

# Rickettsiosis Information

**Tests available at VBDDL:** Serology for spotted fever group (SFG) rickettsiae and PCR for spotted fever and typhus group rickettsiae.

Rickettsiosis in dogs and people can be attributed to pathogens in two groups, the spotted fever group and the typhus group. The SFG group includes *R. rickettsii* (the type species) and cause of Rocky Mountain spotted fever, *R. africae*, *R. akari*, *R. australis*, *R. conorii*, *R. felis*, *R. honei*, *R. montanensis*, *R. parkeri*, *R. rhipicephali* and *R. sibirica* among others. The typhus group Rickettsiae, which includes *Rickettsia typhi* and *Rickettsia prowazekii*, have not been implicated as a cause of illnesses in dogs, and experimental infection of dogs with typhus group rickettsiae in our laboratory did not result in disease.

Throughout the world, spotted fever group rickettsiae are transmitted by *Amblyomma*, *Dermacentor*, *Haemaphysalis*, *Ixodes* and *Rhipicephalus* tick species; typhus group by fleas and the human body louse. *D. variabilis* and *D. andersoni* have been considered the primary vectors for RMSF in the USA. Transmission of *R. rickettsii* by an *A. americanum* (Lone Star) tick to a scientific director of the VBDDL resulted in the development of RMSF (Emerg Infect Dis. 2011;17:873-5). In addition, evidence shows that an outbreak of RMSF in a non-endemic area of Arizona was caused by *R. sanguineus* (The Brown Dog Tick).

Regardless of the strain or species of SFG rickettsiae, these organisms induce an acute febrile illness with duration of signs from 7 to 10 days secondary to endothelial cell damage, which results in vasculitis, altered vascular permeability, edema and necrosis. Dogs may recover spontaneously, recover following doxycycline treatment, or die. We are unaware of a chronic phase for this disease. Immunity following infection is most likely permanent.

The dog is a sentinel for RMSF; therefore it is important that veterinarians accurately diagnose RMSF. Diagnostic confirmation of RMSF in a dog, allows the veterinarian to discuss the risk of *R. rickettsii* transmission in the peri-domestic surroundings.

## **Disease (one or more of the following are good reasons to test)**

- Fever, anorexia, depression, ocular discharge, scleral injection, tachypnea, coughing, vomiting, diarrhea, muscle pain, neutrophilic polyarthritis, and a diverse group of neurologic signs including hyperesthesia, ataxia, vestibular signs, stupor, seizures, coma.
- Weight loss.
- Joint, muscle and/or neurologic pain suggestive of polyarthritis, polymyositis, or meningitis.
- Retinal hemorrhages.
- Epistaxis and petechial to ecchymotic hemorrhages.
- Scrotal edema in male dogs.
- Cardiovascular collapse, oliguric renal failure or brain death in the terminal stages.
- Gangrene affecting the distal extremities, scrotum, mammary glands, nose or lips associated with severe vascular obstruction can induce substantial tissue loss, necessitating reconstructive surgery.
- Clinical manifestations in dogs are identical in most instances to manifestations reported in human patients.

**Testing** Serology (IFA) requires 2mls serum for testing.

If tested early in the course of the disease (first 5 days), a dog will be negative for antibodies to spotted fever group rickettsiae but will subsequently seroconvert. Therefore, low or negative titers found in acute samples do not eliminate the diagnosis of RMSF. Serum should be obtained during the acute phase of the disease and 10 to 14 days later (convalescent titer). Doxycycline treatment has a minimal effect on seroconversion, unless treatment is initiated within the first 3 days of illness. Due to serologic cross reactivity between the *R.rickettsii* antigen used in the VBDDL with other spotted fever group rickettsiae (i.e. *R.parkeri*, *R.felis*, *R.amblyommi*) the infecting species may only be determined by PCR with sequence analysis.

PCR: requires 2mls of EDTA whole blood. The OmpA gene has previously been used as a sensitive target for SFG rickettsiae in conventional and in real-time quantitative PCR assays. Use of the 23S-5S gene target now allows for the detection of SFG and Typhus group *Rickettsia* spp.. Sequencing of amplicons is the only way to determine the species of Rickettsia detected.

**Treatment:** Doxycycline (10 to 20 mg/kg) for two to three weeks. RMSF in dogs and people responds to antibiotics within 24-48 hours, which helps confirm the presumptive diagnosis.

### **Insights gained from VBDDL associated research.**

- In response to a referring veterinarian's call in the mid 1980's seeking consultation relative to sick and dying Huskies in a newly built kennel in North Carolina, **Rocky Mountain spotted fever** was diagnosed by skin biopsy and first identified as a disease of dogs. Published article: Breitschwerdt EB, Meuten DJ, Walker DH, Levy M, Kennedy K, King M, Curtis B. Canine Rocky Mountain spotted fever: a kennel epizootic. Am J Vet Res. 1985;46:2124-8.
- Several treatment studies have been conducted in dogs.
  - Prednisolone at anti-inflammatory or immunosuppressive dosages in conjunction with doxycycline does not potentiate the severity of *Rickettsia rickettsii* infection in dogs. Breitschwerdt EB, Davidson MG, Hegarty BC, Papich MG, Grindem CB. Antimicrob Agents Chemother. 1997 Jan;41(1):141-7.
  - Breitschwerdt EB, Papich MG, Hegarty BC, Gilger B, Hancock SI, Davidson MG. Efficacy of doxycycline, azithromycin, or trovafloxacin for treatment of experimental Rocky Mountain spotted fever in dogs. Antimicrob Agents Chemother. 1999;43:813-21.
- PCR optimization: As part of her PhD thesis, Linda Kidd DVM, PhD optimized the OmpA target gene for the detection of spotted fever group Rickettsia spp in conventional and quantitative PCR assays to be used by the VBDDL. Published article: Kidd L, Maggi R, Diniz PPVP, Hegarty B, Tucker M, Breitschwerdt B. 2008. Evaluation of conventional and real-time PCR assays for detection and differentiation of spotted Fever Group *Rickettsia* in dog blood. Vet Microbiol 129:294-303.

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