RELAPSING FEVER IN SOUTH AFRICA WITH A RECORD OF ITS OCCURRENCE IN EUROPEANS

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Relapsing fever is characterized by pyrexia of sudden onset lasting 3-5 days with rapid subsidence of temperature, followed by a number of relapses at intervals of 1-7 days or longer. The disease is caused by spirochaetes which are present in the circulating blood of the patient during the pyrexial period and in the internal organs when the temperature has dropped to normal. With each relapse the spirochaetes return to the blood stream and may readily be detected by blood-smear examination made at the rise of temperature. Diagnosis of the infection in the apyrexial period is possible by biological tests involving the intraperitoneal inoculation of mice or by a complement-fixation test with the suspension of spirochaetes as antigen.

Two varieties of relapsing fever are distinguished according to the vector of the spirochaetes. Louse-borne relapsing fever is caused by the spirochaete *Borrelia obermeieri* (*recurrentis*) and is met with extensively in Eastern Europe, North and West Africa, India, and the southern parts of the United States of America. Tick-borne relapsing fever occurs in Persia, Central and South America, Spain, Central and South Africa and elsewhere; it is spread by various species of the Ornithodorus group of ticks and in Southern and Central Africa is caused by *Borrelia duttoni*.

In South Africa the tick *Ornithodorus moubata* is the vector. It is found in the cracks and crevices of the walls and floors of the inferior types of dwelling occupied mainly by Natives. The ticks remain hidden during the day and emerge at night to suck blood from their sleeping victims. The spirochaetes which are present in the secretions and excretions of the infected ticks enter the tissues through the bite.

The distribution of the tick and of the disease in South Africa was described more than a decade ago.[1] Present information with regard to the disease is shown graphically in the accompanying map (Fig. 1).

The shaded portions of the map indicate the districts in which cases have been reported. It will be seen that relapsing fever is widely distributed in the Northern,[2] Eastern and Western Transvaal.[1] It also occurs in the Northern part of the Cape Province,[3] as well as in the Graaff-Reinet [4] and Kimberley [5] districts.

The disease and the tick vector are probably more widely distributed than here indicated and it is likely that cases of the infection have escaped recognition.

It will be observed from the map that relapsing fever in South Africa is found mainly on its northern border adjoining Bechuanaland and Southern Rhodesia and on its eastern border adjoining Portuguese East Africa. Relapsing fever is endemic in these countries, whence the disease has spread to the Union. It is interesting to note that the disease appears to have travelled down the central semi-arid regions of South Africa *via* Kimberley through to the Jansenville district within a hundred miles of the coast on the south. The reason for this is not clear but it must be assumed that the disease was spread through the agency of Natives trekking south through these hot dry regions eminently suitable for the development of the tick.

In Johannesburg and the Reef, relapsing fever has since 1934 not infrequently been reported in 'tropical' Natives imported from Nyasaland and other territories from Central Africa as labourers on the gold mines of the Witwatersrand. These Natives, who had undoubtedly acquired their infection in their tropical home-towns, periodically suffer from relapses of a mild type whilst in this country.

RELAPSING FEVER IN EUROPEANS

The Europeans in the endemic relapsing-fever areas in South Africa generally live in houses of good construction and it is thus not surprising that European cases of this disease are uncommon. A European could conceivably develop relapsing fever from living in a poorly constructed house harbouring infected ticks, or taking shelter in empty Native huts while travelling, or camping on sites previously occupied by Natives, especially on sandy soil or near bush where ticks are present.

