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A CASE HISTORY OF CONCURRENT ROCKY MOUNTAIN SPOTTED FEVER AND HUMAN MONOCYTIC EHRLICHIOSIS IN FLORIDA

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On 23 Oct 2009 the first author found 4 small ticks (~2 mm in length) engorged and attached to his left leg after conducting 2 days of field work in Citra (UF-PSREU, Marion County, FL) and Cross Creek (Lochloosa Wildlife Conservation Area, Alachua County, FL). Two of the specimens were preserved in alcohol. Nine days later (1 Nov) he developed a low-grade fever. By 7 Nov he began to experience minor myalgia (muscle pain) and intensifying cycles of fever, chills, and sweating, which were no longer controlled with ibuprofen. Assuming it was influenza, because of the recent outbreaks, he delayed seeking medical attention. On 9 Nov his spouse (a physician, the second author) took him to the emergency room of a Broward County FL hospital, where he presented with generalized "flu-like" symptoms—a fever of 38.9°C (102°F), frontal-temporal headaches, backaches, and malaise. A rapid diagnostic test for novel influenza A (H1N1) was negative, and he was admitted to the ICU for a fulminant (sudden and severe) febrile illness of unknown cause. Initial tests indicated severe thrombocytopenia (low platelets), moderate leukocytopenia (low white blood cells), elevated liver enzymes, and dehydration. That evening, the scientist contacted his senior technician and requested that the tick specimens be photographed and sent to a medical entomologist for identification. By the next day, they were identified as nymphs of the lone star tick, *Amblyomma americanum* L. (Acari: Ixodidae) (Fig. 1). Alerted to the possibility of a tick-borne illness, physicians started the patient on intravenous doxycycline, a broad spectrum tetracycline antibiotic.

Over the next few days paroxysmal high fevers persisted, spiking to 40°C (104°F), and the patient's condition deteriorated to a moribund state. Imaging techniques (CT scan, ultrasound, X-ray) revealed pleural effusion (fluid in the chest cavity) and hepatomegaly (enlarged liver). The patient developed respiratory distress, anemia, intense myalgia and arthralgia (joint pain), nausea, and a blotchy rash that started on the back and spread to the ventral trunk. On day 5 post-admission (13 Nov), the fever finally subsided and the patient began to show improvement. During the 11-d hospitalization (the first 7 in ICU), doctors ruled out numerous viral infections (e.g., influenza strains, HIV, Epstein-Barr, cytomegalovirus) and blood disorders (e.g., leukemia, lymphoma). Blood samples were sent to several reference laboratories to test for vector-borne pathogens, and negative results were obtained for the pathogens causing Lyme disease, typhus, encephalitis, dengue, malaria, and West Nile virus. On d 8 of hospitalization, positive results (indirect immunofluoresence assay, State Health Laboratory,

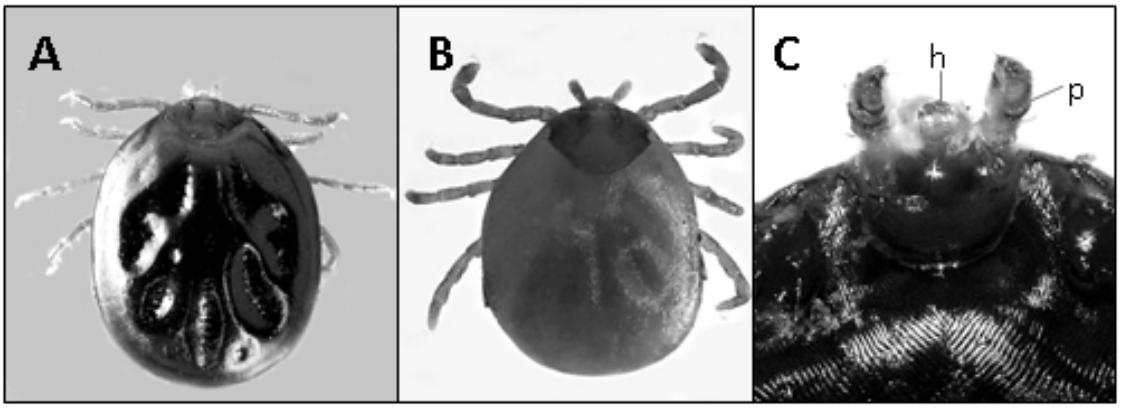

Fig. 1. Engorged nymphs of *Amblyomma americanum* (Lone star tick) removed from author who contracted Rocky Mountain spotted fever (RMSF) and human monocytic ehrlichiosis (HME) after conducting field studies in north-central Florida. *Amblyomma americanum* is a proven vector of *Ehrlichia chaffeensis,* the pathogen causing HME, and a suspected vector of *Rickettsia rickettsii*, the causative agent of RMSF. A. Dorsal view of specimen 2.7 mm long. B. Dorsal view of specimen 2.0 mm long. C. Ventral view of specimen A showing pedipalp (p) and hypostome (h).

