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THE EARLY SYMPTOMS FOLLOWING INFECTION BY SCHISTOSOMUM MANSONI.

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In August and September, 1916, twenty-four cases were admitted to the Australian General Hospital in Cairo suffering from some or all of the following symptoms: Abdominal pain, enlarged and tender liver and spleen, pyrexia, bronchitis, urticaria and diarrhoea.

All the patients were Australians who had not travelled before enlistment. At first it was not clear what was the matter with these men and blood cultures were made and other investigations carried out with negative results, but the blood picture afforded the key. In every case a striking eosinophilia was present. This led to prolonged examination of the stools for parasites and resulted in the discovery of the lateral spined ova of Schistosomum mansoni. The ova were found ultimately in the stools of all. The ova were scarce at this stage of the disease as presumably the majority of the paired adult worms had not yet found a suitable home in the veins draining the rectum.

All of these patients had been in camp at Tel-el-Kebir during the three months preceding the onset of symptoms and it was there that the infection was apparently contracted. Near the rifle range used by the men in camp there is a fresh water canal, in which the water flows sluggishly and the infected men had either bathed or washed in that canal. Most of them had been fully immersed, having swum in the water, but one man had merely washed his hands and another had washed cooking utensils in it. In the last two the infection was quite as severe as in the others. Some of the patients had swum more than once. None of them had washed in any other fresh water in Egypt except the shower baths and water provided for ablution. Itchiness of the skin was observed by several on coming out of the water. None of them had used towels. None of the patients could remember having drunk the water.

Following are notes of three cases:

Case 1.—Admitted August 18.

Past History.—Was overseer on a sheep station, New South Wales. Had had no sickness. Arrived in Egypt June, 1916. Bathed in fresh-water canal at Tel-el-Kebir about July 18.

Present Illness.—This began with a cough about a fortnight ago. He says that his sputum was stained with blood. At the same time he had headache and loss of appetite. These symptoms continued till four days ago, when he had sharp pains in the upper abdomen extending round the right side to his back. To-day the pain became general all over his abdomen. He had retching but no vomiting. His bowels were normal till two days ago, when he had diarrhoea, which continued till this morning. To-day there have been sweating and shivering.

On examination he looks sick and is flushed, and has a hot dry skin. Tongue
moist and slightly furred. Chest scattered rhonchi. There is a little mucoid sputum which is not blood stained. Abdomen: Distension and tenderness all over. Good movement. The maximum tenderness is in the right iliac fossa, and over the spleen and liver, which are enlarged and palpable. Urine normal. Blood culture was made on the night of admission. The result was negative. August 19: Leucocyte count, 20,000. August 20: Shiver. Blood film made and examined for malarial parasites. No parasites found, but high eosinophilia was revealed. August 21: Blood films made for differential white count. Result: Polymorphonuclears, 22.5 per cent; small mononuclears, 15.5 per cent; large mononuclears, 2.0 per cent; eosinophiles, 60.0 per cent. August 24: Urticaria on body and limbs. Present for seven days. Complaining of discomfort after food. August 29: Feels better; has no pain. August 31: Stool examined by pathologist. Large and small amoebae of coli type and coli cysts and blastocystis and cysts were found. September 2: Stool again examined. Same result. September 6: Headache; slight shiver; abdominal pain. September 11: Shivered during night, complaining of headache, abdominal pain and fullness after food. Pain most severe and tenderness most marked in left lower abdomen. Has a little diarrhoea. Stool again examined and lateral-spined bilharzia ova were found. September 13: Abdominal pain during night. Discomfort after food this morning. September 20: Has improved, but abdominal pain and discomfort after food are still present. Liver and spleen are enlarged and easily palpable. September 23: Discharged to Australia as cot case.
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moist and slightly furred; chest normal. Abdomen—Good movement, no distension. Tenderness in right iliac fossa and enlargement and tenderness of liver and spleen. August 30: Urticaria present for two days. September 1: Leucocyte count 17,000. Differential white count: Polymorphonuclears 16 per cent, small mononuclears 25·5 per cent, large mononuclears 3·5 per cent, eosinophiles 55·5 per cent. September 5: Diarrhoea. Stool examined by pathologist. Report—stool liquid, no mucus or blood. Heavy lamblia cyst infection. No other parasites found. September 6: Severe pain in upper abdomen; tender over upper part of right rectus which is rigid. September 9: Stool examined, same report as on the 5th. September 11: Stool examined, lateral-spined bilharzia ova present. September 20: Improved, but still has attacks of severe abdominal pain, and much discomfort after food. Liver and spleen enlarged. He is very wasted. September 23: Discharged to Australia as convalescent.

