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# Molecular identification of *Bartonella bacilliformis* in ticks collected from two species of wild mammals in Madre de Dios: Peru

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## Abstract

**Objective:** To study the presence of *Bartonella bacilliformis* in ticks collected from two wild mammals in Madre de Dios, Peru.

**Results:** A total of 110 ticks were collected. Among the 43 *Amblyomma* spp. extracted from the 3 *Tapirus terrestris* only 3 were positive for *B. bacilliformis*. In addition, 12 out of the 67 *Rhipicephalus* (*Boophilus*) *microplus* obtained from the 3 *Pecari tajacu* were positive for *B. bacilliformis*. For the first time *B. bacilliformis* have been detected in arthropods other than *Lutzomyia* spp. Further studies are required to elucidate the possible role of ticks in the spread of South American Bartonellosis.

**Keywords:** *Bartonella bacilliformis*, Carrion's disease, Ticks, Peru, PCR

## Introduction

*Bartonella* species are fastidious, gram-negative bacteria associated with a wide spectrum of disease manifestations in humans and animals [1–3]. *Bartonella* spp. are organisms transmitted by a variety of bloodsucking arthropod vectors including fleas, ticks, sandflies and other insects capable of infecting humans [3, 4]. The bacteria are known to invade and replicate inside mammalian hosts erythrocytes and endothelial cells causing long-lasting bacteremia [5, 6].

South American Bartonellosis or Carrion's disease is an infection caused by *Bartonella bacilliformis* which was first described in Peru in 1885 [1]. The infection causes an initially life-threatening phase, known as "Oroya fever", and the second phase with chronic cutaneous manifestations called "Verruga Peruana" [3, 7]. Oroya fever is characterized by acute fever and hemolytic anemia with case fatality rates up to 88% in untreated patients. In contrast, the verruga peruana presents as angiogenic benign skin lesions which are self-limiting and can persist for 6 months [7–9]. However, most patients with Verruga Peruana do not have a clear previous history of febrile illness [7, 10].

*Bartonella bacilliformis* is known to be transmitted by the bite of the female sandfly from the genus *Lutzomyia* spp. and humans are considered the only reservoir host [3, 9]. Due to the favorable ecological conditions for the *Lutzomyia* spp., the disease has been historically restricted to remote valleys located between 500 and 3200 m (1600–10,500 feet) above sea level in the Andes Mountains of Peru, Colombia, and Ecuador [7, 9, 11]. However, in the last years, the disease has been expanding over broader geographical areas including lower altitude territories, high forest regions and valleys located in the eastern regions of the Andes representing a major

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