Spotted Fever Group Rickettsiosis
(Including Rocky Mountain Spotted Fever)

DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of Spotted Fever Group Rickettsiosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at http://www.nj.gov/health/lh

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609-826-5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609-392-2020 during all other days and hours.

April 2018
1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Spotted fever group rickettsioses (SFGR) are a group of diseases caused by closely related bacteria spread to people through the bites of infected ticks and mites. In the United States, the most serious and commonly reported spotted fever group rickettsiosis is Rocky Mountain Spotted Fever (RMSF). It is caused by *Rickettsia rickettsia*. Less serious spotted fevers include: *Rickettsia parkeri* rickettsiosis, caused by R. parkeri, Pacific Coast Fever, caused by R. philipii, and Rickettsialpox, caused by R. akari. Questions remain about how often the less serious SFGR’s are misdiagnosed as RMSF. Serologic assays developed for the diagnosis of RMSF may react nonspecifically with antigens of the less serious SFGR species.

B. Clinical Description

For the less serious SFGR’s, most people who get sick will have an eschar (dark scab at the site of tick or mite bite), fever, headache, myalgia and sometimes rash.

In contrast, RMSF is a rapidly progressing illness, which, when left untreated, can lead to widespread vasculitis, resulting in death, even in previously healthy individuals. Untreated case fatality rates may be up to 20-25%. Early treatment is the best way to reduce the likelihood of severe disease or fatal outcome for patients of all ages.

Early signs and symptoms of RMSF can be non-specific and include fever, headache, myalgia and fatigue. Rash occurs in 90% of cases and usually appears 2-4 days after onset of fever, however most patients present for health care before its appearance. Rash typically begins on the wrists and ankles and spreads to the palms, soles and much of the body. Healthcare providers should not wait for the development of rash before considering a diagnosis of RMSF and promptly initiating treatment. Later signs and symptoms include multi-organ failure, septic shock, meningoencephalitis, necrosis of digits and limbs, severe thrombocytopenia and hyponatremia.
C. Treatment

Patients of all ages with suspected RMSF should receive immediate treatment with the appropriate antibiotic. Healthcare providers can consult with CDC on treatment decisions: https://www.cdc.gov/otherspottedfever/healthcare-providers/index.html. Treatment is most effective at preventing death if administered within the first 5 days of symptoms. Use of inappropriate antibiotics is associated with a higher risk of fatal outcomes for RMSF.

D. Vectors and Reservoirs

In New Jersey, the primary vector for RMSF is the American dog tick (Dermacentor variabilis). Adult females are most likely to bite humans although the principal hosts tend to be deer, dogs and livestock. Maximum activity is late spring through early summer. The lone star tick (Amblyomma americanum), found in southern parts of the state is also a vector.

E. Modes of Transmission

SFGR is acquired from the bite of an infected tick. Although peak tick season is an important consideration, tickborne rickettsial illnesses have been reported nationally in every month of the year. Inquiring about contact with pets, especially dogs, and a history of recent tick attachment or removal from pets might be useful in assessing potential human tick exposure. Laboratory data suggest that the tick must remain attached for four to six hours before the transmission of rickettsia can occur. Less commonly, transmission can occur by exposure to fluids released from an infected tick during removal.

Transmission of R. rickettsia via blood transfusion has been reported infrequently. R. parkeri and Rickettsia species 364D transmission via infected blood products has not been documented in the United States.

F. Incubation Period

Incubation periods for all SRGR rickettsial infections range from 2-21 days. Symptoms of RMSF typically appear 3-12 days after the bite of an infected tick or between the fourth and eighth day after discovery of an attached tick.

G. Period of Communicability or Infectious Period

SFGR is not communicable from person to person.

H. Epidemiology

Rocky Mountain spotted fever (RMSF) has been a nationally notifiable condition since the 1920s. As of January 1, 2010, cases of RMSF are reported under the new category called Spotted Fever Group Rickettsiosis (SFGR). The number of cases per year of SFGR reported to CDC has increased from 424 cases in 1993, to an all-time high of 4470 cases reported in 2012. In 2013 and 2014, the number of cases decreased to approximately 3300 to 3500 per year. Although numbers have increased, the geographic distribution has not changed. The majority of cases continue to be reported by 5 states: Arkansas, Missouri, North Carolina,
Oklahoma, and Tennessee. Cases of spotted fever rickettsiosis are more frequently reported in men than in women. The majority of reported cases are among people at least 40 years old. American Indians report higher number of SFR infections than other race groups. Those at increased risk of death include: Children under 10 years old, American Indians, people with a compromised immune system, and people who do not receive treatment within the first 5 days of illness.

