Épidemiologie

Epidemiology of American tegumentary leishmaniasis in domestic dogs in an endemic zone of western Venezuela.

Experimental Institute Jose-Witremundo-Torrealba (former center for parasitological research Jose-Witremundo-Torrealba), Universidad de Los Andes, Trujillo, Venezuela.
E-mail: ajrodriguezm_md@hotmail.com


Résumé : Épidémiologie de la leishmaniose tégumentaire américaine chez le chien domestique dans une zone endémique du Venezuela occidental.

Les chiens domestiques ne sont pas seulement les hôtes réservoirs de la leishmaniose viscérale zoonotique américaine (LVZ), mais aussi, pour différentes raisons, de la leishmaniose tégumentaire zoonotique américaine (LTA). Cependant, il est encore difficile d'affirmer que les chiens sont les hôtes réservoir de la LTA car, de toute évidence, les hommes, comme les chiens, sont exposés au même vecteur : le phlébotome.

Cette question ayant été peu abordée au Venezuela, nous avons sélectionné un site dans la ville de Trujillo pour y étudier les conditions écologiques et épidémologiques, et pour enquêter sur un échantillon significatif de chiens en effectuant le Montenegro skin test (MST). L'antigène a été préparé selon la procédure standard, en utilisant les promastigotes de Leishmania (V) braziliensis (80 µg/ml); la réponse, obtenue 48 heures après inoculation avec une taille d'induration > 5 mm, a été considérée comme positive. L'étude a eu lieu dans une zone endémique montagneuse, semi-urbaine, située à 850-950 m d'altitude, avec une pluviométrie moyenne de 150 mm/an. L'évaluation a porté sur 61 chiens, dans 46 maisons et sur 168 personnes. Dans la population humaine, on a compté 27 cas de LTA (16,1 %). Le MST a révélé 19 chiens positifs (31 %) (taille moyenne du MST 9,58 mm, IC95% : 8,41-10,75) dans 13 maisons (28 %). Les analyses multivariables n’ont pas révélé d’association significative entre les chiens domestiques positifs au MST et les cas de LTA chez l’homme (RR = 1,48, p = 0,28).

Bien que certaines études aient indiqué que les chiens domestiques et les taux d’infection du chien soient associés avec un risque croissant de la maladie chez l’homme dans différents endroits étudiés au Venezuela, on n'a pas encore apporté de réponse suffisante à cette question et il est donc nécessaire de continuer la recherche.

Summary: Domestic dogs are not only reservoir hosts of the American zoonotic visceral leishmaniasis (ZVL) but of the American zoonotic tegumentary leishmaniasis (ATL) as well, for different reasons. However it is still controversial to state that dogs are incriminated as ATL reservoir hosts as there is evidence that humans and dogs are likely to be exposed in the same way to sandfly vector. In Venezuela this issue has not been completely addressed, for this reason we selected a location inside Trujillo city to study eco-epidemiological conditions as well as to survey a significant sample of dogs by Montenegro Skin Test (MST). Antigen was prepared according to standard procedure using Leishmania (V) braziliensis promastigotes (80µg/ml); response was read 48 hours post-inoculation with an induration size >5 mm being considered as positive. The study place is an endemic mountainous semi-urban area located at 850-950 msl with an average rainfall of 150mm/year. We evaluated 61 dogs in 46 houses with 168 human beings. Among the human population 27 cases of ATL were reported (16.1%). With the MST we found 19 positive-reaction dogs (31%) (mean MST size of 9.58mm, 95%CI: 8.41-10.75) in 13 houses (28%). Multivariate analysis did not reveal significant association between domestic MST positive-dog ownership and human ATL cases (RR=1.48, p=0.28). Although some studies have indicated that dog ownership and dog infection rates are associated with an increased risk of human disease in different evaluated places, this question has not been completely answered in Venezuelan studied zones, further research is necessary.
Introduction

There are evidence that domestic dogs are not only reservoir hosts of the American zoonotic visceral leishmaniasis (ZVL) but of American zoonotic tegumentary leishmaniasis (ATL) as well, because:

- high ATL infection rates in dogs are found in ATL-endemic areas across Latin America;
- *Leishmania* (*Viannia*) spp. strains isolated from dogs and humans are symmetrically indistinguishable;
- there is some reported coincidence between households with ATL patients and the presence of infected dogs (10, 9).

However it is still controversial to state that dogs are incriminated as ATL reservoir hosts as there are evidence that humans and dogs are likely to be exposed in the same way to sandfly vector. In Venezuela this issue has not been sufficiently addressed, for this reason we selected a location within Trujillo city (Tamboron), Venezuela, to study eco-epidemiological conditions as well as to survey a significant sample of dogs (*Canis familiaris*) by Montenegro Skin Test (MST).

Materials and methods

The MST antigen was prepared according to standard procedure using *Le. (V) braziliensis* promastigotes; the response was read 48 hours post-inoculation with an induration size >5 mm being considered as positive (2). In another location of the Trujillo state (Loma de Piedras Negras, 1400 masl, average rainfall of 850 mm, rural conditions, figure 1) with 48 dwellings and 211 inhabitants, a previous study used an antigen concentration of 45µg/ml with no response in the whole dog population (56 dogs) (5,4).

For these reasons we used 80µg/ml. Tamboron is an endemic mountainous semi-urban area located at 850–950 masl (9°20’80"N-9°20’90"N, 70°26’20W-70°26’50W) (figure 1), average rainfall of 150 mm/year.

