

*"Muhinyo," a Disease of Natives in Uganda.*

By Colonel Sir DAVID BRUCE, C.B., F.R.S., Army Medical Service; Captains A. E. HAMERTON, D.S.O., and H. R. BATEMAN, Royal Army Medical Corps; and Captain F. P. MACKIE, Indian Medical Service. (Sleeping Sickness Commission of the Royal Society, 1908-10.)

(Received June 7,—Read June 30, 1910.)

When the Sleeping Sickness Commission passed through Kampala, the native capital of Uganda, at the end of October, 1908, on their way to their camp at Mpumu, they were informed by Sir Apolo Kagwa, K.C.M.G., the Prime Minister, that a new disease had broken out in the province of Ankole, and that many people were sick.

This is probably the same disease which was described by Dr. A. G. Bagshawe in 1906. He gives the history and symptoms of nine cases which he saw in Ankole. He concluded that the disease was beri-beri, and states that at one village 25 per cent. of the inhabitants were suffering from a more or less severe form of the disease.

In the same year Dr. L. D. Lowsley also described "Muhinyo," but was of opinion that it might possibly be dengue with persistent joint pains.

Nothing more seems to have been written about "Muhinyo" until the beginning of 1909, when Dr. A. C. Rendle reported its presence in large numbers in the country round Lake Albert Edward. He says that all classes suffer, and that he has no hesitation in saying that "the disease is closely allied to kala-azar, the black death of India."

Thanks to the kindness of Sir Apolo Kagwa and Chief Saulo Mayanja Lumama, the Commission had an opportunity of seeing a case of "Muhinyo," which was sent to Mpumu from Ankole in January, 1909. This patient, who was said to have been ill for three months, was extremely weak and thin, but otherwise he showed no symptoms which pointed to any special disease.

As no other cases could be sent such a long journey as to Mpumu, it was decided that a member of the Commission should proceed to the district, in order to examine sick natives whom A. H. Watson, Esq., the District Commissioner, had kindly undertaken to have collected there.

On May 23, 1909, Dr. A. D. P. Hodges, the Principal Medical Officer, Uganda Protectorate, accompanied by Colonel Sir David Bruce, Director of the Commission, went to Masaka on the borders of Ankole, where they found some 50 sufferers from this disease awaiting them.

2 P 2

*Distribution of "Muhinyo" in Uganda.*

The principal focus of the disease is along the eastern shore of Lake Albert Edward, which corresponds nearly to longitude  $30^{\circ}$  E., in the latitude of the Equator. The most severe cases have been met with at Katwe (Fort George), a settlement on the eastern shore of Lake Albert Edward. It appears to have spread down the eastern shore of this lake, and to have extended in a south-easterly direction into Ankole. Cases have been recorded as far east as the western shore of Lake Victoria, and as far north as the Katonga River, which runs parallel to, and about 10 miles north of, the Equator. The disease is therefore quite limited in its distribution.

There is no evidence to show how it originated.

*Epidemiology.*

The tribes most effected by the disease are the Bakonjo and the Basongora. The former are morally and socially about the lowest class of people to be met with in Uganda. They are abjectly poor and dirty in their persons and in their habits. They live in rude grass huts, which they share with their domestic animals. The Bakonjo keep goats and, if they can afford them, cattle also. They prefer the milk of the cow, but also drink largely of goats' milk. The Basongora are a higher type of native, and resemble in appearance and customs the Bahima, the aristocracy of Uganda. They are not so poor as the Bakonjo, whom they use as serfs; they keep cattle and goats, and consume the milk of both animals. The flesh of the goat is largely eaten by both classes in a partially cooked state. The milk of sheep is occasionally used in default of that of the other animals.

