

THE SUSCEPTIBILITY OF WILD CAUGHT SAND FLIES TO INFECTION
BY A SUBSPECIES OF *LEISHMANIA MEXICANA* ISOLATED FROM
PROECHIMYS IHERINGI DENIGRATUS (RODENTIA, ECHIMYIDAE)

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Several species of wild caught sand flies were collected in the same site where a subspecies of Leishmania mexicana was isolated from the rodent Proechimys iheringi denigratus. The absence of natural infection in these sand flies permitted us to test, with relative assurance, the susceptibility of wild caught females to infection by this parasite. The success obtained in these experimental infections suggest that one or more of the sand fly species encountered in high numbers in the same site where the infected rodents were captured may be the vector(s) of this subspecies of L. mexicana.

Key words: experimental infection – wild sand flies – *Leishmania mexicana* – *Proechimys*

In an attempt to identify the vector(s) of a *Leishmania* of the *L. mexicana* complex isolated from the rodent, *Proechimys iheringi denigratus* (Barretto et al., 1985), 925 sand fly females were collected at the same site, in the Três Braços, Bahia area, where the infected rodents were captured. The insects were dissected for taxonomic identification and parasitological examination for flagellates. No flagellates were found in 283 *Lutzomyia ayrosai*, 110 *Lu. hirsuta*, 101 *Lu. yuilli*, 117 *Lu. longispina*, 109 *Lu. fischeri*, 58 *Lu. davisii*, 35 *Lu. flaviscutellata*, 25 *Lu. bispinosa*, 38 *Lu. shannoni*, 17 *Lu. tupynambai*, 15 *Lu. brachipyga*, 6 *Lu. whitmani*, 4 *Lu. paulwilliamsi*, 4 *Lu. schreiberi*, 2 *Lu. pessoai* and 1 *Lu. pellaoni*.

The absence of natural infection in these sand flies permitted us to test, with relative assurance, the susceptibility of wild caught females of the most common species to infection by the parasite isolated from these rodents. The apparatus described by Vexenat et al. (1984) was utilized for the capture, feeding and maintenance of these sand flies. The foot or nose of hamsters with lesions produced by the parasite was introduced into the apparatus used to collect the insects. Seven species were employed: *Lu. ayrosai*, *Lu. yuilli*, *Lu. hirsuta*, *Lu. longispina*, *Lu. davisii*, *Lu. flaviscutellata* and *Lu. fischeri*. These species were fed on histiocytomas, rich in amastigotes produced by three isolates of *L. mexicana* ssp. from *Proechimys* (MPRO/BR/83-MTB-574, MPRO/BR/83-MTB-581/583 and MPRO/BR/83-MTB-584/585). The results are presented in Table I. The three stocks of *Leishmania* infected 100% of four sand fly species (69 *Lu. ayrosai*, 62 *Lu. yuilli*, 33 *Lu. hirsuta* and 28 *Lu. longispina*) and demonstrated a typical suprapylarial pattern (Lainson & Shaw, 1979). *Lu. ayrosai* and *Lu. yuilli* exhibited abundant active forms of the parasite in the stomach, pharynx and reaching the proboscis. This was not observed in *Lu. hirsuta* and *Lu. longispina* whose promastigote forms were restricted to the stomach and not very active. The same occurred in *Lu. davisii* whose index of infection was 93% (14/15). The 20 *Lu. flaviscutellata*, the proven vector of *L. mexicana amazonensis* in the Amazon Region (Lainson & Shaw, 1968), not only demonstrated a lower index of infection with the three stocks of *Leishmania* (12/20, 60%), but the promastigotes were found only in small numbers in the stomach and exhibited little mobility. The 38 *Lu. fischeri* tested did not become infected after feeding on the hamster lesions rich in amastigotes.

The results demonstrated a high susceptibility of these wild caught sand flies to infection by the *Leishmania mexicana* subspecies isolated from the rodents collected in the Três Braços area. Here the predominant infection in the human population is by *L. braziliensis braziliensis*, although in two of the human cases the isolated parasites belonged to the *L. mexicana* complex. One of these was identified as *L.m. amazonensis*, and the other could not be characterized to subspecies (Cuba, Barretto & Marsden, 1985). However, the parasite isolated from the *Proechimys* appears to be distinct from those isolated from man in this area, even though all three parasites belong to the *L. mexicana* complex (Barretto et al., 1985).

