

**TRYPANOSOMA PESSOAI N. SP., IN VAMPIRE BATS *DESMODUS*
ROTUNDUS ROTUNDUS FROM THE STATE OF
SÃO PAULO, BRAZIL**

Leonidas M. DEANE and Washington SUGAY

SUMMARY

A trypanosome of the *megadermae* group was found in the blood of 8 out of 18 vampire bats *Desmodus rotundus rotundus* captured in São Paulo. No multiplication forms were seen in the blood or viscera, and attempts to cultivate it in blood-agar media, and to infect laboratory mice or triatoma bugs (*Rhodnius prolixus*) have failed. A description and figures of the parasite are presented, and the name *Trypanosoma pessoai* is proposed for the new species.

INTRODUCTION

While searching for *Trypanosoma cruzi* infections in wild mammals of Brazil, we had the opportunity to examine vampire bats of the species *Desmodus rotundus rotundus* (E. Geoffroy, 1810) from Guararema, State of São Paulo. A high proportion of them were found to harbour a different trypanosome, which we are naming *Trypanosoma pessoai* n. sp. in honor of the outstanding Brazilian parasitologist Professor Samuel B. Pessôa.

MATERIAL AND METHODS

The bats were captured in caverns and in a tunnel of a water reservoir, between September 15, 1962 and April 10, 1963. They were brought alive to the laboratory and examined in the following way: they were fixed with adhesive tape, back downwards, to a board, and submitted to xenodiagnosis with five fifth stage nymphs of laboratory-bred triatomid bugs of the spe-

cies *Rhodnius prolixus*; afterwards, a few drops of blood were obtained by pricking one of the wing veins, one drop being used for direct microscopical examination and the others for the preparation of thick and thin smears. In some of the bats, heart blood was drawn for hemoculture in blood-agar media and for intraperitoneal inoculation of white mice 20-30 days old. The bats were then killed, smears of blood, liver and spleen were prepared and pieces of the following organs were kept in 10% formaldehyde for histological sections: heart, liver, spleen, lung, digestive tract, kidney, lymph nodes, diaphragm, tongue and (of some specimens) brain. The blood and viscera smears were stained with Giemsa's and the histological sections with hematoxylin-eosin. The triatomid bugs were examined twice: on the 30th day, when flagellates were searched in the stools obtained through abdominal compression, and on the 60th day, when the hind gut was dissected and the flagellates sought for in its contents.

Faculdade de Medicina da Universidade de São Paulo, Departamento de Parasitologia (Prof. A. D. F. Amaral) and Instituto Biológico de São Paulo.

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RESULTS

No *cruzi*-like organisms were detected in the bats, but out of 18 of these, 8 were found to harbour the trypanosome here described. In all positive animals the flagellates were encountered in the thick blood smears, six also showed them in the thin smears and three in the fresh blood preparations. The trypanosomes were usually scanty, from 1 to 5 per thin film, and no dividing forms were found. The xenodiagnosis performed in 17 bats, including those showing flagellates in the blood smears, was always negative, and so were the hemocultures and mice inoculations from six bats, three of which had positive blood films. The examination of smears and histological sections of the viscera of the infected bats failed to reveal multiplication forms.

The description of the parasite in stained smears is as follows (figures 1 to 10).

