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FEBRILE PHENOMENA IN SCHISTOSOMIASIS MANSONI WITH ILLUSTRATIVE CASES *

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The importance of *Schistosoma mansoni* infestation as the direct cause of febrile syndromes is not generally recognized. Personal interviews with physicians practicing in endemic areas in Puerto Rico have revealed that they rarely, if ever, consider schistosomiasis in the differential diagnosis of their acute or prolonged fevers. Some have even seemed skeptical when told that this condition may cause fever and others have expressed their inability to find any such statement in text-books.

Although they have mentioned it, it does seem that authors have failed to emphasize this manifestation of the disease sufficiently to impress physicians with its importance in the differential diagnosis of the fevers of the tropics.

Manson-Bahr(1), discussing intestinal schistosomiasis, says: "In mass infections, in early cases, toxic symptoms resembling those of Katayama disease are noted, especially in Europeans. The general symptoms consist of a remittent pyrexia with urticaria, marked abdominal pain, anorexia, rigors, and pulmonary symptoms." Under "Katayama disease" (schistosomiasis japonica) he describes a first stage which "occurs within a short period of infection and lasts about a month. It is associated with toxic symptoms such as pyrexia, urticaria, abdominal pain, paroxysmal cough, a leucocytosis, and a high eosinophilia."

* Read before the American Society of Tropical Medicine at the Annual Meeting held in Birmingham, Alabama, Nov. 16–18, 1932. Received for publication, Sept. 1932.

Castellani and Chalmers(2) classify the clinical manifestations of schistosomiasis mansoni into four varieties:

1. Slight infections
2. Schistosomic dysentery
3. Schistosomic tumors
4. Schistosomic fever

Under the last one reads: "Flu in 1911 reported that *Schistosoma mansoni* could give rise to an illness resembling katayama disease. Archibald has also called attention to the fact that intestinal schistosomiasis caused by *S. mansoni* is capable of producing a fever associated with splenomegaly, enlargement of liver, a polymorphonuclear leucocytosis and lymphocytosis."

Byam and Archibald (3), in their chapter on Differential Diagnosis, and under "Febrile Conditions Causing Hepatic and Splênic Enlargement," include schistosomiasis, saying: "all forms produce some cirrhosis with portal congestion and later splenic enlargement." Under "Intestinal Schistosomiasis" one finds: "Symptoms of invasion appear to be the same as for *S. haematobium.* The symptom-complex—urticaria, pyrexia, and abdominal pain—closely resembles the description given by Houghton for the early stages of *S. japonicum* infestation". In the same text-book, and under "Urinary Schistosomiasis", one reads: "toxic symptoms are by no means uncommon in *S. haematobium* infestations, appearing some four to ten weeks after exposure to infection. This toxic absorption causes a generalized urticaria accompanied by pyrexia, rigors, abdominal pain, pulmonary symptoms, emaciation, leucocytosis and a high eosinophilia."

Walter E. Masters(4), in his volume of Essentials of Tropical Medicine, does not mention a period of invasion or toxic symptoms or fever in any form.

Faust (5), describing the clinical manifestations of intestinal schistosomiasis, says: "The clinical picture and the pathological anatomy are in most respects comparable to those of schistosomiasis japonica and are usually distinct from those of schistosomiasis hematobia except during the period of migration and maturation of the worms, when the symptoms of toxemia appear which are common to all three infections, consisting of remittent fever, urticaria, abdominal

pain, anorexia, rigors, and labored breathing. The blood picture shows a leukocytosis and profound eosinophilia."

Rogers and Megaw(6) state that in schistosomiasis mansoni "the *invasion* stage in acute cases is similar to that of the urinary form," and under Urinary Schistosomiasis they say: "The invasion of the system by parasites may be accompanied by toxic signs; these are best seen in primary infections of Europeans; they are rarely noticed in the infected indigenous population. These consist of general urticaria with fever and abdominal pain and some loss of weight; they appear about a month after exposure to infection, and they are common to all the forms of the disease."

Stitt(7), quoting Lawton(8), writes of a fever of 7 to 10 days' duration due to *S. mansoni* in Australian soldiers in Egypt during the World War.

More explicit descriptions of this stage in schistosomiasis japonica are available in the literature. Faust and Meleney (9) reproduce a communication from Surgeon Gordon Muir of the British Navy who suffered from *S. japonicum* infestation. During a period of two months Muir's temperature ranged from normal to 102.8°F. A supplementary febrile period of almost two weeks also occurred. Faust and Meleney state further that the early febrile condition in schistosomiasis japonica persists for from three to ten weeks.*

With so little emphasis placed on this manifestation of schistosomiasis, it is not surprising that a great many cases escape the attention of physicians in endemic areas, and we are certain that many cases are being diagnosed as typhoid fever, others as malaria, and probably some as pulmonary tuberculosis; others, since the stage is probably self-limited, get over it undiagnosed.

