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ECOLOGY OF SANDFLIES DIPTERA: PSYCHODIDAE) IN A RESTRICTED FOCUS OF CUTANEOUS LEISHMANIASIS IN NORTHERN VENEZUELA. IV. SANDFLY MONTHLY FLUCTUATION AND LEISHMANIASIS INCIDENCE RELATIONSHIP

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An attempt has been made to correlate the monthly incidence of human leishmaniasis with the temporal distribution of sandfly species at San Esteban, Northern Venezuela. Upon statistical analysis, the seasonal fluctuation of L. ovallesi *population correlated strongly with the human disease, while the dynamics of* L. panamensis, *generally believed to be the vector in the Central area of the country, showed only a very weak correlation. These findings support the hypothesis that* L. panamensis *might not be the main or unique species responsible for the transmission in this area and that* L. ovallesi *and additionally* L. olmeca bicolor *might be involved in the epidemiollgy of the disease.*

Key works: ecology of sandflies – cutaneous leishmaniasis – northern Venezuela – monthly fluctuation

According to the Archives of the Department of Sanitary Dermatology of the Ministry of Health, 23.134 cases of tegumentary American leishmaniasis have been documented in Venezuela from 1955 to 1984. The incidence of this zoonosis has markedly increased during the last five years and this phenomenon has been linked to the dynamics of social, economical, ecological and cultural change ocurring in the Venezuelan population (Scorza, 1985). Of these cases, 11.27% have been reported from the central-northern region of the country which contain very active endemic foci of the cutaneous form. Such foci are mainly spread at the foothills of the Serranía de la Costa.

Although different aspects of the epidemiology of the disease have been studied in several of these foci (Pifano et al., 1962; Albornoz, 1968; Giordanelli et al., 1978; Ramírez Pérez et al., 1978, 1981), as far as I know, no attempts have been made to quantify the correlation between leishmaniasis incidence and density of sandflies.

Since the spatial and temporal coincidence between an arthropod and a disease are deemed to be essential conditions for incriminating a species as a vector of that disease (Barnett, 1962), this aspect has been an important concern in our study of the ecology of sandflies in San Esteban (Feliciangeli, 1987a, b, c). Moreover, dissection of sandflies was also carried out to search for leishmanial infection.

MATERIALS AND METHODS

Human population and leishmaniasis – 354 houses with about 1500 inhabitants form the village of San Esteban, an endemic focus of cutaneous leishmaniasis situated in Northern Venezuela. There is a primary school and a dispensary which is visited once a week by a medical doctor. The activities of the villagers are related to their sex and age: women are traditionally engaged in housework and helping the old men farm. The young men usually prefer the heavy, but well paid work at the port.

New cases of leishmaniasis, reported regularly over ten years, show that San Esteban is an endemic focus of the cutaneous disease. The monthly distribution of the assumed first appearance of the primary lesion reported during 1967-1976, (Giordanelli et al., 1978) in a total of 115 cases, as judged by the physician, is presented (Fig. 1) with an attempt to correlate this appearance with the monthly fluctuation of sandflies which has been determined in a previous paper (Feliciangeli, 1987c).

Search for leishmanial infection – Five thousand twenty one females comprising 54 *Lutzomyia atroclavata*, 121 *L. cayennensis*, 22 *L. gomezi*, 397 *L. ovallesi*, 2582 *L. panamensis*, 12 *L. shannoni*, 2 *L. punctigeniculata* and 1513 *L. trinidadensis* collected by tye various techniques were dissected in saline and examined for leishmanial promastigotes. Preparations which showed flagellate infections were stained

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by Giemsa's stain for identification of the form of the parasite.

