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BRUCELLOSIS IN SOUTH AFRICA
T. B. ESLIN and J. F. MAINGARD.

Brucellosis, also known as Malta or undulant fever, and in South Africa as Kimberley fever, camp fever or slepende koors, is a disease caused by organisms of the Brucella group, and characterised chiefly by long-continued fever of undulant nature, sweating, headache and constipation. Undulant fever is not one of the major health problems in this country as we may see from the annual reports of the Union Department of Public Health. Thus during 1935 only thirty-six cases were notified in the whole Union, and the total for the last ten years is eighty-four. Its mortality is low, being in the neighbourhood of 3 per cent. Nevertheless on account of the fact that it is a chronic debilitating disease and that it is so vague and varied in its manifestations, it merits more consideration than these figures would perhaps seem to warrant.

History. The first descriptions of the disease that we have appear in the British Army records of the Crimean War (1854). In 1886 Bruce isolated Brucella melitensis for the first time, while, as early as 1897, specific agglutinins were demonstrated in the blood of patients suffering from the disease. In 1904 a British Commission was sent to Malta to investigate the disease in the troops stationed there. The Commission showed that the milk of infected goats, consumed by the soldiers and sailors on the island was responsible for the large number of cases among the forces; and that on boiling the milk so as to destroy the organisms, the incidence was reduced almost to nil.

Undulant fever was probably brought to South Africa by Angora goats, the first batch of which was imported from Turkey about a hundred years ago, and consisted of a few ewes and thirteen rams. The wily Turks, however, castrated all the rams before shipment, to ensure further business, but they were foiled in their greed by one of the ewes which gave birth to a kid on the journey out. In this way Angora goats, and possibly undulant fever, came to South Africa.

"Slepende koors" (as it was called) was rife in the Cape Colony, especially in the goat-rearing districts of the Karroo, at the beginning of this century. The Union Year
Book for 1924 states: “Twenty to thirty years ago a form of fever called “Kimberley fever” was of frequent occurrence in the diamond fields and neighbouring parts of the Cape Province, and subsequently, with the development of goat farming, it spread to many other districts.”

In 1901 a British Army surgeon from Malta, serving in the Boer War, described “camp” or “Kimberley” fever, and demonstrated its identity with Malta fever.

In 1907 undulant fever was made a notifiable disease in the Cape under its old name of Malta fever, and fifty-eight cases were notified in that year alone, but owing to poor notification there were undoubtedly many more cases left unrecorded. At present undulant fever is notifiable in all four provinces of the Union.

**Incidence.** The graph on page 15 shows the yearly incidence in the Union since 1913. The drop in incidence, compared with previous years, and the upward tendency during the past year should be observed.

It is said that South African doctors are on the look-out for this condition nowadays, and this may explain the recent rise in notifications, but it remains to be seen whether this apparent increase in incidence will be maintained or not. It is also possible that the figures indicate a real increase in incidence, but again, as we have said above, we cannot be sure of this owing to the unsatisfactory nature of the available data.

In an attempt to find out in which areas the disease is endemic at the present time, an inspection of the records of the South African Institute for Medical Research (the only source of information available to us) was made with regard to the number of agglutination tests performed for undulant fever in 1935 and the first quarter of 1936.

Now the laboratory tests done in this institution are not by any means representative of the entire Union, for there are laboratories also at Capetown, Durban, Port Elizabeth and Pretoria. However, judging from the other examinations done (e.g. Widals), this institution gets work from all districts in the Transvaal, and South-West Africa, and many in the Free State, Natal and Cape. The following figures were obtained regarding the tests performed during the past fifteen months for undulant fever:

- Total agglutination tests performed .... 524
- Number of positive results .... .... 40

This gives 8 per cent. positive results in sera tested for Brucella agglutinins. From these data therefore it would seem that the medical profession in this country is alive to the presence of the disease. But it must not be forgotten in this connection that many of these tests were done by the Institute not because they were asked for by practitioners, but simply as a routine procedure, on specimens sent in for Widal and other reactions. That a miscellaneous collection of sera, only a small number of which came from suspect cases, should give such a high percentage of positives is remarkable. We are not however entitled to draw any conclusions about the incidence of Brucellosis among the general population from these figures because of their fragmentary and incomplete nature. None of the data at our disposal is entirely satisfactory for similar reasons.

