

The Morphology of Trypanosoma simiæ, sp. nov.

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[PLATE 13.]

INTRODUCTION.

This species of trypanosome, which does not seem to have been described before, is remarkable in that it attacks only such widely different animals as the monkey and the goat. Oxen, baboons, dogs, guinea-pigs, and white rats appear to be immune. The rapidity with which it kills monkeys is very striking. In a series of 19 the average duration of life after the trypanosomes were first seen in the blood was only 2·9 days. Its action on animals, its reservoir, its carrier, and cultivation, have not been fully worked out, and will form the subject of a future paper. In regard to its carrier, it may be stated that in this district it is *Glossina morsitans*, and that scarcely a single cage of flies is brought to Kasu Hill from the neighbouring "fly-country" but is found to be infected with this trypanosome.

A. *Living, Unstained.*

Trypanosoma simiæ shows active translatory movements when alive: some individuals pass completely across the field of the microscope. Apparently the usual mode of progression is flagellum first, but occasionally an individual can be seen to move a short distance in the opposite direction.

B. *Fixed and Stained.*

The blood films were fixed, stained, and measured, as previously described in the 'Proceedings.'*

Length.—The following table gives the length of this trypanosome as found in the monkey and the goat, 500 trypanosomes in all.

* 'Roy. Soc. Proc.,' 1909, B, vol. 81, pp. 16 and 17.

Table I.—Measurements of the Length of *Trypanosoma simiae*.

Date.	No. of expt.	Animal.	Method of fixing.	Method of staining.	In microns.		
					Average length.	Maximum length.	Minimum length.
1912.							
Feb. 12	117	Goat	Osmic acid	Giemsa	17·2	18·0	15·0
" 15	117	"	"	"	16·8	18·0	15·0
" 22	109	"	"	"	16·7	18·0	15·0
Mar. 11	117	"	"	"	16·5	19·0	14·0
" 18	247	"	"	"	18·2	21·0	15·0
June 13	620	"	"	"	18·4	21·0	17·0
" 13	620	"	"	"	17·4	20·0	15·0
Jan. 29	20	Monkey	"	"	17·6	19·0	16·0
Feb. 1	20		"	"	17·5	20·0	15·0
" 6	54		"	"	18·9	22·0	16·0
" 6	55		"	"	17·5	20·0	15·0
" 8	54		"	"	18·5	20·0	16·0
" 12	49		"	"	18·4	21·0	15·0
" 12	54		"	"	18·7	24·0	17·0
" 12	59		"	"	17·5	19·0	15·0
" 23	58		"	"	16·0	18·0	14·0
" 27	58		"	"	17·4	19·0	16·0
Mar. 18	286		"	"	16·1	18·0	14·0
Apr. 4	58		"	"	18·6	20·0	15·0
" 8	286		"	"	17·2	20·0	15·0
" 18	404		"	"	19·8	22·0	16·0
" 18	448		"	"	20·4	23·0	18·0
" 23	405	"	"	19·0	21·0	17·0	
" 25	449	"	"	18·6	21·0	16·0	
" 29	448	"	"	18·9	21·0	16·0	
					17·5	24·0	14·0

The average length of *T. simiae* in the monkey and goat, taken from Table I, is as follows :—

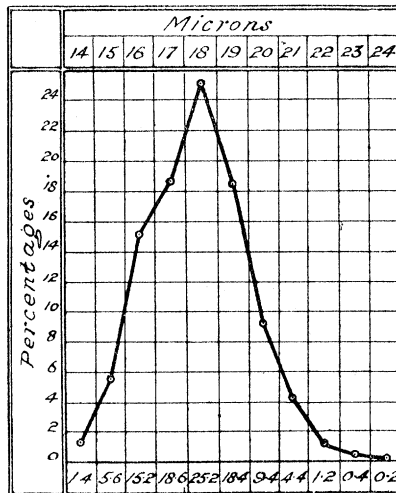
Table II.—Average Length of *T. simiae*.

