

FURTHER OBSERVATIONS ON *LUTZOMYIA UBIQUITALIS* (PSYCHODIDAE:  
PHLEBOTOMINAE), THE SANDFLY VECTOR OF  
*LEISHMANIA (VIANNIA) LAINSONI*

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*Leishmania (Viannia) lainsoni* was first isolated and described from cases of cutaneous leishmaniasis in Pará state, Amazonian Brazil (F. T. Silveira et al., 1987, *Mem. Inst. Oswaldo Cruz*, 82: 289-292). Human infection appears to be uncommon, however, compared with that caused by *L. (V.) braziliensis*, *L. (V.) guyanensis*, other incompletely identified parasites of the *braziliensis* and *guyanensis* complexes, or by *Leishmania (Leishmania) amazonensis* (F. T. Silveira et al., 1991, *Trans. R. Soc. Trop. Med. Hyg.*, 85: 735-738).

Following the examination of many different species of wild animals from the forests of Pará, isolation of *L. (V.) lainsoni* was limited to seven specimens of *Agouti paca* (Rodentia: Dasyproctidae), from areas near Tucuruí, leading us to suggest this animal as a major reservoir host of the parasite (F. T. Silveira et al., 1991, *Rev. Inst. Med. Trop. São Paulo*, 33: 18-22).

In the same year (F. T. Silveira et al., 1991, *Mem. Inst. Oswaldo Cruz*, 86: 127-130) our studies were concentrated on attempts to indicate the phlebotomine vector of *L. (V.) lainsoni*. Working in two similar areas of primary forest, in one of which a patient had frequently been hunting, we captured and examined sandflies of ten different species and isolated *L. (V.) lainsoni* from eight heavily infected *Lutzomyia ubiquitalis* (Mangabeira): no other sandfly species was found infected with the parasite. In addition, the re-examination of a *Leishmania* isolate previously made from *Lu. ubiquitalis* in the foothills of the Serra dos Carajás, Pará, in 1983, showed that this, too, was *L. (V.) lainsoni*. The isolate had been provisionally designated as "... an unnamed parasite of the subgenus *Viannia*". (R. Lainson

& J. J. Shaw, 1987, p. 100. In W. Peters & R. Killick-Kendrick (eds) *The Leishmaniasis in Biology and Medicine* Vol. I, Academic Press, London).

Superficially, these findings strongly indicated *Lu. ubiquitalis* as the vector of *L. (V.) lainsoni*, and they were supported by our observation that large numbers of this fly, caught in nearby forest and then maintained in the laboratory for 48 h, readily fed on the arm of a volunteer. The enigma remained, however, that on no occasion during our many field studies in Amazonia had we taken *Lu. ubiquitalis* from human bait in the forest. We could only conclude that "... under certain conditions it will bite man, and transmit the parasite to him", and that "... This is in keeping with the relatively rare occurrence of human infection".

*New observations* – In June 1991 we visited our study area ("N2") in the Serra dos Carajás, Pará (R. D. Ward et al., 1973, *Trans. R. Soc. Trop. Med. Hyg.*, 67: 174-183). Our express intention was to obtain specimens of *Psychodopygus wellcomei* infected with *L. (V.) braziliensis*, for studies on the use of specific DNA probes in the identification of both the vector and the parasite (P. D. Ready et al., 1991, *Mem. Inst. Oswaldo Cruz*, 86: 41-49). We also hoped, however, to obtain further information on the behaviour of *Lu. ubiquitalis*.

Trapping methods, for five consecutive nights, were as previously described (L. Ryan et al., 1986, p. 307-320. In *Instituto Evandro Chagas: 50 anos de contribuição às ciências biológicas e à medicina tropical*. Vol. I. Min. Saúde, F. SESP, Belém, Pará, Brasil), and as follows: (a) Two unbaited CDC miniature light-traps, set at about 1.0 m above the forest floor. (b) A CDC trap suspended over a caged chicken, at the same height. (c) An unbaited CDC trap in the forest canopy, at about 15-20

m. (d) A disney-trap, baited with a hamster, at ground level. All these traps were in operation from 18.00-07.00 h. (e) A Shannon-trap, illuminated by a ground-level fluorescent strip-light, in use from 19.00-20.00, each night. (f) Human bait: two men aspirating *feeding* flies from their arms, between the hours 19.00-20.00, each night.

The results are summarized in Table. Only female sandflies are recorded, and all were dissected for evidence of intestinal flagellates. Methods for the blood-agar culture of material from positive sandflies and for the identification of isolations were as previously described (F. T. Silveira et al., 1991, *Mem. Inst. Oswaldo Cruz*, 86: 127-130).