In New Jersey, cases of SFGR increased in 2011 and 2012 (136 and 128 respectively) and then averaged 57 cases through 2016. The majority of cases are reported by Atlantic, Ocean, Gloucester, Burlington, Hunterdon and Monmouth counties.

2 CASE DEFINITION

The NJDOH Infectious and Zoonotic Disease Program follows the most current SFGR case definition as published on the CDC National Notifiable Disease Surveillance System (NNDSS) website.


Case definitions enable public health to classify and count cases consistently across reporting jurisdictions, and should not be used by healthcare providers to determine how to meet an individual patient’s health needs.

A. New Jersey Department of Health (NJDOH) Case Definition

1. Exposure
   Exposure is defined as having been in potential tick habitats within the past 14 days before onset of symptoms. Occupation should be recorded if relevant to exposure. A history of tick bite is not required.

2. Clinical Criteria
   Any reported fever and one or more of the following: rash, eschar, headache, myalgia, anemia, thrombocytopenia, or any hepatic transaminase elevation.

3. Laboratory Criteria for Diagnosis
   The organism in the acute phase of illness is best detected by polymerase chain reaction (PCR) and immunohistochemical methods (IHC) in skin biopsy specimens, and occasionally by PCR in appropriate whole blood specimens taken during the first week of illness, prior to antibiotic treatment. Serology can also be employed for detection,
however an antibody response may not be detectable in initial samples, and paired acute and convalescent samples are essential for confirmation.

For the purposes of surveillance:

**Laboratory confirmed:**

- Serological evidence of a fourfold change in immunoglobulin G (IgG)-specific antibody titer reactive with *Rickettsia rickettsii* or other spotted fever group antigen by indirect immunofluorescence assay (IFA) between paired serum specimens (one taken in the first week of illness and a second 2-4 weeks later), OR
- Detection of *R. rickettsii* or other spotted fever group DNA in a clinical specimen via amplification of a specific target by PCR assay, OR
- Demonstration of spotted fever group antigen in a biopsy or autopsy specimen by IHC, or
- Isolation of *R. rickettsii* or other spotted fever group *Rickettsia* from a clinical specimen in cell culture.

**Laboratory supportive:**

- Has serologic evidence of elevated IgG or immunoglobulin M (IgM) antibody reactive with *R. rickettsii* or other spotted fever group antigen by IFA, enzyme-linked immunosorbent assay (ELISA), dot-ELISA, or latex agglutination.

**4. Case Classification**

**CONFIRMED**

A clinically compatible case (meets clinical evidence criteria) that is laboratory confirmed.

**PROBABLE**

A clinically compatible case (meets clinical evidence criteria) that has supportive laboratory results.

**SUSPECTED**
A case with laboratory evidence of past or present infection but no clinical information available (e.g., a laboratory report).

3 LABORATORY TESTING AVAILABLE

Several categories of laboratory methods are used to diagnose SFGR’s. Rapid confirmatory assays are rarely available to guide treatment decisions for acutely ill patients; therefore it is imperative that therapeutic interventions are based on clinical suspicion. Antibiotic treatment should never be delayed while awaiting laboratory confirmation of a rickettsial illness. Nonetheless, laboratory assays are crucial for defining the changing epidemiology and public health impact of tickborne rickettsial diseases. Whenever possible without delaying treatment, species-specific testing methods should be employed, such as detection of DNA by PCR or culture.

Molecular methods, IHC, and Culture

SFGR species infect the endothelial cells that line blood vessels and do not circulate in large numbers in the blood until the disease has progressed to a severe phase of infection. For this reason, tissue specimens from rash or swabs from eschar sites are a more useful source of SFGR DNA in the early phase of illness than acute blood samples. Testing of tissue or swab specimens using PCR or immunohistochemical assays must be performed at CDC.

