SOME CASES OF RELAPSING FEVER IN PALESTINE.

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The following is an account of four cases of relapsing fever which were admitted to the Reception Station, Jerusalem, during the recent disturbances in Palestine.

Relapsing fever exists in two main groups, one transmitted through the agency of the louse, and the other by the tick. Various local types, differing in clinical manifestations, are described, such as the Central African, Persian, and Moroccan forms of the disease. The micro-organism responsible is in all cases a spirochete.

Of the ticks capable of conveying the disease the Ornithodoros moubata is the best known, but it has been well established that other species of tick can do so.

In Palestine relapsing fever appears to be rare and the O. moubata is stated not to exist in this country.

In recent months Adler, Theodore, and Schieber (1936) traced a small outbreak in Palestine to infection from a cave infested by the tick O. palpiipes. They were successful in transferring the infection from the ticks to laboratory rats and demonstrated spirochetes in the blood of the rats. They further showed that infection occurred directly through the bite, and not through the faces or coccal fluid as in the case of O. moubata.

Adler (1936) states that the bite of this tick is painless and that its most characteristic feature is a hemorrhagic mark which persists long after the lesion has healed.

Moskwin (1929) had previously been successful in transmitting the Spirocheta sogdianum through O. palpiipes, and Dyvalitskaya-Barischewa (1931) considers this tick to be the only vector in Central Asia.

Infection from the tick is usually acquired by sleeping in a cave or native dwelling.

As regards the spirochete it is not yet definitely known whether the same organism is responsible for the different forms of relapsing fever. Morphologically at any rate the organisms of the several species are indistinguishable and Wenyon (1926) states that clinical differences, serological cross-immunity tests, and the variations in the susceptibility of laboratory animals to inoculation are not reliable methods of differentiating the species. Adler, however, has examined the spirochetes from the cases described in this article and considers these to be examples of S. sogdianum.

The four cases described have certain factors in common. The patients all belonged to the same battalion and whilst on active service were...
compelled to spend the night of July 16, 1936, in what is described as an open cave or natural dug-out. They were all admitted to the Reception Station, Jerusalem, on the sixth and seventh day after this. They all had fever which subsided after a variable period, only to relapse.

In three of the four cases spirochætes were found in smears of the peripheral blood after staining with Leishman’s method, and this was later confirmed by hæmolysed “thick drops” stained by Giemsa’s technique.

Eight cubic centimetres of blood were removed from a vein of one of the patients (Lance-Serjeant G.) and two cubic centimetres of blood were injected into the peritoneal cavity of each of four guinea-pigs. All the guinea-pigs became ill and spirochætes were demonstrated in the blood of all the animals. Blood taken from the guinea-pigs and injected into pigs, white mice, and rabbits reproduced the disease. In rabbits the condition appears to be short-lived, and two which were inoculated on August 10, 1936, became negative on August 25. One of these was reinoculated on September 16, with a Palestinian strain of spirochæte (S. sogdianum) obtained from Adler. This animal has shown only one spirochæte in two thick drops of blood examined. This resistance to reinfection might be suggestive of identity of the strains.
No ticks or lice were found on the person or clothing of any of the patients and a medical inspection of the rest of the battalion did not disclose the presence of any vermin. None of the patients could remember having been bitten by lice or ticks.

The diagnosis was arrived at in the following manner. When Lance-Serjeant G. was admitted a blood smear was taken and stained by Leishman’s method. A body having the appearance of a spirochète was found. The possibility of relapsing fever was discussed, but as no other spirochætes were found in the slide and seven subsequent slides were all negative, the patient was discharged on the tenth day of his illness, after the temperature had been normal for four days.

He was readmitted with fever on the twelfth day of the disease and spirochætes were found in the blood.

On directly questioning the patient the history of exposure in the cave of himself and his comrades was obtained.

Case 1.—Lance-Serjeant G. History: One day before admission became ill with frontal headache, localized to the orbit. Some pain low down in the back. Pain low down on the left-hand side of the front of the chest on inspiration, but no cough or sputum.

He felt alternately hot and cold and was shivering. Nausea was present and on one occasion some greenish fluid was vomited.
Giddiness was a marked feature and sweats also occurred. The bowels were stated to be open regularly.

**Past History and Family History.**—Nothing with any bearing on the case.

**Condition on Admission.**—Temperature 101.4° F. Pulse 96. The conjunctivae were suffused. The tongue was moist with a thick brown fur. There was some redness of the posterior pharyngeal wall. No abnormality was detected on examination of the eyes, neck, axillae, heart, lungs, or abdomen. The spleen was not palpable. A small area having the appearance of an infected insect bite on the outer aspect of the left calf was observed.

The urine contained excess of urates but no abnormal constituent was found.

**Progress.**—The pyrexial period ended by crisis on the evening of the sixth day of illness. The highest fever observed was a temperature of 103.2° F. on the second day of disease. The morning temperature varying between 101-102° F. was the higher, the evening temperature approaching normal.

Headache persisted, and the patient had several rigors heralded by an intensification of the headache.
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The spleen became palpable on the fourth day of the disease. It was firm, smooth and tender and enlarged to an extent of one fingerbreadth below the costal margin. Pallor was a marked feature which developed rapidly and was treated by the administration of ninety grains of iron and ammonium citrate daily. Seven blood slides were negative for spirochætes and malaria parasites after the first blood examination.

The patient felt quite well after the fever subsided on the sixth day. He was discharged on the tenth day of the disease.

