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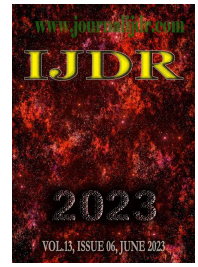
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## TRYPANOSOMA CRUZI INFECTION IN A DOG IN A NON-ENDEMIC AREA: IMPLICATIONS FOR ONE HEALTH

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### ABSTRACT

The protozoan *Trypanosoma cruzi* causes Chagas disease also known as American trypanosomiasis, a vector-borne zoonosis widely dispersed across 21 countries in the Americas that can be transmitted to humans, wild and domestic animals mostly through the infected faeces of the blood-sucking triatomine insects. The role of dogs as sentinels or domestic reservoir for *T. cruzi* has been reported around the world. This study reports for the first time a natural infection by *T. cruzi* in a dog in Northeastern Brazil, and draws attention to the importance of dogs in the epidemiology of this disease within the context of One Health.

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## INTRODUCTION

The American trypanosomiasis, also called Chagas disease, is an endemic zoonotic disease caused by the protozoan *Trypanosoma cruzi* (Chagas, 1909), and it is distributed in all countries in Latin America and Brazil is one of the most important chagas disease endemic countries in latinamerica (PAHO, 2020). The parasite that causes the disease is mostly transmitted through the infected feces of triatomine bugs (Rosypal *et al.*, 2007). *T.cruzi* can infect more than 180 wild species of mammals, particularly armadillos, squirrel monkeys, rodents and opossums; domestic animals, especially dogs, cats, pigs and goats and humans (Brenière *et al.*, 2016). Concerning domestic animals, *T. cruzi* infection in dogs has been reported in different canine populations in North America (Elmayan *et al.*, 2019), Central America (Montenegro *et al.*, 2002; Galaviz-Silva *et al.*, 2017) and South America (Gürtler *et al.*, 1986; Lauricella *et al.*, 1989). In Brazil, the frequencies of *T. cruzi* infection in dogs have been reported in all five official geographical regions of the country, by means of parasitological, serological or molecular tests (Martins-Melo *et al.*, 2014).

The state of Pernambuco have been reported infection by *T. cruzi* in humans in practically all its mesoregions, but there are areas with low endemicity or non-endemic (Santos *et al.*, 2015). However, no canine infection has previously been reported. The present report describes the first case of *T. cruzi* infection in a dog in a non-endemic area of northeastern Brazil and its implications for One Health.

## CASE REPORT

A five-year-old female **Labrador Retriever** dog was brought to a private veterinary hospital in Camaragibe County, Pernambuco, with a history of muscle spasms and diarrhea. This animal was living in Camaragibe (8°01'19"South; 34°58'51"West), situated in the Metropolitan Region of Recife, where she had been born. The owner reported that the dog had a habit of eating garbage, food scraps and insects. On physical examination, fever, dehydrated, pale mucous membranes, tachypnea, tachycardia, enlarged lymphnodes, abdominal distension and pain were observed. Also, the animal showed mild infestation with ticks. The hematological results showed hypochromic anemia with moderate anisocytosis, polychromasia, presence of

platelet aggregate and hypochromasia, leukocytosis with neutrophilia, lymphopenia, monocytosis and presence of trypomastigotes forms of *Trypanosoma* sp. The biochemical profile showed elevation of serum alanine aminotransferase (ALT) levels. Tests for antibodies to *L. infantum* and *D. immitis* were negative. Blood aliquots were separated and stored at -20 °C. For whole blood DNA extraction, the QIAamp® DNA Blood Mini Kit (QIAGEN® Sample and Assay Technologies, Germantown, MD, USA) was used, according to manufacturer's instructions. Quantitative real-time PCR (qPCR) was carried out using two different primer sets for *T. cruzi*: CRUZI 1 and CRUZI 2, as described by Piron *et al.* (2007); TeSAT 1 (F) and TeSAT 2 (R) (Figure 1). As a complementary laboratorial test, whole blood culture was carried out for parasitological confirmation. A volume of 200 µl of peripheral blood from the dog was added to tubes containing Novy-MacNeal-Nicolle (NNN) medium (agar slant tube). Thereafter, 1 ml of Liver Infusion Tryptose (LIT) medium was added to the tubes. The cultures were maintained in a temperature of 27°C and analyzed microscopically each 15 days. After 60 days, the parasites were observed, and the culture was then considered positive.