A survey has been made of the records [6] of blood-

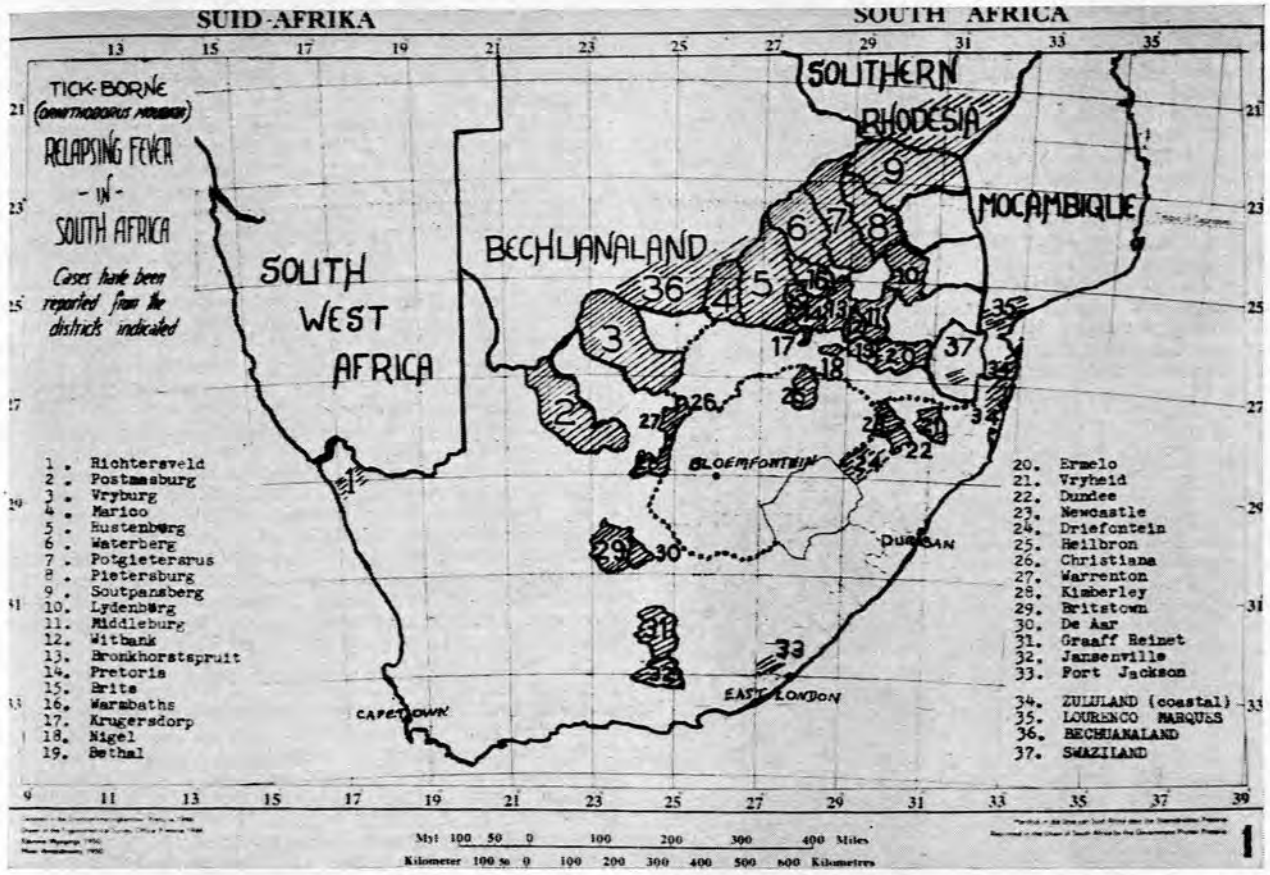

Fig. 1. Tick-borne (*Ornithodorus moubata*). Relapsing fever in South Africa. Cases have been reported from the districts indicated.