The patient was readmitted on the twelfth day of the disease, having complained of a fairly severe nose-bleeding and of a shivering attack. He had vomited, and the vomit contained clotted blood. He was feeling giddy. The temperature was 102° F. The spleen was still enlarged. A blood slide showed the presence of numerous spirochætes, and next morning the patient was transferred to the Royal Air Force General Hospital, Sarafand. Here 0·3 gramme N.A.B. was administered intravenously, and the temperature which had been falling became normal.

A second milder relapse occurred eight days later, on the twenty-first day of the disease. The pyrexia persisted for forty-eight hours, and the highest temperature reached was 100·8° F. The lesion on the left calf had now a hæmorrhagic character, being circular and slightly raised above the surrounding skin, and about quarter-inch in diameter.

Since this time the patient has remained well.

Case 2.—Serjeant B. History: One day before admission he complained of occipital headache, shakiness, and was somewhat giddy. There were pains in the large joints and vague abdominal pains. A very slight cough was present. The bowels were well open, and no other symptoms could be elicited.

Past History and Family History.—Malaria in 1922. Four attacks during a total duration of six to eight months.

Condition on Admission.—Temperature 102·8° F. Pulse 106. The conjunctivæ were suffused and the tongue was furred. The urine contained no abnormal constituents. No abnormal physical signs were found.

Progress.—A continuous pyrexia occurred which fell by crisis on the fifth day. Apart from headache and feeling tired, the patient did not feel particularly unwell; but he looked pale and drawn. The spleen was enlarged. The patient was discharged on the eighth day, after the temperature had been normal for four days.

When the spirochætes were discovered in the blood of the first case, Serjeant B. was asked to attend the Medical Inspection Room twice daily. After attending for one day with a normal temperature a relapse occurred on the fourteenth day of the disease. Temperature was 102·6° F., and pulse 100. Spirochætes were found in the blood in scanty numbers. Three in all were found during prolonged search. He had no symptoms, and stated that he felt quite fit for full duty. He was transferred to the Royal Air Force General Hospital, Sarafand, and 0·3 gramme N.A.B. was
administered intravenously. Next morning the temperature fell to normal and no further relapse occurred.

CASE 2. SGT. B.

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Case 3.—Lance-Corporal B. History: One day previous to admission he complained of pain behind the eyes. This was shortly followed by a shivering attack. He felt giddy and unsteady on his legs. There was nausea but no vomiting. There was some pain on inspiration in the left upper abdominal quadrant, but no cough or sputum.

Past History and Family History.—Nothing with any direct bearing on the case.

Condition on Admission.—The temperature was 102.6° F., pulse 100. Tongue furred; sweating; urine contained a trace of albumin. No abnormality detected on physical examination.

Progress.—The fever was largely of intermittent type and reached 104° F. on two occasions. The peaks were usually in the evening. The pulse was not markedly raised. Headache and drowsiness were prominent features and pallor developed rapidly. Rigors occurred and were severe. Cyanosis of the lips was present to a moderate degree but no changes were found in the heart or lungs. The spleen became palpable on the third day and was firm, tender and smooth. It was enlarged to an extent of two fingerbreadths below the costal margin. Blood slides were negative for spirochætes and for malaria parasites on ten separate occasions. On the
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thirteenth day the patient was transferred to Sarafand where spirochætes were found in the blood on the fifteenth day. He was given 0.3 gramme N.A.B. and the fever subsided; he has had no relapse.

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Case 4.—Pte. B. History: One day prior to admission complained of pain behind the eyes. This was put down by the patient to eye-strain from range-taking. A shivering attack followed. Feelings of lethargy and giddiness were complained of.

Past History and Family History.—Nothing having any bearing on the case.

Condition on Admission.—Temperature 101.8° F.; pulse 88. Eyes suffused. Tongue moist and thickly coated with brown fur. There was erythema of the neck, face and chest which lasted only a few hours. No other abnormal physical sign was elicited. The spleen was not palpable. The urine was concentrated but did not contain any albumin or sugar.

Progress.—A continuous fever for three days was present, the temperature recorded always being between 102° and 103° F. and falling by crisis on the morning of the fifth day. Slight cough was present on the fourth day, and an occasional rhonchus was heard in the chest. Three slides of blood were negative. He was discharged feeling fit on the eighth day. On the thirteenth day the patient was sent for and the temperature was
found to be 100.3° F. He stated that he felt quite fit. No spirochætes could be found in the blood and he was transferred to Sarafand. Next morning the temperature was normal, and remained so until the twenty-

second day of the disease when a slight attack of fever occurred. The temperature was raised for twenty-four hours and reached 103° F. No spirochætes were found in the blood, and no arsenical treatment was given.

**CONCLUSION.**

Four cases of relapsing fever are described and in three of them spirochætes were observed in the blood. It is regretted that full facilities were not available for a thorough investigation of the cases.

The cases are probably tick fever, as the history of exposure in a cave renders this likely.

There is a clinical similarity to sandfly fever in the frontal headache, injected conjunctiveæ and general malaise. The danger of the two conditions being confused is enhanced by the fact that the first relapse may be practically symptomless, and thus if the patient is not under observation the relapsing nature of the fever might be overlooked.

The cases also demonstrate the fact that spirochætes are not always readily found even though the temperature is high, and they may be very
scanty and require prolonged search. They seem most likely to be found at the time of the first relapse. I think a thick drop of blood stained by Giemsa's technique is the most reliable method in the absence of dark ground illumination.

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REFERENCES.