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.

February 2020

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), caused by *Rickettsia rickettsii*. Less serious spotted fevers include: *Rickettsia parkeri* rickettsiosis, caused by *R. parkeri*, Pacific Coast Fever, caused by *Rickettsia* species 364D, and Rickettsialpox, caused by *R. akari*. The burden and distribution of each of the various rickettsioses remains unclear and serologic assays are not able to distinguish between SFGR species.

B. Clinical Description

Spotted fevers can range from relatively mild infections to fatal disease. Infections caused by *R. parkeri, R. species 364D,* or *R. akari* are characteristically less severe than RMSF. Hospitalizations occur less frequently from these spotted fevers and deaths have not been reported. Some patients may resolve without treatment.

Similar to *R. rickettsii, R. parkeri, R*. species 364D, and *R. akari* cause acute febrile illnesses often accompanied by headache, myalgia, and rash, but are also likely to have ulcerated, necrotic regions at the site of tick or mite attachment, called eschars. Eschars often appear before the onset of fever and can be non-tender or mildly tender. Clinical indicators such as thrombocytopenia (low platelet count), hyponatremia (low serum sodium), or mild to moderately elevated levels of hepatic transaminases can be helpful predictors of spotted fever infection but may not be present in all patients, particularly those in early stages of illness.

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 a sudden onset of fever, headache, myalgia and fatigue. Gastrointestinal symptoms (nausea, vomiting, diarrhea, abdominal pain) may also be present. While most (90%) people with RMSF have some type of rash during the course of illness, less than 50% of patients have a rash during the first 3 days of illness, when most people first seek medical care. Rash typically begins on the wrists and ankles and spreads to the palms, soles and much of the body. Later signs and symptoms include multi-organ failure, septic shock, meningoencephalitis, necrosis of digits and limbs, severe thrombocytopenia and hyponatremia. There is no evidence that *R. rickettsii* causes persistent or chronic disease.

C. Treatment

Early recognition and treatment with doxycycline is critical to survival. Doxycycline is the treatment of choice for all suspected tickborne rickettsial infections in patients of all ages (including children <8 years of age). Doxycycline is most effective at preventing severe complications from developing if started within the first 5 days of illness. Treatment for asymptomatic individuals is not currently recommended.

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 occurs in late spring through early summer. The lone star tick (*Amblyomma americanum*), found in the middle and southern parts of the state, is also a vector of SFGR.

E. Modes of Transmission

SFGR is transmitted by the bite of an infected tick. Although cases are reported in every month of the year, most cases occur during May–August. 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 *R. rickettsii* can occur. Less commonly, transmission can occur by exposure to fluids released from an infected tick during removal.

Transmission of *R. rickettsii* via blood transfusion has been reported but is extremely rare. Organ transplant acquired RMSF has not been documented but is physiologically possible. *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 SFGR rickettsial infections range from 2-21 days. Symptoms of RMSF typically appear 3-12 days after the bite of an infected tick.

G. Period of Communicability or Infectious Period

SFGR is generally not communicable from person to person, although transmission through blood transfusion has been reported rarely.

H. Epidemiology

RMSF has been a nationally notifiable condition since the 1920s. As of January 1, 2010, cases of RMSF are reported under the new SFGR category. The number of cases per year of SFGR reported to CDC has increased from 495 cases in 2000, to 6,248 cases in 2017. Notably, while the number of cases and incidence rose, the case fatality rate has declined since the 1940s when tetracycline antibiotics became available. The current case fatality

rate for spotted fever rickettsioses using surveillance data is still roughly 0.5% of cases. The inclusion of less severe spotted fevers, such as *R. parkeri* rickettsiosis, likely leads to the lower case fatality rate observed in recent decades.

Although numbers have increased, the geographic distribution of SFGR has not changed. Over 60% of SFGR cases continue to be reported by five states: Arkansas, Missouri, North Carolina, Oklahoma, and Tennessee. In Arizona, RMSF cases have recently been identified in an area where the disease had not been previously seen. Cases of spotted fever rickettsiosis are more frequently reported in men than in women. Most reported cases are among people at least 40 years old. American Indians report higher number of SFGR 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 five days of illness.

In New Jersey, cases of SFGR increased from 58 reported cases in 2014 to 147 cases in 2018. In 2018, the highest number of SFGR cases in New Jersey was reported in Monmouth, Ocean, Atlantic, and Gloucester 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.

SFGR Case Definition: https://wwwn.cdc.gov/nndss/conditions/spotted-fever-rickettsiosis/

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.

New Jersey Department of Health (NJDOH) Case Definition

A. Clinical Criteria

Fever as reported by the patient or a healthcare provider, AND one or more of the following: rash, eschar, headache, myalgia, anemia, thrombocytopenia, or any hepatic transaminase elevation.