TABLE I. RELAPSING FEVER IN EUROPEANS. BLOOD SMEARS POSITIVE FOR SPIROCHAETES REPORTED BY THE SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH, 1932-1954

Year	*Cases*	*Case No.*	*District*	*Details available*
1932	1	1	Potgietersrust	Nil
1933	0			
1934	0			
1935	0			
1936	0			
1937	1	2	Rustenburg	Nil
1938	0			
1939	2	3	Zeerust	Nil
		4	Vryheid	See text
1940	0			
1941	0			
1942	2	5	Johannesburg	Nil
		6	Trichardt	See text
1943	1	7	Johannesburg	Nil
1944	0			
1945	2	8	Nigel	Nil
		9	Pietersburg	See text
1946	5	10	Britstown	Nil
		11	Groot-Marico	See text
		12	Graaff-Reinet	See text
		13	Lourenco Marques	See text
		14	Rustenburg	See text
1947	0			
1948	1	15	Rustenburg	See text
1949	1	16	Rustenburg	See text
1950	0			
1951	1	17	Bronkhorstspruit	See text
1952	0			
1953	1	18	Warrenton	See text
1954	0			

smear examinations carried out at the South African Institute for Medical Research, Johannesburg, for the past 23 years to determine the incidence of relapsing fever in Europeans. Anything up to 100 blood smears are annually reported as positive but nearly all are from Natives.

In Table I the European cases of relapsing fever reflected in positive blood smears are listed and the districts of probable origin of infection indicated.

Of the 18 positive blood-smears reported in Europeans details are unfortunately lacking in 7 of the cases. The European patients became infected in Potgietersrust, Rustenburg, Zeerust, Vryheid, Trichardt, Pietersburg, Britstown, Groot-Marico, Graaff-Reinet, Bronkhorstspruit and Warrenton. One European acquired his infection in Lourenço Marques while the source of infection in two sufferers who were treated for the disease in Johannesburg could not be determined.

CASE HISTORIES

Case 4. A European male child living in Alberton. The patient visited Vryheid in December 1938, where he was bitten by a 'tampan tick'. He returned to Johannesburg on 1 or 2 January 1939 and became ill a week later with a temperature of 103°F, rapid pulse, severe headaches, vomiting and dyspnoea. He complained of a 'stomach-ache' and a feeling of giddiness. The lungs were clear but there was tenderness over the spleen, which was palpable on inspiration. Albuminuria was present. There was bile in the vomit but jaundice was not noted. A slight rash was present on the abdomen. Epistaxis occurred as the temperature

was subsiding but not during the acute stage. Relapses occurred on 15 and 23 January. Spirochaetes of relapsing fever were seen in a blood smear taken on 24 January.

Case 6. A European female, Trichardt. Dr. L. Becker reported that the patient was infected with relapsing fever in the Bushveld in the Loskop Dam area, which she visited from 20 to 22 December 1941. She became ill on 5 January 1942 after returning to her home in Trichardt. A blood smear then revealed the presence of spirochaetes of relapsing fever.

Case 9. A European boy 6 years of age living in Johannesburg. Dr. J. Beeder reported that the patient visited Pietersburg from 7 to 20 January 1945. The illness commenced about 23 January. He was seen a week later and during this period had had intermittent attacks of fever with rigors. The spleen was enlarged. As malaria was suspected quinine was administered. A blood smear however showed the spirochaetes of relapsing fever. The fever subsided after a day or two and the patient appears to have had only one attack subsequently.

Case 11. A European male 30 years of age living in Groot-Marico, Transvaal. Dr. C. A. Marais reported that the patient lived in the Groot-Marico district 12 miles from town in the direction of Zeerust in a house of brick walls and wooden floors and ceilings. The patient declared that he was bitten by ticks in the veld. He became ill on 3 January 1946 with a temperature of 103° F. Examination revealed a moderately enlarged liver with some enlargement of the spleen. There was general weakness and slight jaundice. Urine examination was negative. As malaria was suspected quinine therapy was commenced. The patient was well after 4 days but soon fell ill again. The liver was palpable but not the spleen. A relapse occurred on 20 January characterized by a high temperature with rigors and now both liver and spleen were enlarged. A blood smear revealed the spirochaetes of relapsing fever. The patient, who had received NAB injections, was much improved after 2 days but still felt weak.