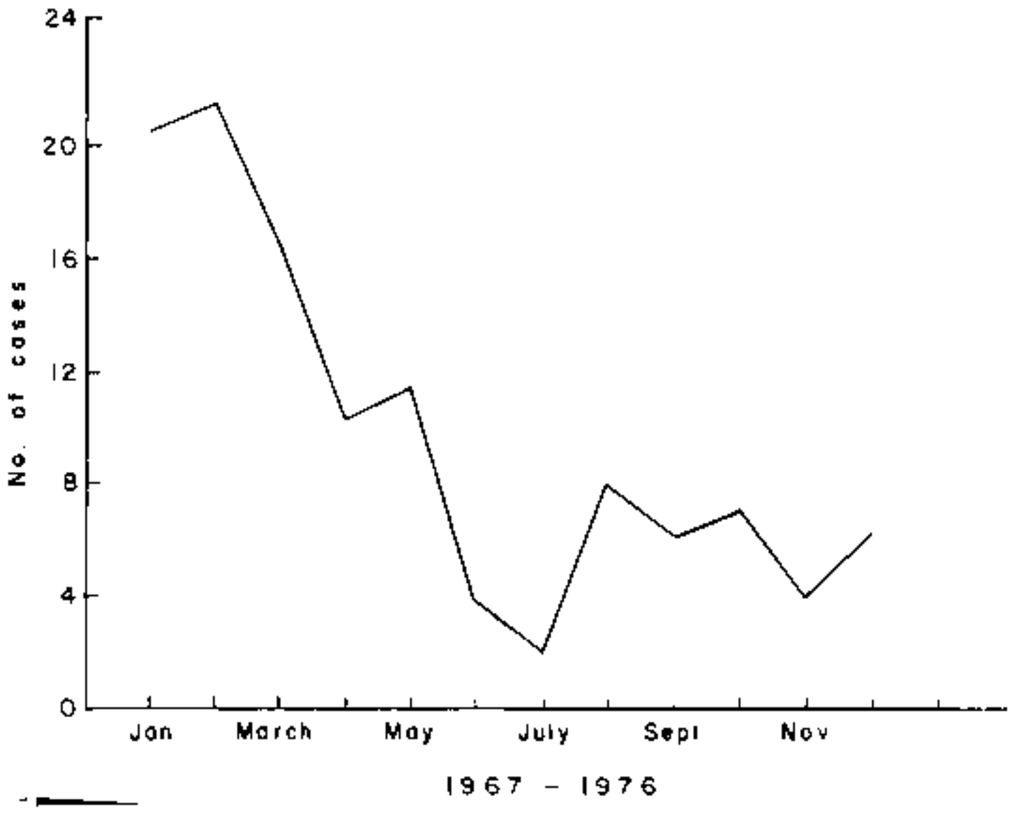

Fig. 1: Incidence of cutaneous leishmaniasis at San Esteban, Carabobo State, Venezuela (adapted from Giordanelli et al., 1978).

RESULTS

Sandflies and leishmaniasis – A significant correlation between the adult population dynamics of the anthropophilic sandfly species with leishmaniasis in San Esteban was found (Table I). However it is worth noting that this association was very weak indeed for *L. panamensis* since only 2.8% of the variation in sandflies was correlated with leishmaniasis (leishmaniasis deviance x 100 / month deviance: 101 x 100 / 3618 = 2.79%). On the other hand 33.9% of the *L. gomezi* and 52.9% of *L. ovallesi* variation appeared to be associated with the monthly incidence of leishmaniasis at San Esteban.

Search for leishmanial infection – No leishmanial infection was found. 2 of 2582 *L. panamensis* (0.08%), 51 of 1513 *L. trinidadensis* (3.37%), 4 of 121 *L. cayennensis* (3.3%), *and* 2 of 54 *L. atroclavata* (3.7%) showed either epimastigotes or trypomastigote forms.