Species of animal.	No. of trypanosomes measured.	In microns.		
		Average length.	Maximum length.	Minimum length.
Monkey	360	18·1	24·0	14·0
Goat	140	17·2	21·0	14·0

Table III.—Distribution in respect to Length of 500 Individuals of *T. simiæ*.

Animal.	In microns.											Average length.
	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	
Goat	—	1	5	5	9	—	—	—	—	—	—	17.2
"	—	3	8	7	2	—	—	—	—	—	—	16.8
"	1	2	5	8	2	2	—	—	—	—	—	16.7
"	2	1	10	1	3	3	—	—	—	—	—	16.5
"	—	1	2	3	5	5	2	2	—	—	—	18.2
"	—	—	—	3	9	6	1	1	—	—	—	18.4
"	—	2	2	7	4	4	1	—	—	—	—	17.4
Monkey.....	—	—	4	7	8	1	—	—	—	—	—	17.6
"	—	1	2	7	6	3	1	—	—	—	—	17.5
"	—	—	1	3	6	2	4	3	1	—	—	18.9
"	—	2	3	8	3	3	1	—	—	—	—	17.5
"	—	—	1	3	5	6	5	—	—	—	—	18.5
"	—	2	1	2	5	7	2	1	—	—	—	18.4
"	—	—	—	3	8	4	4	—	—	—	1	18.7
"	—	1	6	4	5	4	—	—	—	—	—	17.5
"	2	5	7	2	4	—	—	—	—	—	—	16.0
"	—	—	4	6	8	2	—	—	—	—	—	17.4
"	2	4	6	5	3	—	—	—	—	—	—	16.1
"	—	1	1	—	5	9	4	—	—	—	—	18.6
"	—	2	5	4	6	2	1	—	—	—	—	17.2
"	—	—	1	1	2	4	4	5	3	—	—	19.8
"	—	—	—	—	2	3	6	5	2	2	—	20.4
"	—	—	—	1	5	8	5	1	—	—	—	19.0
"	—	—	1	3	5	7	2	2	—	—	—	18.6
"	—	—	1	—	6	7	4	2	—	—	—	18.9
Total	7	28	76	93	126	92	47	22	6	2	1	
Percentages ...	1.4	5.6	15.2	18.6	25.2	18.4	9.4	4.4	1.2	0.4	0.2	

CHART 1.—Chart giving Curve representing the Distribution, by Percentages, in respect to Length of 500 Individuals of *T. simiæ*.



From this curve it will be seen that *T. simice* is a monomorphic species, varying from 14 to 24 microns in length, the greatest number of individuals (25·2 per cent.) being 18 microns long.

Breadth.—Measured across the broadest part *T. simice* averages 1·75 microns in breadth (maximum 2·75, minimum 1).

Shape.—These trypanosomes are monomorphic and, as a rule, fairly uniform in shape. The body is elongated, markedly undulating, and frequently extends in a straight line (Plate 13, fig. 2). The posterior extremity is bluntly pointed or rounded, and there is frequently the appearance of a vacuole at the extreme end, as shown in figs. 6, 9, 11, 16, 17, and 18. The anterior extremity is pointed.

Contents of Cell.—Clear, homogeneous, and free from granules.

Nucleus.—Oval, and situated about the middle of the body.

Micronucleus.—Small and round, situated almost invariably about $1\frac{1}{2}$ microns from the posterior extremity. A peculiarity is that it is almost always placed at the edge of the trypanosome, from which it seems to protrude, or to be on the point of falling out. This is so marked that in the laboratory this trypanosome became known as the "glad eye," from the well-known play of this name.

Undulating membrane.—Well developed and thrown into bold undulations, herein differing from *T. vivax* and *T. uniforme*.

Flagellum.—It is difficult to say whether this species has a free flagellum or not. By careful staining and good illumination it would seem in most cases as if the undulating membrane extended to the tip of the flagellum. In most preparations, however, the last two or three microns of the flagellum often appear to be free. This is shown in Plate 13.

