Spotted Fever Rickettsioses in Kentucky - 2017

Spotted fever rickettsioses (SFRs) are a group of tick-borne infections that can cause disease in humans. For SFR surveillance, the Kentucky Department for Public Health (DPH) uses the most recent Centers for Disease Control and Prevention (CDC)/Council of State and Territorial Epidemiologist (CSTE) case definitions for SFR found at https://wwwn.cdc.gov/nndss/conditions/spotted-fever-rickettsiosis/case-definition/2010/. The definition, included in the Appendix, is used to classify reports as suspected, probable, or confirmed. All Kentucky cases included in this report were compiled from the National Electronic Disease Surveillance System.

Figure 1 shows the reported incidence of SFR, per million population, by state in 2016, and is the most current map published by the CDC. SFR cases have been reported throughout the contiguous United States, although five states (North Carolina, Oklahoma, Arkansas, Tennessee, and Missouri) account for over 60% of SFR cases.[1]

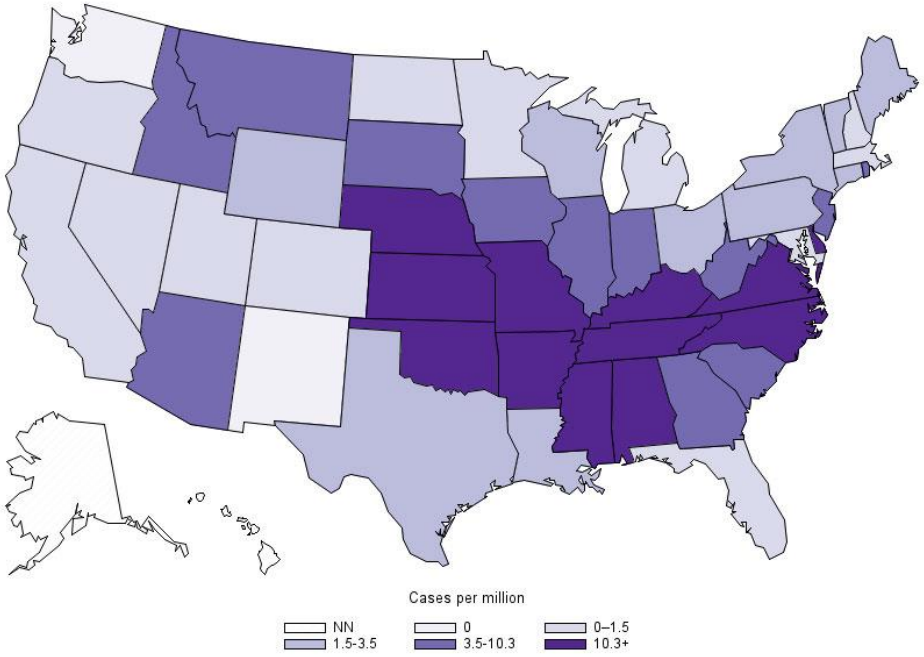

Figure 1: Annual incidence (per million) for SFR in the United States, 2016

The most commonly reported spotted fever rickettsiosis in Kentucky is Rocky Mountain spotted fever ("RMSF"). RMSF is a disease caused by the bacteria *Rickettsia rickettsii*, transmitted through the bite of an infected tick .The disease is spread by several species of ticks in the United States including the American Dog Tick, Rocky Mountain Wood Tick, and the Brown Dog Tick. Figure 2 shows the geographic distribution of RMSF cases reported in Kentucky, by county, for 2017. There were 250 confirmed and probable cases in 2017, a 49.7% increase from 2016 (167 cases were reported in 2016).

