

Ehrlichiosis / Anaplasmosis Investigation Guideline

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Ehrlichiosis / Anaplasmosis

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, there are at least three species of bacteria, responsible for ehrlichiosis/ anaplasmosis in the United States: *Ehrlichia chaffeensis*, found primarily in monocytes, and *Anaplasma phagocytophilum* and *Ehrlichia ewingii*, found primarily in granulocytes. The clinical signs of disease that result from infection with these agents are similar, and the range distributions of the agents overlap, so testing for one or more species may be indicated. Serologic cross-reactions may occur among tests for these etiologic agents.

Problem cases for which sera demonstrate elevated antibody IFA responses to more than a single infectious agent are usually resolvable by comparing the levels of the antibody responses, the greater antibody response generally being that directed at the actual agent involved. Cases involving persons infected with more than a single etiologic agent (indicated equivalent IFA antibody titers), while possible, are extremely rare and every effort should be undertaken to resolve such cases via other explanations or additional testing.

***Ehrlichia chaffeensis* infection (Human Monocytic Ehrlichiosis [HME]):**

- Laboratory confirmed:
 - Serological evidence of a fourfold change in immunoglobulin G (IgG)-specific antibody titer to *E. chaffeensis* antigen by indirect immunofluorescence assay (IFA) between paired serum samples (one taken in first week of illness and a second 2-4 weeks later), or
 - Detection of *E. chaffeensis* DNA in a clinical specimen via amplification of a specific target by polymerase chain reaction (PCR) assay, or
 - Demonstration of ehrlichial antigen in a biopsy or autopsy sample by immunohistochemical methods, or
 - Isolation of *E. chaffeensis* from a clinical specimen in cell culture.
- Laboratory supportive:
 - Serological evidence of elevated IgG or IgM antibody reactive with *E. chaffeensis* antigen by IFA, enzyme-linked immunosorbent assay (ELISA), dot-ELISA, or assays in other formats (CDC uses an IFA IgG cutoff of $\geq 1:64$ and does not use IgM test results independently as diagnostic support criteria.), or
 - Identification of morulae in the cytoplasm of monocytes or macrophages by microscopic examination.

***Ehrlichia ewingii* infection** (Ehrlichiosis [unspecified, or other agent]):

- Laboratory confirmed:
 - Because the organism has never been cultured, antigens are not available. Thus, *Ehrlichia ewingii* infections may only be diagnosed by molecular detection methods: *E. ewingii* DNA detected in a clinical specimen via amplification of a specific target by polymerase chain reaction (PCR) assay.

***Anaplasma phagocytophilum* infection** (Human Granulocytic Ehrlichiosis [HGE]):

- Laboratory confirmed:
 - Serological evidence of a fourfold change in IgG-specific antibody titer to *A. phagocytophilum* antigen by indirect immunofluorescence assay (IFA) in paired serum samples (one taken in first week of illness and a second 2-4 weeks later), or
 - Detection of *A. phagocytophilum* DNA in a clinical specimen via amplification of a specific target by polymerase chain reaction (PCR) assay, or
 - Demonstration of anaplasma antigen in a biopsy/autopsy sample by immunohistochemical methods, or
 - Isolation of *A. phagocytophilum* from a clinical specimen in cell culture.
- Laboratory supportive:
 - Serological evidence of elevated IgG or IgM antibody reactive with *A. phagocytophilum* antigen by IFA, enzyme-linked immunosorbent Assay (ELISA), dot-ELISA, or assays in other formats (CDC uses an IFA IgG cutoff of $\geq 1:64$ and does not use IgM test results independently as diagnostic support criteria.), or
 - Identification of morulae in the cytoplasm of neutrophils or eosinophils by microscopic examination.

Human ehrlichiosis/anaplasmosis – undetermined:

- See case classification for a probable case.

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. Furthermore, IgM tests are not always specific and the IgM response may be persistent. Therefore, IgM tests are not strongly supported for use in serodiagnosis of acute disease

C. Exposure: Defined as 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 no supportive laboratory results.
 - For ehrlichiosis/anaplasmosis – an undetermined case can only be

classified as probable. This occurs when a case has compatible clinical criteria with laboratory evidence to support ehrlichia / anaplasma infection, but not with sufficient clarity to definitively place it in one of the categories previously described. This may include the identification of morulae in white cells by microscopic examination in the absence of other supportive laboratory results.