We have recently had the opportunity of observing two cases which illustrate very clearly the diagnostic problem involved. These cases we are presenting in detail.

CASE I

On May 4, 1932, one of us (J. A. P.) was called to see a white boy of 16, of a well-to-do family, who had been ill for a few days. He then complained only of fever of two days' duration and general malaise.

* The study of Girges appearing in the Dec. 1932 issue of this Journal also deals with this phase of schistosomiasis. P. R. Journal of Pub. Health & Trop. Med. VIII:99. 1932.

PRESENT ILLNESS: About two weeks previously the patient began to "feel badly", complaining chiefly of marked anorexia and nausea; the physician consulted attributed the symptoms to indigestion and prescribed a purgative; the nausea subsided, but the boy "was not himself," and anorexia continued. Sunday, May 1st, he was nauseated again, felt ill and could not eat; it was then noticed that he had been losing weight. Monday he went to see his physician who ordered another purge and gave some medicine which contained paregoric. Tuesday there was high fever with chilly sensations, but no actual chills; there had also been some abdominal discomfort, but no actual pain. A bothersome, persistent, non-productive cough noticed at the time of examination was said to have been present for three or four days.

PHYSICAL EXAMINATION: The patient is a well-nourished, very well developed, white boy of 16 years of age, not appearing acutely or chronically ill. Temperature 100.7° F., pulse 96, respirations 24. There is a slight left nasal obstruction. The pharynx is slightly hyperemic; tonsils have been removed. Lungs reveal no abnormality to inspection, palpation or percussion, but on auscultation occasional distant wheezing rales are heard over the right apex. Heart shows no evidence of valvular defect and no arrhythmia, but the rate is somewhat fast. The abdomen is not unduly distended, is soft and not tender; soft fecal masses are palpated here and there; there is quite an amount of gas in the region of the cecum. The spleen is not palpable and the liver seems normal in size. The genitalia and extremities show no abnormality.

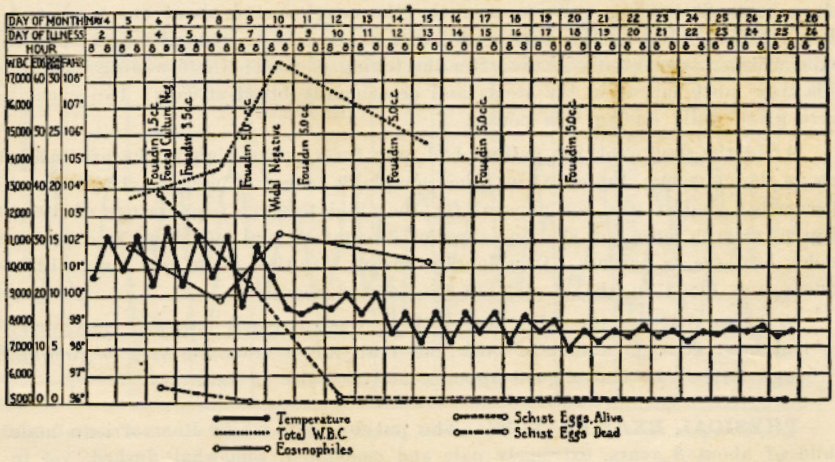
COURSE: Instructions were given for a high colonic irrigation and fractional doses of milk of magnesia. Both lavage and magnesia were very effective and productive of very offensive, slimy movements. That same night, 12 hours later, the temperature was 102.2 degrees. Typhoid fever was suspected as there were several cases in the town, and pertinent instructions were given. The same temperature was sustained throughout the night and a white cell count and differential the next morning gave the following results: White blood cells, 12,700; eosinophiles, 29 per cent. The temperature went down to 100.4 degrees that evening; there had been, during the day, marked abdominal discomfort and a very mucous stool; that night there was some tenderness along the transverse and descending colon, and also over the liver which now seemed somewhat enlarged; the cough persisted and there were signs of infiltration of both apices; a sedative cough mixture was prescribed, and fecal and urine samples were ordered for the next morning. The urine was perfectly normal; fecal cultures were negative for the typhoid group, but *a microscopic examination showed 19 living and 3 dead eggs of S. mansoni* in about 1 gram of feces. There had been more or less continuous fever for four days.

The subsequent course of the illness is illustrated in the accompanying chart. A striking feature, one on which relatives remarked, was the absence of toxemia; only once was there slight headache, and even when the temperature was high, as it was on several occasions, there were no toxic manifestations as in typhoid fever.

Treatment with Fouadin (Neo-Antimosan; Antimony III pyrocatechindisulphonate of sodium) was instituted May 6 and as indicated on the chart.