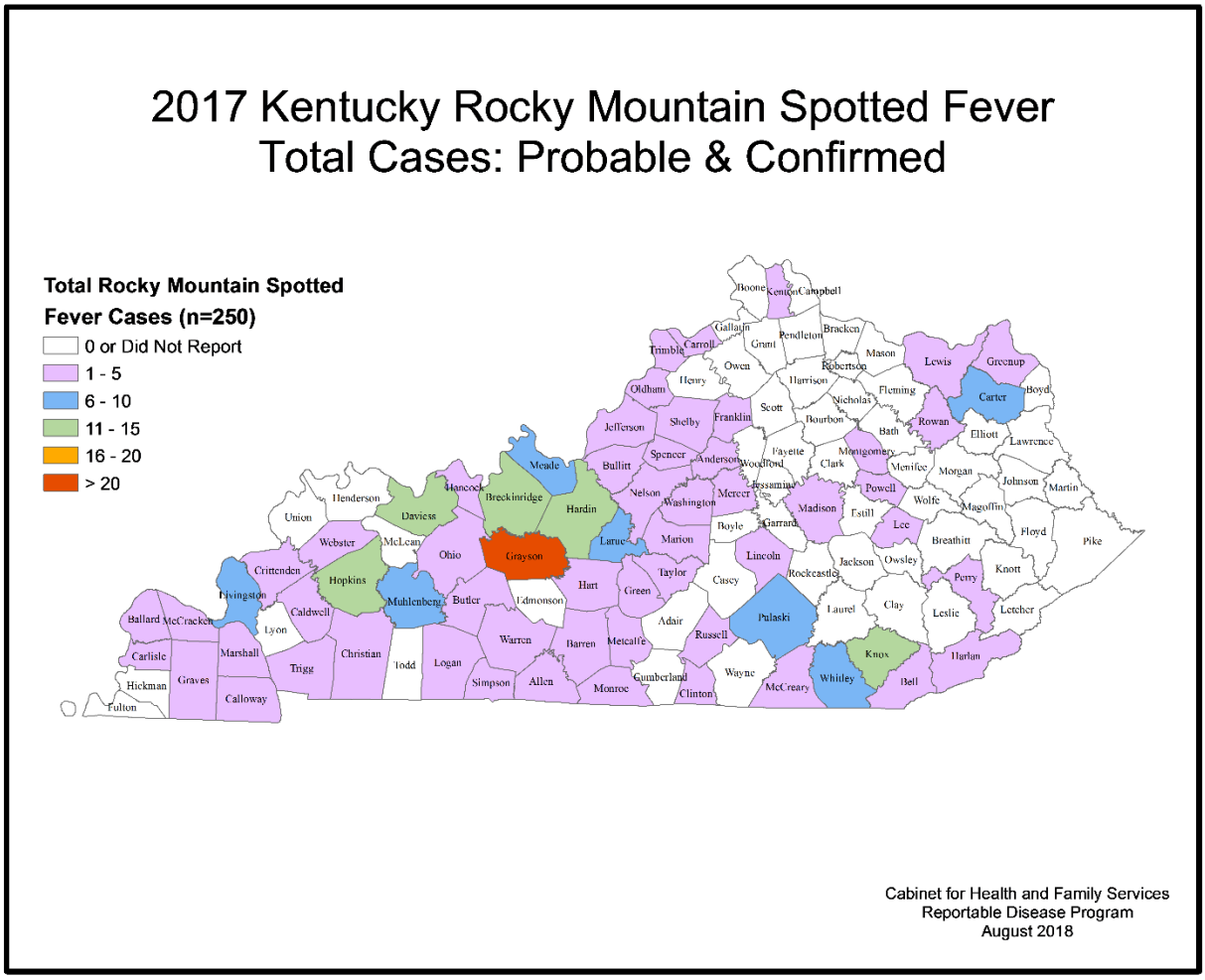

Figure 2: 2017 Kentucky Rocky Mountain Spotted Fever Total Cases: Probable & Confirmed

Figure 3 and Table 1 show the upward trend of RMSF cases from 2012 through 2017. Confirmed cases met clinical evidence criteria along with laboratory confirmation using CDC criteria, while probable cases met clinical evidence criteria with only supportive laboratory results.

