

Rocky Mountain Spotted Fever (RMSF) Investigation Guideline

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Rocky Mountain Spotted Fever (RMSF)

Disease Management and Investigative Guidelines

CASE DEFINITION (CDC 2008)

A. Clinical Description for Public Health Surveillance:

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

B. Laboratory Criteria for Case Classification:

For the purposes of surveillance,

- Laboratory confirmed:
 - Serological evidence of a fourfold change in immunoglobulin G (IgG)-specific antibody titer reactive with *Rickettsia rickettsii* 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* 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* from a clinical specimen in cell culture.
- Laboratory supportive:
 - Has serologic evidence of elevated IgG or IgM antibody reactive with *R. rickettsii* antigen by IFA, enzyme-linked immunosorbent assay (ELISA), dot-ELISA, or latex agglutination.

Notes: Acute illness is best detected by polymerase chain reaction (PCR) and immunohistochemical methods (IHC) in skin biopsy specimens and by PCR in appropriate whole blood specimens taken during the first week of illness, prior to antibiotic treatment. IgM tests are not strongly supported for use in serodiagnosis of acute disease, as the response may not be specific for the agent (resulting in false positives) and the IgM response may be persistent.

Serology can 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. Current commercially available ELISA tests are not quantitative, cannot be used to evaluate changes in antibody titer, and hence are not useful for serological confirmation.

Complement fixation (CF) tests and other older test methods are neither readily available nor commonly used. CDC uses in-house IFA IgG testing (cutoff of $\geq 1:64$), preferring simultaneous testing of paired specimens.

C. Exposure: Having been in potential tick habitats within the past 14 days before onset of symptoms. A history of a tick bite is not required.

D. 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.

- Suspect: A case with laboratory evidence of past or present infection but no clinical information available (e.g. laboratory report only).

E. Laboratory Testing:

- The State Public Health Laboratory does not provide testing but testing may be arranged through other private and public laboratories.
- For additional information and/or questions concerning laboratory testing refer to online guidance at http://www.kdheks.gov/labs/lab_ref_guide.htm

F. Bioterrorism Potential: None.

G. Outbreak Definition:

- There are no formal outbreak definitions; however, the investigator may consider the possibility of an outbreak when there is an unusual clustering of cases in time and/or space.

INVESTIGATOR RESPONSIBILITIES

A. Investigation Related Tasks and Activities:

- 1) Confirm diagnosis with appropriate medical provider.
 - Before contacting the patient or family, first determine what information has been released about the patient's diagnosis and identify if the needed epidemiologic data can be found in the clinical record alone.
 - Obtain information that supports clinical findings in the case definition and information on the onset date of the symptoms.
 - Obtain information on any laboratory tests performed and results.
 - For hospitalization, obtain medical records, including admission notes, progress notes, lab report(s), and discharge summary.
- 2) Conduct case investigation to identify potential source of infection and/or the presence of additional cases in the community.
- 3) Educate contacts that may have been exposed to the source of infection about the risk of exposure and the symptoms of disease.
- 4) No specific public health interventions are necessary as the disease is not transmissible person-to-person.
- 5) Report all confirmed and probable cases to the KDHE Office of Surveillance and Epidemiology, using established methods.

B. Notifications:

- 1) There are no special notifications or additional reporting requirements.
- 2) As appropriate, use the notification letter(s) and the disease fact sheet to notify the case, contacts and other individuals or groups.

EPIDEMIOLOGY

In the United States, RMSF is a seasonal tick-borne disease that usually occurs between April and September when the risk of contact with ticks is greatest. Most cases occur to children <15 years of age as they spend more time in tick-infested areas. Accidental transmission in laboratory settings has occurred.

DISEASE OVERVIEW

A. Agent:

Rickettsia rickettsii, an obligate intracellular coccobacillus.

B. Clinical Description:

Illness occurs more often in children and older adults and is characterized by acute onset of fever sometimes accompanied by headache, malaise, myalgia, nausea/vomiting, or neurologic signs; a macular or maculopapular rash appears 4-7 days following onset in many (~80%) patients, often on the palms and soles. The rash may spread rapidly to the rest of the body. Other symptoms include: abdominal pain, joint pain and diarrhea. Fulminant disease can occur with 20% of untreated cases ending in death.