DISCUSSION

The population density of a potential vector is an epidemiological factor directly correlated with the risk of parasite transmission. Transmission of leishmaniasis to man at San Esteban takes place during the dry season. A weak correlation was found between *L. panamensis* and the incidence of leishmaniasis. No natural infection of promastigotes was observed in 2582 specimens dissected during all the year. In consequence, in spite of previous opinions on the rôle of *L. panamensis* in other parts of the country (Pifano et al., 1959; Ramirez Perez et al., 1981; Aguilar et al., 1984), doubt is cast on the rôle of this species as a vector in this area, where population dynamics slightly differed from that recorded by Ramirez Perez et al. (1981) in the focus Ocumare de la Costa. The same argument can be made for *L. gomezi* which, furthermore, is not so abundant as *L. panamensis.*

The appearance of *L. ovallesi* was accompanied by a prompt outbreak of leishmaniasis. Unfortunately only 397 *L. ovallesi* were dissected which is too small a sample to exclude the possibility of *L. ovallesi* being infective in this area.

The possibility that flies which do not appear to be highly anthropophilic may, in fact, be major vectors of leishmaniasis should be considered in foci of the disease. Williams (1970) strongly suggested that although *L. olmeca olmeca* (Vargas & Diaz-Najera, 1959) in British Honduras is not greatly attracted by man, it is, nevertheless, responsible for leishmaniasis in rodents and for transmitting the disease to man. Williams (1970) explained the apparent contradiction with the hypothesis that the flies normally feeding on rodents and resting on ground flora were disturbed by men walking through the vegetation and were stimulated to feed on them.

L. o. bicolor, a common rodent-biting species (Christensen & Herrer, 1980; Tesh et al., 1972) has also been found to be susceptible to infection by *Leishmania* parasites. It is regarded as a vector of enzootic leishmaniasis in a zone where human leishmaniasis has not yet been observed, even though *L. panamensis* is abundant and strongly anthropophilic (Christensen et al., 1972).

TABLE I

Analysis of Deviance: Correlation between monthly anthropophilic sandfly densities and monthly incidence of leishmaniasis at San Esteban, Northern Venezuela: degrees of freedom, deviance, mean deviance and significance levels

Factor		*L. panamensis*		*L. ovallesi*		*L. gomezi*		*L. o. bicolor*		*L. shannoni*	
	DF	Dev.	Mean Dev.	Dev.	Mean Dev.	Dev.	Mean Dev.	Dev.	Mean Dev.	Dev.	Mean Dev.
Month	11	3618.00	328.91***	1629.00	148.09***	183.00	16.64***	27.10	2.46**	34.67	3.15**
Leishmaniasis	1	101.00	101.00***	862.00	862.00***	62.00	62.00***	1.10	1.10 –	60.48	60.48**

***P < 0.001 **P < 0.01 *P < 0.5 – No significant

Re-examination of *L. ovallesi* and *L. olmeca bicolor* from San Esteban is necessary, if their possible role as vectors of leishmaniasis is to be verified. Collections should be limited to the period running from December to February when the two fly populations reach their greatest size, and should be also made from ground flora where *L. o. bicolor* is known to rest. Large numbers of sandflies should have to be dissected before their capability as vectors of leishmaniasis, both, rodent and human, could be evaluated.

RESUMO

Ecologia dos flebótomos em um foco restrito de leishmaniose cutânea no norte da Venezuela. IV. Flutuação mensal de flebótomos e sua relação com a incidência da leishmaniose — Foi feita uma tentativa de correlacionar a incidência mensal da leishmaniose humana com a distribuição estacional das espécies de flebotomíneos na Venezuela Setentrional. De acordo com a análise estatística a flutuação estacional da população de *L. ovallesi* mostrou forte correlação com a doença humana, enquanto que a dinámica de *L. panamensis*, geralmente considerada ser o vetor na área central do país, mostrou somente correlação muito fraca. Esses achados servem de apoio à hipótese de que *L. panamensis* não seja a principal ou única espécie responsável pela transmissão nessa área e que *L. ovallesi* e também *L. olmeca bicolor* participem da epidemiologia da endemia.

Palavras-chave: ecologia de flebótomos – leishmaniose tegumentar – norte da Venezuela – flutuação mensal

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