observed and distinguished from those clumped. In some culture tubes, rounded (involution) forms appear in great numbers on the third day to the fifth day, and the virulence and properties of these forms are now being separately studied.

The percentage of successes varies very much indeed—from 1 tube in 25 to 6 in 6. Numerous other media have been used, giving invariably negative results by the fifth day, including those consisting of frozen and thawed rabbits' blood serum only.

Further Observations on the Recovery of Trypanosoma gambiense *from* Tragelaphus spekei *on the Islands of Lake Victoria Nyanza*

By Dr. H. L. Duke.

(Communicated by Sir John Rose Bradford, K.C.M.G., Sec. R.S. Received July 17, 1912.)

In a paper* dealing with the recovery of a trypanosome from wild antelope on Damba Island, Lake Victoria Nyanza, the diagnosis is discussed at some length with a view to the exclusion of *T. brucei*.

Fifteen subinoculation experiments were considered and the conclusion was arrived at that the available evidence pointed to the organism being *T. gambiense*. After a lapse of some four months this opinion has received considerable support from a more prolonged investigation of the animal reactions of the trypanosome. In the following table many of the original subinoculations are followed to their conclusion on the death of the animal, and several other experiments have been added to the list.

It will be seen that the evidence supplied by the rat experiments is strongly in favour of *T. gambiense*.

In the six experiments conducted with rats the average duration of the disease is 61 days. This constitutes very strong evidence against *T. brucei*. In guinea-pigs (three experiments) the average duration is 67 days: in five completed monkey experiments, 147 days.

* "Antelope and their Relation to Trypanosomiasis," 'Roy. Soc. Proc.,' B, vol. 85, p. 156.

Animal.	Expt. No.	Source of virus.	Incubation in days.	Duration of disease in days.	Remarks.
Monkey ...	401	Situtunga 402—3	8	144	
„ ...	511	„ 509—10	12—13	144	
„ ...	504	Flies from 401	?	195	
„ ...	525	Goat 512	10	207	
„ ...	543	Calf 478	10	—	Still alive after 192 days. Active; shows no marked symptoms. Slight wasting.
„ ...	575	Goat 579	6	46	This monkey was an old one, and somewhat emaciated at commencement of experiment.
White rat...	477	Monkey 401	5	83	
„ ...	571	„ 401	5	44	A young rat.
„ ...	639	„ 511	7	51	
„ ...	640	„ 511	7	52	
„ ...	646	„ 401	7	62	
„ ...	647	„ 401	7	74	
Guinea-pig	458	„ 401	10	61	
„	572	Rat 477	20	62	
„	638	Monkey 511	14	80	
Goat	512	Situtunga 509—10	15 (?)	—	Has suffered from abscess on leg, from which it recovered rapidly. Apparently in excellent health after 220 days.
„	579	Monkey 401	?	—	Presence of trypanosomes proved by subinoculation into monkey. Never seen in peripheral blood. Killed after 224 days, showing great weakness; some emaciation.
Dog	573	„ 401	12	96	Extremely emaciated; some opacity of cornea. Killed when at point of death.
„	574	Goat 512	14	43	In very poor condition at the time of inoculation and throughout the experiment.
Calf	478	Monkey 401	?	—	Proved by subinoculation into monkey. Trypanosomes seen only once in peripheral blood. Apparently in excellent health after 237 days.

For comparison with the reactions of this Damba trypanosome the following experiments may be considered, involving other trypanosomes strains employed at Mpumu.

Two types were selected for experiment, the one represented by various strains recovered from wild Lake-shore flies by feeding them on monkeys; the other an undoubted *T. gambiense*. This last was obtained in Monkey 199 by direct inoculation from a reedbuck in captivity at the laboratory, 15 months after the original infection of this animal with a human strain. It should be

noted that in the case of all the strains employed the trypanosomes had more or less recently passed through *Glossina palpalis*. This is also presumably the case with the Damba strain as found originally in the wild antelope. This fact is of considerable importance in that it eliminates all idiosyncrasies acquired during continued maintenance in laboratory animals.

Experimental animal.	Origin of trypanosome strain.	Duration of disease.
		days.
Monkey 113	Kibanga flies direct.....	85
„ 56	„ „	104
„ 563	„ „	147
„ 597	Namusenyu flies direct	123
„ 538	Human strain from Monkey 199 through laboratory-bred *G. palpalis*	176
„ 643	„ „ „ „	111
„ 642	„ „ „ „	89
White rat 659 ...	Monkey 597 by inoculation	62
„ 660 ...	„ 563 „	66
„ 576 ...	„ 113 „	57
Guinea-pig 690 ...	Human strain from laboratory antelope	50
„ 1 ...	Monkey 199 through laboratory-bred *G. palpalis*.....	68
„ 2 ...	„ 113 „ „	81
„ 4 ...	„ 113 „ „	76

The average duration of the disease in rats (three experiments) is 61 days: in four guinea-pigs 68 days: in seven monkeys 119 days.

From a comparison of the above two tables it will be seen that there is a close similarity in the animal reactions of all the trypanosomes employed. In no instance does the disease in rats approach the virulence assumed by *T. brucei*. There is, therefore, no reason to doubt that the trypanosomes recovered from wild Lake-shore flies and from the wild situtunga are indeed *T. gambiense*.

A visit was paid to Sese Islands where Carpenter had recently obtained an infection in a monkey with some 6000 odd flies. *G. palpalis* were found to be very numerous and many situtunga tracks were seen. The natural conditions on the islands visited are, however, apparently very much less favourable to the perpetuation of sleeping sickness by these animals than is the case with Damba. There are tracts of open country, between and behind the forests which fringe most of the Lake shore, where situtunga come out to feed and where there are no tsetse. The antelope do not, therefore, enter a fly area immediately upon leaving the shelter of the forest and papyrus as is nearly always the case on Damba.

Six situtunga were shot during the trip. Their blood was examined in the fresh state, by stained films, and by inoculation into goats and monkeys. By

the latter method only was a positive result obtained, *T. vivax* appearing in the goat 13 days after the first inoculation of blood. The two monkeys used in these experiments remained negative to daily examinations for 30 days.

With regard to the appearance of trypanosomes in the goat it must be stated that the animal was sent to Sese direct from Entebbe. I was, therefore, only able to make a few preliminary blood examinations before using it for experiment. In the face of former results with *T. vivax* and the fact that the goat was to all appearance quite healthy, there is every reason to conclude that the trypanosomes came from the situtunga.

Studies on the Reductase of Liver and Kidney.—Part I.

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I. *Introduction.*

The notion has been steadily gaining ground that the reducing powers of animal tissues are due to enzymic action. In March, 1910, one of us* adduced evidence that this so-called "reductase" was active in the press-juice of liver and kidney of sheep, ox, horse, and frog. Soluble Prussian blue, methylene blue, and sodium indigo-disulphonate are all reduced more or less perfectly to leuco-compounds by press juice, whereas by a boiled control they are not.

It seemed very desirable to conduct several lines of investigation arising out of the main contention that the tissues were capable of carrying out reduction-processes because they contained an endo-enzyme, viz., How rapidly does the press juice deteriorate in reducing activity; how does it behave in respect of such comparatively stable but reducible substances as $NaNO_3$; in what way, exactly, does its activity vary with temperature; in what way, if any, is the catalase of the liver related to the reductase? It seemed, in particular, highly desirable that a method capable of following the reduction changes quantitatively should be devised in order to enable us to follow the velocity of any given reaction being studied.

* Harris, D. Fraser, 'Bio-Chem. Journ.,' 1910, vol. 5, p. 143.