C. Reservoirs:

The *Dermacentor* species of ticks (i.e., the American dog tick and the Rocky Mt. wood tick). It is maintained in environment through a complex cycle involving both ticks and mammals. Humans are considered accidental hosts.

D. Mode(s) of Transmission:

Transmission occurs from the bite of an infected tick or by the contamination of broken skin with the crushed tissue or feces of a tick. Laboratory data suggest that the tick must remain attached for 4 - 6 hours before transmission occurs. Person-to-person transmission does not occur, but there have been rare instances of transfusion associated transmissions.

E. Incubation Period:

Range 2-14 days; average 1 week.

F. Period of Communicability:

RMSF is not communicable person-to-person; ticks remains infective for life.

G. Susceptibility and Resistance:

Susceptibility is universal. After infection, immunity is believed to be lifelong.

H. Treatment:

Doxycycline is the treatment of choice. Chloramphenicol is an alternative when contraindications to tetracyclines exist (e.g., child < 8 years of age, pregnancy).

STANDARD CASE INVESTIGATION AND CONTROL METHODS

Standard investigation activities include the following:

- 1) Confirmation of diagnosis using case definition.
- 2) Collection of demographic data (birth date, county, sex, race/ethnicity)
- 3) Collection of clinical data and laboratory results.
 - Clinical symptoms of fever, headache, myalgia, anemia, thrombocytopenia, leukopenia, elevated hepatic transaminases or others.
 - Underlying immunosuppressive condition.
 - Life threatening complications.
 - Hospitalization or death, include dates.
- 4) Determination of risk factors and transmission settings. (i.e., tick exposure)

Standard investigation **includes** completion of the General Investigation Form and Rocky Mountain Spotted Fever (RMSF) Supplemental Form.

Further investigative activity should include:

A. Case Investigation - Identify Potential Source of Infection:

To help identify the source of the infection, the investigator should focus their investigation within the incubation period and on the following potential source(s) of infection.

- Recent travel to endemic areas or history of possible exposure to ticks. List geographic location(s) and date(s). Consider:
 - Exposure to animals or pets with ticks.
 - Outdoor activities.
 - Occupational risks (e.g., laboratory worker, landscape worker, etc.).
- History of tick bites, include geographic location of bite and date.

B. Contact Investigation – Identify Exposed Individuals / Populations:

- There are no formal definitions of a contact; however, consideration should be given to individuals that were in the same geographic location as the case when they were bitten by a tick.

C. Isolation, Work and Daycare Restrictions

- None.

D. Case Management, Including Follow-up of cases:

- None.

E. Contact Management, Including Protection of Contacts:

- Monitor those exposed to a tick for symptoms. Preventive treatment is not warranted. Treatment is necessary only if symptoms develop.
- Those who exhibit any signs or symptoms compatible with tick-borne illness should be referred to their medical provider for evaluation.

F. Environmental Measures:

Community-based integrated tick management strategies may reduce the incidence of tick-borne infections, but limiting exposure to ticks is presently the most effective method of prevention.

- Strategies to reduce vector tick densities through area-wide application of an acaricide (i.e., chemicals that kill ticks and mites) and control of tick habitats (e.g., leaf litter and brush) have been effective in small-scale trials.
- New methods under development include applying acaricide to rodents and deer by using baited tubes, boxes and deer feeding stations in areas where these pathogens are endemic.
- Biological control with fungi, parasitic nematodes, and parasitic wasps may play important roles in integrated tick control efforts.

G. Education:

As opportunities allow, the following general messages should be distributed:

- In tick-infested areas, the highest risk of bites is occurs from March-July.
- The use of protective clothing, including light-colored garments, long pants tucked into socks, long-sleeved shirts, hats, as well as tick repellents, may reduce risk.
- Outdoor activities in tick-infested areas present many opportunities for exposure.
- Keep yards clear of excessive leaves, brush, and tall grasses. Walk in the center of trails to avoid contact with tall grasses and brush.
- When camping, sleep in screened tents. Hunters should be aware of tick infestations on mammals, especially deer and check for tick attachments after handling carcasses.
- Keep pets free of ticks.
- Transmission requires a long attachment. Check for ticks after spending time outdoors in tick infested areas.
- Remove attached ticks intact, do not leave embedded head parts. Use gentle, direct traction with tweezers or hemostat. Other methods, such as application of a hot match or petroleum products to the tick, are less reliable. Do not crush ticks as this may result in direct inoculation of spirochetes.

