

Epidemiological patterns of cutaneous leishmaniasis in Panama

II. Incidental occurrence of cases in non-endemic settlements*

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Susceptibility to cutaneous leishmaniasis among humans is independent of age, sex or race. However, the risk of acquiring the infection is directly related to the activities of individuals and the frequency with which such activities bring them into intimate contact with endemic foci of the disease.

Presently there are no methods available to assess accurately the level of endemicity in any particular locality. This is a serious deficiency in epidemiological investigations as it relates to changes in transmission activity following the establishment of new forest settlements.

Due to the frequent travel of settlers, an individual residing in a non-endemic community may acquire the disease during excursions through endemic areas. The nature of these cases, as well as their epidemiological significance are difficult to assess and frequently lead to erroneous estimations concerning the local distribution of the infection in forested regions of the neotropics.

This report concerns a community in the Bayano region, central Panama, where cutaneous leishmaniasis had disappeared, but sporadic infections persisted among the villagers and their dogs.

MATERIALS AND METHODS

The Study Area

Majecito Arriba is a community irrigated by the Majecito river in the Bayano basin, Panama province. First settlers arrived there from western provinces about 12 years ago. Homesteads were constructed and the primary forest surrounding the settlement was cut and burned. Small sections of the land were set aside for crops but the principal occupation of the settlers was cattle raising, which necessitated planting grass over most of the cleared area. Feral mammals are rare in this area but phlebotomine sandflies still persist especially along the river, where many large trees were left unmolested.

The Majecito river flows westward through the study area which is situated in a narrow valley ranging from about 250 to 350 m above sea level. Most of the valley floor is grassland which now extends well into the foothills and forms a sharp ecotonal division with the primary forest of the bordering mountain ridges (see Fig., arrow).

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Homesteads are limited to the narrow valley floor which is planted with grass for cattle grazing. The primary forest, shown in the background, forms a sharp contrast with the grassland (arrow). The area in the right foreground is undergoing deforestation for additional grazing.

Human dwellings and enclosures for cattle and other domestic animals were built only in the cleared area, and at considerable distances from each other and the surrounding forest. All houses visited had been sprayed periodically with insecticides by a governmental agency to control malaria.

Epidemiological Census

House-to-house visits were made of the entire settlement which comprised 20 families in 1971. Dogs were also examined for leishmania and all animals which had suspicious skin lesions were purchased to facilitate complete examinations in the laboratory.

Sampling of Feral Mammals and Phlebotomine Sandflies

Feral mammals were collected in the study area inhabited by the settlers and in the surrounding forest. Several different methods of capture were used: live-trapping, direct catching and shooting. Trapping was conducted during nine consecutive nights.

Phlebotomine sandfly populations were sampled by collections made with CDC miniature light traps; anthropophilic species were obtained in man-biting collections.

Study methods used during the epidemiological census, including the collection and processing mammals, and characterization of leishmanial strains were described in the previous paper (Herrer and Christensen, 1975).

RESULTS

Active Human Cases of Cutaneous Leishmaniasis

Individuals from the 20 families were interviewed and examined for leishmaniasis

during the first study trip (1971) (Table). All but one of the nine patients found with active lesions were male. The ages were as follows: 8, 14, 20, 23, 30, 32, 35, 45, and 50 years. Six of these cases were members of three families, with two cases in each family. In two of these families infections appeared simultaneously in both persons; in the third family one of the patients had a history of leishmaniasis for three years and showed both active lesions and scars at the time of our first visit. Of the remaining cases lesions were first noticed one to eight months previously.

TABLE
Leishmanial infections among settlers in Majecito Arriba (March 1971)

	<i>Under eight years of age</i>	<i>Eight years of age and over</i>	<i>Total</i>
Total persons examined	46	115	161
With previous history of leishmaniasis	0	11	11
With active lesions	0	9	9
With no history of leishmaniasis and absence of active lesions	46	95	141

During our second study trip (1972) we found that eight new settlers had arrived and 20 persons interviewed the previous year had left the study area to establish new homesteads deeper in the forest. No new active cases were found at this time, and the majority of those discovered in 1971 had been cured.

Natural Leishmanial Infections among Dogs

Suspicious skin lesions, which occurred mainly on the nose and ears, were found in 13 of the 55 dogs examined in 1971. Amastigotes were found in skin smears from lesions in five (9%) of them. All infected dogs were adult males and four belonged to families with active human cases of leishmaniasis. The types of leishmanial lesions varied somewhat, and all but one were located either on the nostrils or at the lower aspect of the ears. The etiological agent was isolated in culture from the lesions of each of four animals which were processed in the laboratory. However, blood, sound skin and viscera samples cultured were negative in all cases.

Thirty-two dogs, 20 of which had not been seen previously, were examined in the study area in 1972; no additional cases of leishmaniasis were discovered. Of the dogs examined during our first trip and found free of infection, six had died and 11 were no longer in the study area in 1972.