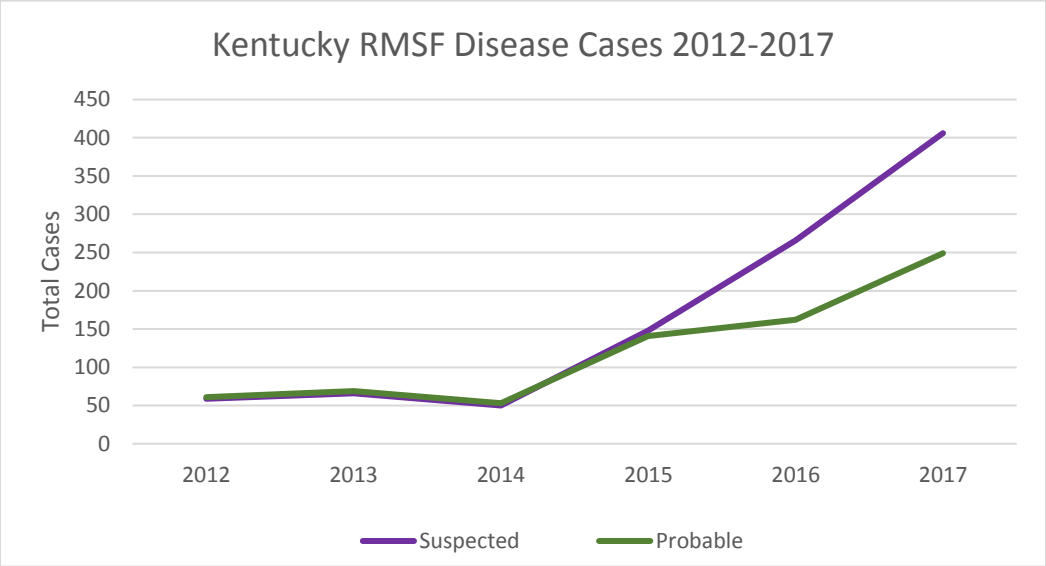

Figure 3: 2012 – 2016 Probable & Suspect Cases

2012-2017 RMSF Probable & Confirmed Cases			
Year	**Probable**	**Confirmed**	**Total**
2012	**61**	**3**	**64**
2013	**69**	**2**	**71**
2014	**53**	**0**	**53**
2015	**141**	**1**	**142**
2016	**162**	**5**	**167**
2017	**249**	**1**	**250**

Table 1: 2012 – 2017 RMSF Probable & Confirmed Cases

Early signs and symptoms such as fever and headaches are not specific to RMSF; however, the disease can rapidly progress to a serious and life-threatening illness.

RMSF illness is characterized by acute onset of fever, and may be 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 present on the palms and soles. RMSF may be fatal in as many as 20% of untreated cases, and severe, fulminant disease can occur[2].

According to the case definition, a fever must be present to meet clinical criteria. The second most common symptom after fever was myalgia, which was identified in 121 reported cases (approximately 48%) in 2017 (Figure 4).