Both locations have suitable ecological and climatological conditions for the development and life of phlebotomine sandflies (photo 1); *Lutzomyia youngi*, *Lu. ovallesi*, *Lu. scorzai*, *Lu. gomezi*, *Lu. lichyi*, and *Lu. shannoni* have been captured and reported in the Trujillo state (11). *Lutzomyia youngi*, *Lu. ovallesi* and *Lu. gomezi* are considered as ATL vectors of this state (11). After an initial pilot survey, the total dog population was estimated at 96 dogs. Through Epi Info v.6.0 we calculated a significant (confidence 95%) sample of 60 individuals. All houses with dogs included in this study were surveyed and geopositioned (GPS) (to develop an epidemiological map).

Statistical analysis was made with Epi Info v.6.0 and SPSS v.10.2. Logistic regressions were used to evaluate the epidemiological impact of the MST positive dog. The effect of the following variables: MST positive dog presence in households, number of dogs per house and proportion of households with dogs, among others, was tested in the univariate analysis.

Results

We evaluated 61 dogs in 46 houses with 168 human beings (average dog/house relation of 1.32 and average human/dog of 2.75). Families remain an average of 21.7 years in Tamboron. Informal business is the main work activity in this area (22%) followed by building work (20%) and agriculture (8%). Disease prevalence in human population corresponded to 27 reported cases of ATL (16.1%). Rats were reported by families in the area in 23.8%. *Didelphis marsupialis* was reported in 19%. Ten percent of the evaluated houses had poor sanitary conditions and 43% had farm animals in their backyards.
From total studied dogs, 57% were male and 43% female. Mean dogs age was 3.48±3.16 years old. According to owners 77% of the dogs live and rest outdoors, 11.5% indoors and 11.5% live and rest irregularly in both places. Only 46% of the dogs have received medical veterinary care at least once in their life. A general veterinary evaluation did not reveal apparent relevant health alterations in this group of studied dogs with one exception (1.6%), a female boxer of 1 year-old with suspected lesions on the head, legs and genitals (photo 2). Direct Giemsa stained smear, culture in NNN medium and MST, all resulted negative for leishmaniasis. With the MST we found 19 positive-reaction dogs (31%) (mean MST size of 9.58 mm, 95%CI: 8.41-10.75) in 13 houses (28%). No spatial association was observed, cases were distributed in the whole location without taking into account the latitude/longitude or altitude in a range of 850-950 masl (figure 2).

MST positive dogs presence in households was not associated with ATL in people (p=0.66); number of dogs per house was not statistically different between group of positive and negative MST dogs (p=0.13) and proportion of households with human ATL cases was not different according to result of MST in dogs (p=0.24). The multivariate analysis did not show significant association between domestic MST positive-dog ownership and human ATL cases (RR=1.48, p=0.28).

Discussion

Tegumentary leishmaniasis is widely spread in the mountainous Andean regions of South America. In Venezuela, these regions represent the coffee-growing states of Trujillo, Merida and Tachira (7). Many eco-epidemiological issues are still to be addressed on the field and in laboratory research. The role of dogs and other possible reservoirs are one of them. Although some studies have indicated that dog ownership and dog infection rates are associated with an increased risk of human disease in different evaluated places as Peru (2, 9, 10), Guatemala (12), some locations of Brazil (1, 13), this question has not been completely answered in Venezuelan studied zones as well as in other countries as Argentina (8) and Brazil (13). In Brazil a study found that the cycle of the parasite in São Paulo county has been maintained by wild animals and the dog would probably be an accidental host just as humans (13). In Tamboron this is likely to be the same, human and dogs are possibly equally exposed to phlebotomine sandflies (although MST calculated prevalence of response against leishmanial antigens was significantly higher than the disease prevalence in humans, for this zone, 31% vs. 16%). It is important to consider the proportion of positive MST dogs, higher in the group living indoors, although differences with outdoors group were not statistically significant. Differences in exposure between human and dogs should be addressed in a further necessary research. In addition to this MST survey, it is necessary for a specific and accurate diagnosis of ATL in dogs to have other available diagnostic tools as immunological and molecular tests, after standardization of these techniques. This improves the sensitivity of ATL diagnosis.

Conclusions

Although dog is a human-close domestic animal, in many regions of Venezuela, as Tamboron, Trujillo, wild
animals are widely present. Previous studies have found different rodent species naturally infected with *Leishmania* spp., i.e., cotton rats (*Sigmodon hispidus*) and black rats (*Rattus rattus*) (3). In our study almost a quarter of houses reported the presence of rats and almost a fifth reported the presence of marsupials. These animals could be possible reservoirs of *Leishmania* spp. In any case, research and prevention in this geographical zone should be continued, especially because in the past years some practical interventions as the use of mosquito nets impregnated with insecticide (6) reduced in the short term the disease incidence and probably brought about considerable degree of protection against indoor transmission of the tegumentary leishmaniasis, not only for humans but also for dogs.

Acknowledgements

This work was previously presented in part at the XVIth International Congress for tropical medicine and malaria, IVth European Congress on tropical medicine and international health and VIIth Congrès international de la Société de pathologie exotique (Medicine and health in the tropics), Marseille, France, September 11-15, 2005. Poster No. P478. The travel of Alfonso J. RODRIGUEZ MORALES to this meeting was partially granted by the Société de pathologie exotique and the Universidad de Los Andes.

Références bibliographiques