On May 10th a Widal test was found negative for typhoid and paratyphoid "A" and "B" in three dilutions; on this day the patient was feeling much better, but there still remained some mucus in the stools, which were very offensive; there was very little if any abdominal discomfort. On May 11th the lungs were clear and the cough had disappeared; the liver was still somewhat large and slightly tender. On May 20th he was eating well, regaining weight and walking about the house; there was no abdominal discomfort whatsoever. The number of *S. mansoni* ova in the stools gradually declined.

I



Case I Composite Chart Showing Temperature(12 hrs.), Total White Cell and Eosinophile Counts, Dead and Living Schistosoma Ova in Fesces

DISCUSSION: When the first blood count was made on May 5th, schistosomiasis was immediately suspected. The patient was carefully questioned as to whether he had bathed or waded in any stream recently, which he emphatically denied; as he lived in a city, it seemed improbable that he had done so. When the eggs were found, and there was no doubt that we were dealing with a recent infestation with *S. mansoni*, he was again questioned, but still he adhered to his original statement. Suddenly he remembered that eight weeks previously, about six weeks before he began to "feel badly," he had waded in a stream in Aibonito where he had bathed a horse; he did not remember having had any subsequent itching. Aibonito was not known to be an endemic area. We went there immediately and obtained snails (*Planorbis guadeloupensis*) from the very stream in which the patient had waded. Cercariae of *S. mansoni* were found emerging from some of them. On inquiring from the local physician if he had, at the time, any case resembling typhoid fever, we were shown the following case:

CASE II

A white male child of 8 years, parents of moderate means. First seen by us May 18th, the only complaints being fever and loss of weight.

PRESENT ILLNESS: The child had been seriously ill since May 1st, curiously enough the same day on which Case I became ill. For about one week previously, the child had been feeling unwell, with frequent severe headaches, extreme fatigability and anorexia; on one day, during this week, the patient is said to have had high fever which was attributed to indigestion, but the next day he was up and about, although not feeling at all well. Finally, on Sunday, May 1st, he was taken with very high fever; there was a severe cough with no expectoration and slight pain in the chest; the fever continued high, his temperature never descending quite to normal; the cough lasted about one week and then subsided. During this first week there was indefinite generalized abdominal pain, which was especially severe after the taking of food; there was also during this time much mucus in the stools and occasionally blood streaks; two enemas were given daily during this period.

After the first week the patient had only fever, quite high in the afternoon, low in the morning; there was no other complaint except an occasional abdominal discomfort, and it was not unusual for the child to have temperature of 104.0 degrees or even more, yet show no signs of discomfort, and be talking and joking to his brothers or parents. Occasionally during this time there was also a little mucus and blood in the stools, but no marked tenesmus.

When we first saw the child, May 18th, he was extremely pale and emaciated; he had been kept on a diet of milk and fruit-juices from the very beginning, although latterly he had a good appetite and a desire to eat.

PHYSICAL EXAMINATION: The patient is a white Puertorrican male child of about 8 years, extremely pale and emaciated, somewhat flushed, yet in good spirits, talkative, and not appearing toxic. The skin is intensely hot, dry and elastic. The fauces are slightly hyperemic, the tonsils somewhat scarred, the tongue is heavily coated. There are no palpation or percussion findings in the lungs but auscultation reveals small areas of both upper lobes, over which breath sounds are somewhat rough and musical, and subcrepitant rales are heard. Heart sounds are rapid and somewhat feeble, but rhythmical. The abdomen is distended and slightly tender throughout, especially along the entire colon. The spleen is palpable one finger-breadth under the costal margin on deep inspiration. The liver edge is one finger-breath under the costal margin, and slightly tender. The genitalia and extremities are normal.

A white blood cell count yielded 12,800 per c. mm., and a differential count showed an eosinophilia of 25 per cent.

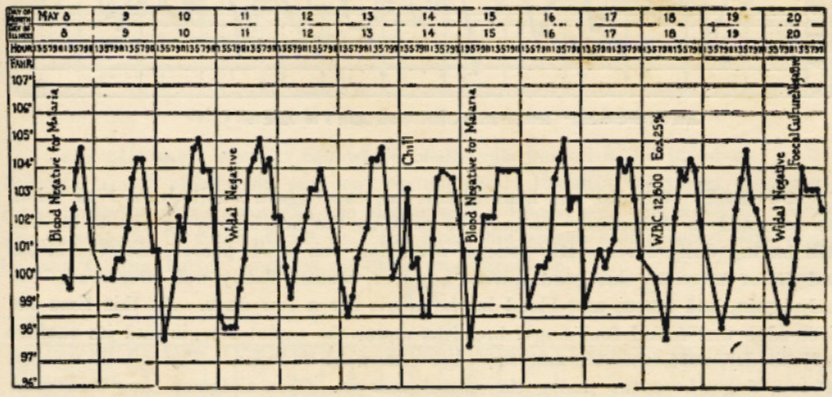
We thought, from the beginning, that we were dealing with a case of intestinal schistosomiasis, in the *invasion* stage. The stream previously found by us to be infected is only 300 yards behind the house. The child, however, denied having bathed or waded in this stream or in any other. An aunt living with the family then recalled that about ten weeks previously he had returned home itching very severely over the entire body and that the itch had lasted about two hours requiring vigorous alcohol rubs for relief. The boy then told her that he had bathed in the stream. He had denied this at first in fear of

