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DEVELOPMENT OF A PANAMANIAN STRAIN OF *LEISHMANIA MEXICANA* IN CO-INDIGENOUS *LUTZOMYIA SANGUINARIA* AND *LU. GOMEZI* (DIPTERA: PSYCHODIDAE)

Abstract. Further characterization of an indigenous strain of Panamanian *Leishmania mexicana* was obtained by observation of parasite distribution in the intestinal tract of 2 local sand fly species. Dissection of the sand flies from 2–9 days after they had fed on infected hamsters showed that development of the parasites occurred chiefly anterior to the pylorus, which is characteristic of members of the *Le. mexicana* complex.

Johnson, McConnell & Hertig (1962, J. Parasitol. **48:** 158) and Johnson & Hertig (1970, Exp. Parasitol. **27:** 281–300) reported that the development of Panamanian *Leishmania braziliensis* promastigotes from man, spiny rat and sand flies occurred primarily in the hindgut with or without growth in the midgut of experimentally infected *Lutzomyia sanguinaria* and *Lu. gomezi* from Panama. Those authors observed also that the growth of promastigotes of *Le. mexicana* human strains from Guatemala and British Honduras in the same sand fly species was primarily in the midgut, and concluded that the position of promastigotes in the gut of sand flies may serve as a reliable taxonomic character for the separation of strains or species of *Leishmania*. Lainson & Shaw (1972, Br. Med. Bull. **28:** 44–48) incorporated the distinctive growth patterns of the 2 leishmanial species in sand flies as a salient feature in their reclassification of New World leishmaniae.

Panamanian *Le. mexicana* has been isolated from 4 mammalian species in Sasardi, San Blas Territory (Herrer, Telford & Christensen, 1971, Ann. Trop. Med. Parasitol. **65:** 349–58), but never from man. The present work was undertaken to determine if the promastigote growth pattern of an indigenous strain of *Le. mexicana* in *Lu. sanguinaria* and *Lu. gomezi* was similar to Guatemalan and British Honduran isolates in these sand fly species.

Laboratory techniques used in rearing the *Lutzomyia* have been reported by Hertig & Johnson (1961, Ann. Entomol. Soc. Am. **54:** 753–64).

Golden hamsters experimentally infected with the indigenous strain of *Le. mexicana* (1746) isolated from a rice rat, *Oryzomys capito*, were used as donor animals for sand fly feedings. The hamsters had been infected for about 1 year prior to the study, and manifested histiocytomas of the nose, feet and ears. These areas, rich in parasites, were readily probed by the flies. The animals were placed inside wire cages, within large Barraud cloth cages housing sand flies, and exposed overnight. Engorged flies were retained individually in shell vials lined with plaster of paris until dissected.

Seventy-two (88.9%) of 81 *Lu. sanguinaria* and 19 (82.6%) of 23 *Lu. gomezi* became infected. The development of *Le. mexicana* promastigotes in both *Lutzomyia* species was identical, with most flagellates concentrated in the midgut and cardia, occasionally extending into the pharynx and rarely into the mouthparts. The parasites typically were ovoid, nonmotile or slightly motile, and attached to the gut wall, although elongated forms were found in the lumen of the midgut. Midgut and cardia infections were extremely heavy, and the parasites appeared to adhere to each other in several layers with only the outermost individual having access to the gut wall (FIG. 1). Intestinal infections posterior to the midgut, although fairly common, usually comprised a few elongate motile stages free in the lumen. TABLE 1 records the location of flagellates in the gut of both sand fly species.

