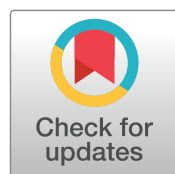




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CASE REPORT

First Urban Case of *Rickettsia parkeri* (Atlantic Rainforest Strain) Rickettsiosis in Mérida, Mexico: A Case Report

Primer caso urbano de rickettsiosis por *Rickettsia parkeri* (cepa Atlantic Rainforest) en Mérida, México

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Rickettsia parkeri, Amblyomma, *Rickettsia rickettsii*, Tick Bites, Doxycycline, *Rhipicephalus sanguineus*, Dermacentor, *Rickettsia* Infections

Palabras clave

Rickettsia parkeri, Amblyomma, *Rickettsia rickettsii*, Picaduras de garrapatas, Doxiciclina, *Rhipicephalus sanguineus*, Dermacentor, Infecciones por rickettsia

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Abstract

Case description:

The first human case in urban ambient of infection by *Rickettsia parkeri* Atlantic Rainforest strain in an 8-year-old male patient is presented.

Clinical findings:

The patient reporting a tick bite presented with fever (38 °C), myalgia, abdominal pain, arthralgia, and mild lymphadenopathy in the right axilla. A lesion was observed at the tick-bite site.

Treatment and results:

A biopsy sample was obtained from the tick bite area for diagnosis by PCR and sequencing of the DNA fragment, resulting in 100% homology towards *Rickettsia parkeri* Atlantic Rainforest strain reported in human cases in Brazil. Treatment consisted of 100 mg of doxycycline for 10 days, with symptoms ceasing 24 hours after the start of treatment.

Clinical relevance:

We report the first case of rickettsiosis by *Rickettsia parkeri* in an urban area in Mexico. Infection is considered mild to moderate, but it is unusual in urban environments. Medics should be concerned about the clinical manifestations associated with tick bites, particularly when lymphadenopathy is present.

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Resumen**Descripción del caso:**

Se presenta el primer caso humano en un entorno urbano de infección por *Rickettsia parkeri*, cepa Atlantic Rainforest, en un paciente masculino de 8 años de edad.

Hallazgos clínicos:

El paciente, quien refirió una picadura de garrapata, presentó fiebre (38 °C), mialgia, dolor abdominal, artralgia y linfadenopatía leve en la axila derecha. Se observó una lesión en el sitio de la picadura de la garrapata.

Tratamiento y resultados:

Se obtuvo una muestra de biopsia del área de la picadura para diagnóstico mediante PCR y secuenciación del fragmento de ADN, que mostró una homología del 100 % con *Rickettsia parkeri*, cepa Atlantic Rainforest, reportada en casos humanos en Brasil. El tratamiento consistió en 100 mg de doxiciclina durante 10 días, con desaparición de los síntomas a las 24 horas de iniciado el tratamiento.

Relevancia clínica:

Reportamos el primer caso de rickettsiosis por *Rickettsia parkeri* en un área urbana de México. La infección se considera de curso leve a moderado, pero es inusual en ambientes urbanos. Los médicos deben estar atentos a las manifestaciones clínicas asociadas a picaduras de garrapata, especialmente cuando se presenta linfadenopatía.

Introduction

Until the end of the 20th century, the only recognized *Rickettsia* species in America were *Rickettsia prowazekii*, *Rickettsia typhi*, and *Rickettsia rickettsii*¹. In the last decade, several *Rickettsia* species belonging to the pathogenic spotted fever group have been identified, including *Rickettsia parkeri*².

Rickettsia parkeri was reported as a pathogenic to humans in United States in 2004 from a patient with an eschar-associated fever produced by a tick bite³. Symptoms and signs reported in Rickettsiosis by *Rickettsia parkeri* are fever, eschar and rash but myalgia are predominant nonspecific symptom with altered laboratory parameters like an increase in transaminases and leukopenia. Doxycycline is considered the recommended antibiotic therapy⁴.

Tick species associated to *Rickettsia parkeri* belongs to the genus *Amblyomma* (*A. americanum*, *A. aureolatum*, *A. dubidatum*, *A. longirostre*, *A. maculatum*/*A. triste*, *A. nodosum*, *A. ovale*, *A. parkeri*, and *A. tigrinum*) as well as *Ixodes scapularis*, *Rhipicephalus sanguineus* s.l., *D. parumapertus*, and *D. variabilis*^{2,5-9}.

In Mexico, *Rickettsia parkeri* was identified in *Amblyomma maculatum*, *Amblyomma ovale*, *Dermacentor parumapertus* and *Rhipicephalus sanguineus* s.l. at the north and south of Mexico⁹⁻¹³.

The first human case of *Rickettsia parkeri* rickettsiosis in Mexico was recently reported in the southeast, in Yucatan. Clinical case reports a tick bite in a woman living in a rural area with the presence of eschar, fever, myalgia and lymphadenopathy¹⁴.

The associated vector of *Rickettsia parkeri* is mostly prevalent in rural and sylvatic areas². In this study, we report on a human case of *Rickettsia parkeri* rickettsiosis in the urban area of Merida City, capital of Yucatan, with no previous report of *Rickettsia parkeri* presence.

Case presentation

On January 16th, 2021, an eight-year-old boy and her mother, who lives in an urban area, close to the downtown of Merida City in Yucatan State (Figure 1), went to the General State Hospital: General Agustin O'Horan due to different symptoms including fever (38 °C), myalgia, abdominal pain, arthralgia and lightly lymphadenopathy at the right axilla. The mother reports identifying a tick bite behind the right ear 3 days prior to the onset of symptoms. Unfortunately, the mother removed and discarded the tick species. The mother mentioned that there are no domestic animals in her house, but her neighbor has two dogs. After a physical examination, medics identified a tick bite lesion (11 x 13 mm) behind the right ear, characterized by an eschar surrounded by erythema, forming a halo (Figure 2). A skin biopsy from the tick bite site was obtained and analyzed by conventional PCR as a probable rickettsial infection.