his parents' anger, but his confidence was obtained, and he confessed this to have been the only occasion on which he had ever bathed in a stream.

Fecal samples were examined May 18th to 24th through methods of concentration to be described in a subsequent article, and found consistently negative for *S. mansoni* ova. The urine was normal. Sputum showed no acid-fast bacilli.

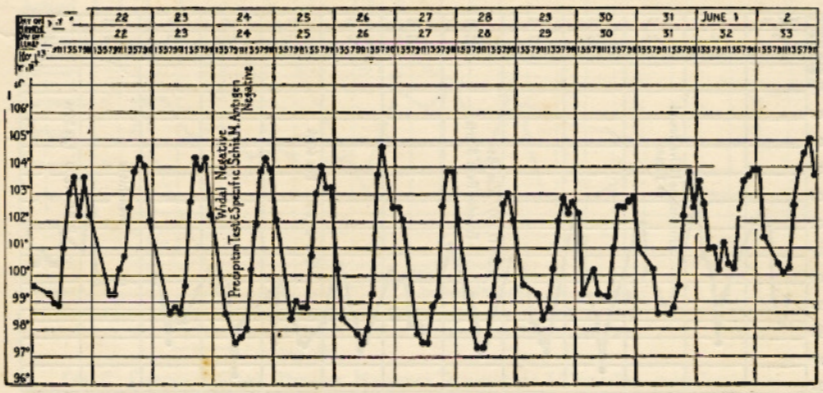
On May 20th the Widal test was negative for typhoid and paratyphoid "A" and "B" in three dilutions; on this latter date a precipitin test with specific *S. mansoni* antigen was negative.

II



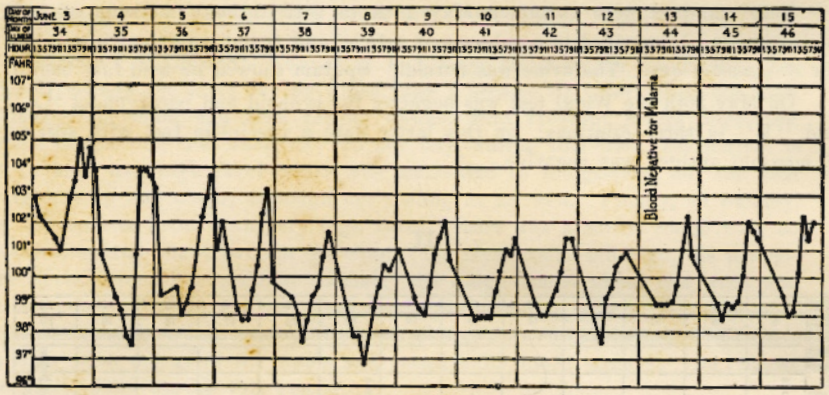
Case 2 - Two-hour Temperature Chart from May 8 to May 20 Laboratory findings and Treatment are also indicated