## DISCUSSION

Canine trypanosomiasis comes in four different forms in Brazil, as follows: *T. cruzi*, *T. evansi*, *T. caninum* and *T. rangeli*. Infection by *T. cruzi* can be acquired through consumption of triatomines or of infected synanthropic or wild small mammals (FUNG *et al.*, 2014; Curtis-Robles *et al.*, 2017; Meyers *et al.*, 2017). According to Gomes *et al.* (2009), the diagnosis of Chagas disease can be made through detection of the parasite using parasitological methods during the acute or chronic phase of the disease. However, these diagnostic methods may lead to misdiagnosis of parasite species. On the other hand, the qPCR methodology is adequate for specific detection of *T. cruzi*, as well as for detection of low parasitemia in patients with chronic Chagas disease (Moreira *et al.*, 2013). Hematological profile of dogs infected by *T. cruzi* are nonspecific as they will depend on factors such as: parasite load, serological status and molecular profile of the parasite strain (Guedes *et al.*, 2012; Jaimes-Dueñez *et al.*, 2020). Moreover, the clinical signs observed are not pathognomonic. Dogs with Chagas disease may remain undiagnosed as asymptomatic animals or may display a few clinical signs such as fever or lymph node enlargement, as we observed here. In this way, dogs may develop acute or chronic disease and pathological changes such as hypertrophy, abnormal cardiac rhythms and congestive cardiac insufficiency with right ventricle dysfunction (Souza *et al.*, 2008). However, due to the multisystemic nature of Chagas disease and the variety of clinical signs, the diagnosis is always difficult to make, and it can often be missed. In Brazil, the infection of *T. cruzi* in dogs has been reported in all regions. The state of Pernambuco 37.8% of the counties have reported at least one case of acute Chagas disease in humans (Santos *et al.*, 2015). However, no canine infection has previously been reported. This is the first report of *T. cruzi* infection in a dog in the metropolitan region of Recife, state of Pernambuco. From an epidemiological perspective, dogs can play an important role because they live close to dwellings where they serve as a link between the wild and peridomestic environments (Roque *et al.*, 2008; Freitas *et al.*, 2018). In conclusion, dogs sharing the same environment with humans can present the potential to act as sources of *T. cruzi* infection. Because of this close relationship with humans, dogs have key epidemiological importance within the context of One Health.

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## REFERENCES

Brenière, S., Waleckx, E. and Barnabé, C. 2016. Over six thousand *Trypanosoma cruzi* strains classified into discrete typing units

(DTUs): attempt at an inventory. PLoS Negl Trop Dis. 10. e. 0004792.

