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# Detection of *Leishmania* (*Leishmania*) *amazonensis* and *Leishmania* (*Leishmania*) *infantum chagasi* in Brazilian bats

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ABSTRACT

Although bats are one of the most abundant mammals in the new world and are present in virtually all ecosystems, including urban and peri-urban environments, few studies have investigated the role of these animals in the epidemiological chain of leishmaniosis. Here, we report a study of 683 bats captured in São Paulo county (southeastern from Brazil), which were screened by serology, parasitologic methods and polymerase chain reaction (PCR) for trypanosomatids. The indirect immunofluorescent antibody test demonstrated that 0.9% of bats react positively for leishmaniosis and PCR detected the presence of DNA of *Leishmania* (*Leishmania*) *amazonensis* in 18 bats and *Leishmania* (*Leishmania*) *infantum chagasi* in 3 specimens. These results indicate that further studies are necessary to evaluate the role of bats in maintenance of the *Leishmania* life cycle, especially in areas where these diseases are endemic.



## 1. Introduction

The Mammalia class contains 5416 species, and the order Chiroptera comprises the second largest group of mammals, with 1120 species (Wilson and Reeder, 2005). In Brazil, there are 9 families, 64 genera and 167 species of bats (Reis et al., 2007).

The survival of bats depends mainly on their mobility in search of food and shelter. Forest fragmentation reduces the availability and alters the distribution of resources, which leads the bats to undertake long-distance migrations to urban areas (Menezes et al., 2008). Urban ecosystems also offer an abundance of food and shelter and relative safety from predators. Consequently, some bat species have adapted to roosting in buildings (Kunz, 1982), increasing the probability of contact with people and domestic animals. This may be hazardous from a public health standpoint, considering that these animals can serve as vectors or reservoirs of zoonotic disease.

Insectivorous bats are useful in the control of night-flying insects (Reis et al., 2002) and may also control agricultural pests. Frugivorous and nectarivorous bats play important ecological roles as pollinators and seed dispersal agents (Swier, 2003).

In São Paulo, bats inhabit all of the regions of the county and citizens have often complained of their presence because of the noise and waste they produce (Sodré, 2003).

Many mammals can serve as reservoirs for life cycle of *Leishmania* parasites. Bats are known to be trypanosome hosts and may also serve as a food source for sand flies (Lampo et al., 2000). Bat's dispersal capabilities and longevity could facilitate dispersal and persistence of their *Leishmania* parasites (Lampo et al., 2000), with important implications for preventive measures and disease control. Nevertheless, few studies have investigated the possible

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role of bats in the transmission of leishmaniosis in America.

Autochthonous human cases of American cutaneous leishmaniasis (ACL) have been recorded in São Paulo county. All of these cases were associated with the primary forest in north of the city, Serra da Cantareira. Two autochthonous human American visceral leishmaniosis (AVL) cases have also been recorded, but neither infected dogs nor sand flies were found to confirm the transmission (Iversson et al., 1979, 1982). Animals infected with *Leishmania* (*Leishmania*) *infantum chagasi* have already been observed in the Embu das Artes and Cotia counties, localities that are near to São Paulo city (Savani et al., 2003, 2004).

According to a survey of the phlebotomine fauna performed by Zoonosis Control Center of the Municipality of São Paulo, *Pintomyia fischeri*, *Migonemyia migonei*, *Psychodopygus lloydi*, *Nyssomyia intermedia*, *Psathyromyia pascalei*, *Psychodopygus arthuri*, *Martinsmyia alphabetica*, *Psychodopygus ayrozai*, *Pintomyia monticola* and *Evandromyia edwardsi* (Galati, 2003) have been observed in the city (Savani et al., 1999).

Considering the undeveloped state of knowledge on potential zoonotic parasites of bats, the conservation importance of bats, which are wild animals protected by law, the close proximity of them and humans in the urban environment and the presence of primary forests in north and south of the São Paulo city (Serra da Cantareira and Serra do Mar, respectively), this study was carried out to detect evidence of *Leishmania* protozoans in bats of the county.

## 2. Materials and methods

Here, we report data from 683 bats received or captured by Zoonosis Control Center of the Municipality of São Paulo, as part of the rabies control program, from April 2007 to November 2008. This study was approved by the Institutional Scientific Committee. Bats were identified according to family, genus and species using the identification key proposed by Vizotto and Taddei (1973). After weighting, bats were anesthetized with ketamine hydrochloride, which was injected into the pectoral muscle, considering the weight and volume. Cardiac puncture was

**Table 1**
Number of bats by family, genus and species feeding habits, São Paulo county, April 2007 to November 2008.

| Family (food preference) | Genus/species | No. | % |
|---|---|---|---|
| Molossidae (insectivorous) | *Molossus molossus* | 217 | 63.5 |
| | *Molossus rufus* | 5 | 1.5 |
| | *Tadarida brasiliensis* | 62 | 18.1 |
| | *Nyctinomops macrotis* | 19 | 5.6 |
| | *Eumops perotis* | 5 | 1.5 |
| | *Promops nasutus* | 4 | 1.2 |
| | *Nyctinomops laticaudatus* | 10 | 2.9 |
| | *Eumops glaucinus* | 12 | 3.5 |
| | *Eumops auripendulus* | 4 | 1.2 |
| | *Molossops neglectus* | 1 | 0.3 |
| | *Eumops bonariensis* | 2 | 0.6 |
| | *Molossus* sp. | 1 | 0.3 |
| | SubTotal Molossidae | 342 | 50.1 |
| Phyllostomidae (nectarivorous or frugivorous) | *Glossophaga soricina* | 141 | 50.7 |
| | *Artibeus lituratus* | 62 | 22.3 |
| | *Platyrrhinus lineatus* | 59 | 21.2 |
| | *Desmodus rotundus* | 5 | 1.8 |
| | *Artibeus planirostris* | 1 | 0.4 |
| | *Artibeus* sp. | 1 | 0.4 |
| | *Artibeus fimbriatus* | 3 | 1.1 |
| | *Pygoderma bilabiatum* | 1 | 0.4 |
| | *Micronycteris megalotis* | 1 | 0.4 |
| | *Sturnira lilium* | 4 | 1.4 |
| | SubTotal Phyllostomidae | 278 | 40.7 |
| Vespertilionidae (insectivorous) | *Myotis nigricans* | 34 | 54.8 |
| | *Histiotus velatus* | 12 | 19.4 |
| | *Myotis rubber* | 1 | 1.6 |
| | *Myotis* sp. | 2 | 3.2 |
| | *Eptesicus* sp. | 1 | 1.6 |
| | *Eptesicus brasiliensis* | 1 | 1.6 |
| | *Eptesicus furinalis* | 4 | 6.5 |
| | *Eptesicus diminutus* | 4 | 6.5 |
| | Vesperstilionidae | 1 | 1.6 |
| | *Lasiurus blossevillii* | 2 | 3.2 |
| | SubTotal Vespertilionidae | 62 | 9.1 |
| Emballorunidae (insectivorous) | *Diclidurus scutatus* | 1 | 100.0 |
| | SubTotal Emballorunidae | 1 | 0.2 |
| | Total | 683 | 100.0 |