III



Case 2 (continued) - Temperature Chart from May 21 to June 2

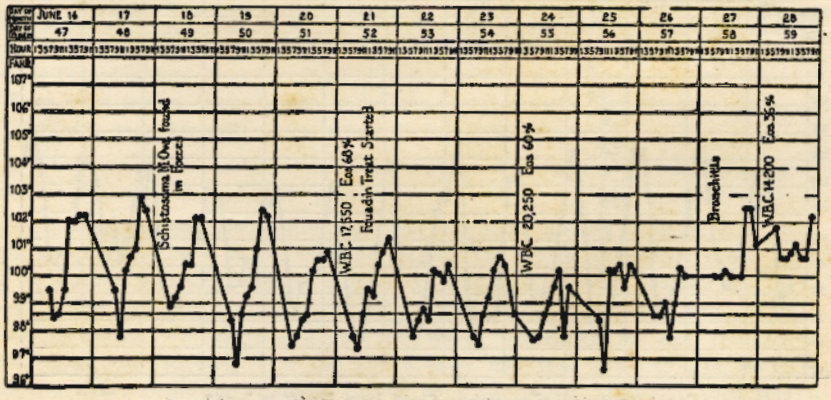
IV



Case 2 (continued) - Temperature Chart from June 3 to June 15

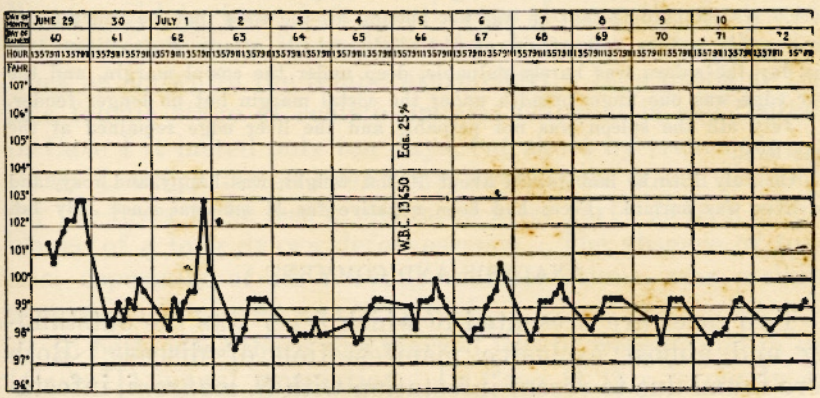
COURSE: We did not hear about the case again until June 17th when we returned to Aibonito. As may be seen in the accompanying chart, he was still having daily fever. His general condition was much poorer, his emaciation and pallor extreme; his good spirits, however, seemed fairly well preserved. He had, again, had mucus and blood in the stools for a few days. At this time the liver edge was found four finger-breadths under the costal margin and its surface very tender, soft, smooth, and the edge somewhat rounded. The spleen reached to two finger-breadths under the costal margin. The abdomen was somewhat distended and slightly tender. We insisted that we were dealing with a case of schistosomiasis. The next day, June 18th, a sample of feces was received *and 14 living and 13 degenerated ova of S. mansoni* were found in approximately one gram of material.

V



Case 2 (continued) - Temperature Chart from June 16 to June 28

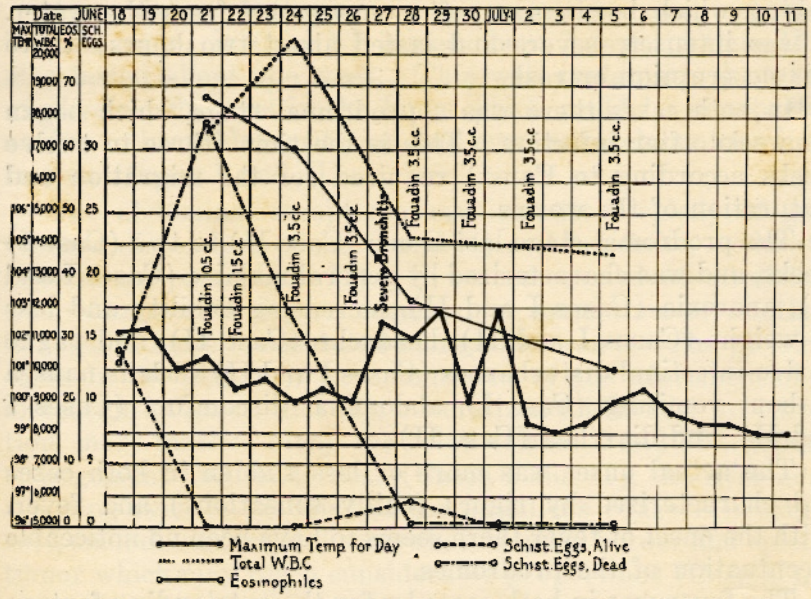
VI



Case 2 (continued) - Temperature Chart from June 29 to July 11

June 21st there were 17,550 white blood cells per c.mm. of blood and a differential count yielded 68 per cent eosinophiles. Fouadin treatment was instituted immediately as shown on the charts, and a liberal soft diet allowed. After two injections (a total of 2.0 cc.) the liver and spleen had receded somewhat, he was feeling better, and his appetite was voracious.

VII



Case 2 - Composite Chart Showing Maximum Temperature for each Day under Treatment Total White Cell and Eosinophile Counts, Dead and Living Schistosoma Ova in Faeces

July 1st the patient was found dressed and walking about the house, looking like a different child, although having a moderately severe bronchial catarrh and fever. He complained that he was not getting all the food that we had allowed him, as his mother was afraid of the slight febrile afternoon reactions. On this day the spleen was barely palpable, deep under the costal margin, and the liver edge was one finger-breadth under the costal margin but no longer tender.

July 5th the spleen was not palpable and the liver edge remained at the same level.