B. Laboratory Criteria

Confirmatory laboratory evidence:

- Detection of SFGR nucleic acid in a clinical specimen via amplification of a *Rickettsia* genus- or species-specific target by Polymerase Chain Reaction (PCR) assay,
  OR
- Serological evidence of a fourfold increase in Immunoglobulin G (IgG) -specific antibody titer reactive with SFGR antigen by indirect immunofluorescence antibody assays (IFA) between paired serum specimens (one taken in the first two weeks after illness onset and a second taken two to ten weeks after acute specimen collection),*
  OR
- Demonstration of SFGR antigen in a biopsy or autopsy specimen by immunohistochemical methods (IHC),
  OR
- Isolation of SFGR from a clinical specimen in cell culture and molecular confirmation (e.g., PCR or sequence).

Presumptive laboratory evidence:

- Serologic evidence of elevated IgG antibody at a titer ≥1:128 reactive with SFGR antigen by IFA in a sample taken within 60 days of illness onset.**

Supportive laboratory evidence:

- Serologic evidence of elevated IgG antibody at a titer <1:128 reactive with SFGR antigen by IFA in a sample taken within 60 days of illness onset.

*A four-fold rise in titer should not be excluded (as confirmatory laboratory criteria) if the acute and convalescent specimens are collected within two weeks of one another.

**This includes paired serum specimens without evidence of fourfold rise in titer, but with at least one single titer ≥1:128 in IgG-specific antibody titers reactive with SFGR antigen by IFA.

C. Criteria to Distinguish a New Case from an Existing Case

A person previously reported as a probable or confirmed case-patient may be counted as a new case-patient when there is an episode of new clinically compatible illness with confirmatory laboratory evidence.

D. Case Classification

CONFIRMED

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

PROBABLE

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

POSSIBLE

- A case with laboratory evidence of infection with no clinical information available,
  OR
- A clinically compatible case (meets clinical criteria) that has supportive laboratory evidence.
  - ***Note****: Elevated IgG titers of <1:128 meet supportive laboratory evidence. If resources are limited, a public health investigation is not necessary; classify these reports as "POSSIBLE."*

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.

A. PCR, 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, whole blood specimens obtained during the first several days of illness are often negative when tested by polymerase chain reaction (PCR) assays or culture. If the patient has a rash or eschar, PCR, or immunohistochemical (IHC) assays can be performed on a skin biopsy specimen. Eschars may alternatively be swabbed for the collection of

infected exudate. Swabs of eschars are less invasive than skin biopsies, but do not allow for IHC testing or cell culture evaluation. 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.

PCR of whole blood specimens can be performed at New Jersey's Public Health and Environmental Laboratories (PHEL). Specimens should be collected before antibiotics are administered but not sooner that three days after symptom onset. If collected earlier, results are often negative. Testing of tissue or swab specimens using PCR or IHC assays can be performed at CDC.

B. 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. species 364D) 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.

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 resolution of illness. 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. In most patients with a spotted fever group rickettsiosis, the first immunoglobulin G (IgG) IFA titer is negative and the second typically shows a four-fold or greater increase in IgG antibody levels.

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 of 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 SFGR 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 two weeks and close cases in the Communicable Disease Reporting and Surveillance System (CDRSS) within three months.