Case 3.—Admitted August 25.


Present Illness.—At the onset at the end of June he had headache and dizziness
and felt weak. He reported sick on July 9 with these symptoms, pains all over and feverishness. He was sent to a Stationary Hospital and remained there for three weeks, during which time he had headache and pyrexia. In hospital he developed a cough. He was thought to have an enterica infection and was sent to an infectious diseases hospital on July 31. There the same symptoms continued. The cough became worse and was very troublesome at night and he had night sweats. Blood examinations for enterica were negative. His urine

was sterile and faeces negative for organisms of the enterica group. August 18: Leucocytes 18,000. August 20: Sputum negative for tubercle bacilli. August 25: Transferred to No. 3 Australian General Hospital. Examination—Looks sick, is pale and wasted, tongue moist, white fur in centre, teeth very bad, severe pyorrhoea; signs of pneumonia in chest; liver not felt but dullness extends to the fourth rib in the nipple line; spleen palpable; he states that he had a rash about a fortnight after the onset; urine normal. August 26: Differential white
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count, polymorphonuclears 15 per cent, small mononuclears 14 per cent, large mononuclears 3 per cent, eosinophiles 68 per cent. August 29: Stool examined. Report—liquid stool, blood and mucus present; trichomonas and lambia cysts present; no amœbe or cysts seen. Many Charcot's crystals. August 31: Stool examined, similar results. September 7: Stool examined, similar results. September 10: Stool examined, similar results. September 11: Stool examined, lateral-spined Ova of bilharzia present and living miricidium seen. September 20: From August 29 there was considerable improvement; but the cough continued to be very troublesome, especially at night, and caused loss of sleep. There was sometimes abdominal pain and discomfort after food, and his bowels were often loose; he had frequent night sweats; he was discharged to Australia as cot case on September 23.

INCUBATION PERIOD.

The period of incubation was not as a rule easy to fix accurately, for the date of exposure to infection often could not be given definitely and, when the symptoms had appeared, some weeks before the patients were transferred to the base, the exact time of their onset was, in some instances, unknown. The shortest incubation period was four weeks, and the longest was about three months. Most often it was between four and eight weeks. This is shorter than the incubation period in vesical bilharziosis and none of the patients had signs or symptoms of that condition and ova were not found in their urine. But it is possible that symptoms of vesical bilharziosis may have become manifest later, for both types of bilharzia exist in the water where the rectal disease was acquired, for a patient who swam in the same water was admitted to No. 14 Australian General Hospital with vesical bilharziosis.

Symptoms (General).—Onset. This was sometimes abrupt, but more often the patients felt out of sorts for a few days, with loss of appetite, persistent headache, pains in the back and limbs and dizziness. There was usually a cough in the early stages. Sometimes cough was the first symptom. Vomiting was uncommon. These symptoms were followed by abdominal pain, which was often accompanied by diarrhœa. At the onset the pain was usually in the lower abdomen, but in a few cases pain in the upper abdomen was first noticed and later in the illness the most troublesome pain was in the right upper abdomen. During the first weeks of illness, there was pyrexia with hot dry skin and dirty tongue.