MANAGING SPECIAL SITUATIONS

A. Outbreak Investigation:

- Notify KDHE immediately, 1-877-427-7317.
- Active case finding will be an important part of any investigation.

B. Tick Removal Procedure:

To remove attached ticks, use the following procedure:

- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, the elderly, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.
- Use fine-tipped tweezers or shield fingers with a tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers.
- Do not squeeze, crush, or puncture the body of the tick because its fluids (e.g., saliva, hemolymph, gut contents) may contain infectious organisms.
- After removing the tick, thoroughly disinfect the bite site and wash hands with soap and water.

DATA MANAGEMENT AND REPORTING TO THE KDHE

- A. Organize, collect and report data with the “General Investigation Form(s)” and “Rocky Mountain Spotted Fever (RMSF) Supplemental Form”.
- B. Report data electronically via KS-EDSS or by fax, include:
 - At a minimum, data collected during the investigation that helps to confirm or classify a case.
 - All information collected on the General Investigation and supplemental form(s).

ADDITIONAL INFORMATION / REFERENCES

- A. **Treatment / Differential Diagnosis:** American Academy of Pediatrics. 2006 Red Book: Report of the Committee on Infectious Disease, 27th Edition. Illinois, Academy of Pediatrics, 2006.
- B. **Epidemiology, Investigation and Control:** Heymann. D., ed., Control of Communicable Diseases Manual, 18th Edition. Washington, DC, American Public Health Association, 2004.
- C. **Case Definitions:** CDC Division of Public Health Surveillance and Informatics, Available at: http://www.cdc.gov/ncphi/diss/ndss/casedef/case_definitions.htm
- D. **Animals in Public Places Compendium:**
http://www.kdheks.gov/epi/human_animal_health.htm
- E. **Diagnosis and Management of Tickborne Rickettsial Diseases: Rocky Mountain Spotted Fever, Ehrlichioses, and Anaplasmosis --- United States (MMWR 2006):** <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5504a1.htm>
- F. **Additional Information (CDC):** <http://www.cdc.gov/health/default.htm>

Kansas Disease Investigation Guidelines

General Investigation Form

Investigation Information		
Case Type: <input type="checkbox"/> Human Case <input type="checkbox"/> Non-human Case	Disease Name: _____	
Classification: <input type="checkbox"/> Suspect <input type="checkbox"/> Probable <input type="checkbox"/> Confirmed	KS-EDSS Investigation ID: _____	
Outbreak: <input type="checkbox"/> Yes <input type="checkbox"/> No	Outbreak Name: _____	Outbreak #: _____
Onset Date: _____	Diagnosis Date: _____	Report Date: _____
Assigned to (Investigator): _____	Patient Died: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
Patient Information		
Name Type: <input type="checkbox"/> Default/Common <input type="checkbox"/> Legal <input type="checkbox"/> Maiden <input type="checkbox"/> Nickname		
Last: _____	First: _____	Middle: _____
Street: _____	City/State: _____	Zip: _____
Evening Phone #: _____	Daytime Phone #: _____	
Sex: <input type="checkbox"/> Failure to Report <input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Other <input type="checkbox"/> Transexual <input type="checkbox"/> Unknown		
Race: <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> White <input type="checkbox"/> Unknown		
Hispanic / Latino Ethnicity: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Date of Birth: _____	Age: _____	Age Unit: <input type="checkbox"/> Days <input type="checkbox"/> Weeks <input type="checkbox"/> Months <input type="checkbox"/> Years
Parent Information (if under 18)		
Last: _____	First: _____	Middle: _____
Street: _____	City/State: _____	Zip: _____
Evening Phone #: _____	Daytime Phone #: _____	
Work / Occupation or School / Grade		
Worksites / School: _____		
Occupations / Grade: _____		
Travel History		
1st	Destination: _____	Depart Date: _____ Return Date: _____
2nd	Destination: _____	Depart Date: _____ Return Date: _____
3rd	Destination: _____	Depart Date: _____ Return Date: _____
4th	Destination: _____	Depart Date: _____ Return Date: _____