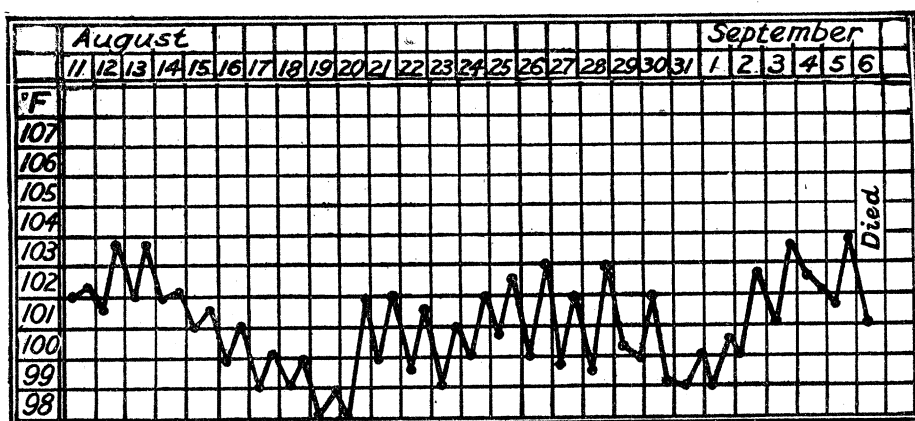
*Clinical Symptoms of "Muhinyo."*

As the result of the examination of the 50 cases sent into Masaka, it appeared that the principal symptoms of "Muhinyo" are fever, profuse sweating, pains in the joints and along the course of nerves, swelling of the various joints, especially the ankles, and extreme weakness and emaciation. The disease is of long duration; most of the patients had been ill for several months. In 13 cases, taken at random, the average duration was three and a-half months. Another had been ill for two years.

The following temperature chart was the only one which could be obtained.

In most of the cases there was no marked enlargement of the spleen or liver, nor symptoms of paresis or paralysis. The microscopical examination of the blood showed various degrees of anæmia, but no parasites or marked changes in the white blood corpuscles could be detected. Further, the

examination of the splenic pulp, obtained by puncture of the spleen, failed to reveal the presence of the parasites of kala-azar. It was therefore evident that “Muhinyo” was neither kala-azar nor beri-beri, but the long duration of the fever, the joint pains, and the extreme weakness and emaciation suggested a continued fever, such as typhoid or Malta fever.



*Examination of the Blood for Agglutinative Phenomena.*

The blood of several of these cases was therefore tested with *Bacillus typhosus* and *Micrococcus melitensis* by Widal's method, with the result that no reaction was obtained with the former, but positive results, in fairly high dilutions, were got with the latter.

The following table represents the result of the examination of the blood of “Muhinyo” with a strain of *Micrococcus melitensis* from Malta, from which it will be seen that five out of the seven cases examined gave a positive reaction :—

Table I.

No. of experiment.	Dilution of serum.			Control.
	1 in 50.	1 in 100.	1 in 200.	
927	+	+	—	—
928	+	+	—	—
929	—	—	—	—
930	—	—	—	—
931	+	+	+	—
932	+	+	+	—
933	+	+	—	—

*Isolation of the Micrococcus of Malta Fever from the Spleens of Cases of  
"Muhinyo."*

The next thing to be undertaken was the isolation of the *Micrococcus melitensis* from the tissues of patients suffering from "Muhinyo."

The spleens of two cases (925 and 926) were punctured in the usual way, and the splenic pulp smeared on the surface of tubes of nutrient agar-jelly. Small white colonies were grown from both cases, and these were sub-cultured and used to study the morphology, cultural characters, and animal reactions of the organism of which they were composed.

*Morphology.*—Under the microscope the organisms were found to be minute micrococci, indistinguishable in size or appearance from the *Micrococcus melitensis*.

*Cultural Characters.*—In the same way it was found that the sub-cultures of the organism showed after some days as minute transparent colonies, resembling tiny drops of dew, which afterwards became more opaque, and in no way differed from colonies of *Micrococcus melitensis* cultivated under the same circumstances.

*Animal Reactions.*—The sub-cultures were also emulsified in saline solution and injected into a monkey and rabbit. The monkey sickened with fever, and when the agglutinating power of its blood was tested with the strain of *Micrococcus melitensis* from Malta it was found to give a complete reaction in a dilution of 1 in 200. Having thus proved that two animals treated with the "Muhinyo" organism gave a serum capable of agglutinating a known *Micrococcus melitensis* from Malta, the converse experiment was made.

A rabbit was inoculated with the Malta strain, and its serum tested on the "Muhinyo" organism. This rabbit's serum, immunised against Malta fever, agglutinated the "Muhinyo" organism in a dilution of 1 in 200; and thus the proof that the micrococcus obtained from the spleen of "Muhinyo" cases and that obtained from cases of Malta fever were identical, was established.

