

## SHORT COMMUNICATION

## Feeding Preference of the Sand Flies *Lutzomyia umbratilis* and *L. spathotrichia* (Diptera: Psychodidae, Phlebotominae) in an Urban Forest Patch in the City of Manaus, Amazonas, Brazil

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*Precipitin tests were performed on blood meals of 199 sand flies (161 Lutzomyia umbratilis, 34 L. spathotrichia, two Lutzomyia of group shannoni, one L. anduzei) in a non-flooded upland forest on the Campus of the Universidade Federal do Amazonas. This is the second largest forest fragment in an urban setting in Brazil. Results on L. umbratilis, which is considered to be the principal leishmaniasis vector in this region, indicated rodents as its predominant blood source in contrast to previous reports in which blood meal analysis indicated that this species fed principally on Xenarthra (particularly sloths)*

Key words: bloodmeal sources - precipitin test - *Lutzomyia* - Amazonas - Brazil

The city of Manaus is one of the Amazonas state townships where the number of human cases of the American cutaneous leishmaniasis (ACL) is considered to be one of the highest in Brazil. It has been increasing for the past few years comprising 57.4% (17.374/30.251) of the disease's autochthonous cases in the region (Guerra et al. 2003). The high ACL incidence occurs mainly due to the destruction of tropical forests in order to develop several settling enterprises where man exerts activities related to civil construction, hunting, fishing, and deforestation among others, thus getting in contact with the natural transmission cycles, and acquiring the disease (Araújo Filho 1981, Arias & Naiff 1981). There is a great richness of phlebotomine sand fly species in Manaus and its neighboring areas, as well as in urban forest patches including that of the Campus of the Universidade Federal do Amazonas (UFAM). Nery (2003) pointed out the occurrence of 40 phlebotomine sand fly species in this Campus alone. These included the vectors of *Leishmania (Viannia) guyanensis*, *Lutzomyia umbratilis* (Lainson et al. 1976, Ward & Fraiha 1977), and *L. anduzei* (Arias & Freitas 1978); of *L. (Leishmania) amazonensis*, *L. flaviscutellata*, and *L. olmeca nociva* (Lainson & Shaw 1968, Arias et al. 1987); *L. (V.) lainsoni* - *L. ubiquitous* (Lainson et al. 1990, Silveira et al. 1991), and the probable vectors of *L. (V.) naiffi*, *L. ayrozai*, and *L. paraensis* (Lainson et al. 1990).

The purpose of the present study is to determine the blood meal sources of some of the phlebotomine sand fly species found in the forest remnants of the UFAM Campus. The Campus, is located in the city of Manaus, state of Amazonas.

This Campus area, measuring nearly 800 ha and located at 03°04'34''S and 59°57'30''W, is considered to be one of the largest urban tropical sites (Carmo 2002) and Brazil's second urban forest patch (Figure). Several mammal species such as, edentates (*Bradypus tridactylus*, *Choloepus didactylus*, *Tamandua tetradactyla*, *Dasybus novemcinctus*, *Cyclopes didactylus*), primates (*Pithecia pithecia*, *Saimiri sciureus*, *Saguinus bicolor bicolor*), rodents (*Sciurus* sp., *Dasyprocta agouti*, *D. fuliginosa*, *Myoprocta acouchy*), and carnivorous such as *Nasua nasua* (Carmo 2002), inhabit this forest patch.

The landscape is comprised by plateaus, slopes and lowlands and is covered with upland non-flooded forest, grassland, campinarana, second growth and secondary forest in various succession levels (Nara & Cruz 1996, Ribeiro et al. 1999). The present study was conducted in upland non-flooded forest with varying degrees of environmental anthropophilic alterations. The collections were carried out in November and December 2002 from 8:00 to 10:00 a.m., by using the aspiration method at the tree base with a modified type CDC light trap on previously determined sites [areas with distinct anthropic alterations – sites P1, P2, P3 (less anthropic), P5, P6 (more anthropic)]. The phlebotomine specimens were hauled to the Inpa/AM laboratory, killed at 20°C in order to interrupt the digestive process and then kept at this same temperature up to the onset of the precipitin assays (microcapillary).