In some instances, however, the illness appeared to have been mild from the beginning. The temperature remained high for about ten days and then descended and sometimes it did not rise again above 99° F. or 100° F., but in other cases after seven to ten days another pyrexial period ensued. In a few cases the period of pyrexia extended over several weeks, the longest being about eight weeks. Shivers and sweats were frequent. The latter generally occurred at night and were sometimes severe. Headache was usually a troublesome symptom. Notwithstanding the temperature, the pulse was slow. Dicrotism was observed once. Later there was invariably an evening rise to 99° F. or 100° F. or 103° F. The temperature remained high for about ten days and then descended and sometimes it did not rise again above 99° F. or 100° F., but in other cases after seven to ten days another pyrexial period ensued. In a few cases the period of pyrexia extended over several weeks, the longest being about eight weeks. Shivers and sweats were frequent. The latter generally occurred at night and were sometimes severe. Headache was usually a troublesome symptom. Notwithstanding the temperature, the pulse was slow. Dicrotism was observed once. Later there was invariably an evening rise to 99° F. or 100° F. either daily or at intervals of two to three days, as long as the patient was under observation.
Urticaria.—Urticaria was always present at some stage of the disease and in patients who were seen soon after the onset it appeared in the second or third week. Its duration was variable, being from twelve to forty-eight hours as a rule, but in some cases it remained for seven or eight days. Its distribution was general, large wheals being scattered over the body and limbs. Often it had come and gone before the patients were sent to the base. In one case the urticaria recurred several times.

Blood Changes.—The red corpuscles were counted and haemoglobin estimated in only two cases and these showed no changes. There was always a leucocytosis. It varied from 18,000 to 22,000 and was usually about 18,000. Differential white cell counts invariably gave a high eosinophilia. This was never lower than thirty-six per cent and was most often about fifty per cent. The highest was seventy-six per cent.

In cases of bilharzia haematothium previously reported the eosinophilia was generally lower.


Douglas and Hand [3] in fifty cases found the eosinophilia was less than 5 per cent in 1 case, less than 10 per cent in 13, less than 15 per cent in 12, less than 20 per cent in 11, less than 30 per cent in 10 and greater than 30 per cent in 3.

Kautskv bey [4] reported no leucocytosis, and red cells not diminished and haemoglobin 50 to 80 per cent. In 22 cases the eosinophilia was in 5 cases 5 to 10 per cent, 13 cases 10 to 20 per cent, 2 cases 20 to 30 per cent, 2 cases 40 per cent, and in 1 case 53 per cent.

Catouillard and Gober [5] described the following blood picture: Red corpuscles 3 to 5 million, white corpuscles 8,525 to 10,850, eosinophiles 5 to 26 per cent.

Nathan Laxrier [6] estimated the eosinophiles to be from 5 to 25 per cent.

Zweifel [7] gave the blood picture as: Red corpuscles 2,700,000 to 7,780,000, white corpuscles 4,500 to 17,500, eosinophiles 3 to 35 per cent.

Symptoms, Abdominal.—The abdomen was often distended. At first it was tender all over, but the maximum tenderness was over the descending colon and in the right upper quadrant and in the latter area the muscles were held on guard. The tenderness was very marked in the beginning but gradually diminished. It never entirely disappeared, some tenderness over the descending colon and over the liver remaining. The liver and spleen were enlarged, easily palpable and tender. Enlargement of those organs was found without exception in the first weeks, but though the liver continued to be palpable the spleen after three or four weeks could not in many cases be felt. Attacks of pain in the upper abdomen were frequent and often severe but the most distressing symptom was a feeling of fullness in the epigastrium after taking any nourishment. This was a constant and persistent symptom, and was the cause of much discomfort. Attacks of diarrhoea occurred but were not very common and not severe and rarely were present for more than twenty-four hours. During such attacks blood and mucus were often passed. With the diarrhoea tenesmus sometimes occurred but gave little trouble.