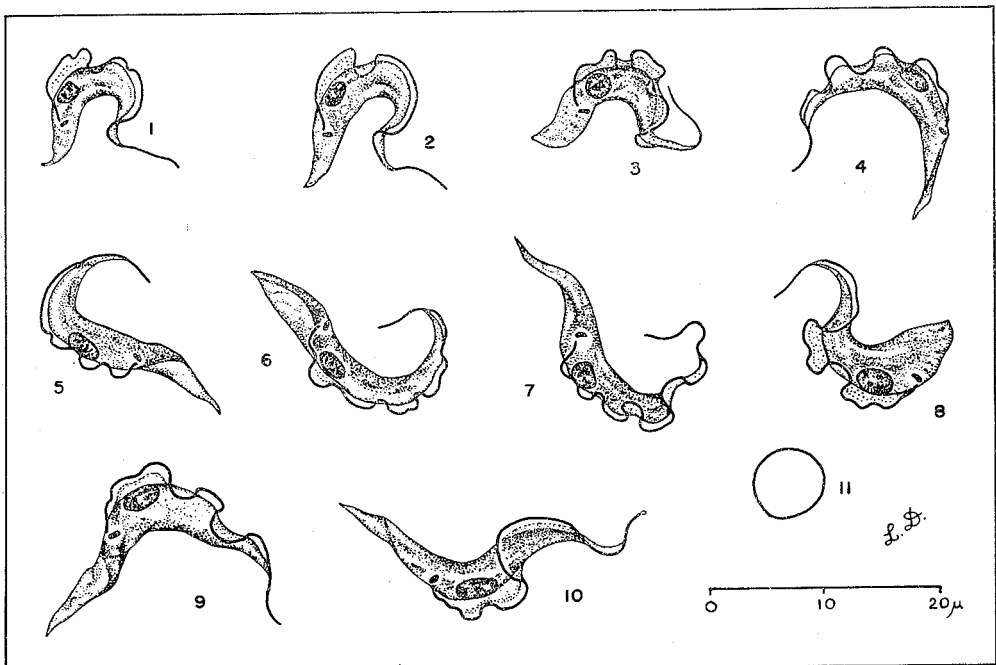
Large and relatively broad trypanosome, with a pointed posterior end, a tapering anterior extremity and a well developed free flagellum; the cytoplasm stains deep blue and shows longitudinal paler stripes, pro-

bably due to the presence of myonemae; the post-kinetoplasmic portion often seems to be twisted (figures 4, 5, 6, 9 and 10). The ruby-stained kinetoplast is large, elongated, rod-shaped, situated far from the posterior extremity of the body, and much closer to the pink-stained nucleus; this is ellipsoid, more often placed beyond the middle of the body and close to its convex margin. The undulating membrane is broad and wavy. A vacuole-like pale area is usually observed in connection with the kinetoplast.

The measurements based on the specimens shown in the figures are seen in Table I.

DISCUSSION

Two main groups of trypanosomes are known to occur in bats (DIAS³, 1936): the *vespertilionis* group, of small organisms (15-20 micra) with a very large, round, subterminal kinetoplast and a narrow undulating membrane; and the *megadermae* group, of large (25-40 micra) and broad forms, with a smaller, round or rod-shaped



Figures 1 to 10 — *Trypanosoma pessoai* n. sp., of vampire bats *Desmodus rotundus rotundus*: forms in thin bloods smears.

Figure 11 — Erythrocyte of *D. rotundus* (camera lucida drawings).

kinetoplast located far from the posterior end of the body, closer to the nucleus, and a broad, very wavy undulating membrane.

In the first group, the type-species is *Trypanosoma vespertilionis*, described by Battaglia, in 1904, from Italian bats; names have been given to trypanosomes morphologically undistinguishable from this and found in other species of bats and in other countries, but their independent status is still to be proved; they are *T. nicolleurum* Ed. & Et. Sergent, 1905; *T. dionisii* Betten-court & França, 1905; *T. phyllostomae* Cartaya, 1910; *T. lineatus* Iturbe & Gonzalez, 1916 and *Schizotrypanum pipistrelli* Chatton & Courier, 1921. In this same group we can place *Trypanosoma cruzi* Chagas, 1909, and other *cruzi*-like organisms found in bats. *T. hipposideri*, described by MACKERRAS⁹ in 1962, although smaller, also seems to fit into this group.

The second group, of which the first species described was *Trypanosoma megadermae* discovered by WENYON¹³, in 1909, in

the Sudanese bat *Megaderma frons*, includes the other following species: *T. morinorum*, found by LÉGER & BAURY⁸, in 1923, in *Hipposiderus tridens* from Senegal; *T. heybergi*, by RODHAIN¹², in 1923, in *Nycteris hispida* from the Congo; *T. mpapuensis*, by REICHENOW¹⁰, in 1940, in *Nycteris aethiopica* from Tanganyika; and *T. leleupi*, by RODHAIN¹¹, in 1951, in *Hipposiderus caffer* from Katanga.