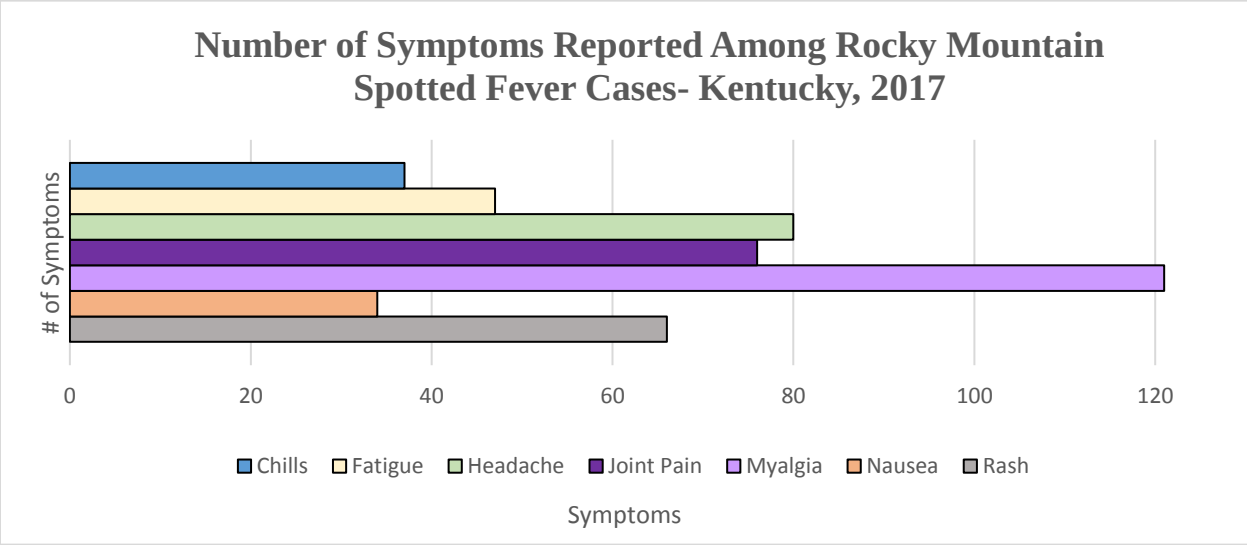

Figure 4: 2017 Probable & Confirmed Cases by Symptoms

A review of surveillance data indicates that cases of Rocky Mountain spotted fever are more commonly reported in men than in women (Figure 5). The majority of reported cases are among people at least 25 years old with the highest number of cases in people between 45-64 years of age (Figure 6).