Feral Mammals and Phlebotomine Sandflies

Only 33 feral mammals were obtained and processed (21 rodents, four primates and four marsupials, three edentates and a single carnivore). Twenty-seven were live-trapped, three were shot and three caught by hand. One hundred and sixty-five cultures were made from these animals, as follows: 26 from heartblood, 107 from the skin and 32 from the viscera, mainly liver and spleen. A single animal, a three-toed sloth, *Bradypus infuscatus*, proved to be infected and cultures from its liver and spleen yielded a vigorous growth of promastigote flagellates which was characterized as *Leishmania braziliensis*. Blood cultures of this animal as well as cultures from three samples of sound skin were negative. The infected animal had no gross skin alterations and apparently was in good health at the time of capture.

One hundred and fifty-three sandflies were collected, representing 10 different species. Approximately 60% of them comprised four species, *Lutzomyia panamensis*, *L. gomezi*, *L. trapidoi* and *L. sanguinaria*. All are man-biting species and have been incriminated previously as vectors of human cutaneous leishmaniasis in the Republic of Panama (Christensen and Herrer, 1973).

Species of *Leishmania* Found

Seven isolates of the parasite obtained in Majecito Arriba were characterized: two from patients, four from dogs and one from a three-toed sloth. In addition, two strains from dogs in an area adjacent to the study site were also included in these studies. Isolates were inoculated intradermally into the nasal tissue of 80 hamsters; 65 survived long enough to classify the resulting infection. Fifty-two (80%) of them were observed for periods of 5-17 months postinoculation, and autopsies were performed in 40 (77%).

All the hamsters inoculated except one became infected, and all nine strains of the parasite were identified as *Leishmania braziliensis*. The virulence of these strains varied slightly. From some hamsters inoculated with canine strains the parasite was occasionally recovered in culture from liver and/or spleen 6-15 months after the inoculation. Also, positive skin cultures were obtained sometimes from areas of the skin (ears and tail) far from the site of inoculation.

DISCUSSION

Our first impression of the Majecito community was that the settlement itself constituted an endemic focus of leishmaniasis, since 6% of the settlers and 9% of the dogs were found infected with the disease. However, as our investigations progressed it became apparent that the endemic focus existed only in the surrounding forest and not in the settlement itself. The living quarters of most of the people were quite primitive, consisting of dirt floors, cane walls, thatched roofs and open doors and windows. Some of these huts were located within the flight range of the sandflies of the surrounding forest, and their construction would provide easy access to vector species. However, the entire valley was planted with grass, heavily grazed by cattle, and completely bare of secondary growth vegetation except for occasional palm trees. This possibly created a sharp humidity gradient between the tropical rain forest and the valley floor inhabited by the settlers and acted in some degree as a barrier to the sandflies. In addition, the houses were sprayed periodically with residual insecticides. Occupants questioned about the presence of insects in their houses consistently answered that their quarters were free of biting insects at night. We were unable to discover phlebotomine sandflies in their houses after considerable searching.

We noted that most of the adult settlers frequently hunted for game at night in the nearby forest with their dogs. They constituted a high risk group, and all the human leishmanial infections, except one, occurred among males older than 13 years of age. The five canine infections occurred among hunting dogs.

Our findings in Majecito Arriba indicate that a distinct bias in infection rates among certain age group and a single sex may be the result of customs and activities of this group rather than to a different *Leishmania* species, reservoir host or insect vector.

Neotropical areas endemic for leishmaniasis vary greatly in their intensity of transmission and geographic magnitude. In Panama leishmaniasis is a sporadic zoonosis affecting humans who encroach upon sylvatic foci.

The insular effect resulting from conditions described in the establishment of the settlement of Majecito, safeguarded the community proper against the infection prevalent in the immediate forest environment. The elucidation of such conditions, which successfully interrupted the transmission cycle, lends insight into the ecological parameters of this disease.

SUMMARY

Epidemiological studies on cutaneous leishmaniasis were carried out in a settlement in the Bayano region, Republic of Panama, during 1971-72. This settlement was established about 12 years earlier for the purpose of cattle raising by small groups of settlers. The primary forest was cut and cleared and the area planted with grass. The presence of active cases of cutaneous leishmaniasis among humans and animals, both domestic and ferals, was investigated. In addition, phlebotomine sandflies were collected to determine their species composition. In 1971, nine of the 161 persons interviewed had active lesions; all but one of the patients were males and of these seven were adults. Five (9%) of 55 dogs and one (3%) of 33 feral mammals examined also were found infected. Strains of the parasite infecting both humans and animals were characterized as *Leishmania braziliensis*. About 60% of the sandflies collected belonged to four man-biting species previously incriminated as vectors of human cutaneous leishmaniasis in Panama. The extensive pasture, together with periodic applications of insecticides in the houses by the antimalarial agency in this country, provided an effective barrier against transmission within the settlement itself. However, both humans and dogs acquired the disease during excursions into the surrounding forest. No new cases were found in 1972.

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