Dr. Marais had observed that tick bites were fairly common in the Groot-Marico district, where newcomers rather than local inhabitants were affected by them.

Case 12. A European man 34 years of age living in Johannesburg. He visited Graaff-Reinet on holiday from 3 to 29 December 1945, where he lived with his parents. He returned to Johannesburg on 30 December and next morning became ill and remained so for 3 days. He resumed work for a few days but once more had a relapse lasting 3 days.

He was admitted to the Johannesburg Hospital on 31 January 1946 with a temperature which lasted only 1 day, followed however by 6 or 7 relapses. A blood smear positive for the spirochaetes of relapsing fever was reported on 3 February. Each relapse was characterized by pyrexia, rigors and perspiration followed by headache and general weakness after the acute stage. The liver and spleen were enlarged during these attacks but jaundice was absent. A further relapse occurred on 14 February with severe headaches, sweating and drowsiness. Jaundice was now present with enlargement of the spleen and liver. The patient had had continuous headaches since the onset of the illness with aching of the eyes and severe aching of the back of neck, hip and legs.

Case 13. A European boy 16 years of age living at Christiana in the Transvaal but attending school in Potchefstroom. The patient became ill on 21 September 1946. There was no history of a tick bite at any time, including the period of a camping holiday at Lourenço Marques from 3 to 24 July of that year. From 23 September onwards he developed a headache with afternoon temperatures of 101-103° F for about a month. Apart from epistaxis there was no other complaint. The spleen was not enlarged. On 30 September the temperature was still high and the patient was perspiring freely. A blood smear was negative for relapsing fever but biological tests carried out on the patient's blood were positive for relapsing-fever infection. On the following day the temperature became normal and remained so.

Case 14. A European man 63 years of age—a farmer in the Rustenburg district. He became ill on 25 December 1946. He stated that he had been bitten by a 'big tick' between the toes while working in his tobacco lands on 5 December. He was admitted to hospital on 21 February 1947, after having suffered 8 relapses since his first attack. A blood smear on 28 February was positive for relapsing-fever spirochaetes.

Case 15. A European boy 8 years of age living in the Rustenburg district. He had been bitten by ticks at his home on 4 July 1948 and fever commenced 10 days later, lasting about 12 days. A relapse occurred 2 weeks later. He was admitted to hospital on 22 August with pyrexia which lasted 4 days, followed by another 5 days thereafter. Blood-smear examination showed spirochaetes of relapsing fever.

Case 16. A European man 64 years of age—a retired schoolteacher in the Rustenburg District. He became ill on 7 February 1949 with a temperature of 103° F, which returned to normal in a few days. He was admitted to hospital on 16 February with a relapse. A blood smear taken the following day was positive for spirochaetes of relapsing fever. The patient was unaware of having been bitten by a tick but admitted the possibility of it.

Case 17. A European boy 3 years of age living near Bronkhorstspruit in the Transvaal. He first became ill on 7 December 1950 with pyrexia, rigors, delirium, headache and pain in the legs, which lasted 3 days. He had 3 relapses subsequently with intervals of apyrexia of 3 or 4 days. When first seen by Dr. C. Zaayman the child was in his 4th relapse, with a temperature of 104° F. There was considerable enlargement of the spleen and blood smears showed the presence of relapsing-fever spirochaetes. By courtesy of Dr. Zaayman I paid a visit to Bronkhorstspruit to see the patient in his home. The house, about 25 years old and in a delapidated condition, had walls of unplastered brick and stone. The mother and 3 children were living in the house under unhygenic conditions. All appeared in good health at the time except the patient, who was in bed with high fever. The mother stated that the other children had at various times been similarly affected with this type of illness. Numerous *Ornithodorus moubata* ticks were readily collected from cracks in the walls of the patient's room.