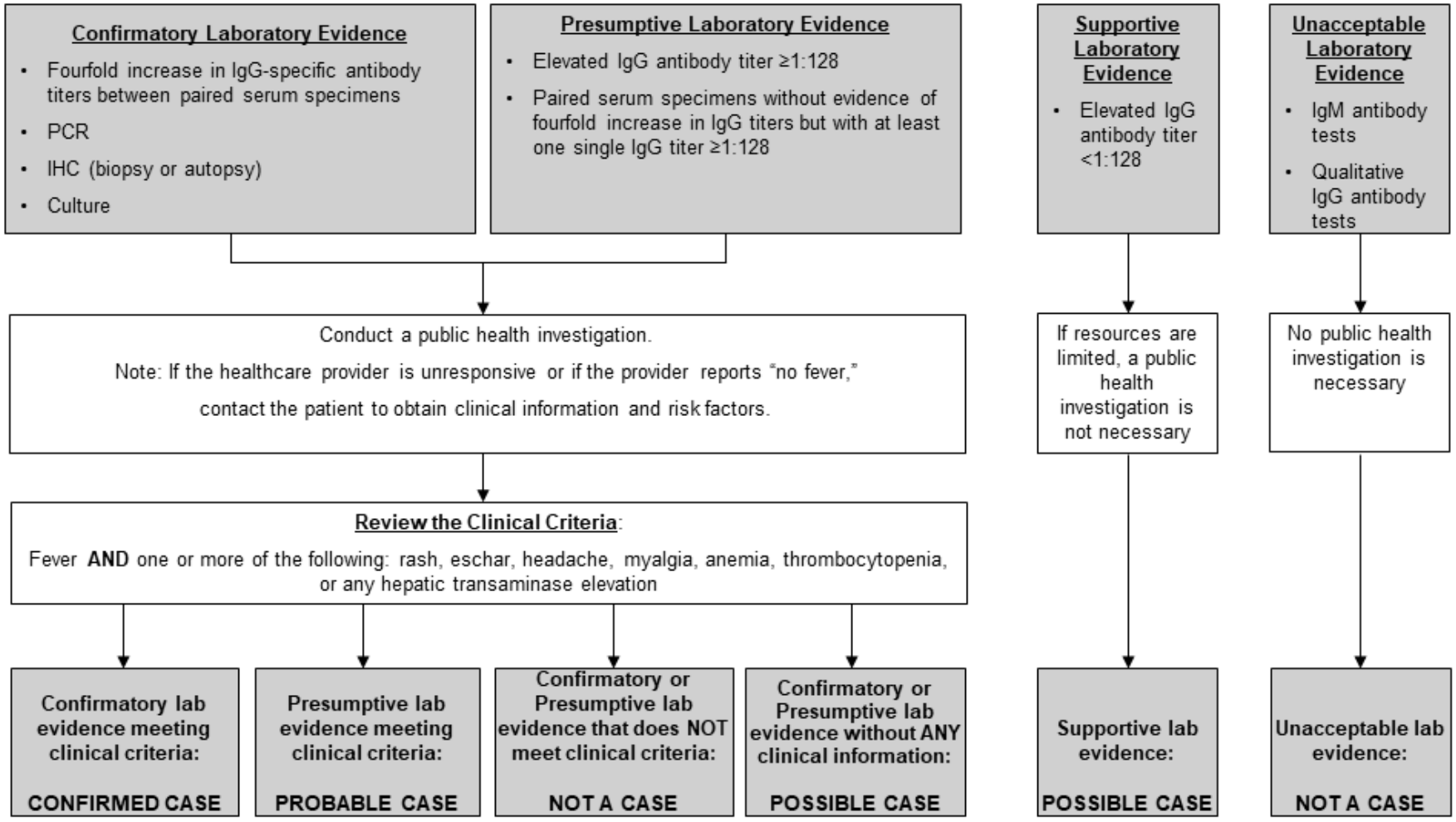
To assist with the investigation, the **NJDOH SFGR Investigation Worksheet** can be used to obtain essential information from the healthcare provider: http://www.nj.gov/health/cd/topics/rocky.shtml. All information should be entered in CDRSS. Worksheets should not be sent to NJDOH. If investigators do not receive a response from the healthcare provider, they should contact the patient directly to obtain the investigation information. Additionally, if the patient did not have a fever on the day they visited a healthcare provider, the provider may report this as "no fever." In these cases, it is important for investigators to interview the patient directly and confirm if the patient presented with an acute onset of fever during the course of illness.

Investigators should make a minimum of three attempts to obtain information from the health care provider and the patient. After three attempts, enter what is known into CDRSS and then classify and close the case according to the case definition; the investigator should note in CDRSS the dates and outcomes of all attempts to obtain information from the health care provider and patient.

B. Key CDRSS Fields Specific for Spotted Fever Group Rickettsioses

CDRSS Screen	Required Information
Laboratory and Diagnostic Test Information	• If negative results of acute or convalescent serology testing were provided by healthcare provider, enter the results.
Additional Requirements: SFGR	• In this section, record whether the patient was tested for other tick-borne diseases as a part of this illness. If results were provided, enter in the laboratory and diagnostic testing information section.
Case Comments	Indicate the following: • Is an immunosuppressive condition present? If so, list the condition • Any of the following complications: Adult Respiratory Distress Syndrome, Renal failure, Disseminated intravascular coagulopathy, Meningitis / encephalitis • Patient's occupation and industry/work setting • For serological testing (acute/convalescent), was a 2nd specimen obtained (or will one be obtained) • Document attempts made to obtain critical investigation details from the patient's healthcare provider and from the patient

2020 NEW JERSEY SPOTTED FEVER GROUP RICKETTSIOSES SURVEILLANCE ALGORITHM



To Distinguish a New SFGR Case from an Existing Case: A person previously reported as a PROBABLE or CONFIRMED SFGR case may be counted as a new SFGR case if there is an episode of **NEW CLINICALLY COMPATIBLE ILLNESS WITH CONFIRMATORY LABORATORY EVIDENCE**. Otherwise, classify the current report as NOT A CASE.

Note: IgG antibody titers collected **> 60 days** after illness onset are unacceptable laboratory evidence. Classify the report as NOT A CASE.

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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 Tick Encounter Resource Center has tick identification resources online: http://www.tickencounter.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 two 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.

Antibiotics as Prophylaxis: Post-tick bite antibiotic prophylaxis is not recommended to prevent rickettsial infection. Persons who experience a tick bite should watch for symptoms suggestive of tickborne illness and consult a health care provider if fever, rash, eschar, or other symptoms develop within 2 weeks of tick bite. Treatment for asymptomatic individuals is not currently recommended.

7 ADDITIONAL INFORMATION

- NJDOH: Rocky Mountain Spotted Fever: http://www.nj.gov/health/cd/topics/rocky.shtml
- CDC: Rocky Mountain Spotted Fever: https://www.cdc.gov/rmsf/index.html
- CDC: Other Spotted Fever Group Rickettsioses: https://www.cdc.gov/otherspottedfever/

8 REFERENCES

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