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Study of sand flies (Diptera: Psychodidade) in visceral and cutaneous leishmaniasis areas in central western of Minas Gerais state – Brazil

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ABSTRACT

The transmission of *Leishmania* involves several species of sand flies that are closely associated with various parasites and reservoirs, with differing transmission cycles in Brazil. A study on the phlebotomine species composition has been conducted in the municipality of Divinópolis, Minas Gerais, Brazil, an endemic area for cutaneous leishmaniasis (CL), which has intense occurrence of visceral leishmaniasis (VL) cases. In order to study the sand flies populations and their seasonality, CDC light traps (HP model) were distributed in 15 houses which presented at least one case of CL or VL and in five urban parks (green areas). Collections were carried out three nights monthly from September 2010 to August 2011. A total of 1064 phlebotomine specimens were collected belonging to eight genera and seventeen species: *Brumptomyia brumpti, Lutzomyia bacula, Lutzomyia cortelezzii, Lutzomyia lenti, Lutzomyia sallesi, Lutzomyia longipalpis, Lutzomyia migonei, Lutzomyia intermedia, Lutzomyia neivai, Lutzomyia whitmani, Lutzomyia christenseni, Lutzomyia monticola, Lutzomyia pessoai, Lutzomyia aragaoi, Lutzomyia brasiliensis, Lutzomyia lutziana*, and *Lutzomyia sordellii. L. longipalpis*, the main vector of *Leishmania infantum* in Brazil, was the most frequent species, accounting for 76.9% of the total, followed by *L. lenti* with 8.3%, this species is not a proven vector. Green and urban areas had different sand flies species composition, whereas the high abundance of *L. longipalpis* in urban areas and the presence of various vector species in both green and urban areas were also observed. Our data point out to the requirement of control measures against phlebotomine sand flies in the municipality of Divinópolis and adoption of strategies aiming entomological surveillance.

1. Introduction

The leishmaniasis are the most severe and common sand fly-borne diseases. The phlebotomine sand flies are notorious vectors of human diseases caused by *Leishmania* (Young and Duncan, 1994). Over the last decade, the number of cases and the geographical spread of visceral and cutaneous leishmaniasis has increased considerably within Brazil. Currently, the disease constitutes one of the most serious problems faced by the public health authorities (Ministério da saúde do Brasil, 2006).

Visceral leishmaniasis (VL) is the most severe form of the disease owing to its high mortality rate. VL presents peri-urban and urban patterns of occurrence in many Brazilian cities including Belo Horizonte, Campo Grande, São Luís, and Teresina (Silva et al., 2001; Felipe et al., 2011; Soares et al., 2011; Oliveira et al., 2012). Regarding about the 27 Brazilian states, 19 have reported autochthonous VL cases. Recently, the expansion of the disease has been observed in the Amazon basin as a result of human activities such as deforestation, establishment of field plantations, mining, and new settlements (Silva-Nunes et al., 2008).

Cutaneous leishmaniasis (CL) is a disease with a range of etiological agents, reservoirs, vectors and transmission patterns. Comprehension about this zoonotic disease is still limited in certain

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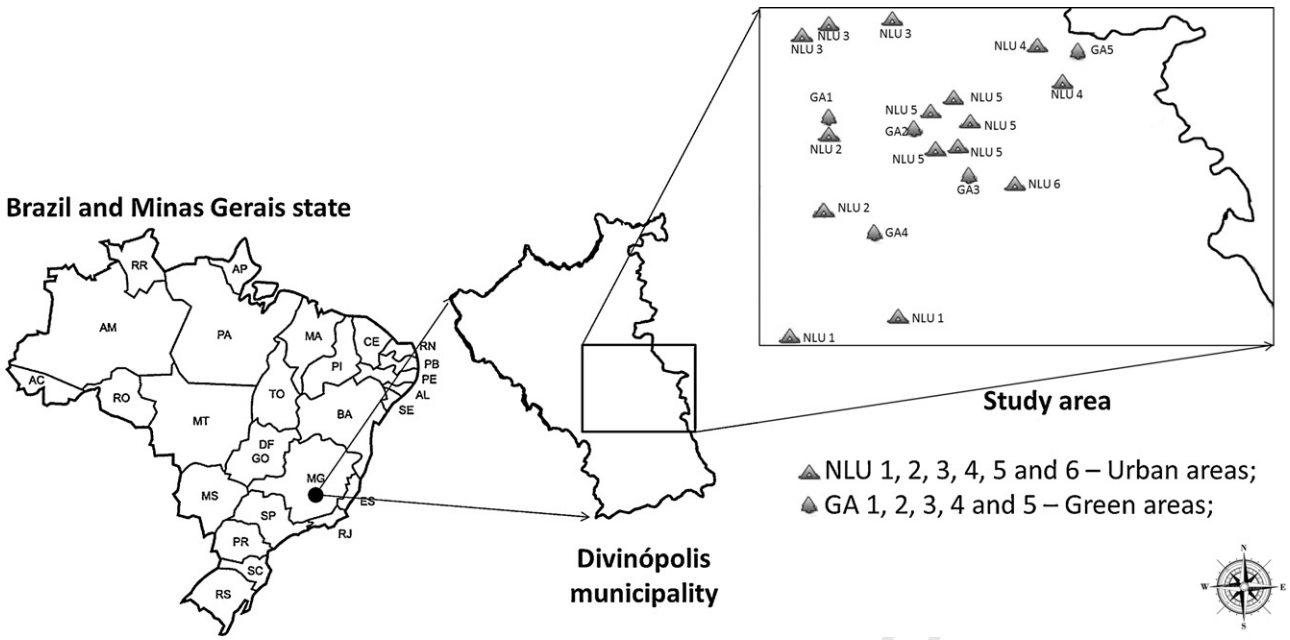