Growth patterns of the local strain of *Le. mexicana* in *Lu. sanguinaria* and *Lu. gomezi*, reported here, were similar to those from Guatemala and British Honduras in

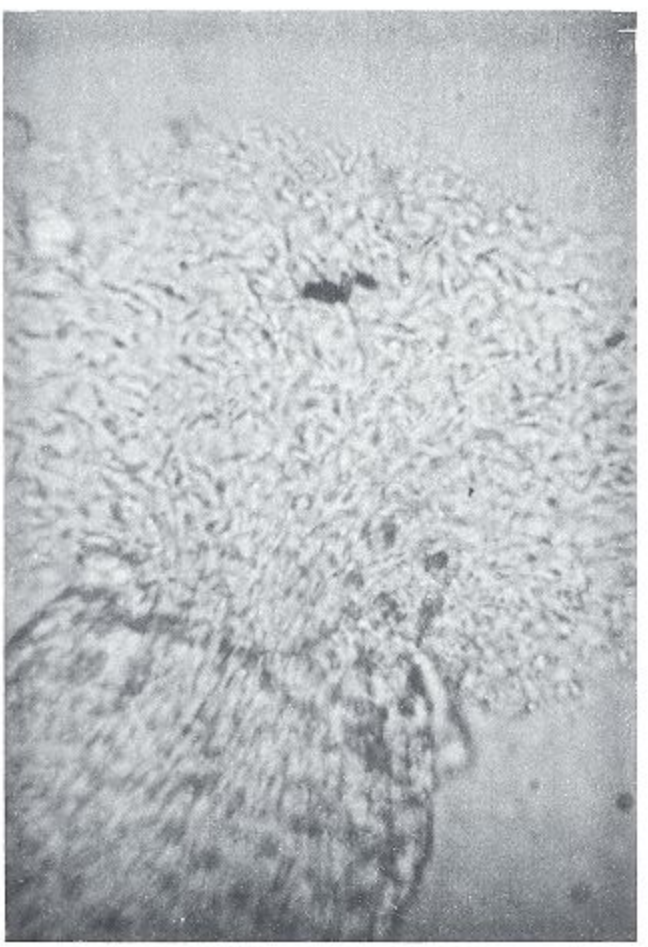

FIG. 1. Promastigote flagellates of Panamanian *Leishmania mexicana* spewing from the severed anterior aspect of the cardia of an experimentally infected *Lutzomyia sanguinaria*.

TABLE 1. Distribution of *Leishmania mexicana* in the alimentary tract of *Lutzomyia sanguinaria* and *Lu. gomezi* after feeding on infected hamsters.*

Post-prandial day	No. of sand flies	Location of promastigotes in the alimentary tract						
		Mouthparts	Pharynx	Cardia	Midgut	Pylorus	Hindgut	Rectal ampulla
2	3			3	3	1	1	1
3	4		1	4	4			1
4	5			4	5	3	2	3
5	16	1	6	16	16	9	7	6
6	10		1	9	10	6	5	5
7	4			4	4	3	2	2
8	2			2	2	1	1	
9	1			1	1	1	1	
Total	45	1	8	43	45	24	19	18
(%)	(100.0)	(2.2)	(17.8)	(95.6)	(100.0)	(53.3)	(42.2)	(40.0)

* Data from flies in which the entire alimentary tract was visible at dissection.

that the establishment and development of promastigotes occurred primarily anterior to the pylorus.

The pathology in hamsters and growth patterns in sand flies are clearly those of a member of the *Le. mexicana* complex. However, Chance, Peters & Shchory (1974, Ann. Trop. Med. Parasitol. **68**: 307–16) noted that 2 strains of Panamanian *Le. mexicana* (including strain 1746) had nuclear/kinetoplast buoyant densities distinct from those of other members of the *Le. mexicana* group. Gardener, Chance & Peters (1974, Ann. Trop. Med. Parasitol. **68**: 317–25) reported that the same Panamanian strains show a different electrophoretic mobility of malate dehydrogenase than other *Le. mexicana* strains, and suggested that the Isthmian isolates merit consideration as a separate subspecies. We recommend that additional indigenous isolates be tested with a battery of isoenzyme systems currently available to facilitate further characterization of the parasite.

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