Diarrhoea, however, was in a few cases the outstanding feature of the illness and continued for from two to three weeks. When this was so, blood and mucus
were abundant in the stools and tenesmus was marked. In the absence of diarrhoea, or when the diarrhoea was present only for a few days, and had passed off, a little blood and mucus often insufficient to attract the patient's attention was the only abnormality seen in the stool. Often the stool appeared to be normal. In every case the stool sooner or later contained the lateral-spined ova of Schistosomum mansoni. Usually the ova were found at this stage of the disease only after prolonged search. Sometimes they were more readily found in mucus removed from the rectum.

Pulmonary.—Cough was sometimes the most prominent symptom and in a few instances it was present during the whole of the patient's stay in hospital. In the chest there were signs of bronchitis and in some cases there were also patches of consolidation. These signs usually cleared up fairly quickly, but in one case they were present for more than ten weeks, and were still present when the patient was discharged from hospital. Generally, the chest symptoms did not cause great inconvenience, but in some patients the cough was worse at night and resulted in loss of sleep.

Course of the Disease.—In most of the cases observed the tendency was for the symptoms to moderate after a varying time in which the patients were acutely ill. When the earlier stages were severe and the pyrexial period protracted there was considerable emaciation and weakness. Though the symptoms moderated, in no case did they clear up completely. All the patients remained weak, but improved a little and their weight increased. They were troubled by frequent headaches, occasional attacks of abdominal pain and diarrhoea and the feeling of fullness after food. Sometimes the condition of the bowels was normal and sometimes there was constipation. In some cases the acute stage had been passed before the patients reached the base and they were in this chronic condition when first seen.

Parallelism with Katayama Disease.—The early symptoms in these cases of rectal bilharziosis resembled, in a general way, those described in katayama disease, and the symptoms and course of the illness in some of these cases were very similar to those in cases of katayama disease reported by Bassett-Smith [8] and Edgar [9]. Though resembling it in a general way, the illness was less severe than that described in the katayama disease, for there was no ascites or oedema of the legs and there were no deaths.

A search of the literature showed an absence of any record of these early symptoms in infection by S. mansoni. All state that the first symptoms are those occasioned by the presence of the worm in the mucous membrane of the intestine. Sandwith [10] in 1905 stated that "no symptoms are known to show when liver and lungs are affected."

The only observation indicating any recognition of an earlier febrile state set up by the development of the embryo in the liver is a note by Archibald [11], who described three cases of pyrexia of unknown origin which, at post-mortem, were found to have intestinal schistosomiasis. He emphasizes the fact that in these cases there was no eosinophilia.

Differential Diagnosis.

No. 1, Dysentery.—When the illness began with diarrhoea accompanied by the passage of blood and mucus and by abdominal pains and tenesmus, there
was a close resemblance to dysentery. In such cases dysentery was excluded by examinations of the stools for protozoa and bacilli.

No. 2, Enterica.—The early symptoms sometimes were suggestive of an enterica infection. This was always excluded on further investigation.

No. 3, Urticaria.—In some cases men first reported sick with urticaria, and when they were not very ill the condition was regarded as the result of some intestinal toxemia and they were not sent to hospital till other symptoms appeared. In a few cases the first symptoms to attract attention were painful swellings of the eyelids and lips, and on the limbs, and in the absence of other symptoms a diagnosis of angioneurotic oedema was made.

No. 4, Pulmonary Tuberculosis.—When cough was the most prominent symptom and there were also wasting, evening rise of temperature and night sweats, and signs of bronchitis and consolidation, pulmonary tuberculosis was diagnosed. Several patients were admitted to hospital with this diagnosis and repeated examinations were made of the sputum for tubercle bacilli, but none were found.

No. 5, Hepatic Abscess.—In two cases this condition was thought to be present. In the first the liver was explored with a large needle, and pus was not found. This man had a history of dysentery a few months previously. The second man came in after a diagnosis of bilharziosis had been made in a number of other cases. A blood film showed an eosinophilia and bilharzia ova were found in his stools.

No. 6, Ulcerative Endocarditis.—One man presented a clinical picture very suggestive of this condition. Two blood cultures were made and both were negative. A blood film showed a high eosinophilia.

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REFERENCES.