Fig. 1. Divinópolis municipality map, showing the collection places of sand flies – NLU 1 to NLU 6 – Urban localities, GA: Green areas—from September 2010 to August 2011.

aspects, which makes it difficult to control. World Health Organization considers CL one of the six most important infectious diseases due to its high detection rates and the potential to cause deformities in patients (World Health Organization, 2010).

The zoonosis is widely disseminated in Brazil, which reports cases in all regions. From 1985 to 2005, there was an average annual rate of 28,568 autochthonous cases recorded and a medium detection rate of 18.5 cases per 100,000 inhabitants (Ministério da Saúde do Brasil, 2007). The first records of CL cases in Minas Gerais state were associated to deforestation to construction of roads and to agricultural activities (Orsini, 1940). However the transmission of the disease in Minas Gerais has changed with outbreaks occurring in rural settlements and in peri-urban and urban areas, as in other Brazilian regions (Lainson, 1989; Brazil et al., 2007; Gontijo et al., 2002).

An important aspect of the leishmaniasis in Brazil is the adaptation of proven vectors of different species of *Leishmania* to urban areas of many municipalities. For instance *Lutzomyia longipalpis* (Lutz & Neiva, 1912), the main vector of *Leishmania infantum*, *Lutzomyia intermedia* (Lutz & Neiva, 1912) and *Lutzomyia whitmani* (Antunes & Coutinho, 1939) vectors of *Leishmania braziliensis* are commonly collected in urban areas (Barata et al., 2005; Gontijo et al., 2005; Carvalho et al., 2009; Saraiva et al., 2011).

Divinópolis municipality is considered an endemic region of CL. In the 1990 decade 135 human cases of American cutaneous leishmaniasis were reported. From 2000 to 2011, 52 cases were recorded by Health Authorities (DEDCH, 2012). Considering the occurrence of VL in the municipality, four cases were registered in 2011. According to the classification of Ministry of Health in Brazil for areas to surveillance and control of visceral leishmaniasis, the Divinópolis is ranked as a moderated transmission area whereas the average number of VL human cases was between 2.4 and 4.4 cases in the last five years. Until now, 21 species of sand flies were reported in the municipality of Divinópolis (Andrade Filho et al., 2008; Margonari et al., 2010).

This classification indicates the necessity of epidemiological surveillance measures with respect to VL, once other cities in Minas Gerais state have had the same historical profile, currently are areas of intense transmission of VL, for instance Belo Horizonte and Santa Luzia municipalities (PBH, 2012).

Disorganized growth of Divinópolis can favor the proximity of suburban areas and areas of residual forest. This fact can promote the occurrence of transmission cycles of leishmaniasis. Nevertheless there are no concluded studies on the epidemiology of leishmaniasis in the municipality. As stated by Silva et al. (2001) several zoonoses have assumed increasing public health importance due to their urbanization. However these urban rates have increased without the incidence of the diseases being reduced in rural areas. Alterations in rural environments and the constant migratory movements of the population to the periphery of cities have facilitated this process.

The aim of this study was to provide information about the diversity, abundance and seasonality of sand flies vectors in the municipality, focusing the development of control measures well targend and entomological surveillance.

2. Materials and methods

2.1. Study area

Divinópolis has 213,000 inhabitants in a total area of 708 km^2 (IBGE, 2011). The municipality coordinates are 20° 8′21″S e 44° 53′17″W, the altitude ranges from 600 to 850 m above sea level. Divinópolis is located in the metallurgical zone, in the region called "Alto São Francisco River" in Minas Gerais state, Brazil (Fig. 1). The municipality benefits from a humid subtropical climate (Cwa – Koppen climate classification), warm weather with a distinctly dry winter. The average annual temperature is 16 °C and an average rainfall varies from 1200 to 1700 mm/year. The average annual humidity of the air varies around 72%. The predominant vegetation in the municipality is the Brazilian Savannah called "Cerrado". Main degradation factors in the area include the pastoral activity, due to the extensive cattle raising, and the urban occupation (SEPLAN/PMD, 1998).

2.2. Sample collection and identification of phlebotomines

Sampling was performed every month between September 2010 and August 2011, using CDC light traps, HP model (Pugedo et al., 2005) located in fifteen houses and in five green areas.

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