

myocardium was unaffected and though, it is true, hepatic cirrhosis was present, syphilis rather than alcohol seems to have been the etiological factor.

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PULMONARY GANGRENE WITH EMPY-  
ÆMA AND ACUTE MENINGISMUS,  
DUE TO ASCARIS LUMBRICOIDES\*

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Intestinal infestation with *ascaris lumbricoides* is so very common in children that it is often regarded by the laity, and even by some members of the medical profession, in the same light as mumps and measles—an almost necessary evil, to be endured and recovered from before adolescence is reached. That a child has, or may have, worms is apparently more often considered as an insult to the eye and the imagination than as a cause for alarm or anxiety. The following case is considered noteworthy in that it illustrates the fact that grave complications and unusual clinical pictures may arise from this infestation.

S. K., male, aged four years, was admitted to the Children's Memorial Hospital in January, 1929, because of deepening coma, marked stiffness of the muscles, and a discharging right ear. He was born in Hungary, always healthy, and had been brought to Canada only two months before. The doctor who recommended his admission considered him to be suffering from meningitis, possibly as a complication from his otitis media. His mother and father were alive and well, and one other child was apparently healthy. The right ear had begun discharging two weeks prior to admission, and this had continued with little apparent discomfort. Two days before admission the patient became restless and drowsy. The drowsiness had gradually progressed until the time of admission, when he was absolutely comatose. He vomited several times before arrival at the hospital.

Physical examination at the time of admission

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showed the child to be very well developed and well nourished. No response of any kind could be elicited. The breathing was rapid and laboured. The body generally was of a pale dusky colour, the lips cyanosed; the hands, feet and dependent parts, a mottled blue. The pulse was weak and thready, 120 per minute; the temperature was 97.2°. On the right side of the face, along the line of the jaw and over the scalp, were a number of superficial crusted ulcerations. The percussion note, particularly over the left chest, was definitely impaired, and everywhere over the chest could be heard fine and coarse moist râles. A friction rub was made out just below the left nipple. Blowing breathing was present over the left scapula, and throughout the remainder of the chest there were diminished breath sounds. The heart did not appear to be increased in size and the sounds were indistinct and irregular. The muscles everywhere were spastic; the jaw clenched, the abdomen rigid, the limbs stiffened, and the neck could not be flexed. No reflexes could be obtained. Kernig's sign was not present. Both eyes were closed, and the eyeballs moved slowly from side to side. The pupils were equal, of normal size, and reacted to light. The other systems were found to be normal. A tentative diagnosis of pneumonia, right otitis media, and meningitis was made.

After admission a spinal puncture showed increased pressure, but the fluid contained only 35 cells per c.mm., and these were chiefly monocytes. Pandy's test for globulin was negative, and the fluid did not reduce Fehling's solution. Cultures made from the fluid were sterile.

The child showed a slight transient improvement following the spinal puncture, but soon the pulse became imperceptible at the wrist, the breathing very irregular, and death ensued twelve hours after admission.

At the autopsy, performed twelve hours after death, the brain and meninges showed no evidence, grossly, microscopically, or culturally, of any infective process. The right middle ear contained pus and granulation tissue. The mastoid antrum was not involved. On opening the abdomen the abdominal organs were found to be normal, save for the fact that the intestines and stomach contained about forty *ascarides lumbricoides*. These were scattered mainly in the upper small intestines; two were found in the stomach; and a large number formed a ball in the upper ileum. The left pleural cavity contained about 500 c.c. of thin, dark-brown pus.

The left lung was practically collapsed, the lower lobe airless, firm and brownish-green in colour. Two and a half inches of the cephalic extremity of a round worm protruded into the left pleural cavity through a perforation of the lower lobe posteriorly, near the hilum. The worm was greyish-white in colour, about five inches long, with two lance-like projections from a subterminal cloaca (male). It still exhibited slow movements. The track along which this worm had passed could be traced into the lung substance. Apparently it must have been regurgitated from the stomach to the level of the larynx and aspirated into the left bronchus, which it perforated to reach the present position occupied in the lung. The opposite lung showed patchy areas of acute consolidation. The other organs were found to be normal. The anatomical diagnosis was:

Intestinal ascariasis; an *ascaris lumbricoides* in the lower lobe of the left lung; early gangrene of the lower lobe of the left lung; perforation of the left visceral pleura; early empyæma, left; bilateral bronchopneumonia; right otitis media.

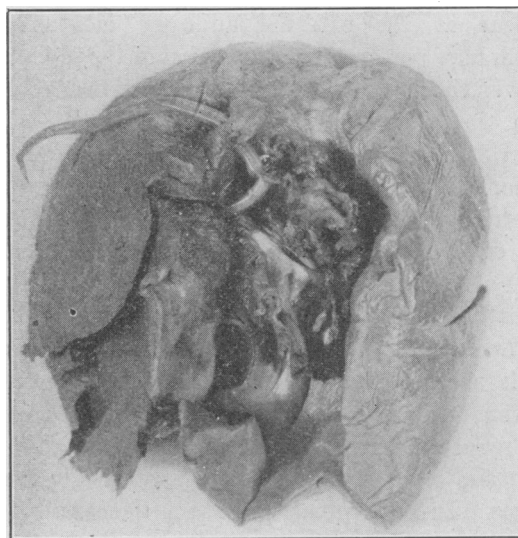
#### DISCUSSION

*Ascaris lumbricoides* is probably the most common human parasite, especially in children, and as it does not require an intermediate host infection takes place through food or drink, or by the fingers in the case of children who have been playing where soil pollution exists. Stewart<sup>1</sup> noted that the eggs of this parasite may hatch out in the intestines of rats, mice, and pigs and that these may serve as a means of infecting man. The disease is found in all countries, being particularly prevalent in the tropics, but cases have been reported from the Arctic regions.