The districts from which positive sera came were, in the Transvaal: the Reef (mostly from the mines), Rustenburg, Christiana and Schweizer Reineke; in South-West Africa: Swakopmund and Windhoek; in the Cape: Kuruman, Upington, De Aar, Hopetown and Umtata; and in Rhodesia: Shabani and Broken Hill. One case came from Beira in Portuguese East Africa. The figures for each district are too small to be of any significance, but it may be added that ten of the cases occurred in the Transvaal, seven of which were on the Reef, mostly in mine natives, sixteen in South-West Africa, fifteen of which were in Swakopmund, ten in the Cape and two in Rhodesia.

For the years prior to 1935 the records from various sources show cases in various other districts, but roughly in a similar distribution, namely, scattered throughout South-West Africa, the Karroo, the Transvaal, and Rhodesia. It is not so frequent in the Karroo as formerly, according to the figures given in the old Cape of Good Hope Government reports and in the papers of Gow and Strachan. Cases are sometimes reported from the Free State and Natal, but never in large numbers.

Outside South Africa undulant fever has a wide distribution. It is very common around the Mediterranean and in Europe. In England and Wales between four and five hundred cases have occurred since 1917. No fewer than ten thousand cases have been reported in the United States up to now.

**Clinical Aspects.** Undulant fever may be described, like another disease we know, as
protean in its manifestations. The disease is rare before the tenth year. This has been ascribed to a congenital immunity. The preponderance of male over female cases has been observed in all countries where the disease prevails. In England and Wales, in a series of two hundred and fifty-five cases collected by Dalrymple-Champneys, one hundred and seventy or sixty per cent. were males. The explanation lies probably in the fact that males, by virtue of their occupations, are more exposed to infection than females. If milk alone were the infecting agent the incidence in the two sexes would probably be equal. Brucellosis in England is mainly derived from cattle, and the infection is transmitted in several ways and not chiefly by milk as in the case of goats. Dalrymple-Champneys describes the clinical course of the disease as follows. The onset of definite fever is preceded, usually, by a period of malaise, with headache and sometimes sweating, lasting from a day to several weeks. This is followed by the onset, often sudden, of definite symptoms, of which the chief are sweating which is often profuse, fever, malaise and fatigue, headache, pains in the body and abdomen, and constipation. The symptomatology however is very variable, making the diagnosis purely on clinical grounds difficult. Other signs and symptoms which may be present are anorexia, rigors, enlarged spleen, cough, insomnia, diarrhoea, relative bradycardia, various rashes, arthralgia, epistaxis, nausea and vomiting. There are thus many points of similarity to typhoid and influenza, which render diagnosis difficult. The temperature chart may pursue one of three courses.

(1) Typical or classical undulant form: out of sixty-six cases, thirty-seven presented this type of temperature.

(2) The remittent and undulant type. Four cases showed this.

(3) Some cases showed an irregular type of temperature without undulations; this may simulate that of malaria or septicaemia. This occurred in thirteen out of sixty-six cases.

The afebrile periods which occur in the course of the fever last from a few days to several weeks, and may raise premature hopes of recovery. A feature of diagnostic importance is a conspicuous lack of relation between the height of the fever and the degree of prostration. Many patients will pursue their normal avocations with temperatures of 103° to 105°F. The duration of the fever varies from one week to two years, with an average of three months in the series reported by Dalrymple-Champneys. The mortality in his cases was 3.1%. In a series of 607 cases from Sweden the average duration of the fever was 91 days, and the average period of convalescence lasted another three months.

Diagnosis. A positive diagnosis depends either on the agglutination test or the intradermal test. The agglutination test will be found positive after the fifth day in most cases. It has been suggested that a Brucella agglutination test should be asked for more often in obscure fevers, and even that every serum sent in for the Widal reaction should be put up against a Brucella strain as well.

Occasionally the agglutination test is negative in undoubted cases of Brucellosis. Simpson gives the percentage of negative sera as 5%.

Another source of difficulty is that sera from apparently normal people and patients suffering from other diseases may give a positive reaction with Brucella organisms. A man in Capetown with coronary thrombosis is said to have given a positive result in dilutions up to 1 in 9,600. Formerly a titre of 1/80 was considered diagnostic. Now, a rising titre in successive samples is considered to be the most reliable test, although we can be pretty certain that we are dealing with undulant fever if, in a suspected case, the titre is 1/200 or more. However it must not be forgotten that a titre of 1/200 may occur without there being any clinical evidence of the disease at all, and, on the other hand, cases have been observed in which the titre never rose above 1/80, and others in which it was impossible to get any positive result whatsoever. Therefore it is always best to confirm the diagnosis by some additional test such as the skin test, or by repeating the agglutination after a short time. Hauptmann recommends that a Widal test should be done at the same time so as to exclude typhoid, but this is not likely to be omitted in the investigation of these cases.