T. pteropi Breinl, 1911, from Australia (see MACKERRAS⁹) apparently does not belong to any of the above groups.

In the New World, trypanosomes of the *megadermae* group have been detected in various species of bats: *Myotis nigricans* from Venezuela, by Pifano in 1939 (in DIAS & PIFANO⁵, 1941); *Glossophaga soricina* and *Hemiderma perspicillatum* from Pará, Brazil, by DIAS & col.⁴ (1942); *Desmodus rotundus* from the same area by Romaña, in 1940 (according to DIAS & col.⁴, 1942); an unidentified bat also from Pará, by DEANE² (1961), and *Desmodus rotundus*

TABLE I

Trypanosoma pessoai n. sp., of vampire bats *Desmodus rotundus rotundus* from São Paulo, Brazil. Measurements, in micra, based on 10 specimens found in thin blood smears

Measurements	Average	Maximum	Minimum
Total length, flagellum included	31.2	37.0	24.2
Body length	25.8	29.8	20.9
Body width	3.6	4.8	3.2
Posterior end of body to kinetoplast	7.8	10.7	4.3
Kinetoplast to anterior margin of nucleus	2.6	3.8	1.6
Nucleus, length	2.9	3.6	2.1
Anterior margin of nucleus to anterior end of body	12.5	15.4	10.7
Kinetoplast	1.1	1.3	1.0
Undulating membrane, width	1.6	2.1	0.8
Free flagellum	5.4	7.2	3.2
Index PK/KN *	3.0	4.2	2.2
Index PN/NA **	0.9	1.1	0.6

* Distance from posterior end of body to kinetoplast, divided by distance from kinetoplast to anterior margin of nucleus.

** Distance from posterior end of body to middle of nucleus, divided by distance from middle of nucleus to anterior end of body.

murinus from Costa Rica, by ZELEDON & VIETO¹⁴ (1957). None of these Authors, however, except DEANE² (1961), described or figured the parasites, and none gave them specific names.

Therefore, all the previously described species of the *megadermae* group, to which *Trypanosoma pessoai* n. sp. belongs, are found in Africa.

Each of those species has been discovered in a different species of bat and is supposed to be recognizable on the basis of morphological details and, sometimes, also on the ability to grow in culture media. Since the description of some of them is based on few blood forms and on scattered biological data, it is, at present, difficult to decide on their validity. In spite of that, we think it better to keep the existing specific names until a more thorough comparison is possible.

The flagellate described in the present paper differs from the descriptions and figures of the other species of the *megadermae* group by the following characters:

T. megadermae is longer (40 micra) and narrower, with the nucleus placed distinctly before the middle of the body (index PN/NA = 1.6) and spread across its whole width;

T. morinorum is also longer (37-45 micra) and broader (7-8 micra), has a much smaller nucleus (2 micra), very close to which lies the kinetoplast; LEGER & BAURY⁸ refer that in the blood of infected bats that had died several hours before, atypical forms were found, including very large organisms with 3 or 4 nuclei and kinetoplasts;

T. heybergi is smaller (25-30 micra) and broader, has a smaller nucleus (2-2.5 micra), a more delicate kinetoplast and a much shorter free flagellum (2-4 micra).

In *T. mpapuensis* the kinetoplast is very near the nucleus and the flagellate develops in culture media;

T. leleupi seems to be closer to our species than any of the others, but is larger (35.5-45 micra), has a round nucleus, a longer free flagellum (up to 12 micra), and also develops in culture media.

Therefore, the trypanosome of *Desmodus rotundus rotundus* from São Paulo cannot

be identified to any of the previous species of bat haemoflagellates, and is believed to be a separate species, for which the name *Trypanosoma pessoai* is here proposed.

Since vampire bats are known to become infected with, and to transmit trypanosomes of other mammals on whose blood they feed, such as *Trypanosoma equinum* and *T. hippicum* (= *T. evansi*) of cattle^{1, 6, 7}, one might wonder if the flagellate here described could not be a normal parasite of another animal; this hypothesis is, however, unlikely, since trypanosomes of the *megadermae* group have only been found in bats and more often in non-hematophagous species.

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RESUMO

Trypanosoma pessoai n. sp., de morcêgos *hematófagos* *Desmodus rotundus rotundus* do Estado de São Paulo, Brasil.

