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FOCUS ON

Rocky Mountain Spotted Fever in Ontario

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Introduction

This document explores the epidemiology and clinical presentation of Rocky Mountain spotted fever (RMSF). RMSF is caused by the bacterium *Rickettsia rickettsii* and transmitted among hosts by infected ticks. The American dog tick (*Dermacentor variabilis*), the primary vector of *R. rickettsii*, is a common tick species in Ontario.[1] While cases of RMSF occur throughout North America, the highest incidence of disease is in the Southern United States (US).[2] Signs and symptoms of RMSF include fever, headache, nausea, muscle pain, and rash. If left untreated, RMSF can be fatal or lead to long-term sequelae.

Public Health Ontario (PHO) developed this Focus On to raise awareness of *R. rickettsii* and RMSF among Ontario public health partners and healthcare providers. This resource is both timely and essential, given the emergence of RMSF in Ontario.

Key Messages

- *Rickettsia rickettsii*, the bacterium that causes Rocky Mountain spotted fever (RMSF), is present in Ontario. American dog ticks, which are commonly found in Ontario, are the likely vectors. In June 2025, the Ontario Veterinary College (University of Guelph) notified PHO of a cluster of RMSF cases among dogs with exposures at Long Point, Ontario. In July 2025, American dog ticks collected from the Long Point area tested positive for *R*. *rickettsii*. In August 2025, PHO became aware of two confirmed human cases of RMSF, both likely to have acquired the infection from Long Point.
- Clinicians should consider RMSF in their differential diagnoses for individuals with compatible symptoms, recent travel history to Long Point and surrounding areas, and/or history of a tick bite. RMSF is classically characterized by fever, headache, and rash. Testing via serology and PCR is available at PHO. Treatment with the antibiotic doxycycline is effective.
- Preventive measures for tick-borne diseases include using insect repellent, wearing protective clothing, performing regular tick checks, and promptly removing ticks to reduce the risk of infection.

Background and Ontario Context

Rickettsia rickettsii is found throughout North, Central, and parts of South America. Historically, RMSF cases in Canada have been reported from British Columbia and Alberta, but have been exceedingly rare in Ontario with only two documented human cases since 1979.[3,4,5] Since RMSF is not a DoPHS in Ontario and not reportable to public health authorities, the incidence of disease is likely underestimated. *Rickettsia rickettsii* is not typically detected in American dog ticks in the northern US nor in Ontario.[6,7] Together with human disease surveillance and serological studies of dogs, vector surveillance studies show that RMSF is rare in Canada.[3,6,8,9] The American dog tick is the second most commonly encountered tick in Ontario, behind the blacklegged tick (*Ixodes scapularis*), and its distribution is expected to expand due to climate change (increasing temperatures).[2,10–12]

In June 2025, PHO was notified by the Ontario Veterinary College (University of Guelph) of a cluster of confirmed RMSF cases among dogs all likely exposed at Long Point, Ontario.[13] In Ontario, RMSF in animals such as dogs is not an immediately notifiable hazard. Following this notification, *R*. *rickettsii* was detected in American dog ticks collected from Long Point near locations where the dogs were exposed. These are the first *R*. *rickettsii* positive ticks in Ontario in over 50 years. Following the detection of RMSF in dogs and *R*. *rickettsii* in American dog ticks, PHO was made aware of two confirmed human cases of RMSF with compatible clinical presentation and confirmatory laboratory evidence, both with exposure history to suggest Long Point is likely the location of acquisition.

Methods

We conducted a literature search on August 6, 2025, in PubMed using the key phrases “Rocky Mountain spotted fever” and “*Rickettsia rickettsii*”. The exposures of interest were ticks and the outcome of interest was RMSF. English-language peer-reviewed and non-peer-reviewed records that described RMSF and its epidemiology were included. Out-of-scope for this document was the pathophysiology and immunology of RMSF. The search concentrated on the epidemiological information relevant to Ontario. In addition, we concentrate on the epidemiology of RMSF in Canada, Mexico, and US; epidemiological characteristics of RMSF in Central and South America are out-of-scope for this document.

Results

Ecology

Rickettsia rickettsii is an obligate intracellular *Alphaproteobacteria* (*Rickettsiaceae*) that relies on host cells for survival and reproduction.[14] *Rickettsia rickettsii* is transmitted among hosts through tick bites. Vectors in North America include the Rocky Mountain wood tick (*Dermacentor andersoni*) in the western US and Canada, the brown dog tick (*Rhipicephalus sanguineus*) in the southwest US and northwestern Mexico, and the American dog tick (*D. variabilis*) elsewhere. It is not known whether the newly described tick species *Dermacentor similis* in the western United States could also be a vector.[15] The prevalence of *R. rickettsii* in ticks in North America is typically low; in the US, the pooled prevalence of *R. rickettsii* is 0.5% (95% confidence interval [CI]: 0.15–1.05) among all tick species tested.[16] In a study of 883 American dog ticks across 12 states in the US, only a single tick (0.1%) was positive for *R. rickettsii*. Recent Canadian studies looking for *R. rickettsii* in *D. variabilis* have not detected the bacteria.[6,8] *Rickettsia rickettsii* detections in Ontario ticks have been documented from American dog ticks and rabbit ticks (*Haemaphysalis leporispalustris*), all prior to 1973.[17]

