Short Report: Serologic Evidence of Human Ehrlichiosis in Peru

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Abstract. A serosurvey for human ehrlichiosis caused by *Ehrlichia chaffeensis* and *Anaplasma phagocytophilum* was performed in different regions of Peru by using indirect immunofluorescence assays (IFAs). Regions included an urban community in a shantytown in Lima (Pampas) and three rural communities located on the northern coast of Peru (Cura Mori), in the southern Peruvian Andes (Cochapata), and in the Peruvian jungle region (Santo Tomas). An overall *E. chaffeensis* seroprevalence of 13% (21 of 160) was found by IFA. Seroprevalences in females and males was 15% (16 of 106) and 9% (5 of 53), respectively. Seroprevalences in Cura Mori, Cochapata, Pampas, and Santo Tomas were 25% (10 of 40), 23% (9 of 40), 3% (1 of 40), and 3% (1 of 40), respectively. Seroprevalences in Cura Mori and Cochapata were significantly higher than in Santo Tomas or Pampas (*P* < 0.01). No sera were reactive to *A. phagocytophilum*. These findings suggest that human infection with *E. chaffeensis* occurs in Peru. Further studies are needed to characterize *Ehrlichia* species in Peru, their vectors and their clinical significance.

Human ehrlichiosis are emerging tick-borne infections that were first recognized in humans in 1987. Human infections are caused by at least 3 distinct species: *Ehrlichia chaffeensis*, *E. ewingii*, and *Anaplasma phagocytophilum*. *Ehrlichia chaffeensis* and *A. phagocytophilum* are the causative agents of human monocytic ehrlichiosis (HME) and human granulocytic anaplasmosis (HGA), respectively. Serosurveys and molecular techniques have documented the presence of human ehrlichiosis in South America. Evidence of human ehrlichiosis in Peru is lacking although *E. canis* infection was recently demonstrated in dogs. Given the absence of data, we conducted a serosurvey in geographically distinct rural communities from Peru to establish the possible presence of this pathogen.

Healthy inhabitants from four communities were surveyed for the presence of antibodies against *E. chaffeensis* and *A. phagocytophilum* (Figure 1).

The first community was Cura Mori (population = 159), a sea level rural community located in the northern coastal region of Peru 15 km southwest of Piura. Agriculture and animal husbandry (e.g., swine, goats) are the main economic activities of the community. Village inhabitants live in adobe houses with no piped water or sewage systems. The second community was Cochapata (population = 138), a rural village in the southern Peruvian Andes situated 98 km north of Cuzco at an altitude of 4,173 meters. The main sources of employment are agriculture and animal husbandry. Livestock raised by the community include swine, sheep, and cattle. Village inhabitants live in adobe houses with dirt floors and piped river water. Serum samples in Cura Mori and Cochapata were obtained as part of a cysticercosis serosurvey during 1999.

The third community was Santo Tomas (population = 1,293), a rural community on the Nanay River in the northeastern Amazon in Peru. The town is located 15 km from Iquitos. Agriculture is the main economic activity. Most of the population relies on wells for drinking water and uses latrines for waste disposal. Houses are generally made of wood, and some are without walls, with palm leaf roofs usually open at the top. The fourth community was Pampas, a sea level, peri-urban shantytown (population = 40,000) located in the southern part of Lima. It is located near the Pacific Ocean and has a desert climate. Households are built next to each other and made of woven thatch walls with roofs of plastic coverings, usually containing one or two bedrooms. Most houses in this area have piped water. Serum samples in Santo Tomas and Pampas were collected as part of surveys of strongyloidiasis during 1998 and 2003 respectively.

This study was reviewed and approved by the ethical review boards of AB Prisma (Lima, Peru) and the Johns Hopkins University School of Public Health (Baltimore, Maryland). Serologic specimens were tested in a private laboratory for immunoglobulin G antibodies against *E. chaffeensis* (HME) and *A. phagocytophilum* (HGA) by indirect immunofluorescence assay (IFA). The HGA and HME IFAs were performed on all the serum samples according to the manufacturer’s instructions (IGeneX Inc, Palo Alto, CA). Titters ≥ 80 were considered positive.

Mean age of participants whose age was available (n = 78) was 30.2 years (range = 6–85 years). An overall seroprevalence for HME of 13% (21 of 160) was found by IFA. Five (95) of 53 were males and 16 (15%) of 106 were females. Seroprevalences of 25% (10 of 40), 23% (9 of 40), 3% (1 of 40), and 3% (1 of 40) were found in Cura Mori, Cochapata, Pampas, and Santo Tomas, respectively. Seroprevalences in Cura Mori and Cochapata were significantly higher than in Pampas and Santo Tomas (*P* < 0.01, by chi-square test). Twelve persons (8%) had titers ≥ 160. All HGA IFA test results were negative.

Our findings suggest that antibodies against *E. chaffeensis* or other closely related *Ehrlichia* spp, are present in human serum samples from geographically distinct communities in Peru. No sera were reactive to *A. phagocytophilum*. Human ehrlichiosis was first reported in Venezuela where polymerase chain reaction (PCR) techniques demonstrated that up to 30% of patients with HME could be infected with *E. canis*. Use of similar techniques in a more recent study suggested an *E. chaffeensis* infection in a Venezuelan child. Serosurveys in Argentina, Brazil, Chile, Mexico, and Venezuela have detected human ehrlichiosis but it is unclear what

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_Ehrlichia_ species may be causing human infection. Recent findings using molecular diagnostic techniques indicate that _E. chaffeensis_ may be present in the Brazilian marsh deer, which suggests that this mammal may act as a natural reservoir of the agents that cause HME. \(^{11}\) High seroprevalences of ehrlichiosis observed in the rural communities of Cura Mori and Cochapatá may be caused by vertebrate reservoirs that remain to be identified. Livestock and dogs are quite prevalent in these communities and their role as potential reservoirs of the bacterium should be explored.

In North America, _E. chaffeensis_ is transmitted by the lone star tick, _Amblyomma americanum_, but this tick is not present in South America. _Amblyomma cajennense_ is known to transmit rickettsial spotted fever in South America and has been implicated as the possible vector of _E. chaffeensis_. \(^{4}\) Further studies using molecular techniques are needed to clarify if this tick may be involved in the transmission of _E. chaffeensis_ if this organism indeed occurs in South America.

In our study, we used _E. chaffeensis_ and _A. phagocytophilum_ antigen in the IFA and did not test sera against other ehrlichial species. Serologic cross-reactions between _E. chaffeensis_, _E. ewingii_, _E. canis_, and _Rickettsia rickettsii_ are known to occur. \(^{12}\) Therefore, we cannot exclude the possibility that cross-reacting antibodies may have been detected in some persons. In our experience, sera containing _R. rickettsii_ cross-reacting antibody give false-positive reactions in HME and HGA IFAs. We did not find any serum samples positive in both assays; therefore, it is unlikely that cross-reactions with this organism occurred. It is important to rule out cross-reactivity with _R. rickettsii_ because serologic evidence of human infection with this pathogen has been demonstrated near the study communities of Cura Mori and Cochapatá. \(^{13}\)

Our findings and the recent description of a new strain of _E. canis_ identified in Peruvian dogs using PCR techniques highlight the importance of ehrlichiosis as an emerging infection in Peru. There is a need for deliberate search of human cases in Peru, especially among patients with compromised immunity such as infection with human immunodeficiency virus in whom severe or fatal HME has been described. \(^{12}\) Further studies are needed to characterize the _Ehrlichia_ species in Peru and the natural reservoirs and tick vectors involved in transmission and their clinical significance.

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