Serological Survey for Tick-Borne and Flea-Borne Pathogens on Human Blood Samples

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Western Gulf Center of Excellence for Vector-Borne Diseases

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INTRODUCTION

Approximately **642,602** cases of vector-borne diseases were reported to the Centers for Disease Control and Prevention (CDC) during 2004-2016.

- Tick-borne diseases account for **more than 77%** of these reported cases in the United States.

There is increasing **concern** about the rising incidence of vector borne-disease outbreaks.

- Severe, prevalent and rapidly increasing tick-borne diseases in the United States include the Rocky Mountain spotted fever caused by *Rickettsia rickettsii* and human erlichiosis *caused by Erlichia chaffeensis as well as the* flea-borne disease, murine typhus, caused by *Rickettsia typhi.*

The distribution and prevalence of tick-borne and flea-borne pathogens in the US-Mexico border region is poorly understood.

- Identifying Rickettsial antibodies in human blood samples illustrates the importance of tick-borne and flea-borne disease surveillance and research, but more importantly, determines if the El Paso region is affected by these pathogens.

Vector-Borne Diseases- An Increasing Threat

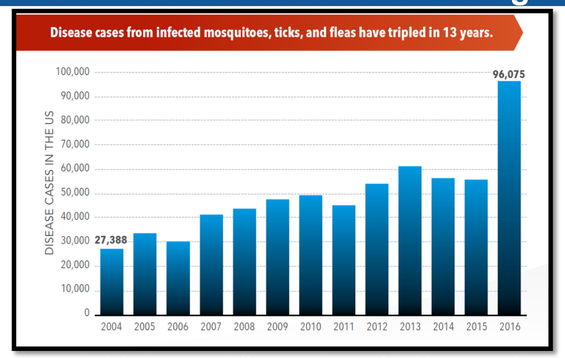


Figure 1. CDC reported that cases of diseases transmitted by mosquitoes, ticks, and fleas tripled during the years 2004-2016.

OBJECTIVE

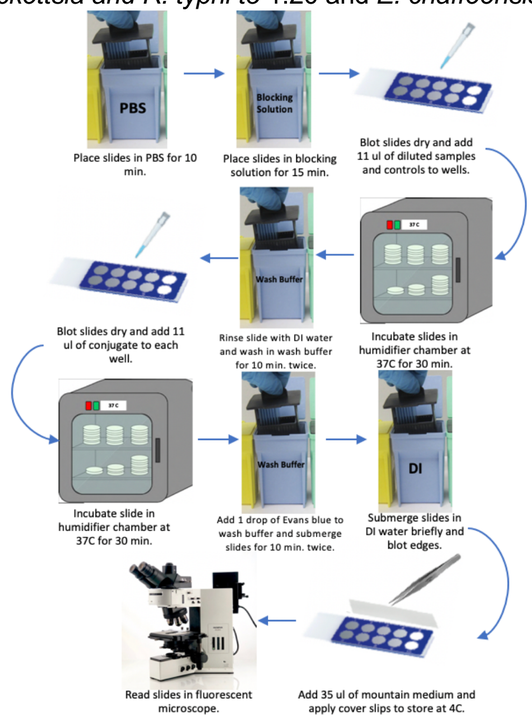
To determine if humans in the El Paso community are infected by *R. rickettsii, R. typhi,* or *E. chaffeensis* using an IFA.

- Test a collection of approximately 3,000 human cord-blood plasma samples that were collected during 2017 and 2018 from child-bearing mothers at 3 hospitals in the city of El Paso, Texas.

METHODS & RESULTS

The testing of human serum samples was performed using an IgG immunofluorescence assay (IFA) specific for *R. rickettsii, R. typhi*, and *E. chaffeensis*.

- IFA slides were provided and coated with inactivated *Rickettsia* and *Erlichia* antigens by The University of Texas Medical Branch at Galveston.
- The following were diluted: blood serum samples to 1:64, anti-human IgG conjugated with FITC to 1:1200, and positive controls for *R. rickettsia and R. typhi to* 1:20 and *E. chaffeensis to 1:10.*



We tested 40 human blood samples for *Rickettsia rickettsii* which resulted negative.

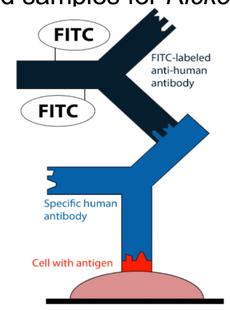


Figure 2. If the sample is positive, antibodies from the sample will bind to antigens in the infected cells with Rickettsia. Then, the FITC conjugated anti-human IgG antibody will bind to the antibodies from the sample (EUROIMMUN US, Inc. 2020).

Rickettsiales IFA

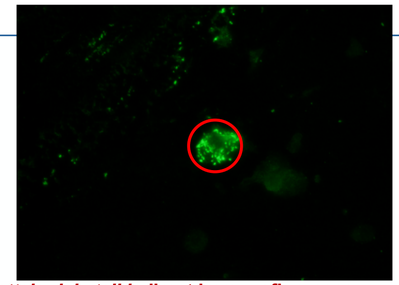


Figure 3. *Rickettsia ricketsii* indirect immunofluorescence assay showing the morphology of *R. rickettsii* in Vero cells.

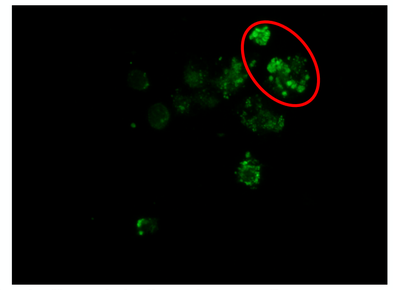


Figure 4. *Ehrlichia chaffeensis* indirect immunofluorescence assay showing the morphology of *E. Chaffeensis* in DH282 cells.

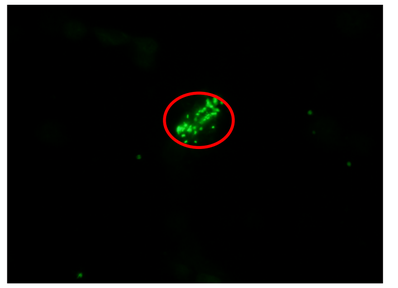


Figure 5. *Rickettsia typhi* indirect immunofluorescence assay showing the morphology of R. typhi in Vero cells.

FUTURE DIRECTIONS

- Continue testing for Rickettsia in approximately 3,000 blood samples from child-bearing women with an IFA.
- Isolate *R. rickettsii* from samples collected in Mexico to compare the virulescenses of Mexican vs. American Rickettsial strains.
- Get permission from El Paso Animal Control Center to collect ticks and fleas from domestic animals.
- Begin testing deer blood samples for Heartland virus and Bourbon virus with IgG ELISA. Then, test if ticks collected from deer are infected by Heartland or Bourbon using a real-time PCR.

Contact Information

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References

References available upon request.