Dermacentor variabilis larvae and nymphs feed on small rodents (e.g., voles, mice, chipmunks), some of which can act as amplifying hosts of *R. rickettsii*.[18] Important hosts for adult *D. variabilis* are dogs, racoons, and opossums. Unlike adult stages, larvae and nymphs rarely feed on humans. *Rickettsia rickettsii* is transmitted from adult female *D. variabilis* to eggs (transovarial transmission) and then to subsequent stages (transstadial transmission); thus, the tick and its progeny are infected for life. Ticks, aside from being vectors, act as the major reservoir and amplifier of *R. rickettsii* in nature. American dog ticks frequent areas with tall grasses, such as fields along the edge of woodlots, fence rows, and ditches; they are more abundant in areas of low elevation, high temperature, and high humidity, such as grassy areas along bodies of water (e.g., rivers, lakes, ponds).[18–20]

Epidemiology

While found throughout North America, RMSF incidence is greater in the Southern US (i.e., Alabama, Arkansas, Missouri, North Carolina, and Tennessee), Southwest US (i.e., Arizona), and Northwest Mexico (i.e., Baja California, Sonora). The incidence of spotted fever rickettsioses, including RMSF, has been increasing in the US since the early 2000s. In the US, the incidence rate per 1,000,000 population of spotted fever rickettsioses increased from 11.9 in 2014 to 19.3 in 2017.[2] The highest incidence rate of spotted fever rickettsioses was 21 per 1,000,000 population in Arkansas, Kentucky, and North Carolina. In a modelling study of RMSF epidemiology in the Midwestern US (i.e., Arkansas, Kansas, Missouri, Oklahoma), factors contributing to increased incidence of RMSF include higher average relative humidity and higher average land surface temperature.[21]

Where rickettsial diseases (including RMSF) are reportable to Canadian public health authorities, the case counts are low, averaging about three cases per year in British Columbia, and one per year each in Alberta and Saskatchewan[17,22–24] Seropositivity to rickettsiae (defined as a single positive serological test for either spotted fever group or typhus group rickettsiae) in Ontario residents increased from 13% (317/2,438) in 2013 to 35% (648/1,851) in 2018.[3] From the same Ontario study, a putative laboratory-diagnosed case of RMSF was reported based on a four-fold increase in antibody titres between acute and convalescent sera. An additional two case reports of RMSF were reported in Ontario in 1979 and 2024, and both cases had exposures in the Ottawa region.[4,5]

In the US, the highest incidence of spotted fever rickettsioses are among those aged 55–79 years (>19 per 1,000,000 population) and deaths are most common among children.[2] In a selection of studies (n=7), the majority of RMSF cases occur among males and children or young adults; however, we note that

most studies concentrate on the pediatric population (Table 1). The incidence of RMSF is seasonal and corresponds to activity of adult American dog ticks, so while infections can occur year-round, the majority of infections occur in the summer from May through August. In the US, incidence of spotted fever rickettsioses is highest in June and July.[2] In Ontario, passive tick submissions of *D. variabilis* peak in late May and early June.[1]

Rickettsia rickettsii can be transmitted through contact with tick saliva, feces, and other fluids. Rarely, infection can occur through aerosolized bacteria, thus, veterinary professionals and laboratory workers may be at risk of infection.[25]

Table 1. Demographic summary for cases of RMSF reported in the US and Mexico.

Study	No. patients	Age	Proportion female	Case fatality rate
US[26]	340	69% ≤18 years	48%	9%
Arizona, US[27]	205	Mean: 19.8	48%	7%
Arizona, US[28]	80	Median: (IQR): 15 (5–41)	50%	21%
California, US[29]	78	Median (range): 44 (4–81)	37%	7%
Baja California, Mexico[30]	779	Mean (±SD): 23.9 (17.67)	57%	18%
Sonora, Mexico[31]	510	Median (IQR): 19 (10–42)	48%	44%
Sonora, Mexico[32]	104	Mean (±SD): 7.7 ± 3.8	45%	20%