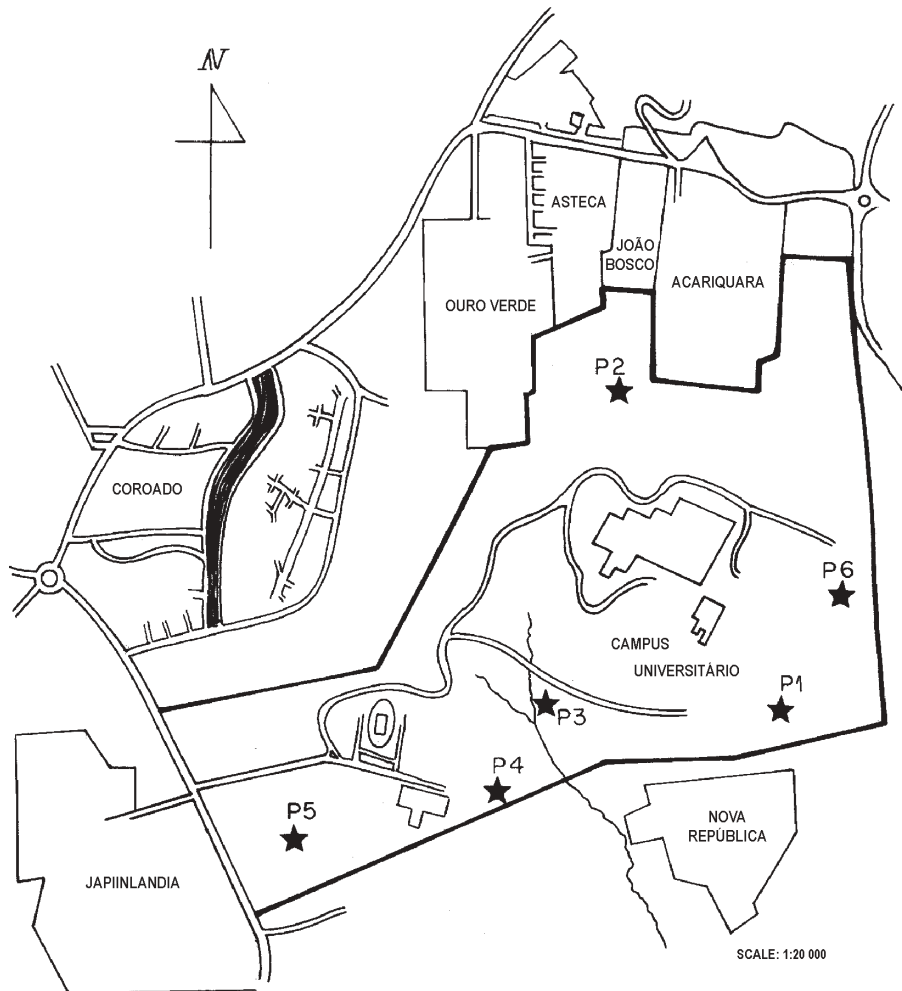
Identification was done according to Young and Duncan (1994) taxonomic key. Females were stocked into eppendorf tubes according to species and forwarded to

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Universidade Federal do Amazonas Campus area showing the location of the sites within the environments with less (P1, P2, P3) and more (P5, P6) anthropic alterations.

sent to the Fiocruz, RJ, for the precipitin test. The insects were individually ground in pH 7.0 saline solution and later centrifuged at 1800 rpm for 5 min and the eluate was examined through the in vitro reaction, by using bird and mammal anti-sera (Siqueira 1960, Lorosa et al. 1998). Blood-meal fully fed females were processed testing five antigens in the obtained eluate, using anti-sera from: human being (*Homo sapiens*), rodent (*Rattus rattus*), edentate (*Bradypus* sp.), canids (*Canis familiaris*), fowl (*Gallus gallus*) prepared in rabbits.