Jacksonville) were obtained for *Rickettsia rickettsii,* the pathogen causing Rocky Mountain spotted fever (RMSF). Post-release from the hospital, results came back seropositive (private laboratory, Tampa) for *Ehrlichia chaffeensis*, the causative agent of human monocytic ehrlichiosis (HME). Based on elevated titers of IgG and IgM antibodies to both pathogens, physicians concluded the patient had concurrent RMSF and HME, 2 tick-borne rickettsial diseases effectively treated with doxycycline.

RMSF is an acute disease, described as one of the most virulent human infections ever identified (Dumler & Walker 2005), and state health departments are required to report all cases to the Centers for Disease Control and Prevention (CDC). Timely diagnosis is critically important because mortality may be as high as 23% if treatment is delayed (Kirkland et al. 1995). The etiologic agent, *R. rickettsii*, is an obligate intracellular coccobacillus that infects vascular endothelial cells and smooth muscle, affecting multiple organ systems (Dantas-Torres 2007). *Rickettsia rickettsii* is transmitted through salivary secretions during a blood meal from an infected tick. Certain ticks serve as both vector and reservoir, because the pathogen can be acquired from vertebrate hosts and then maintained across several tick generations via transovarial passage. Primary vectors are *Dermacentor variabilis* (Say) (American dog tick) in the eastern U.S. and *D. andersoni* Stiles (Rocky Mountain wood tick) in the West, but other tick species have been implicated, including *A. americanum, A. cajennense* (F.) (cayenne tick) and *Rhipicephalus sanguineus* Latreille (brown dog tick) (Warner & March 2002). Although first described from the Rocky Mountain area in the 1800s, RMSF occurs most frequently in the south-Atlantic states, with the highest incidence in North Carolina (CDC 2008c). The disease is uncommon in Florida, with only 154 cases reported in the last 10 years, mostly from northern and north-central counties (FL Dept. of Health 2009b). The probability of contracting RMSF from a tick bite is actually quite low, as only 1-5% of the tick population is estimated to harbor *R. rickettsii,* and pathogen transfer to a host requires at least 6-20 h of feeding (Warner & Marsh 2002). However, the severity of the disease poses a high risk once infection occurs, with onset of initial symptoms varying from 3-12 d. As detailed in the case history above, symptoms of RMSF are nonspecific, and its diagnosis presents a difficult challenge for physicians, especially if tick involvement is not recognized.

Ehrlichiosis is a general term applied to tick-borne diseases caused by *Ehrlichia* bacteria that selectively infect white blood cells. Several pathogens of veterinary importance (e.g., *E. bovis, E. canis, and E. ovina*) have been known for decades (Harwood & James 1979), but in recent years human forms of ehrlichiosis have been recognized in the U.S. (Vorvick et al. 2009). HME is caused by *E. chaffeensis*, an obligate intracytoplasmic bacterium that infects monocytes and macrophages. Like RMSF, HME has clinical manifestations that are characterized as generalized flu-like symptoms. Most people experience mild to moderate symptoms, but for others, ehrlichiosis can be just as life-threatening as RMSF. HME occurs throughout the Southeast and south-central states, mirroring the distribution of its principal vector, *A. americanum,* but *D. variabilis* is also a potential vector. It is likely that many cases of HME go undiagnosed due to mild symptoms, so its prevalence in the U.S is uncertain. Florida records indicate 71 cases of HME from 2000 to 2008 (FL Dept. of Health 2009a).

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Summary

Concurrent Rocky Mountain spotted fever and human monocytic ehrlichiosis was documented for the first time in Florida. Both are acute, potentially fatal diseases whose pathogens are vectored by ticks commonly encountered in the Southeast, *Dermacentor variabilis* and *Amblyomma americanum*. Though rare in Florida, the rickettsial pathogens for both diseases are endemic within the state's tick populations. Researchers conducting field studies in heavily wooded areas of north-central Florida are strongly advised to take precautions against tick bites (see recommendations CDC 2008b).

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