Supplemental Laboratory Report Form

Lab Reports

Laboratory Name: _____

Lab Report Date: _____

Ordering Provider Name: _____

Phone: _____

Facility: _____

Specimen Accession Number: _____

Specimen Collection Date: _____

Organism Name: _____

Organism Species: _____

Organism Serogroup: _____

Organism Serotype: _____

PFGE Results

Pattern 1 KS: _____

Other State: _____

CDC: _____

Pattern 2 KS: _____

Other State: _____

CDC: _____

Pattern 3 KS: _____

Other State: _____

CDC: _____

Additional Results Information

Reported Test Name:

Coded Result:

Text Result:

Numeric Result:

Comments:

Supplemental Contact Form

Contacts

Last: _____ **First:** _____ **Middle:** _____

Street: _____ **City/State:** _____ **Zip:** _____

Evening Phone #: _____ **Daytime Phone #:** _____ **E-mail:** _____

Sex: Failure to Report Female Male Other Transexual Unknown

Race: American Indian or Alaska Native Asian Black or African American Native Hawaiian or Other Pacific Islander White Unknown

Hispanic / Latino Ethnicity: Yes No

Date of Birth: _____ **Age:** _____ **Age Unit:** Days Weeks Months Years

Worksites / School: _____

Occupations / Grade: _____

Exposure Information

Contact Type: Household Sexual Other: _____ **Partner / Cluster Code:** _____

Date of First Exposure: _____ **Date of Last Exposure:** _____ **Frequency:** _____

Nature of Exposure: _____ **Comments:** _____

Testing and Treatment Information

Clinic Code: _____ **Examination Date:** _____

Examination Test: _____ **Examination Result:** _____

Prophylaxis/empiric treatment date: _____ **Drug / Dosage:** _____

Provider (Name / Facility): _____

Disposition and Diagnosis Information

Initiation Date: _____ **Disposition Date:** _____ **Disposition:** _____

Diagnosis: _____ **Referral Type:** Patient Provider **Post-test Counseled :** Yes No

Currently Assigned To: _____ **Follow-up Date:** _____

Risk Factors

Pregnant: Yes No **If Yes, # of Weeks:** _____

Risk factors for complications in contact: None Pregnant Woman HIV Seropositive Unimmunized Index case is a super-spreader

Child younger than 5 Age > 65 Otherwise immunosuppressed (s/p transplant, high dose steroids, etc)

Rocky Mountain Spotted Fever RMSF Supplemental Form

Kansas Department of Health

Note: This form is also used to report Ehrlichiosis / Anaplasmosis.

Epidemiologic Case History

* indicates required fields

Case Type* <i>Human Case Non Human Case</i>	Classification* <i>Confirmed Not a Case Probable Suspect Deleted Unknown</i>
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Supplemental Form Status <i>Not Done Form Complete Form in Progress Form Approved Form Sent to CDC</i>
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Report Date* <small>mm/dd/yyyy</small>
--

Patient Demographic Information

* indicates required fields

Last Name*	First Name*	Middle Name	Name Type*	Age
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Age Unit <i>Days Weeks Months Years</i>	Date of Birth <small>mm/dd/yyyy</small>
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Race* <small>(Check all that apply)</small> <i>American Indian or Alaska Native Asian Black or African American Native Hawaiian or Other Pacific Islander White Unknown</i>
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Ethnicity* <i>Hispanic or Latino Not Hispanic or Latino Unknown</i>

Sex* <i>Failure to Report Female Male Other Transexual Unknown</i>

Street Address

City	County	State	Zip
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Evening Phone <small>###-###-####</small>	Daytime Phone <small>###-###-####</small>
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Occupation

Person Providing Report

Name of Reporting Facility*

Epidemiological Investigation

During the 30 days before onset of symptoms, did the patient travel outside the county of residence? <i>Yes No</i>