A total of 199 phlebotomine sand fly blood meals were tested (Table). Of this total 151 were from an environment with lower (sites: P1, P2, P3) and 48 from one with higher anthropophilic alteration (sites: P5, P6). In the environments thought to be of lower anthropic alteration it was found that 76.2% (115) were of species *L. umbratilis*, 21.9% (33) *L. spathotrichia*, 1.3% (2) *Lutzomyia* of group *shannoni*, 0.6% (1), and *L. anduzei*. In the higher anthropophilic environment 95.8% (46) were of the *L. umbratilis* and 4.2% (1) *L. spathotrichia*. The *L. umbratilis* was abundant in the tree base, and it could be noted that

the predominant feeding source for this species at the areas with lower alteration was from rodents 34% (46), followed by canids 19% (26), edentate 18% (24), human beings 16% (22), fowl 13% (18). Similarly at the area with higher alteration, canids and rodents both prevailed with 29% (13) of positivity, followed by sloth 22% (10), and human being 20% (9). The digestive tract content in 10 specimens of *L. spathotrichia*, reacted with the edentate anti-sera (40%), rodent and fowl 15 of each (20%), 3 of human being (12%) and 2 of canids (8%). In the more altered environment only one content of the digestive tract reacted with human being anti-serum and one with fowl. One specimen of *L. anduzei* collected from site P2 reacted with edentate anti-serum and two digestive tract contents of *Lutzomyia* of the group *shannoni* reacted for rodent and canids. Multiple blood meals were noted in *L. umbratilis* (site P1 – human being/fowl, dog/fowl, human being/dog, sloth/fowl, P2 – dog/fowl, P3: dog/fowl and human being/fowl) and *L. spathotrichia* (P1 – sloth/fowl, dog/rodent, rodent/fowl).

The phlebotomine feeding habit together with other

TABLE  
Number of positive reactions to anti-sera for sand flies species  
in different environments at the Universidade Federal do  
Amazonas Campus

Sand flies species	Anti-sera used in the precipitin test <sup>a</sup>				
	More/less disturbed environment				
	M	R	E	C	F
<i>Lutzomyia umbratilis</i>	22/9	46/13	24/10	26/13	18/0
<i>L. spathotrichia</i>	3/1	5/0	10/0	2/0	5/1
<i>L. anduzei</i>			1/0		
<i>L. group shannoni</i>		1/0		1/0	

a: anti-sera; M: man; R: rodent; E: edentate; C: canids; F: fowl

factors may determine their possibility of being infected by *Leishmania*. With the exception of *L. (L.) donovani* in India, where the infection apparently occurs from man to man, and in their majority the vectors feed on human and animal reservoirs (WHO 1980). Precipitin test carried out with *L. (V.) guyanensis* vectors in the Manaus, AM region revealed that the predominant feeding source for *L. umbratilis* was edentate (sloth) followed by rodents, similar findings occurred with *L. anduzei* species and from the group *shannoni* (Christensen et al. 1982). However, we found that *L. umbratilis* presented higher positivity for rodent blood followed by dog and sloth. The campus area is considered an isolated forest patch within an urban center, where the occurrence of human beings as well as the presence of dogs is a common fact. In this location, the two-toed-sloth density was around 0.12 individuals/ha as reported by Carmo (2002).

All these findings suggest that the environmental changes and the consequent food offer opportunity may have had an influence on the findings obtained when compared with the correlated literature, where two-toed-sloth would be the predominant feeding source for *L. umbratilis* in the area of Manaus (Christensen et al. 1982). In spite of all the difficulties related to the experiment for verifying the feeding habits of *L. umbratilis*, *L. anduzei*, *L. spathotrichia*, and *Lutzomyia* group *shannoni*, by the results of the precipitin reactions presented in this paper, it can be deduced that *L. umbratilis* fed preferably on rodents (34% and 29%) in the two studied areas, which differs from the results of Christensen et al. (1982) in four upland non-flooded forest areas in the city of Manaus.

A fact such as this may be related to the anthropic actions on the natural environment, greatly influencing the host's availability (Aragão 1975, Gomes et al. 1983). The feeding participation of *L. spathotrichia* in the transmission of ACL is discussed, verifying that their preference as a feeding source in both areas is for the blood of sloths (around 40%), as well as different species of other animals (rodents, fowl, canids), in addition to the blood of human beings (12%). We noted that these insects have the ability to perform multiple blood-meals suggesting alternative vectoring possibilities to several hosts in case one does not fulfil the complete blood-meal, as for instance the mixed blood meals of: *L. umbratilis* on human

being/fowl, dog/fowl, human being/dog and sloth/fowl, and *L. spathotrichia* on sloth/fowl, dog/rodent, and rodent/fowl. The undertaking of studies on the fauna of phlebotomine sand flies in areas where environmental changes have occurred it has become a subject of great interest on account of the great ability of many of these insect species to adapt themselves to any anthropophilic environment.

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