On July 12th he had gained about 10 lbs. weight, was happy and rosy, and the liver was normal. Feces had been negative for *S. mansoni* since July 1st.

ANALYSIS AND COMMENT

Two cases are presented in which *fever* was the outstanding and almost exclusive manifestation of disease. Both were found due to recent infestation with *S. mansoni,* infestation occurring in both cases at about the same time and in the same stream of a newly recorded endemic area in Puerto Rico. One case (Case II) was born in, and is a resident of, the locality, while the other (Case I) lives in San Juan, 86 kilometers away, but was spending a vacation in the described area at the time of his infection.

In only one of the cases (Case II) was there a history of itching which began soon after emergence from the water. It was intensely severe and lasted about two hours; there was no eruption or rash.

In both cases there was a prodromal stage which began six weeks after infection. This is the time (three to twelve weeks according to Faust) required for the migration and maturation of the worms.

The prodromal stage lasted one (Case II) to two (Case I) weeks, and was characterized by general malaise (Cases I and II), anorexia (Cases I and II), increasing debility and loss of weight (Cases I and II), headache (Case II), and vague gastro-intestinal disturbances (Cases I and II) such as nausea without vomiting (Case I), abdominal discomfort (Cases I and II), and diarrhea (Case II).

The actual onset was more or less sudden in both cases and characterized by rigors (chilly sensations) and fever. With the onset of fever there seems to have been no noticeable accentuation of the prodromes.

The fever was in both cases by far the outstanding feature of the clinical picture. In one case (Case I) it was continuous or subcontinuous with slight evening remissions during the

week or ten days that it lasted. In the other case (Case II) it was said to have been continuous during the first week, but was definitely intermittent in character after the first week as shown in the temperature chart. It is probable that this febrile stage of schistosomiasis mansoni is self-limited; in Case I it lasted only ten days, cut short by treatment; in Case II, which lasted over sixty days, there was a tendency for the fever to be less pronounced after forty days, a resemblance of a long drawn defervescence. The absence of toxemia, especially of its nervous manifestations, was striking even when the fever was very high.

In both cases there was marked loss of weight, and in one (Case II) actual emaciation. In Case II this is partly explainable on the basis of starvation as the child was kept for about seven weeks on a diet consisting of a small amount of milk and occasional fruit-juices. Case I, however, was allowed a liberal soft typhoid diet, highly nutritious, and in the very short time that the fever lasted (10 days) he became markedly wasted. The loss in strength was proportional, it seems, to the loss of flesh.

A persistent, bothersome, non-productive cough occurred in both cases; in Case I it lasted about 7 days, in Case II it also lasted about one week. This was explainable in terms of physical findings in the lungs which could be interpreted as due to bronchial irritation and even parenchymatous infiltration (Cases I and II).

The abdominal symptoms have consisted chiefly of gen eralized discomfort (Cases I and II) and indefinite, moderate, generalized pain (Case II). In both cases abdominal distention of moderate degree occurred at some time or another, in Case II more marked and more bothersome. The physical signs in the abdomen have consisted of the aforementioned distention (Cases I and II), generalized tenderness on palpation, more marked along the colon (Cases I and II), hepatic enlargement and tenderness (Cases I and II), the liver edge reaching even to the level of the umbilicus (Case II), with a soft, smooth surface and somewhat rounded border and splenic tumor which may reach considerable proportions (Case II).

The stools have contained mucus in both cases, the amount varying from day to day; in Case II blood in small amounts was present at times. Case II had occasional loose move-

ments and also at times frequent, small defecations; Case I had a tendency to slight constipation.

The blood showed a leukocytosis in both cases and also an eosinophilia which in Case II reached 68 per cent. In both cases there was an initial rise in the white blood cells after the beginning of treatment; in one case (Case I) there was also an initial rise in the eosinophiles while in the other case (Case II) there was a steady drop in these cells; since, however, cell counts were not made daily, it may have been that in this case the days of the initial rise were missed. In other cases treated, a tendency to a rise in total white cells and eosinophiles has been noticed which has been attributed to the death of the worms. No observations were made in the red cells and hemoglobin.

Fouadin was used in the treatment of both these cases. The dosage and frequency of injections are indicated in the charts. All injections were given intramuscularly. Marked subjective and objective improvement was noticed after the third, but especially after the fifth injection. With the gradual return to normal the number of eggs in the stools diminished and finally disappeared. No definite relation can be established in these cases between the progress of treatment and any proportionate diminution in living eggs and increase in degenerated ova. Whether eggs reappear in the stools after some time remains to be determined. No untoward effects have been noticed from Fouadin except for a diminution in pulse rate about one-half hour after the injection and lasting for about two hours.

