an hepatic abscess opening externally. Worms have also been discharged externally by fecal abscesses, and they not unfrequently pass into the cavity of the peritoneum through perforations of the intestines. Abscess of the pancreas has been caused by a round worm blocking the duct, an example of which has been reported by Dr. John Shea.

**Treatment.**—There are various remedies highly effective in the removal of the ascaris lumbricoides. The most generally used is *santonine*, or santonin acid, the active constituent of *artemisia santonica*. The advantage of this, besides its efficiency, is the slight taste and ease of administration. It should always be explained that the vision of those taking santonine is affected: all objects seem as if looked at through yellow-colored glasses, and also that the urine is stained a deep yellow. In overdoses santonine causes violent nervous symptoms. It is given in the form of powder, rubbed up with sugar, or some extract of liquorice—two to four grains at night, followed by a laxative in the morning. Calomel has considerable vermifuge property, and is often alone sufficient, but is now used as an adjunct to santonine, two to four grains given with the same quantity of santonine. This plan, which is very satisfactory, is still more efficient if the use of the vermifuge is preceded by hydrocyanic acid (the officinal dilution), two or three drops, three times a day, for two days. Next to santonine in point of efficiency is chenopodium or worm-seed, which is usually administered in the form of the oil. Its powerful odor and disagreeable taste are strong objections. Five to ten drops can be given in an ounce of castor-oil, or in the fluid extract of spigelia, also an efficient vermifuge. The fluid extract of spigelia (pink-root) may be given alone in from one to four drachms at a dose, or in the officinal combi-

nation, the fluid extract of senna and spigelia. Any of the remedies named are efficient against the round worm.

#### OXYURUS VERMICULARIS.—THREAD-WORM.

**Description.**—This parasite (Fig. 12) derives its common name—thread-worm—from its whitish appearance and size, like a bit of fine sewing-cotton, and from its habitat, the seat-worm. There are two sexes, male and female, the male being only one half the size of the female. The female worm is scarcely a half inch (nine to twelve mm.), and the male is about one fourth of an inch (three to five mm.) in length, cylindrical, tapering to both extremities, but the cephalic end



FIG. 11.—Trichocephalus of Man.—1, female: *a*, cephalic extremity; *b*, caudal extremity and anus; *c*, *d*, digestive tube and ovary; *e*, orifice of sexual apparatus. 2, isolated egg. 3, male: *a*, cephalic extremity; *b*, anus; *c*, digestive tube; *d*, spicula or penis; *e*, sheath into which it is withdrawn.

is blunter. The ova are contained in a stout envelope which resists considerable heat as well as cold, but softens in the intestinal canal of man, and discharges its embryo, which, indeed, may be discerned in the mature eggs already in process of development. The habitat of the oxyurus is the large intestine of man, especially the rectum, and they insinuate themselves into the folds of the mucous membrane and skin at the margin of the anus. They are most abundant in early life, and sometimes at the other extreme, in old age.

**Symptoms.**—They excite by their presence in the rectum an intolerable itching, sometimes severe pain, tenesmus usually, and these sensations are propagated to the genito-urinary organs. The tormenting itching occurs at special times, and is very aggravating at night, when warm in bed. The stools are usually a little relaxed, fetid, and coated

with mucus, and occasionally streaked with blood. An inspection of the parts discloses a reddened and roughened integument all about the anus, and excoriations of the mucous membrane caused by the repeated friction of the parts. The worms may often be seen *in situ*, or in the evacuations, but it is necessary sometimes to administer an injection or a laxative to procure ocular evidences of the presence of these parasites. Besides the local, various reflex phenomena are induced by the irritation of the oxyurus, as epilepsy, chorea, catalepsy, etc. Unquestionably, excitation of the sexual organs is thus caused, leading to onanism. Besides the reflex, direct irritation of the genitals in girls is set up by the presence of these worms in the vagina, where they deposit their ova and develop in immense numbers. Violent local inflammation and a blenorrhagic discharge are also induced in this way, exciting suspicion of gonorrhœal infection. The oxyurus is not confined to the rectum, nor are its excursions limited to the perineum and vagina. It migrates upward into the large intestine, develops in the cæcum, and the lower part of the ileum is also invaded. So that, although the proper habitat of the parasite is the rectum, it should not be overlooked that they exist in the cæcum and in the lower part of the ilium in great numbers.

**Treatment.**—The fact just stated in regard to the position of these parasites in the intestinal canal is of great importance in the treatment. The administration of one of the vermifuges, especially santonine, aided by calomel, should be the first step in the treatment. As soon as this has acted, the bowel should be irrigated by a weak decoction of quassia or of aloes. A simple injection will usually suffice, since the santonine has probably displaced all of the parasites above. The decoction should also be used as a vaginal injection, employing a very small tube, so that all of the canal can be reached. As the ova are deposited in the folds of the anus, and are not reached by the injections, the next step consists in carefully sponging out all the folds and crevices of the anus and perineum, and the external genitals also, with a one per cent. solution of carbolic acid. If treated in this thorough manner, the applications being repeated a few times, the parasites will be entirely destroyed, but neglect of any of these precautions will render repeated applications necessary. Solutions of carbolic acid as an injection have been used with success in the treatment of the oxyurus, but such serious symptoms have arisen in some cases that this practice ought not to be continued.