The ova, which are covered with a thick, coarse, albuminous mantle, become infective, depending upon the temperature, in two weeks to one month after being passed. During this time an embryo develops, and it is stated that it may remain alive in the shell for years. After being swallowed the embryos leave the egg, pierce the intestinal wall, reach the liver through the portal system and thence the lungs through the systemic circulation. They penetrate the bronchi, pass up the trachea, are swallowed, and reach the small intestines, where they develop into adult worms. An interesting point is that when the primary infection is heavy the larvæ may, when in the lung, produce a pneumonia with cough and bloody sputum, lasting about

two to seven days and ending by crisis. It is stated that the number of adult worms usually present is small, about four to ten, but they may occur in enormous numbers, five thousand having been recorded in one case.

The symptoms usually attributed to worms are abdominal pain, umbilical or colonic, mucus in the stools, occasional loose stools, and indigestion, sometimes anæmia and eosinophilia. But occasionally unusual clinical pictures are produced and the diagnosis for a time is unsuspected. There is a type represented in the case under discussion, in which nervous symptoms resembling meningitis are so marked that they dominate the picture. Giampetruzzi<sup>2</sup> recently reported a case of this variety in which tuberculous meningitis was simulated. Piper<sup>3</sup> and others have suggested that these nervous symptoms may be due to a peculiar irritating toxin which is formed by this parasite and is often



View of the medial surface and hilum of the left lung showing an *ascaris lumbricoides* piercing the pleura and protruding from the upper posterior border of the lower lobe. The lower lobe is darkened in colour and exhibits early gangrene.

evident to the sense of smell. Occasionally, in adult patients, nervous symptoms of marked neurotic nature have developed from the mental shock experienced in the passage of a worm. Chauffard, Marie and Tauchon<sup>4</sup> report a remarkable condition of fever, foul breath, and intermittent diarrhœa, which they term typho-lumbricosis, and more recently Banerji<sup>5</sup> has added another case of this variety. This febrile condition may last a month or more and may be associated with marked anæmia and high eosinophilia. In certain individuals, research workers

and slaughter-house employees, the so-called "gut-cleaners," who handle these worms, a peculiar hypersensitiveness, not unlike the phenomena associated with asthma and hayfever, sometimes develops from contact with the toxin of *ascaris lumbricoides*. It has been suggested that the worms may themselves suffer from disease, and at this time the toxin produced by them is much more virulent towards man. Various attempts have been made to employ a toxin of extracts of crushed worms in cutaneous tests for diagnostic purposes, but the results have not been found satisfactory. According to Coventry and Taliaferro<sup>6</sup> and Rackemann and Stevens<sup>7</sup>, there exists no correlation between positive skin tests and the presence of infection.

The migrations and complications of these intestinal helminths are most interesting. They have been known to enter the biliary, pancreatic and even the lacrimal ducts; to travel through the Eustachian tube, pierce the ear-drum and appear at the external auditory meatus. A worm may perforate an ulceration of the intestine or even the healthy intestinal wall to gain entrance into the abdominal cavity. Blanchard<sup>8</sup>, compiled 81 cases in which these parasites actually perforated the abdominal wall and appeared externally, most often in the region of the umbilicus or groin. The possibility that they may gain access into the peritoneal cavity through operative measures on the intestines must always be thought of. Stiles<sup>9</sup> refers to 40 cases in which adult worms have been found in the lungs, causing gangrene and pneumonia, and Dixey<sup>10</sup> has reported an instance of sudden death due to occlusion of the larynx by two *ascarides lumbricoides*. In abdominal operations, especially in the Orient, the surgeon not infrequently finds an intestinal obstruction or a perforated appendix, due to the *ascaris lumbricoides*.

The first step in the treatment should be directed against auto-infection by thorough cleansing of the hands after defaecation. The stools should be sterilized with disinfectants or heat. On the day previous to active treatment the patient should be on a soft diet and castor oil given at night. Santonin, in doses of one to five grains, with calomel one or two grains given the following morning, followed in three hours by a large saline purgative, is usually sufficient. It is well to repeat this medication the following morning, and again later, if ova are still found in the stools. Oil of chenopodium, male fern, or thymol may also be used.

#### SUMMARY

1. The *ascaris lumbricoides* is one of the commonest parasites of man.
2. It may produce obscure symptoms resembling acute pneumonia, a continued febrile condition, or, as in our case, meningismus, in which the true nature of the condition may not be recognized.
3. Hypersensitiveness to its toxin may be exhibited by certain individuals, which can be detected by skin tests. These are, however, not diagnostic of infestation.
4. Certain of these parasites exhibiting nomadic tendencies are found in the most unlikely places, and they may even penetrate previously healthy tissue, the ear-drum, intestinal wall, urinary tract or, as in our case, the lung and pleura.
5. Transmission is usually direct. An intermediary host is not necessary in the life cycle of the *ascaris*, but rats, mice, and pigs may possibly also serve as a means of propagation.

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#### AN UNUSUAL CASE OF EXOMPHALOS, OR EXTROVERSION OF THE VISCERA, IN A NEWBORN.

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The mother was a primipara, aged 25, with normal pelvic measurements. Her pregnancy had followed the normal course, and the expected date of confinement was January 31st, 1929.

The *Personal* and *Family History* of both parents were quite negative.

The mother went into labour at 2 a.m. February 22nd, 1929. Examination showed a vertex presentation in the left occipitoanterior position. Dilatation of the cervix, rupture of the membranes and descent of the head were completed at 6 a.m.