DOMESTICATION OF AMERICAN CUTANEOUS LEISHMANIASIS IN COLOMBIA

Clara Ocampo1, Cristina Ferro2, Carlos Valderrama1, Horacio Cadena1, Dairo Marín1,2, Theodore Holford3, Leonard E. Munstermann3, and Neal Alexander1

1CIDEIM, Cali, Colombia; 2Nacional Instiuto de Salude, Bogota, Colombia; 3Yale University School of Medicine, New Haven C, USA

Increasing instances of epidemic outbreaks of cutaneous leishmaniasis in the Americas (ACL) have pointed to a changing epidemiological pattern from transmission centered in the forest to transmission foci within peridomestic environments. An epidemic occurrence of ACL in the Tolima Province of Colombia led to the development of a project to assess the relative roles of the environment, the insect vector, the vertebrate reservoir, and the human in the transmission cycle. This information was necessary to satisfy the demands of two objectives: (1) to establish the boundaries of a risk map for ACL transmission and (2) detect points at which a transmission cycle may be prevented or interrupted. The investigation centered on two townships, one located near the center of the epidemic zone—satisfied criteria of habitat variety, large number of cases and accessibility. A nearby non-epidemic township was selected as a reference control that appeared equivalent in terms of environment and demography but without leishmaniasis transmission.

ASTER satellite images of each township were compared for 16 spectral characteristics that were highly correlated with the physical environment, including vegetation structure, water quantity and temperature. Epidemic and control townships were compared with the following data: (1) 8 supervised classifications that included forest, cultivation, grassland and urban; (2) fourteen climatic layers obtained from Worldclim (www.worldclim.org); and (3) incidence and prevalence data from local hospitals—demographic data from the Colombian government agency (SIBEN). Main association with leishmaniasis cases was effect of adjacent forest/scrub vegetation. Case incidence was 34% higher for each 10% increase in woodland cover. Second, seasons of high and low temperature were least conducive to appearance of ACL cases.

Extensive trapping for reservoir feral animals was not highly productive. However, approximately equal numbers were captured in control and epidemic areas. The preponderant animal at both sites was the opossum, Didelphus marsupialis. Of the 39 total animals tested by PCR with Leishmania-specific kDNA primers, only one opossum and one unidentified rodent were positive. The low animal numbers and preliminary generally negative PCR tests indicate that feral animals play only a small role in epidemic transmission. In contrast, domestic animals were more abundantly sampled—a dog sample of 278 indicated high numbers of antibody positive canines.

In a 2-year collection of the presumptive vector, the phlebotomine sand fly, approximately 8,800 flies were collected. (1) 53 x as many flies were found in the epidemic townships in contrast to the control region (8,650 vs 161). The monthly collections paralleled the transect collections. (2) Substantial seasonal variation was observed with two notable peaks—Aug-Sept and in Jan-Feb. Flies collected in peak months ranged from 838 to 3,143 flies, whereas in the non-peak months the range was 153-573. (3) Species composition: Lutzomyia longiflocosa (65%); Lu. trinidadensis (25%); Helococyrtomyia spp. (8%); Lu. nuneztovari (<1%); Lu. columbiana (<1%); unidentified species (1%). The species were quite evenly distributed amongst the habitats with the following exceptions. Lu. trinidadensis was rarely found inside houses, but always in peridomestic and forest collections. Lu. columbiana was collected at all seasons in approximately equal numbers, albeit always <10 / month. The Lu. trinidadensis is typically not a human feeder and is unlikely to be involved in leishmaniasis transmission.

In summary, the Tolima epidemic involves a combination of the following contributory factors: (1) higher density scrub and forest vegetation, (2) very high densities of sand flies, and (3) high density of a putative vector, Lu. longiflocosa. The paucity of wild animal reservoirs pointed to a domestic animal reservoir, with dogs as a probable important source, and enhanced the probability of a human to sand fly to human transmission cycle. The atypical characters of this epidemic were the implied vector species Lu. longiflocosa (a rarely documented species), and the domesticity of transmission that may involve a domestic reservoir (dog) and possibly a human to sand fly to human route.