PCR of whole blood specimens can be performed at NJ PHEL. Specimens should be collected before antibiotics are administered but not sooner that 3 days after symptom onset. If collected earlier, results are often negative.

PCR, culture, and IHC assays can also be applied to autopsy tissue specimens. SFGR species are obligate intracellular pathogens and cannot be propagated using routine blood culture methods. Culture of SFGR species is generally available only at specialized laboratories that perform cell culture and are equipped with the appropriate biosafety facilities.

Serologic methods

Serologic assays are the most frequently used methods for confirming cases of spotted fever group rickettsiosis and are widely available at commercial laboratories. Immunoglobulin M (IgM) antibodies are less specific than IgG antibodies and more likely to produce a falsely positive result. Closely related species of SFGR (such as R. rickettsii, R. akari, R. parkeri, or R. philipii) share similar antigens such that antibodies directed to one of these antigens can cross-react with other heterologous spotted fever group antigens. Most commercial labs are unable to differentiate one spotted fever infection from another using these serologic methods.

April 2018
The reference standard for serologic diagnosis is the indirect immunofluorescence antibody (IFA) assay. Diagnosis is typically confirmed by documenting a four-fold or greater rise in antibody titer between acute and convalescent-phase serum samples. Acute-phase specimens are taken during the first week of illness and convalescent-phase samples are generally obtained 2–4 weeks after the acute specimen. Eighty-five percent of patients will not have detectable antibody titers during the first week of illness and a negative test during this time does not rule out spotted fever infection.

**Persistent Antibodies**

Antibody titers can remain elevated for months or longer after the disease has resolved or can be detected in persons who were exposed previously to antigenically related organisms. For these reasons, as many as 10% of persons in some areas of the United States can have elevated levels of antibodies that react with *R. rickettsii* or similar organisms. Therefore, a single antibody titer should not be used to document or exclude a diagnosis of a spotted fever group rickettsiosis. The most conclusive method is the evaluation paired serum samples, collected 2-4 weeks apart, which reveal a four-fold or greater rise in antibody titer.

### 4 PURPOSE OF SURVEILLANCE AND REPORTING AND REPORTING REQUIREMENTS

- To better understand the local epidemiology of infection with SFGR in New Jersey.
- To recognize areas in New Jersey where SFR incidence has increased or decreased.
- To focus SFGR preventive education.

### 5 CASE INVESTIGATION

#### A. Investigation Guidelines

Local health departments are asked to initiate investigations of laboratory positive cases of SFGR within 2 weeks and close cases in CDRSS within 3 months. To assist with the investigation, the NJDOH SFGR Investigation Worksheet can be used to obtain essential information from the healthcare provider:
[http://www.nj.gov/health/cd/topics/rocky.shtml](http://www.nj.gov/health/cd/topics/rocky.shtml). All information should be entered into CDRSS. Worksheets should not be sent to NJDOH.

April 2018
B. Key CDRSS Fields Specific for Spotted Fever Group Rickettsioses

<table>
<thead>
<tr>
<th>CDRSS Screen</th>
<th>Required Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease-Specific</td>
<td>• Enter any negative results for other tickborne diseases along with date specimen collected.</td>
</tr>
<tr>
<td>Case Comments</td>
<td>• Indicate whether an immunosuppressive condition was present and if so, list the condition.</td>
</tr>
<tr>
<td></td>
<td>• If requested information was not provided by the patient’s healthcare provider, list the dates attempts were made to obtain information and the outcomes. For example, 1/12/17 faxed form to provider; 1/31/17, spoke with office manager and re-sent form; 2/15/17, refaxed form to provider. Provider non-response.</td>
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</tbody>
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6 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (NJAC 8:57-1010)

There are no isolation or quarantine restrictions.

B. Managing Special Situations

Removing a Tick

Ticks should be removed as soon as they are found on the skin. Fine-tipped tweezers should be used to firmly grasp the tick very close to the skin. Using a steady motion, the tick’s body should be pulled away from the skin. Efforts should be made to not twist or jerk the tick – this can cause the mouth-parts to break off and remain in the skin. If this happens, the mouth-parts should be removed with tweezers. If they can’t be removed, it isn’t cause for concern. Once the mouthparts are removed from the rest of the tick, it can no longer transmit rickettsia bacteria. After the tick is removed, the bite area should be cleaned with rubbing alcohol, an iodine scrub, or soap and water.