- Chagas, C. 1909. New human trypanosomiasis. Study on the morphology and evolutionary cycle of *Schizotrypanum cruzi*, N. Gen. N. sp., the etiological agent of man's new morbid entity. *Mem Inst Osw Cruz.* 1 pp. 159-218.
- Curtis-Robles, R., Zecca, I.B., Roman-Cruz, V., Carbajal, E.S., Auckland, L.D., Flores, I. *et al.* 2017. *Trypanosoma cruzi* (agent of Chagas disease) in sympatric human and dog populations in "Colonias" of the Lower Rio Grande Valley of Texas. *A J Trop Med Hyg.* 96(4), pp. 805–814.
- Elmayan, A., Tu, W., Duhon, B., Marx, P., Wolfson, W., Balsamo, G., Herrera, C., Dumonteil, E. 2019. High prevalence of *Trypanosoma cruzi* infection in shelter dogs from southern Louisiana, USA. *P Vectors.* 12(1), p. 322.
- Freitas, N., Souza, F., Magalhães, J., e Sousa, R., d'Escoffier, N. 2018. *Natural infection by Trypanosoma cruzi* in triatomines and seropositivity for Chagas disease of dogs in rural areas of Rio Grande do Norte, Brazil. *Rev S B Med Trop.* 51(2), pp.190–197.
- Fung, H.L., Calzada, J., Saldaña, A., Santamaria, A.M., Pineda, V., Gonzalez, K. *et al.* 2014. Domestic dog health worsens with socio-economic deprivation of their home communities. *Act Trop.* 135, pp. 67–74.
- Galaviz-Silva, L., Mercado-Hernández, R., Zárate-Ramos, J., Molina-Garza, J. 2017. Prevalence of *Trypanosoma cruzi* infection in dogs and small mammals in Nuevo León, Mexico. *Rev Argent Microbiol.* 49(3), pp. 216-223.
- Gasparim, Z., Fontes, R., Rossoni, F., Toledo, O. 2018. Epidemiological and clinical profile of patients with Chagas disease in the Central-North area of Paraná, Southern Brazil. *Rev Soc Bras Med Trop.* 51(2), pp. 225-230.
- Gomes, M., Lorena, Virginia, Luquetti, A. 2009. Diagnosis of Chagas disease: what has been achieved? What remains to be done with regard to diagnosis and follow up studies?. *Mem O Cruz Institute.* 104 (Suppl. 1), pp. 115-121.
- Guedes, P., Veloso, V., Mineo, T., Santiago-Silva, J., Crepalde, G., Caldas, I., Nascimento, M., Lana, M., Chiari, E., Galvão, L. e Bahia MT. 2012. Hematological alterations during experimental canine infection by *Trypanosoma cruzi*. 2012. *Rev Bras Parasitol Vet.* 21(2), p. 151-6.
- Gürtler, R., Solard, N., Lauricella, M., Haedo, A., Pietrokovski, S., Alberti, A., Wisnivesky-Colli, C., 1986. Dynamics of transmission of *Trypanosoma cruzi* in a rural area of Argentina. III. Persistence of *T. cruzi* parasitemia among canine reservoirs in a two-year follow-up. *Rev. Inst. Med. Trop.* 28, pp. 213–219.
- Jaimes-Dueñez, J., Jiménez-Leaño, Á., Esteban-Mendoza, M., Moreno-Salcedo, L., Triana-Chávez, O. e Cantillo-Barraza, O. 2020. Epidemiological and clinical characteristics of *Trypanosoma cruzi* infection in dogs (*Canis lupus familiaris*) from a Chagas Disease-Endemic Urban Area in Colombia. *Prev Vet Med.* 182. e. 105093.
- Lauricella, M., Sinagra, A., Paulone, I., Riarte, A., Segura, E. 1989. Natural *Trypanosoma cruzi* infection in dogs of endemic areas of the Argentine Republic. *Rev Inst Med Trop Sao Paulo.* 31, pp. 63-70.
- Martins-Melo, F., Ramos, AN Jr., Alencar, C., Heukelbach J. 2014. Prevalence of Chagas disease in Brazil: a systematic review and meta-analysis. *Acta Trop.* 130, pp. 167-174.
- Meyers, A., Hamer, S., Matthews, D., Gordon, S., Saunders, A. 2019. Risk factors and select cardiac characteristics in dogs naturally infected with *Trypanosoma cruzi* presenting to a teaching hospital in Texas. *Jour of vet Inter Med.* 33(4), pp. 1695-1706.
- Meyers, A., Meinders, M., Hamer, S. 2017. Widespread *Trypanosoma cruzi* infection in government working dogs along the Texas-Mexico border: Discordant serology, parasite genotyping and associated vectors. *PLoS Negl Trop Dis.* 11 (8), p. e0005819.
- Montenegro V., Jiménez M., Pinto Dias J. e Zeledón R. 2002. Chagas disease in dogs from endemic areas of Costa Rica. *Mem Inst Oswaldo Cruz.* 97, pp. 491-494.
- Moreira, O., Ramírez, J., Velázquez, E., Melo, M., Lima-Ferreira, C., Guhl, F., Sosa-Estani, S., Marin-Neto, J., Morillo, C e Britto, C.

2013. Towards the establishment of a consensus real-time qPCR to monitor *Trypanosoma cruzi* parasitemia in patients with chronic Chagas disease cardiomyopathy: a substudy from the BENEFIT trial. *Acta trop.* 125(1), pp. 23-31.
- Piron, M., Fisa, R., Casamitjana, N., López-Chejade, P., Puig, L., Vergés, M. e Sauleda, S. 2007. Development of a real-time PCR assay for *Trypanosoma cruzi* detection in blood samples. *Acta trop.* 103(3), pp. 195-200.
- Roque, A., Xavier, S., Rocha, M., Duarte, A., D'Andrea, P., Jansen, A., 2008. *Trypanosoma cruzi* transmission cycle among wild and domestic mammals in three areas of orally transmitted Chagas disease outbreaks. *Am. J Trop MedHyg.* 79 (5), pp. 742–749.
- Rosypal, A., Corte's-Vecino, J., Gennari, S., Dubey, J., Tidwell, R. e Lindsay, D. 2007. Serological Survey Of *Leishmania Infantum* And *Trypanosoma cruzi* In Dogsfrom Urban Areas Of Brazil And Colombia. *Vet Parasitai.*49, pp. 72- 177.
- Santos, F., Lorena, V., Souza, W., Gomes, Y 2015. Spatiotemporal analysis of reported cases of acute Chagas disease in the State of Pernambuco, Brazil, from 2002 to 2013. *Rev Soc Bras Med Trop.* 48(2). p. 181-7.
- Souza, A. , Paulino-Junior, D. , Sousa, M. , Camacho, A. 2008. Clinical and laboratory aspects of natural infection by *Trypanosoma cruzi* in dogs from Mato Grosso do Sul. *Ciênc Rur.* 38(5), p. 1351-6.

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