*Examination of Goats from the "Muhinyo" District, to ascertain if they are  
reservoirs of the virus of Malta Fever.*

*By Widal's Reaction.*—In Malta, the Royal Society Commission discovered, in 1905, that the drinking of goats' milk was the sole mode of infection in Malta fever. Many of the Maltese goats were examined, and 50 per cent. of them found to be affected in some way by the disease, while [10½ per cent. were actually excreting the *Micrococcus melitensis* in their milk.

It was, therefore, a matter of importance, as well as curiosity, to ascertain if the Ankole goats also suffered from Malta fever, and if the causation of this disease was the same in Central Africa as it had been proved to be on the shores of the Mediterranean, in the Soudan, and in South Africa.

When Sir Apolo Kagwa was approached as to the feasibility of obtaining goats from the most affected districts, he informed the Commission that he would see what could be done. About six weeks later a flock of goats, numbering in all 24, was driven up to the laboratory at Mpumu, and it was stated that these had come from a place where “*Muhinyo*” was common. They were at once examined, with the result that the blood of three out of their number reacted to the strain of *Micrococcus melitensis* obtained from cases of “*Muhinyo*,” and also to the Malta strain.

The following tables give the details :—

Table II.—*Micrococcus melitensis* (“*Muhinyo*” strain).

No. of experiment.	Dilutions of serum.					Control.
	1 in 10.	1 in 20.	1 in 50.	1 in 100.	1 in 200.	
1512	+	+	+	—	...	—
1507	+	+	+	+	...	—
1776	+	+	+	+	+	—

Table III.—*Micrococcus melitensis* (Malta strain).

No. of experiment.	Dilutions of serum.				Control.
	1 in 10.	1 in 20.	1 in 50.	1 in 100.	
1512	+	+	+	—	—
1507	+	+	+	+	—

*Isolation of the Micrococcus of Malta Fever from the Tissues of the Goats.*—After having found that some of the Ankole goats reacted to the agglutination test, an attempt was made to isolate the *Micrococcus melitensis* from their tissues. This proved successful in two cases. The following experiment gives one of these in detail :—

#### Experiment 1475. Goat.

August 11, 1909.—This goat, which was one of a herd from Ankole, died this morning. The spleen was removed, and small portions of the pulp spread over the surface of agar tubes.

August 16.—A growth consisting of several very small, round, white colonies appeared after three days. A stained preparation from one of these showed that they were composed of organisms resembling *Micrococcus melitensis*. Sub-cultures made.

September 29.—The growth from two agar tubes was made into an emulsion with salt solution, and an agglutination test made with serum from a rabbit immunised against *Micrococcus melitensis*, Malta strain.

The result was that the organism from the goats agglutinated completely in a dilution of 1 in 100, and the proof was complete that the Ankole goats are liable to contract Malta fever, and to act as a reservoir of the virus.

#### *Conclusions.*

1. "Muhinyo" is Malta fever.
  2. "Muhinyo" is conveyed from the goat to man by the drinking of goats' milk.
- 

#### *The Natural Food of Glossina palpalis.*

By Colonel Sir DAVID BRUCE, C.B., F.R.S., Army Medical Service; Captains A. E. HAMERTON, D.S.O., and H. R. BATEMAN, Royal Army Medical Corps; and Captain F. P. MACKIE, Indian Medical Service. (Sleeping Sickness Commission of the Royal Society, Uganda, 1908-10.)

(Received June 15,—Read June 30, 1910.)

As a good deal of interest, and it may be importance, attaches to the food of the tsetse fly—the carrier of Sleeping Sickness—the following notes are placed on record:—

In the laboratory it was found that the flies fed with far more avidity on birds than on monkeys, while they could hardly be tempted to feed on young crocodiles, iguanas, or lizards. It was very marked, this preference of theirs for birds; the moment a chicken was placed against the netting of the cage, they instantly swarmed on it in hundreds. From this it was thought probable that the natural food of the flies would prove to be birds' blood, but the two following experiments do not bear this out to any great extent:—

The first experiment was carried out in the laboratory at Mpumu, and extended over several months. Flies which had been caught on the Lake-shore and which had been kept over from the previous day, and sometimes longer, were dissected, and each portion of the alimentary canal examined in the fresh state under a low power. The various organs of the fly were then