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TABLE I

Experimental infection of wild caught sand flies with a *Leishmania mexicana* subspecies isolated from *Proechimys iheringi denigratus* (Rodentia)

Stocks	Number of sand flies infected per number examined						
	<i>Lu. ayrosai</i>	<i>Lu. yuilli</i>	<i>Lu. hirsuta</i>	<i>Lu. longispina</i>	<i>Lu. davisi</i>	<i>Lu. flaviscutellata</i>	<i>Lu. fischeri</i>
MPRO/BR/83-MTB-574	27/27	22/22	17/17	7/7	5/5	4/6	0/17
MPRO/BR/83-MTB-581/583	17/17	13/13	4/4	9/9	5/5	3/4	0/12
MPRO/BR/83-MTB-584/585	25/25	27/27	12/12	12/12	4/5	5/10	0/9
Totals	69/69	62/62	33/33	28/28	14/15	12/20	0/38
Percent infected	100%	100%	100%	100%	93%	60%	0%

The great number of sand fly species encountered in this enzootic leishmaniasis site and the lack of finding naturally infected sand flies obviously hamper the identification of the *Lutzomyia* species responsible for maintaining the natural cycle of the parasite. However, the success obtained in experimental infections of various sand fly species suggest that one or more of those found in high numbers in this site may be the potential vector(s) of this subspecies of *L. mexicana*.

RESUMO

Várias espécies de flebotomíneos silvestres foram coletados no mesmo local onde o roedor *Proechimys iheringi denigratus* foi encontrado infectado com uma subespécie de *Leishmania mexicana*. A ausência de infecção natural desses flebotomíneos nos permitiu testar, com relativa segurança, a susceptibilidade de algumas dessas espécies à infecção por esse parasito. O sucesso obtido nas infecções experimentais sugere que uma ou mais das espécies de flebotomíneos encontradas em alta densidade nesse local podem ser um vetor, em potencial, dessa subespécie de *L. mexicana*.

REFERENCES

- BARRETTO, A.C.; PETERSON, N.E.; LAGO, E.; ROSA, A.C.; BRAGA, R.S.M.; CUBA, C.A.C.; VEXENAT, J.A. & MARSDEN, P.D., 1985. *Leishmania mexicana* in *Proechimys iheringi denigratus* Moojen (Rodentia, Echimyidae) in a region endemic for American cutaneous leishmaniasis. *Rev. Soc. Bras. Med. Trop.*, 18 (4) :243-246.
- CUBA, C.A.C.; BARRETTO, A.C. & MARSDEN, P.D., 1984. *Leishmania mexicana*: aspectos taxonômicos y rareza de la infección humana en Três Braços, Bahia, Brasil. *Rev. Soc. Bras. Med. Trop.*, 17 (3) :115-122.
- LAINSON, R. & SHAW, J.J., 1968. Leishmaniasis in Brazil. I. Observations on enzootic rodent leishmaniasis – incrimination of *Lutzomyia flaviscutellata* (Mangabeira) as the vector in the lower Amazon Basin. *Trans. R. Soc. Trop. Med. Hyg.*, 62 (3) :385-395.
- LAINSON, R. & SHAW, J.J., 1979. The role of animals in the epidemiology of South American Leishmaniasis. In *Biology of the Kinetoplastida*. Lumsden, W.H.R. and Evans, D.A. editors. London and New York. Academic Press. Volume 2, p. 1-116.
- VEXENAT, J.A.; CUBA, C.A.C.; BARRETTO, A.C. & MARSDEN, P.D., 1984. Descrição de um dispositivo para coleta, infecção experimental e manutenção de flebotomíneos adultos (*Lutzomyia*, Psychodidae, Diptera). *Rev. Soc. Bras. Med. Trop.*, 17 (3) :151-152.