Dispose of a live tick by submersing it in alcohol, placing it in a sealed bag/container, wrapping it tightly in tape, or flushing it down the toilet. Never crush a tick with fingers. Petroleum jelly, a hot match, nail polish, or other products should not be used to remove a tick.

Tick Testing and Identification

Tick testing of individual ticks is not useful because:
• If the test shows that the tick contained disease-causing organisms, that does not necessarily mean that the person has been infected.

• Is someone has been infected, s/he will probably develop symptoms before the results of the tick testing are available. Treatment should not be delayed while waiting for tick testing results.

• Negative results can lead to false assurances. For example, the person concerned may have been unknowingly bitten by a different tick that was infected.

Tick identification may be of value when discussing tick bite exposures with a healthcare provider. County mosquito control agencies or agricultural extension offices may offer tick identification services. The TickEncounter Resource Center has tick identification resources online: http://www.tickenounter.org/tick_identification.

C. Preventive Measures

Preventing ticks in the yard: Involves keeping wildlife (especially deer and rodents) out of the backyard and making it less attractive to ticks.

• Clear tall grasses and brush around homes and at the edge of lawns.

• Place a 3-ft wide barrier of wood chips or gravel between lawns and wooded areas and around patios and play equipment. This will restrict tick migration into recreational areas.

• Mow the lawn frequently and keep leaves raked.

• Stack wood neatly and in a dry area (discourages rodents that ticks feed on).

• Keep playground equipment, decks, and patios away from yard edges and trees and place them in a sunny location, if possible.

• Remove any old furniture, mattresses, or trash from the yard that may give ticks a place to hide.

• When using acaricides (tick pesticides) around the home, always follow the label instructions and never use near streams or other bodies of water.

Preventing ticks on pets: Although dogs and cats can get SFGR’s, there is no evidence that they spread the disease directly to their owners. However, pets can bring infected ticks into the home or yard. For these reasons, it’s important to use a tick preventive product for dogs.
Preventing tick bites on people: The best preventive measure is to avoid tick-infested areas. In areas where contact with ticks may occur, individuals should be advised to do the following:

- Wear long-sleeved shirts and long, light-colored pants tucked into socks or boots.
- Stay on trails when walking or hiking and avoid high grass.
- Use repellent that contains 20 percent or more DEET, picaridin or IR3535 on exposed skin for protection that lasts several hours. Always follow product instructions. Parents should apply this product to their children, avoiding hands, eyes, and mouth.
- Use products that contain permethrin on clothing. Treat clothing and gear, such as boots, pants, socks and tents with products containing 0.5% permethrin. It remains protective through several washings.
- Bathe or shower as soon as possible after coming indoors (preferably within 2 hours) to wash off and more easily find ticks that are crawling on you.
- Conduct a full-body tick check using a hand-held or full-length mirror to view all parts of your body upon return from tick-infested areas. Parents should check their children for ticks under the arms, in and around the ears, inside the belly button, behind the knees, between the legs, around the waist and especially in their hair.
- Examine gear and pets. Ticks can ride into the home on clothing and pets, then attach to a person later, so carefully examine pets, coats, and day packs.
- Tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors.

Tick Bite Prophylaxis

The Infectious Disease Society of America (IDSA) does not generally recommend antibiotic treatment following a tick bite as a means to prevent SFGR’s. There is no evidence this practice is effective, and it may simply delay onset of disease. Instead, persons who experience a tick bite should be alert for symptoms suggestive of tickborne illness and consult a physician if fever, rash, or other symptoms of concern develop.
**Additional Information**


CDC: Rocky Mountain Spotted Fever: [https://www.cdc.gov/rmsf/index.html](https://www.cdc.gov/rmsf/index.html)

CDC: Other Spotted Fever Group Rickettsioses: [https://www.cdc.gov/otherspottedfever/](https://www.cdc.gov/otherspottedfever/)

**References**