The intradermal test for Brucellosis is performed in the same way as the Schick test. One or two minims of a filtrate from a broth culture of Brucella are injected into the skin of the forearm. A positive reaction consists in the appearance of a red, swollen, area at the site of injection within 24 hours. A control using sterile broth is done on the opposite arm. Another way of doing a control
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is to inject some of the Brucella filtrate into the arm of a healthy normal subject at the same time.

Brucella filtrate is not obtainable in South Africa, but perfectly satisfactory results are given by the use of B. melitensis vaccine, containing about three million organisms per cc. one minim is sufficient. The chief value of this test is as a confirmatory reaction. It may also be used for diagnosis where it is not possible to get an agglutination test done, for instance, at a distance from the laboratory. The test is much lauded by the Americans who say that it is easier than the agglutination test and not so liable to give fallacious results.

The blood count presents characteristic features in a large percentage of cases, and may often suggest the diagnosis. The chief points of diagnostic importance are:—leucopenia, usually of a high degree, relative lymphocytosis, and a moderate diminution in the red cell count. The leucopenia is often a striking feature, and the white cell count may be so low as to make one think of agranulocytosis.

In no other disease, excepting agranulocytosis and, perhaps, occasionally in typhoid, does the white cell count reach such low figures. Blood culture would be of the greatest value in diagnosis if it were always positive, but only a small number of cases give positives with this method. The Brucella organisms are unfortunately very delicate and consequently difficult to keep alive on artificial media.

Blood culture was positive in only 13% of a series of 77 cases. Therefore it is not of much use as a diagnostic measure. The importance of blood culture lies in the fact that it is the only trustworthy means of telling which species of Brucella is responsible for infection.

**Differential Diagnosis.** The most important point as far as the differential diagnosis is concerned is the necessity of distinguishing undulant fever from typhoid. This is the problem which will most often arise in practice. All writers agree on this matter. Dalrymple-Champneys says “The diagnosis from enteric fever is often extremely difficult in the early stages. The two diseases have many symptoms in common such as headache, abdominal pain, constipation, enlargement of the spleen, slow pulse in relation to the temperature, and epistaxis.” If, however, in a case which looks like typhoid fever we find that sweating is unduly profuse and that the prostration is less than one would expect with the degree of pyrexia, then it should be suspected that we are dealing with Brucellosis and not with enteric. The undulant temperature chart, and the fact that in typhoid the pyrexial period is never longer than forty days, will also suggest the diagnosis in long standing cases.

Other causes of the so-called “pyrexia of unknown origin,” from which Brucellosis has sometimes to be differentiated, are influenza, malaria, typhus, tuberculosis, subacute bacterial endocarditis and septicemia. It has also on occasion been mistaken for rheumatic fever and cholecystitis.

**Treatment.** In all textbooks consulted it is stated that there is no specific treatment for undulant fever. Yet in 1933 S. Miller published seven cases treated by “protein shock” with results so striking that it can unhesitatingly be recommended as our best therapeutic weapon against this disease. Miller’s method is to inject hypodermically or intravenously TAB vaccine at intervals of three to seven days. The initial dose is usually fifty million organisms, but this is reduced to twenty million in certain instances. In three of his cases a single injection led to a permanent arrest of the fever after an initial reaction. In three other cases two to five injections were sufficient, while the seventh case showed steady but slow improvement in the course of several weeks. By 1935 Miller had collected over 20 cases treated in this manner with consistently good results. In another series of 13 cases, with this treatment 9 were benefitted. Dalrymple-Champneys warns against its use in extreme age or youth, debilitated persons, or where there is cardiac or renal disease.

In the case reported by Beaumont & Page, the patient was given 100 million organisms in one dose, which nearly killed him. However he improved rapidly after a few days, and became apyrexial in 19 days.

Apart from the use of TAB, Dalrymple-Champneys recommends the following general treatment: The diet must be appetising and nutritious, with “slops” restricted to the febrile periods, for the patient is probably in for a long and exhausting illness. Constipation, oral hygiene, and the frequent changing of sweat-sodden clothing should all be attended to. For the severe aches, aspirin is the best sedative. Carminatives must be used to
relieve the flatulence which is so frequent and distressing a symptom. At least five days of apyrexia should elapse before the patient is allowed to get up, because there is usually a certain amount of myocardial weakness in these cases.