Clinical Signs, Symptoms, and Outcomes

Fever? <i>Yes No Unknown</i>	Headache? <i>Yes No Unknown</i>	Myalgia? <i>Yes No Unknown</i>	Anemia? <i>Yes No Unknown</i>
Thrombocytopenia <i>Yes No Unknown</i>	Leukopenia? <i>Yes No Unknown</i>	Elevated hepatic transaminases? <i>Yes No Unknown</i>	Rash? <i>Yes No Unknown</i>
Other Symptoms? <i>Yes No Unknown</i>		If yes, specify symptoms:	
Was an underlying immunosuppressive condition present? <i>Yes No Unknown</i>		If yes, specify condition(s):	
Specify any life-threatening complications in the clinical course of this illness			
<small>(Check all that apply)</small>			
<i>Adult respiratory distress syndrome (ARDS)</i>	<i>Disseminated intravascular coagulopathy (DIC)</i>	<i>Meningitis/encephalitis</i>	
<i>Renal failure</i>	<i>Other (specify) _____</i>	<i>None</i>	

Public Health Fact Sheet

Rocky Mountain Spotted Fever (RSMF)

What is Rocky Mountain spotted fever (RSMF)?

Rocky Mountain spotted fever or RMSF is the most severe tick-borne rickettsial illness in the United States and is spread by the bite of infected ticks. It is caused by infection with the bacterial organism, *Rickettsia rickettsii*. The disease gets its name from the Rocky Mountain area where it was first identified.

Who gets RMSF?

Anyone can get RMSF. Despite its name, the RSMF is seldom seen in the Rocky Mountain region and most cases are reported in the eastern and central states, including: Kansas, North and South Carolina, Virginia, Georgia, Tennessee, Arkansas, Missouri and Oklahoma.

How is RMSF spread?

People get RSMF from the bite of an infected tick. The tick must attach to the skin and feed on blood for at least 4-6 hours in order to spread the bacteria. There is no evidence of person-to-person transmission; however, there have been cases of people removing an infected tick from other people and in doing so, crushed the ticks and exposed themselves to the disease.

What are the symptoms?

Symptoms include a sudden onset of fever onset of moderate to high fever (which can last 2 - 3 weeks), severe headache, deep muscle pain, nausea and vomiting. Most people develop a rash on their arms and legs. This rash can spread to the palms, soles, and over the rest of the body. RMSF can be fatal if not treated promptly.

How is it diagnosed?

RMSF is diagnosed based on a positive antibody test or by taking a biopsy of the skin where the rash occurs.

How is RMSF treated?

Antibiotics such as tetracycline or doxycycline have been effective in treating this disease. Many people with the disease require hospitalization and serious complications, including death, may occur if the disease is not treated promptly.

This fact sheet is for information only and is not intended for self-diagnosis or as a substitute for consultation. If you have any questions about the disease described above or think that you may have an infection, consult with your healthcare provider. This fact sheet is based on the Centers for Disease Control and Prevention's Health and Safety topic fact sheets.

How can you prevent RMSF?

Like all tick-borne diseases, preventing tick bites is the key to preventing RMSF.

Prevention strategies include:

- Avoid tick-infested areas, especially during the warmer months.
- Wear light colored clothing so ticks can be easily seen. Wear a long sleeved shirt, hat, long pants, and tuck your pant legs into your socks.
- Walk in the center of trails to avoid overhanging grass and brush.
- Check your body every few hours for ticks when you spend a lot of time outdoors in tick infested areas. Ticks are most often found on the thigh, arms, underarms, legs or where tight fitting clothing has been. Ticks should be removed immediately.
- Use insect repellents containing DEET on your skin or permethrin on clothing. Be sure to follow the directions on the container and wash off repellents when going indoors. Carefully read the manufacturer's label on repellents before using on children.

How should a tick be removed?

To remove attached ticks, use the following procedure:

- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, the elderly, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.
- Use fine-tipped tweezers or shield fingers with a tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- After removing the tick, thoroughly disinfect the bite site and wash hands with soap and water.

Where can I get more information?

- Your Local Health Department
- Kansas Department of Health and Environment, Office of Surveillance and Epidemiology (877) 427-7317
- <http://www.cdc.gov/health/default.htm>
- Your doctor, nurse, or local health center

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