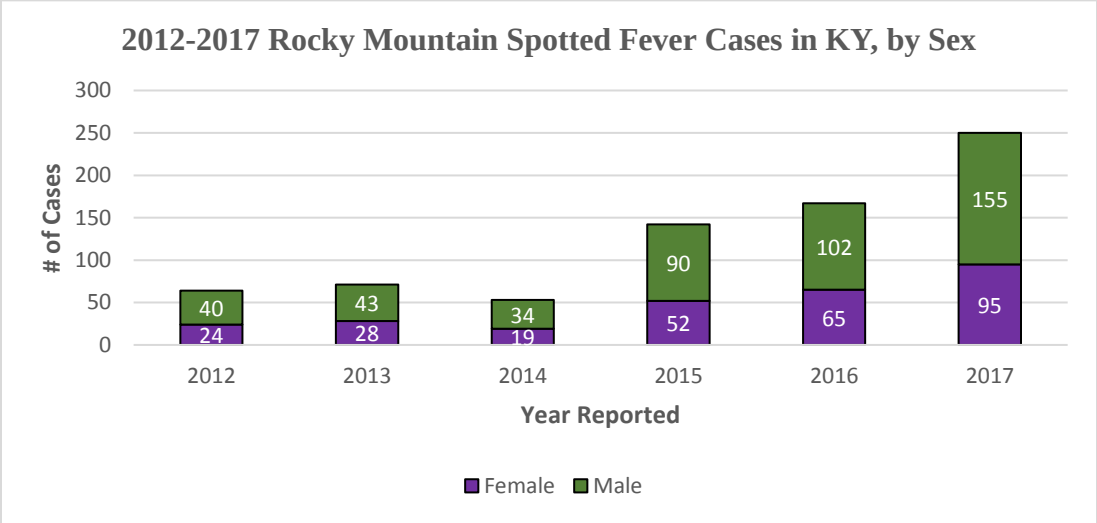

Figure 5: 2012 -2017 Probable & Confirmed Cases by Sex

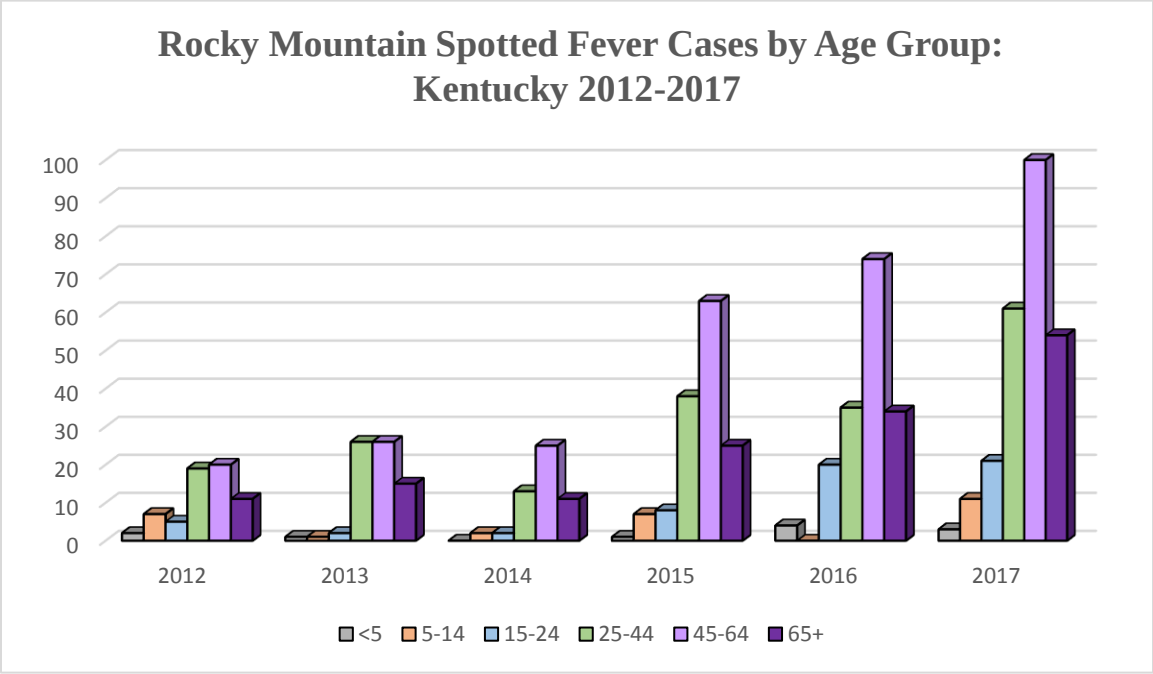

Figure 6: 2012 – 2017 Probable & Confirmed Cases by Age

Both molecular and serologic testing can be performed for SFR. Less than half (46%) of all RMSF cases reported included both immunoglobulin G (IgG) and immunoglobulin M (IgM) testing (Figure 7). A single positive IgG or IgM antibody result is considered supportive laboratory evidence, and the reported case could be considered probable. According to CDC standards, confirmatory laboratory evidence includes:

- Serological evidence of a fourfold change in IgG-specific antibody titer reactive with *Rickettsia rickettsii* or other spotted fever group antigen by indirect immunofluorescence assay 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[3].

Only one of the 250 cases in 2017 had confirmatory laboratory criteria. Increased collaboration with Kentucky healthcare providers is needed to obtain the necessary confirmatory lab tests to meet the confirmed case definition and understand the true burden of SFRs.