Um tripanosoma do grupo *megadermae* foi encontrado no sangue de 8 dentre 18 morcêgos da espécie *Desmodus rotundus rotundus* capturados em Guararema, São Paulo. Não foram vistas formas de multiplicação no sangue ou vísceras, tendo sido negativas as tentativas de cultivá-lo em meios de ágar-sangue ou de com êle infectar camundongos ou barbeiros (*Rhodnius prolixus*). A descrição do parasita, acompanhada de figuras, é seguida de uma comparação com os demais tripanosomas de morcêgos, concluindo os Autores tratar-se de uma nova espécie, para a qual propõem o nome de *Trypanosoma pessoai*.

REFERENCES

1. ACOSTA, J. L. & ROMANA, C. — Infección del murcielágo *Desmodus rotundus rotundus* (E. Geoffroy) por *Trypanosoma equinum* (Elmassian) y transmisión del "mal de caderas" por su mordedura. Mem. Inst. Oswaldo Cruz 33:291-295, 1938.

DEANE, L. M. & SUGAY, W. — *Trypanosoma pessoai* n. sp., in vampire bats *Desmodus rotundus rotundus* from the State of São Paulo, Brazil. Rev. Inst. Med. trop. São Paulo 5:165-169, 1963.

2. DEANE, L. M. — Tripanosomídeos de mamíferos da Região Amazônica. I. Alguns hemoflagelados encontrados em mamíferos do Estado do Pará. Rev. Inst. Med. trop. São Paulo 3:15-23, 1961.
3. DIAS, E. — Revisão geral dos hemoflagelados dos chiropteros. Estudo experimental do *Schizotrypanum* de *Pyllostomus hastatus*: identidade com o *Schizotrypanum cruzi*. O grupo *vespertilionis*. 9.ª Reunion Soc. argent. Pat. Reg., Mendoza: 10-88, 1936.
4. DIAS, E.; MELLO, G. B.; COSTA, O.; DAMASCENO, R. & AZEVEDO, M. — Investigações sôbre esquizotripanose de morcegos no Estado do Pará. Encontro do barbeiro *Cavernicola pilosa* como transmissor. Rev. brasil. Biol. 2:103-110, 1942.
5. DIAS, E. & PIFANO, F. — Estudo experimental de um *Schizotrypanum* do morcego *Hemiderma perspicillatum* da Venezuela. Mem. Inst. Oswaldo Cruz 36:79-98, 1941.
6. DUNN, L. H. — Experiments in transmission of *Trypanosoma hippicum* Darling with the vampire bat *Desmodus rotundus murinus* Wagner as a vector in Panama. J. prevent. Med. 6:415-424, 1932.
7. JOHNSON, C. M. — A natural infection of *Trypanosoma hippicum* Darling in the vampire bat *Desmodus rotundus murinus* Wagner. Amer. J. trop. Med. 16:59-62, 1936.
8. LEGER, M. & BAURY, A. — Trypanosome de la chauve-souris du Sénégal *Hipposiderus tridens* Et. Geoff. C. R. Soc. Biol. 88: 866-869, 1923.
9. MACKERRAS, M. J. — The hematozoa of Australian mammals. Australian J. Zool. 7:105-135, 1962.
10. REICHENOW, E. — Ostafrikanische Beobachtungen an Trypanosomiden. Arch. f. Protistenkunde 94:207, 1940.
11. RODHAIN, J. — *Trypanosoma leleupi* n. sp., parasite de *Hipposiderus caffer* au Katanga. Ann. Parasit. hum. & comp. 26:133-137, 1951.
12. RODHAIN, J. — Trypanosome d'un cheiroptère insectivore *Nycteris hispida* Schreiber au Congo Belge. C. R. Soc. Biol. 16: 659-664, 1923.
13. WENYON, C. W. — Protozoology. London, Baillière, Tindall & Cox, 1925, 1:480.
14. ZELEDON, R. & VIETO, P. L. — Hallazgo de *Schizotrypanum vespertilionis* (Battaglia, 1904) en la sangre de murcielagos de Costa Rica. Rev. Biol. trop. (Costa Rica) 5:123-128, 1957.

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