TABLE

Presence of *Leishmania* in some female sandflies (Psychodidae: Phlebotominae) taken by a variety of trapping methods in Serra dos Carajás, Pará, Brazil: 15-19 June, 1991

Sandfly species	CDC (ground) no bait	CDC (ground) chicken	CDC (canopy) no bait	Shannon trap	Disney trap	Human bait	Infected flies	Parasite (isolations)
<i>Lutzomyia aragaoi</i>	1	—	—	—	—	—	—	1
<i>Lu. brachyphalla</i>	1	—	—	—	2	—	—	3
<i>Lu. carvalhoi</i>	1	1	—	1	—	—	—	3
<i>Lu. damascenoi</i>	3	—	—	—	1	—	—	4
<i>Lu. dasypodogeton</i>	1	1	—	—	—	—	—	2
<i>Lu. dendrophila</i>	1	—	—	—	—	—	—	1
<i>Lu. flaviscutellata</i>	3	—	—	—	12	—	—	15
<i>Lu. furcata</i>	1	—	—	—	—	—	—	1
<i>Lu. saulensis</i>	—	—	—	—	3	—	—	3
<i>Lu. shawi</i>	1	—	2	4	—	1	—	8
<i>Lu. tuberculata</i>	7	2	1	—	—	1	—	11
<i>Lu. ubiquitalis</i>	142	3	21	30	—	1	4	<i>L. (V.) lainsoni</i> (3) 197
<i>Lu. umbratilis</i>	41	2	20	—	—	1	—	64
<i>Lu. whitmani</i>	1	—	—	—	—	—	—	1
<i>Psychodopygus</i>								
<i>amazonensis</i>	—	—	—	2	—	—	—	2
<i>Ps. carrerai</i>	2	3	1	24	—	9	—	39
<i>Ps. davisi</i>	6	2	—	6	—	4	—	18
<i>Ps. hirsutus</i>	—	—	—	2	—	—	—	2
<i>Ps. paraensis</i>	—	—	—	9	—	3	—	12
<i>Ps. wellcomei/</i> <i>complexus</i> <sup>a</sup>	12	5	1	431	1	221	1 <sup>a</sup>	<i>L. (V.) braziliensis</i> (1) 671
Total	224	19	26	529	19	241	5	1058

a: females of *Ps. wellcomei* and *Ps. complexus* are morphologically indistinguishable: the infected sandfly was identified as *Ps. wellcomei* by a specific DNA probe (Dr P. D. Ready, pers. comm.)

Recognition and separation of *Lu. ubiquitalis* in mixed catches is relatively easy due to this insect's large size and uniform dark colour. About 80 were accumulated in a cage and, at a time varying from 24-48 h after capture, offered a bloodmeal from the arm of a volunteer. A total of 64 engorged, and were returned to Belém to establish a laboratory colony.

Subsequent dissection of the experimentally fed flies showed one of them to be heavily infected. Although two bite-reactions on the hand of the volunteer persisted for several days after the others had faded, no parasites could

be detected in Giemsa-stained smears of exudate from them, and blood-agar culture was not attempted. As the man had previously been infected with other parasites of the subgenus *Viannia*, his failure to produce a lesion due to *L. (V.) lainsoni* was not unduly surprising.

In conclusion, although only a single specimen of *Lu. ubiquitalis* was caught feeding on man in its natural environment, this does greatly strengthen our belief that this sandfly is a vector of *L. (V.) lainsoni* to man, as does the finding of four more naturally infected specimens of this sandfly. In this respect one must take into account the likelihood that if a casual visitor

spending a total of only 5 h in the forest is bitten by one *Lu. ubiquitalis*, those who regularly work or hunt there will be bitten by very many more. Further support for this view comes from our consistent failure to find *L. (V.) lainsoni* in any other sandfly species in the enzootic areas studied; the repeated demonstration that *Lu. ubiquitalis* is 'triggered' into avidly attacking man under unusual conditions; and the fact that this sandfly was the second most abundant species captured in the present study.

This interesting eco-epidemiology is not without parallel. Another Amazonian parasite, *L. (V.) shawi*, was first described in monkeys, sloths and procyonids; among the many sandfly species examined it has been isolated, on six occasions, only from *Lu. whitmani* – a fly we have so far failed to catch from human bait in

Amazonian forest (R. Lainson et al., 1989, *Ann. Parasit. Hum. Comp.*, 64: 200-207). Recently, however, *L. (V.) shawi* has been recorded in man (J. J. Shaw et al., 1991, *Ann. Parasit. Hum. Comp.*, 66, 243-246). This anomalous situation can have but one of two explanations: either there is an alternative, anthropophilic vector that we have so far not detected or, like *Lu. ubiquitalis*, Amazonian *Lu. whitmani* does bite man under certain circumstances.

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