The urticaria described for this stage of the disease has not been observed by us (See Addendum).

In the *differential* diagnosis, naturally, all the conditions capable of producing fever are to be considered; in tropical countries where a great many such diseases exist besides the cosmopolitan maladies, arriving at a diagnosis would be a much more difficult task. In Puerto Rico, besides the pyogenic infestations, one will think of typhoid fever, malaria and perhaps tuberculosis.

In our Case I we suspected typhoid fever, because of the prodromal symptoms, the continuous character of the temperature curve and the absence of other signs; the leukocytosis and eosinophilia, however, excluded this condition for

the time being and negative fecal cultures and Widal tests excluded it definitely; there was not the usual slow pulse of the first week of this disease. In our Case II a diagnosis of typhoid fever had been agreed upon at two previous consultations, the last having been held only a few days before we saw it. This diagnosis was made in spite of negative Widal tests, but no hematologic or bacteriologic studies had been made.

Malaria may be excluded by examination of the blood for parasites and by the total and differential white cell counts; the usual symptomatology of malaria, also, is quite different from this picture.

Tuberculosis resembles this condition and one can not help thinking of it as a possibility, especially if there are such lung findings as we noted in our cases. The means of differentiating the one condition from the other are quite obvious. In our Case II we could not resist the temptation of examining the sputum, which was very scanty, for acid-fast organisms.

SUMMARY AND CONCLUSIONS

Recent infestation with *S. mansoni* may give rise to an acute or prolonged fever which may offer diagnostic difficulties and puzzle the physician unless the condition is suspected.

Important points in the diagnosis are:

1. Residence in, or a visit to, an endemic area and bathing or wading in an infected stream about six (three to twelve) weeks previous to a prodromal stage.

2. Itching over the entire body if it has been immersed or on the legs if the patient has only waded, this itching beginning shortly after emergence from the water and lasting about two hours.

3. Indefinite ill health for one to two weeks, with anorexia, general malaise, aches and pains, increasing debility and some loss of weight, headache and ill-defined gastro-intestinal disturbances.

4. A rather sudden onset with rigors and fever, continuance but no accentuation of the prodromal symptoms, dry cough and perhaps signs of bronchial irritation, and even parenchymatous infiltration, especially of the apices.

5. The fever may be continous, subcontinuous, remittent, or intermittent; the abdomen becomes distended and may cause respiratory embarrassment; tenderness along the colon appears coincident with mucus, or mucus and blood, in the stools and perhaps frequent small defecations.

6. Enlargement and tenderness of the liver and later splenic tumor.

7. Leucocytosis and eosinophilia.

8. Finding of *S. mansoni* ova in the stools, but one must consider that a considerable length of time may elapse between the onset of this stage and the appearance of ova.

ADDENDUM

The additional cases here reported were not under our care, but were observed by us on requests from physicians in private practice in San Juan after the above was ready for publication. These cases not only corroborate our observations on this stage of the disease, but also serve to emphasize (*a*) the importance of the malady as a public health problem in Puerto Rico; (*b*) the necessity of recognizing its early symptomatology in order to avoid, through proper treatment, more serious subsequent pathology; (*c*) the urgent need of an organized campaign which should have for its aim the elimination of the sources of infection in a plague which has been utterly neglected in the Island and which is the cause of a higher morbidity and mortality than has heretofore been suspected. They also illustrate other possible features of the clinical picture, such as urticaria, persistent vomiting, photophobia.

On July 6th, 1932, E. A. I., a mechanical engineer, went to the country on a consultation. He took with him his son and nephews, six boys, all between 7 and 13 years of age. While E. A. I. attended to his business the boys enjoyed a swim in a near-by stream where he later joined them. All seven experienced more or less itching over the entire body during or after the bath. Residents of the district commented that bathing in this particular stream was always attended by itching, but stated that it would wear off, which it did in all cases within an hour or two; there is no recollection of the occurrence of a rash in any of the cases.

About two weeks later the entire family went on a picnic and the next day three of these seven persons had vague intestinal disturbances which were at-

tributed to indigestion and treated accordingly; recovery was not complete, as anorexia, occasional epigastric pains, slight diarrhoea, fatigability, headaches and occasional nausea persisted. On July 29th, 23 days after exposure, two others were taken with fever of 105°F, nausea, vomiting, slight abdominal pain, slight diarrhoea and malaise; the fever subsided within a day or two, but general poor health and indefinite gastro-intestinal symptoms persisted. The other two had, likewise, been feeling badly, were losing weight, and had symptoms similar to the above. On August 14th, 39 days after infection, these last two became acutely ill with chills, high fever, general aches and pains, intestinal cramps, photophobia, nausea and vomiting; the other five soon followed with these same symptoms in varying intensity. When seen by one of us (J. A. P.) on August 20th they were all acutely ill. All had had abdominal discomfort or pain, most marked along some part of the colon or its entirety, or else in the region of the liver; all had extreme anorexia, muscular pains, abdominal distention, weakness and headache. Some had persistent nausea and vomiting, others photophobia. All had had, or had at the time, persistent, slight, non-productive cough, and tenesmus of varying degrees of intensity with slight diarrhoea or passage of frequent small movements; in all there had been blood and mucus in the stool, while in some the discharges from the bowel were still frankly dysenteric.