Clinical Manifestations and Disease Severity

The incubation period for *R. rickettsii* ranges from 2 to 14 days (with an average of 7 days) following the bite of an infected tick.[33] The classic symptoms of RMSF include fever, rash, and headache in a person with a history of a tick bite.[34] Early in illness, most individuals have non-specific signs and symptoms including fever, headache, muscle pain, joint pain, abdominal pain, and nausea, with or without vomiting.[28,35] In approximately 95% of children and 80% of adults, a maculopapular rash on the wrists, forearms and ankles, sometimes involving the palms and soles, typically starts 2 to 5 days following onset of illness.[33] This characteristic rash spreads to the trunk and becomes petechial over time, typically occurring on the 6th day after initial symptoms, and is indicative of more severe disease progression. In a small proportion of cases, the rash can be absent, can appear later in course of disease, or can be difficult to recognize, leading to misdiagnosis and delayed treatment. *Rickettsia rickettsii* first infect the endothelial cells of blood vessels, causing vascular leakage and the classic maculopapular rash, followed by spread of the bacteria to other organs.[36] Major complications include encephalitis, respiratory distress, cardiac arrythmias, and coagulopathy. As the illness progresses, thrombocytopenia (low platelet count) becomes more prevalent and severe.

If left untreated or if treatment is delayed, RMSF can lead to death, and those that survive can suffer from long-term sequelae.[26,37,38] In California, US, among 78 reported clinical cases of RMSF, 57% required hospitalization, and in Sonora, Mexico, 52% of 759 patients with RMSF required hospitalization.[29,30] Depending on study location, the case fatality rate for RMSF ranges from 7–44%

(Table 1); however, in the US, current fatality rates range from 5–10% in symptomatic patients.[2] In a study of 80 hospitalized patients in Arizona, 21% died, 38% survived with ongoing symptoms and loss of function, and 23% had neurological sequelae.[28] Patients at risk of long-term sequelae had a longer hospital stay, higher level of disability at discharge, and delayed antibiotic treatment. In the US, surveillance data indicates those with compromised immune systems or glucose-6-phosphate dehydrogenase deficiency are at higher risk of hospitalization, severe disease, or death.[2]

Treatment and Prevention

Early empiric antibacterial therapy can prevent severe disease and death.[26,39] Delays in antibiotic treatment of more than five days is associated with increased risk of mortality.[27] For adults and children, doxycycline is the treatment of choice for RMSF.[40,41]

Currently there is no vaccine to prevent RMSF. Early detection and removal of attached ticks may prevent disease transmission. The minimum period of tick attachment for disease transmission ranges from 4–6 hours.[33] Tick exposure can be prevented through environmental tick control, tick repellents for dogs, and personal protection against tick bites (e.g., use of N,N-diethyl-meta-toluamide [DEET] or icaridin insect repellent, wearing long pants and long sleeves, performing tick checks).[39,42] If a tick is found on a person or a pet, a photo of the tick can be submitted to eTick.ca for species identification and surveillance.

Laboratory Diagnostics

The main diagnostic test options for *R*. *rickettsii* are serology and PCR. Serology usually consists of an indirect immunofluorescence antibody (IFA) assay, which provides semi-quantitative detection of IgG antibodies to spotted fever group rickettsiae. This serological assay cannot determine which species is responsible for elevated IgG titres. Serology sensitivity remains under 50% when tested within the first week of illness and should not be used to rule out infection. Pairing an acute serum sample with another serum sample collected two to three weeks later allows for comparing serological titres, increasing sensitivity to at least 85%. A four-fold increase in titres is often needed for confirmatory laboratory diagnosis. Otherwise, a single positive serological test result cannot distinguish recent from remote infection in previous years, and cross-reactivity may occur with typhus group rickettsiae or other non-rickettsial infections. *Rickettsia* PCR assays can detect and identify *R*. *rickettsii* on blood specimens (and occasionally skin biopsy specimens), however PCR sensitivity is usually low, therefore a negative result cannot be used to rule out infection.[43–47]

Considering laboratory turnaround times, limited interpretation of single serological test results, and low PCR sensitivity, prompt empiric treatment should not be withheld pending laboratory results.

For further details, see PHO's testing information page.

Implications for Public Health

- Rocky Mountain spotted fever (RMSF) is an emerging tick-borne disease in Ontario, with cases reported in summer of 2025 among dogs and humans that had exposures to the Long Point area. American dog ticks are the likely vectors for RMSF.
- Continued surveillance is essential to monitor the evolution of the risk of RMSF in Ontario. Further tick surveillance will inform whether *R*. *rickettsii* becomes endemic in the local American dog tick population and spreads geographically beyond the Long Point area. RMSF cases among animals may serve as sentinels, signaling presence of infected ticks and potentially preceding human cases.

- Clinicians should consider RMSF in their differential diagnoses for individuals with compatible symptoms, recent travel history to Long Point and surrounding areas, and/or history of a tick bite.
- Ontarians may not be familiar with the American dog tick since attention on tick-borne diseases have focused on the blacklegged tick (which is associated with Lyme disease, among other established tick-borne diseases in Ontario). Public health messaging will be pertinent to raise awareness of a new tick species that also poses a significant health risk. Precautions to prevent tick bites are effective against both tick species.

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