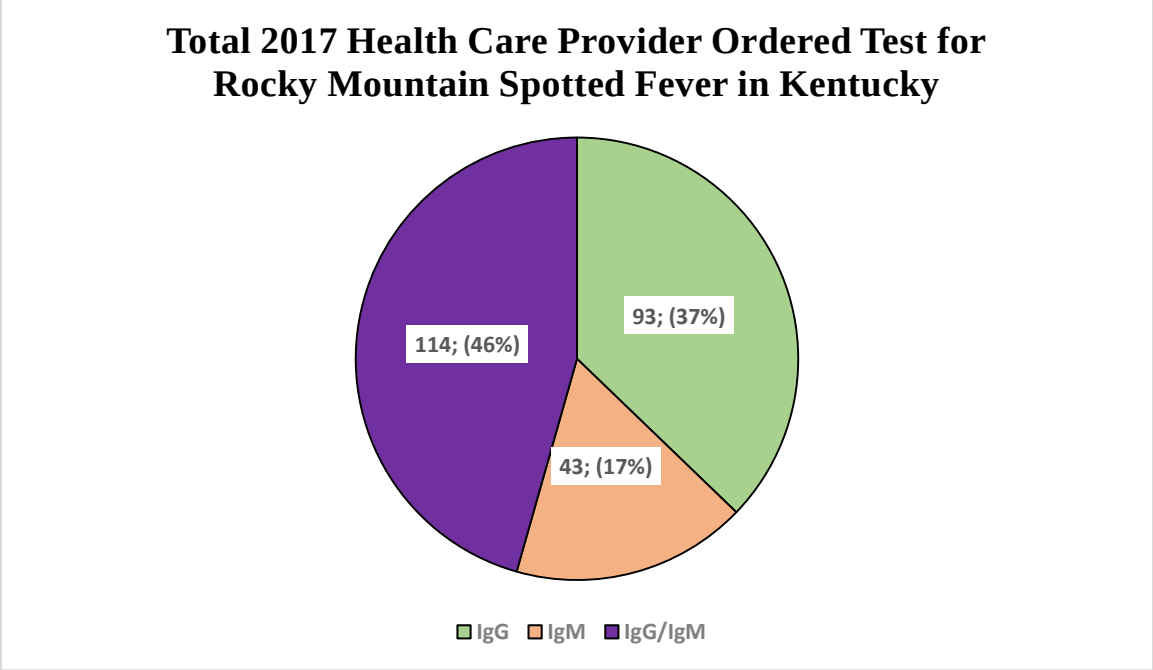

Figure 7: 2017 Probable & Confirmed Cases by Ordered Test

References:

1. "Rocky Mountain Spotted Fever (RMSF)." Centers for Disease Control and Prevention, http://www.cdc.gov/rmsf/stats/index.html.
2. Rocky Mountain Spotted Fever (RMSF)." Centers for Disease Control and Prevention, http://www.cdc.gov/rmsf/symptoms/index.html .
3. "Spotted Fever Rickettsiosis (Rickettsia Spp.) 2010 Case Definition." Centers for Disease Control and Prevention, 2010, https://wwwn.cdc.gov/nndss/conditions/spotted-fever-rickettsiosis/case-definition/2010/ .

Appendix

Spotted Fever Rickettsiosis (*Rickettsia* spp.)
2010 Case Definition,

CSTE Position Statement(s)
https://wwwn.cdc.gov/nndss/conditions/spotted-fever-rickettsiosis/case-definition/2010/

Clinical Description

Spotted fever rickettsioses are a group of tickborne infections caused by some members of the genus *Rickettsia*. Rocky Mountain spotted fever (RMSF) is an illness caused by *Rickettsia rickettsii*, a bacterial pathogen transmitted to humans through contact with ticks. *Dermacentor* species of ticks are most commonly associated with infection, including *Dermacentor variabilis* (the American dog tick), *Dermacentor andersoni* (the Rocky Mountain wood tick), and more recently *Rhiphicephalus sanguineus* (the brown dog tick). Disease onset averages one week following a tick bite. Age-specific illness is highest for children and older adults. Illness is characterized by acute onset of fever, and may be 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 present on the palms and soles. RMSF may be fatal in as many as 20% of untreated cases, and severe, fulminant disease can occur. In addition to RMSF, human illness associated with other spotted fever group *Rickettsia* species, including infection with *Rickettsia parkeri* (associated with *Amblyomma maculatum* ticks), has also been reported. In these patients, clinical presentation appears similar to, but may be milder than, RMSF; the presence of an eschar at the site of tick attachment has been reported for some other spotted fever rickettsioses.

Clinical Criteria

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

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.

    Note: 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. 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. 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 ≥1:64), preferring simultaneous testing of paired specimens, and does not use IgM results for routine diagnostic testing.

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 a tick bite is not required.

Case Classification

Suspected

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

Probable

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

Confirmed

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