Division Forms.—In the monkey, in which these trypanosomes swarm in enormous numbers, masses of them can be seen, sometimes filling up the whole field of the microscope. It would seem as if multiplication took place so rapidly that the individual trypanosomes had not time to disengage themselves. A small part of such a mass is represented in fig. 1 in the text.

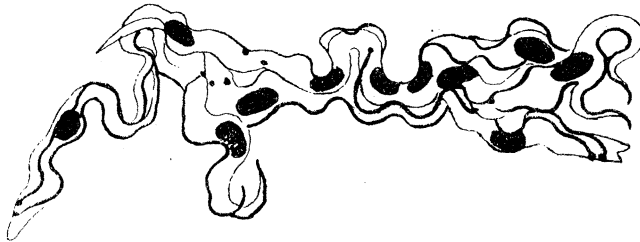
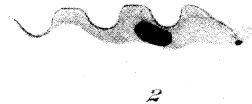


FIG. 1.



1



2



3



4



5



6



7



8



9



10

Monkey.



11



12



13



14



15



16



17



18



19



20

Goat.

M.E. Bruce, del.

Trypanosoma simice, sp. nov.

Grout sc. & imp.

In addition to this, numerous division forms are seen, often four or five in a field, in which the trypanosomes appear to slip past one another until they are only joined by their non-flagellar ends, as shown in fig. 2.

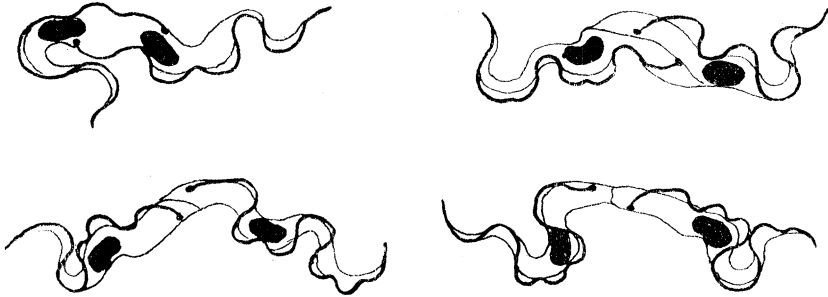


FIG. 2.

CONCLUSIONS.

1. *T. simiæ*, sp. nov., is a well-defined species, easily separated by its morphology alone from the other trypanosomes which have been described as causing disease among domestic animals.

2. It sets up a chronic disease in goats, but is chiefly remarkable for its rapidly fatal action on monkeys.

3. In Nyasaland it is carried by *G. morsitans*, and in this district—Central Angoniland—this tsetse-fly is found to be heavily infected with this trypanosome.

DESCRIPTION OF PLATE.

Trypanosoma simiæ, sp. nov.—Elongated, narrow, undulating body; posterior extremity bluntly pointed or rounded; anterior extremity pointed; nucleus oval; micronucleus small, round, situated about 1·5 microns from posterior extremity, placed laterally, protuberant; undulating membrane marked, thrown into bold folds; flagellum frequently not projecting beyond undulating membrane, sometimes 1 or 2 microns of the extremity apparently free.

Figs. 1—10, *T. simiæ* from the monkey; figs. 11—20 from the goat. Stained Giemsa. $\times 2000$.



1



2



3



4



5



6



7



8



9



10

Monkey.



11



12



13



14



15



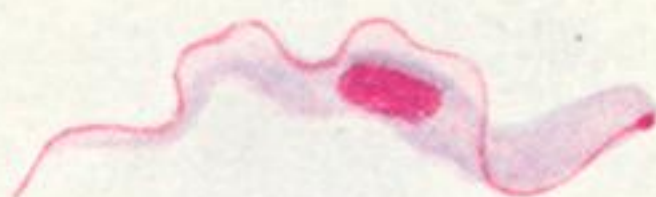
16



17



18



19



20

Goat.

Trypanosoma simice, sp. nov.