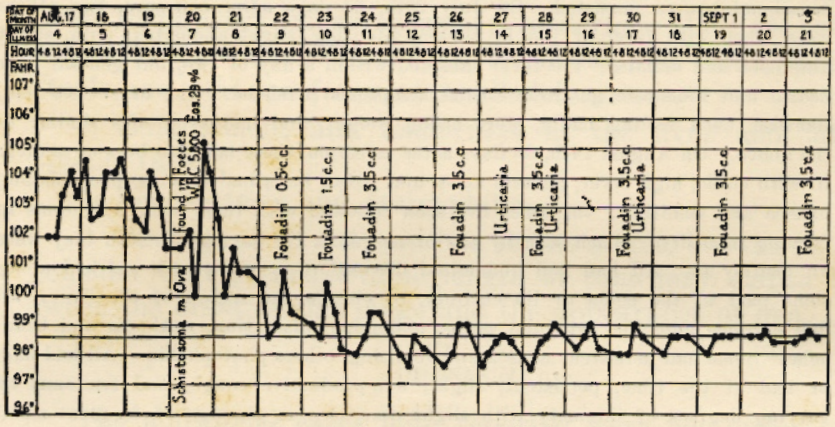
Physical examination of five of the cases showed varying degrees of pulmonary infiltration, usually apical, manifested by increased vocal fremitus, impaired resonance, rough breath sounds and crepitant or subcrepitant rales. The pulse was rapid in all cases and the heart revealed no abnormality. The abdomen was tender at some point in all cases and showed varying grades of distention; tenderness was most marked along some part of the colon or over its entirety; the region of the liver was quite tender in some. The latter organ was enlarged in all cases, in some to rather large proportions; the spleen was palpable in all and in three cases reached to about three inches under the costal margin, soft, slightly tender, with rounded edge. White blood cell counts in these five cases ranged from 4,600 to 17,600 per c.mm. and eosinophile counts from 29 to 56 per cent. The Widal test and examinations of blood films for malaria had been done repeatedly by the attending physicians, all with negative results. Fecal examinations within the next two days revealed the presence of dead and viable *S. mansoni* ova in all seven cases.

Treatment with Fouadin was instituted immediately with prompt subsidance of fever and all symptoms, diminution in the size of liver and spleen, disappearance of abdominal tenderness, diarrhoea, pulmonary signs, tenesmus and blood and mucus from the stools, and a steady decline in the number of ova and eventually complete absence. Urticaria was observed in some of these cases while treatment was in progress.

The region in which infestation had taken place was not known to be endemic. Snails were collected by one of us (W. A. H.) and cercariae of *S. mansoni* were seen emerging from some of them. A rapid survey of residents of the region revealed an apparent high incidence of what seem to be cases in the advanced stages of the disease.

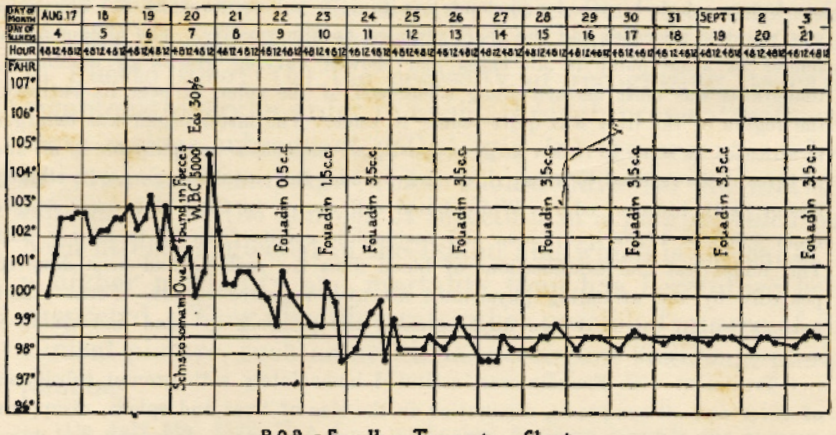
The appended charts show the temperature curves and treatment of two of the children, R. E. R. and R. O. R.

VIII



R.E.R - Four-Hour Temperature Chart

IX



R.O.R - Four-Hour Temperature Chart

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