



## Epidemiology of leishmaniasis in French Guiana

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### Summary

*Lutzomyia umbratilis* is confirmed as the vector of *Leishmania braziliensis guyanensis*, the cause of "pian bois" in man in French Guiana. Although spending most of the year in the forest canopy, this sandfly is abundant at ground level for about two weeks at the beginning of the long rainy season. The maximum number of infective bites per man per hour (3.9) was reached at the end of November 1979. Infections were found in one of seven *Potos flavus*, seven of 15 *Choleopus didactylus* and two of 19 rodents examined. *C. didactylus* seems likely to be the main reservoir.

In French Guiana, the number of cutaneous leishmaniasis cases has increased notably in the last three years (454 in all). These cases are connected with the clinical form locally known as "pian-bois" (forest yaws) caused by the parasite *Leishmania braziliensis guyanensis*. A first series of entomological observations made in 1978, and during the first three months of 1979, showed that the vector of this disease was very likely the phlebotomine sandfly *Lutzomyia umbratilis* Ward & Fraiha (see LE PONT *et al.*, 1980), a species already noted as the vector of *L. braziliensis guyanensis* in Para State, Brazil (LAINSON *et al.*, 1976) and suspected (under the name *Lu. andusei*) of being the vector of this parasite in French Guiana (FLOCH & ABONNENC, 1952) and in Surinam (WIJERS & LINGER, 1966).

A series of observations made during 1979 and 1980 enabled us to: (i) confirm the role of *Lu. umbratilis* in the transmission of "pian-bois" in French Guiana; (ii) collect important information on the bio-ecology and the natural infection rate of this species; (iii) specify the epidemiology of this form of leishmaniasis in primary forest and in a village situated in a forest area recently populated; and (iv) to show what is likely to be the main reservoir of the parasite in the two principal, active foci of cutaneous leishmaniasis (Cacao and Sinnamary).

In French Guiana, *Lu. umbratilis* is essentially an arboreal, forest sandfly, and its population increases as one reaches the forest canopy. Infrequent at ground level, except for a short period of two weeks during the first rains of the long rainy season and, to a lesser extent, for a short time when the rains slacken before the dry season, *Lu. umbratilis* populations are heavy in the canopy. Here, populations are very dense at the end and, especially, at the beginning of the rainy season. At ground level, *Lu. umbratilis* represents only a small fraction of the sandflies which are aggressive to man, except at the end and the beginning of the rainy season. On the other hand, in the canopy, it is always the dominant species, representing 75 to 98% of the sandflies collected on human bait. This sandfly is not generally aggressive during the day at ground level,

but is very susceptible to the effects of intrusion and attacks when one enters its biotope and upsets its habitat. On the ground and in the under-storey, its activity is predominantly after dusk, whereas in the canopy it is especially active at twilight, activity diminishing steadily thereafter (LE PONT & PAJOT, 1980). Females seem to be opportunist in their choice of hosts. They are very partial to two-toed sloths, an animal found quite frequently in foci of leishmaniasis and which is a carrier of *L. braziliensis guyanensis* (see GENTILE *et al.*, LAINSON *et al.*, 1981). 85% of the infections we have found in *Lu. umbratilis* in primary forest of French Guiana are distinctly peripylarian and may be attributed to *L. braziliensis guyanensis*, as confirmed for one of them (Lainson, personal communication). In the canopy, the infection rate of females is high during the dry season and beginning of the rains, reaching up to 21.6% (October 1979). The maximum number of infective bites per man, per hour was 3.9, which was reached at the end of November 1979. At ground level, the infection rate reached 15% at the same time and the number of infective bites per man, per hour was 1.3 (LE PONT & PAJOT, 1980). It therefore seems that man is at greatest risk at the beginning of the rains after the dry season (end of November). A study of the human cases of leishmaniasis occurring during the last three years shows that many of them became apparent in December and January, indicating that infection was acquired at the beginning of the rainy season, when infected female *Lu. umbratilis* are exceptionally abundant on the forest floor for a period of about two weeks.

As human occupation of the natural environment decreases, so the infection rate of female *Lu. umbratilis* increases (LE PONT & PAJOT, 1980), but the role of *Lu. umbratilis* in transmitting leishmaniasis in a heavily populated forest environment remains fundamental. At Cacao, a forest village inhabited by Asians (Hmongs), numerous cases of leishmaniasis have occurred in men, women and children living in a group of houses situated on the edge of the village, whereas in the centre of the village, only men and a few children contracted this disease. We have found (LE PONT & PAJOT, 1981) some dwellings on the outskirts, about 30 to 70 m from a remaining, isolated patch of forest, which housed infected people of all ages. Here, despite heavy degradation of the natural environment, numerous *Lu. umbratilis* females remained, some of them infected, biting the occupants of the nearest houses and thus directly transmitting leishmaniasis. As in dense forest, most of the *Lu. umbratilis* live in the tree canopy of this forest patch and represent 98% of the sandflies collected on the verandas of the Hmong di

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74 mammals belonging to 5 orders and 14 species (GENTILE *et al.*, 1981) were examined for *Leishmania* infection. One of seven (14.3%) kinkajous, *Potos flavus*, seven of 15 (46.7%) sloths, *Choloepus didactylus* and two *Proechimys* sp. of 19 (10.5%) rodents were found to be infected with *Leishmania*. A strain isolated from a sloth and sent for identification to the Instituto Evandro Chagas of Belém, Para, Brazil, was found to be indistinguishable from *L. braziliensis guyanensis* strains already isolated from man, sandflies, ant-eaters and sloths in North Brazil (LAINSON *et al.*, 1979, 1981a, 1981b).

Thus, in French Guiana, "pian-bois" or leishmaniasis due to *L. braziliensis guyanensis* seems to have an enzootic cycle occurring especially in the upper storeys of the forest. The two-toed sloth seems most likely to be the main reservoir of this disease and was found to be infected in the two main foci studied (Cacao and Sinnamary). The role of the kinkajou and possibly other arboreal mammals remains to be studied more in detail. Man is infected following an upheaval of the forest environment (e.g. by tree felling) or an intrusion into the resting places of *Lu. umbratilis* but, most of all, as the study of recent human cases has shown, during the first rains of the long rainy season, the time of year when *Lu. umbratilis* are particularly abundant at ground level. Man may also be infected in his home when this is situated close to a silvatic focus.

This cycle of leishmaniasis in French Guiana is reminiscent of one of the principal cycles of leishmaniasis due to *L. braziliensis panamensis* in Panama involving the sandfly *Lu. trapidoi* and the two-toed sloth *C. hoffmani*, a cycle which demonstrates the close relationship between hosts, vectors and parasites in the forest canopy (HERRER *et al.*, 1971; HERRER & CHRISTENSEN, 1976).

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