Case 18. An unmarried European man 21 years of age living in Johannesburg. He was born in the Wolmaransstad District, where he had lived for 3 years. He spent a portion of his childhood years also in a Northern Rhodesia mining town. From 1949 he lived with his parents on a farm near Warrenton in the Cape Province, where the house was comparatively new, with rough plastered brick walls and wooden floors. The Native servants on the farm lived in brick huts in the grounds. Eight months after arrival at the farm he began to suffer from attacks of fever with headache and vomiting which necessitated his staying in bed for periods of 3-4 days. He arrived in Johannesburg for permanent residence in January 1953, and remained well for 5 months, when he was again attacked by the same type of illness he had experienced at his home. He had suffered 6 relapses in Johannesburg up to September 1953, when he was admitted to Edenvale Hospital under the care of Drs. G. Lange and I. Segal. He complained of headache, abdominal pain and nausea. On admission the temperature was 101° F and tenderness was present in the right hypochondrium. A tentative diagnosis of infective hepatitis was made, but was not confirmed by laboratory tests. Investigation of the blood showed a raised sedimentation rate and an absolute monocytosis. The temperature became normal the day after admission and he was discharged from hospital on 6 October, to be readmitted on 2 November with headaches, backache and profuse perspiration. His temperature was slightly over 99° F, but returned to normal on the following day. A relapse occurred on 13 November, commencing with a rigor and a temperature of 103° F. Blood smears were positive for the spirochaetes of relapsing fever. The temperature became normal the following day.

There is little doubt that the patient had originally contracted relapsing fever at his home in the Warrenton district.

The following two cases although not in Europeans (a Eurafrican and an Indian) are placed on record because they do not fall into the Native group:

Case 19. A Eurafrican (Coloured) woman 43 years old. She was infected with relapsing fever while working as a nurse in the Native location in Graaff-Reinet which has already been described[4] as being heavily infested with *Ornithodorus moubata* ticks. Dr. A. L. te Water reported that the patient was bitten by ticks on 16 December 1944 whilst in attendance on a maternity case in the location. The patient had 4 relapses at 7-10 day intervals.

Case 20. An Indian man 20 years old living in Johannesburg. He visited Lourenço Marques from 27 December 1947 to 24 February 1948. There was no history of a tick bite. Symptoms

commenced during his stay in Lourenço Marques in the last week of January 1948. Three weeks before his return from Lourenço Marques he developed fever. After his return to Johannesburg he was admitted to the Coronation Hospital on 11 March with pyrexia which lasted 2 days. The spleen was palpable and soft, but not tender. A blood smear showed the presence of spirochaetes of relapsing fever. The patient had most likely become infected in Lourenço Marques.

In addition to these cases, 5 blood smears from Europeans positive for relapsing-fever spirochaetes have in the last 20 years come to the notice of Dr. S. Annecke [7] of the Union Health Department, Tzaneen. Details of these cases are not available except that they represent 3 men and 2 women all from the Pietersburg district.

The total of 23 cases of relapsing fever over a period of 23 years reflects a very small infection rate in Europeans. The possibility that other cases have in fact occurred but remained undiagnosed cannot of course be excluded.

Physicians should consider relapsing fever in differential diagnosis in the areas shown in the map as well as in adjoining regions in any patient with a recurrent type of temperature, and should attempt to confirm its presence by the examination of blood smears taken at the height of the temperature or enlist laboratory aid for a complement-fixation test on the patient's blood-serum.

SUMMARY

Relapsing fever transmitted by the *Ornithodorus moubata* tick occurs mainly in the northern and eastern parts of the Union of South Africa bordering the countries where the disease is endemic, and also in the semi-arid central regions through Kimberley and Graaff-Reinet.

The infection rate in Europeans in South Africa from relapsing fever (tick-borne) is very low; only 23 cases are on record as having occurred in the last 23 years. Other cases in Europeans may have escaped notice, and physicians in the endemic areas are well advised to bear in mind the possibility of a diagnosis of relapsing fever in cases where pyrexia in a patient is unexplained.

REFERENCES

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6. Annual Reports S. Afr. Inst. Med. Res., Johannesburg.
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