Trichocephalus (Fig. 11) is rarely encountered. In respect to clinical history and symptoms, it does not differ from the round worm.

## DISEASES OF THE PERITONEUM.

## PERITONITIS.—INFLAMMATION OF THE PERITONEUM.

**Definition.**—Inflammation of the peritoneum occurs in two forms—*acute* and *chronic*. It may be limited to a part, or involve the whole of the membrane: in the former it is *local*, in the latter *general* peritonitis. It may be an independent affection, or *primary*, or it may be caused by the extension of a morbid process, from adjacent organs or tissues, or *secondary*.

**Causes.**—As a primary disease peritonitis is rare, but it may occur at any age, even during intra-uterine life. Intense cold, severe and protracted counter-irritation by blisters, and blows on the abdomen, may excite the inflammatory process. Very much the most frequent cause is the extension of internal lesions of the abdomen—e. g., perforations of the stomach, intestines, bladder, etc., or inflammation of these organs. To this category may be added the causes of pelvic inflammation of the uterus and annexed organs. It is not unfrequently an intercurrent malady coming on in the course of certain cachexiæ, as pyæmia, albuminuria, and the eruptive fevers.

**Pathological Anatomy.**—The first step in the inflammatory process is the occurrence of hyperæmia, the capillaries being enlarged and distended, and the blood-pressure is so increased within the area of inflammation that extravasations of blood occur at various points. An arrest of the normal secretion and an abnormal dryness are then evident; next an exudation, very thin but adhesive, forms on the inflamed surface and glues the neighboring parts together, but not firmly, for they may be easily separated. Simultaneously, a reddish, serous fluid is poured out into the cavity. The inflammation will now assume one of two directions—it will take the *adhesive* or *exudative* form. The fibrinous exudation already mentioned is almost pure fibrin and contains but few cellular elements. Presently, however, the cells of the endothelium become swollen, their contents granular, and their nuclei undergo multiplication. If, now, the process ends with the adhesive inflammation, the proliferation of the endothelium will soon be arrested, a delicate connective tissue will be formed from the new cellular elements, blood-vessels soon appear, and a distinct neo-membrane is the result, binding neighboring surfaces together, or forming bands of adhesion of greater or less extent. If the inflammatory process assumes the other direction, the effusion increases. It is at first sero-fibrinous, i. e., a serous fluid, having masses of flocculi of lymph floating in it. The deposit of fibrin, which in the other form (adhesive) is slight in extent, and which disappears in the process of

formation of the neo-membrane from the new cells, in this form (exudative) is very much increased, and constitutes a coating of considerable thickness. The endothelium undergoes extensive proliferation; the connective-tissue corpuscles of the basement membrane also, and new vessels develop. On separation of the fibrin layer from the serous membrane, the latter bleeds from rupture of minute new-formed vessels; it appears dense, thick, and œdematous. The swelling, hyperæmia, and œdema, also extend to the sub-peritoneal connective tissue, and ultimately to the muscular tissue, which in turn becomes softened, pale, and flabby. When the inflammation occurs in the peritoneal layer of the liver or spleen, the tissue adjacent to the inflamed membrane is paler than normal, softened from œdematous infiltration, and otherwise altered. The effusion poured out into the cavity assumes various appearances and characteristics. The quantity varies from a few ounces, in the dependent parts of the cavity, up to several gallons. It may be sufficient to force up the diaphragm to a level with the third rib, make the heart lie transversely by pushing up the apex, displace the lungs, etc. The effusion may be chiefly fibrinous with but little fluid. When this is the case, the thickest deposits are seen over the solid organs, the liver and spleen, and it may be general, uniting the whole surface, or limited in extent, forming occasional adhesions. The neo-membrane contains vessels, often of considerable size, and having walls of exceeding tenuity. These vessels rupture easily, and considerable hæmorrhage results, and this, mixed with the effusion, constitutes another form, the so-called hæmorrhagic effusion. The adhesions, when isolated and not general, undergo great changes ultimately, by reason of the extensive motion possessed by the abdominal organs. They may, by subsequent contraction, cause great deformity of organs and seriously impair their functions, and in the case of the intestine may induce twisting, encroach on their caliber, and bring about slow occlusion. The small intestines may by means of such adhesions be agglutinated together, forming an almost solid mass, irregularly rounded, as the author has seen, in certainly one well-marked case. The effusion may be serous—a faint greenish, or greenish-yellow, or milky fluid, similar to the fluid of ascites, except in the presence of flocculi of fibrin, bits of false membrane, and casts of cells of the endothelium. The effusion is sero-fibrinous, when there is a large quantity of fibrin suspended in it. When absorption of the fluid takes place, the solid exudation undergoes the changes already described. The effusion may be purulent. When this is the product of the inflammation, its cause is, as a rule, perforation and the escape of purulent or decomposing matters into the peritoneal cavity. When the effusion is purulent, the amount of fluid contained in the abdomen varies greatly. There may be thick masses of pus, or the pus may be mixed with a quantity of serum, constituting a sero-purulent fluid.