Opinions as to the usefulness of B. melitensis or B. abortus vaccine vary, which means that they are probably not of much value. Vaccine therapy was said to be the best treatment by Langley and Killingsworth in reporting 26 cases from the U.S.A. The opinion in France, according to Cambasèdes, is that vaccine therapy is the most efficient. Dalrymple-Champneys treated 21 cases in his series with a B. melitensis stock vaccine and 4 benefitted definitely. 16 cases were treated with an autogenous vaccine. Only one of these benefitted definitely by the treatment. These results are, to say the least, disappointing. In Sweden opinion seems to be strongly against the use of these vaccines. G. Olin states that in 33 vaccinated cases the average duration of the disease was longer than in 22 unvaccinated cases.

Epidemiology. Some years ago Evans demonstrated the close relationship between Brucella melitensis and Brucella abortus, and proved conclusively that B. abortus was also pathogenic to man. It was shown that undulant fever might be due to either of these two organisms. This led to the discovery of undulant fever in countries where it had hitherto gone unrecognised, for it was now realised that, apart from goats' milk, the infection could be carried to man by the milk, carcasses, excreta and products of conception of cattle and swine suffering from contagious abortion.

In countries such as Great Britain cattle form the chief reservoir of infection. About 50% of the herds are said to be infected in England and Wales. That milk is one of the infecting agents is well shown by the fact that in London, where all milk is pasteurised, Brucellosis is rare, while it is prevalent where milk is not pasteurised.

The position in South Africa, with regard to the relative importance of goats and cattle as sources of infection, is not clear, as figures are unobtainable. The serological reports from laboratories in this country do not enable us to distinguish between the two organisms. Usually a given serum is found to agglutinate both organisms in equal dilutions, and a distinction is only possible by
means of agglutinin-absorption tests. An investigation of this problem is now being carried out by the South African Institute for Medical Research. Until the results of this work are available, all that we can say is that cases of infection from both sources have been described in this country, and that goat infection is apparently not so common as it used to be.

This increases the significance of Brucellosis to the Union for if the incidence among cattle in this country is at all high, it is obviously necessary for us to take steps to prevent its spread by infected milk and meat. Perhaps the recent increase in the number of cases reported is due to increase of the infection among cattle and swine, and may thus be a warning to us of a dangerously high incidence in the near future.

At the present time Brucellosis is, from the human point of view, not sufficiently widespread to call for any drastic measures. This does not mean however, that, because there are relatively few cases occurring now, we can rest satisfied; for it is conceivable that the time may come when, owing to the spread of contagious abortion in cattle, South African national health, and the dairy industry will be seriously threatened by this disease. The problem is not one for the medical profession alone, and we must look to the veterinarians to save us from such a disaster.

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AN UNUSUAL CASE OF UNDULANT FEVER.

J. F. MAINGARD.

Mr. L. J. F., a farmer aged 47, was admitted to Professor Craib’s ward on 22/2/36 complaining of:—

1. Epigastric pain.
2. Dry cough.
3. Loss of appetite.

The history which he gave was as follows: On 21/12/35 he had an attack of what he describes as “sunstroke.” From that time he felt weak, feverish, and was mentally confused. This state lasted for a month during which time he was confined to bed. Towards the end of January 1936 he felt a little better and got up. Since 2/3/36 he has been quite clear mentally. However, on 3/2/36 he had an attack of diarrhoea with three or four motions during the day and two or three at night, which lasted for two or three days. The stools were watery, pale yellow in colour, and did not contain any blood or mucus. After this he was, and has remained, constipated. At the same time he got severe epigastric pain which was still complained of at the time of admission. About 10/2/36 he had a rigor and began to sweat profusely at night. At this stage he took to his bed again and remained in bed until transferred to hospital. On 13/2/36 he began coughing. There was a dry cough with slight pain in the chest on coughing. No phlegm or blood was brought up. He thinks he has lost about 20 lbs in weight since the onset of his illness. There was no history of vomiting, rash, headache, backache, jaundice or pain in the limbs. Nausea was present, especially with meat, and insomnia was marked.

Past History. Dysentery seven years ago. Previous health otherwise good. He never takes tobacco or alcohol, and sleeps well as a rule.