DNA was purified by following the instructions of the DNeasy Blood & Tissue kit (Qiagen, Cat No. 69504). Conventional PCR was performed to amplify two specific and conserved gene fragments for *Rickettsia* species identification: *gltA* (380bp) and *ompB* (420bp), as the Latin American guidelines for diagnosis of tick-borne rickettsiosis recommend for *Rickettsia* species identification¹⁵. In all conventional PCR procedures, we included a negative control consisting of sterile water and a positive control consisting of *R. typhi* DNA and employed the DreamTaq PCR Master Mix (2X) (Thermo Scientific, Cat. No. k1071).

PCR products from *gltA* and *ompB* gene fragments were analyzed by agarose gel electrophoresis, purified, and sequenced. DNA sequences obtained were compared with other rickettsial DNA sequences by using BLASTn, and amplified products were 100% homologous to *Rickettsia parkeri* strain Atlantic rainforest (Gene bank Accession number: MW653958.1 for the *gltA* PCR fragment and MW653959.1 for the *ompB* PCR fragment) human case in Brazil¹⁶, a recently identified *Rickettsia parkeri* isolate from *Amblyomma ovale* tick species in Veracruz, Mexico State¹¹ as well as a human case of rickettsiosis by *R. parkeri* in a rural area in Yucatan State¹⁴.



Figure 1. Urban area where the patient is located. A black spot indicates the location.



Figure 2. Skin lesion produced by a tick bite 3 days post-infection in the patient.

After *Rickettsia* sp. identification, on January 18th, 2021, the patient was treated with doxycycline 100 mg twice daily for 10 days. Symptoms ceased one day after the beginning of treatment. Due to the medics considering it a mild to moderate infection, the patient did not require hospitalization.

Discussion

In Mexico, particularly in the southeast region, different biotic factors (presence and interaction with dogs and domestic animals) and abiotic factors (hot and humid climate) contribute to the proliferation of rickettsiosis caused by *Rickettsia* species belonging to the spotted fever group and its etiological agents such as *R. parkeri*¹⁰. Presence of the etiological agent has been reported in *Amblyomma mcaulatum* ticks collected from dogs in Tabasco as well as *Amblyomma maculatum* ticks collected from pigs in Campeche at the southern of the Yucatan Peninsula^{12,13}; and recently human cases in rural areas in Yucatan with symptomatic and asymptomatic features^{14,17}.

Until 2014, *Rickettsia parkeri* rickettsiosis have been reported in Latin America in southern countries like Uruguay, Argentina and Brazil¹⁸. In Mexico, recent reports of *Rickettsia parkeri* rickettsiosis are limited to southern regions in Yucatan in rural areas and can easily masquerade as other rickettsioses like *Rickettsia felis* rickettsiosis, Rocky Mountain spotted fever or Dengue fever due to the nonspecific signs and symptoms like fever, arthralgia, headache and epidemiological data like convicence with domestic animals or tick and/or flea bite¹⁴.

A physical examination, looking for arthropod bites or lymphadenopathy, could be suggestive of *Rickettsia parkeri* rickettsiosis.

Our strategy in the diagnosis of this rickettsiosis was the use of two primer pairs for the partial identification of *OmpB* and *gltA* genes, instead of the use of primer pairs that amplify gene fragments with a lower grade of polymorphism between *Rickettsia* species^{15,19}.

In the clinical case, the patient presented a history that allowed the doctors to initially associate with an arthropod-borne disease, such as proximity to domestic animals, a tick bite and its consequent injury to the area¹⁵. The 3-day period that exists between the onset of symptoms and the detection of the ectoparasite indicates that the patient carried it, for a period of at least 10 days. Usually, from the incubation period of the bacteria to the development of symptoms is one week after the tick bite event²⁰.

In addition, other classic symptoms of spotted fever group rickettsiosis, such as a fever of 38 °C, myalgias, arthralgias, and abdominal pain, are nonspecific symptoms that occur in the classic pictures of rickettsiosis but also in other infections caused by other etiological agents²¹. In addition to the tick bite, clinical suspicion related to rickettsiosis, and more specifically, to an infection by *R. parkeri*, can be increased by the presence of lymphadenopathy. In this case, mild lymphadenopathy was present in the right axilla.

Development of symptoms was stopped, and the general condition of the patient improved after providing treatment with Doxycycline^{4,14,22}, an antibiotic widely used in cases of rickettsiosis. However, the development of this disease, caused by *R. parkeri* is usually benign and self-limited²³, not leading to more aggressive symptoms or death, as occurs in cases related to *R. rickettsii*²⁰.

Conclusion

The present work reports a case of rickettsiosis caused by *Rickettsia parkeri* in a child residing in a downtown area of Mérida City, Yucatán, Mexico. The importance of this human case is not only due to the presence of this bacterium in the southeast of Mexico, but also because it cohabits in urban environments. Urbanization affects flora and fauna components as well as the climate of natural ecosystems, which can affect the abundance of ticks and consequently, the incidence and prevalence of tick-borne diseases²⁴. This report evidences the active presence of rickettsiosis caused by *Rickettsia parkeri* in urban environments in Mexico. It is necessary to strengthen the molecular diagnosis of rickettsiosis and complement it with characterization and bioinformatic tools to achieve the identification of the causal species, as well as consider urban areas in epidemiologic studies of rickettsial diseases to identify vectors and reservoirs. It is important to consider, in clinical practice, the presence of eschar and lymphadenopathy as a sign of rickettsial infection caused by *Rickettsia parkeri*.

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