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

E. Laboratory Testing:

- The State Public Health Laboratory does not provide testing and sends all isolates to the CDC. Specimens sent to CDC must have prior authorization from the State Epidemiology Program before they are processed.
- For additional information and/or questions concerning isolate submission, and laboratory kits call (785) 296-1620 or 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) Identify contacts that may have been exposed to the source of infection and monitor them for 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 or as requested, use the notification letter(s) and the disease fact sheet to notify the case, contacts and other individuals or groups.

EPIDEMIOLOGY

Because human ehrlichiosis has been recognized as a disease in North America only since the 1980's, information about the epidemiology of the disease, its range, and the associated animal and insect vectors is incomplete. Most cases of HME have been reported from south-central and southeastern states and occur during tick season, early spring to hard frost.

DISEASE OVERVIEW**A. Agent:**

Ehrlichia spp. are gram-negative bacteria. Human monocytic ehrlichiosis (HME) is caused by *E. chafeensis* and *E. ewingi* and human granulocytic ehrlichiosis (HGE) is caused by *E. phagocytophila* and *E. equi*.

B. Clinical Description:

A tick-borne illness characterized by acute onset of fever, headache, myalgia, and/or malaise. Nausea, vomiting, or rash may be present in some cases. Clinical laboratory findings may include thrombocytopenia, leukopenia, and/or elevated liver enzymes. Intracytoplasmic bacterial aggregates (morulae) may be visible in the leukocytes of some patients.

C. Reservoirs:

The principal vector of HME is *Amblyoma americanum*, (i.e., lone star tick). The vector for HGE is unknown but believed to be the *Ixodes scapularis* (i.e., deer tick). Animal reservoirs for HME and HGE are uncertain at this point.

D. Mode(s) of Transmission:

The bite of an infected tick can cause HME and HGE. Since bites from ticks are often painless and may occur on parts of the body that are difficult to observe, cases of may have no known history of a tick bite.

E. Incubation Period:

Range 7-21 days; average 9 days.

F. Period of Communicability:

Not transmissible person-to-person.

G. Susceptibility and Resistance:

Susceptibility is believed to be general. No data are available on immunity caused from previous infection.

H. Treatment:

Doxycycline, tetracycline or chloramphenicol. Preventive treatment for those who have been exposed to a tick but are not ill is not warranted.

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.

(**Note:** The use of the RMSF supplemental form will result in complete reporting of all information requested from the CDC on tick-borne disease case reports.)

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.).
 - Any travel 30 days prior to onset that was outside of the county.
- 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:

The role of the local health department is limited to providing information to interested members of the public, as well as working with other agencies (e.g., parks departments, etc.). 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 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).
- Cases will be reported using the following disease names (see case definitions):
 - Ehrlichiosis, *Anaplasma phagocytophilum*
 - Ehrlichiosis, *Ehrlichia chaffeensis*
 - Ehrlichiosis, *Ehrlichia ewingii*
 - Ehrlichiosis / Anaplasmosis, undetermined

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/nndss/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

Ehrlichiosis

What is Ehrlichiosis?

Ehrlichiosis is a tick-borne infection that affects both animals and humans. These diseases are caused by the organisms in the genus *Ehrlichia*.

What are the symptoms?

Symptoms associated with ehrlichiosis often resemble a variety of other infectious and non-infectious diseases. Initial symptoms include: fever, headache, malaise, and muscle aches. Additional symptoms may include: nausea, vomiting, diarrhea, cough, joint pains, confusion, and occasionally a rash. It is possible that many individuals who become infected may not become ill or they develop only very mild symptoms.

How is Ehrlichiosis spread?

Ehrlichiosis is spread by the bite of an infected tick. The lone star tick (*Amblyomma americanum*) is the primary vector of both *Ehrlichia chaffeensis* and *Ehrlichia ewingii* in the United States. It cannot be spread from person-to-person.

In the United States, where do most cases of ehrlichiosis occur?

Most cases of ehrlichiosis are reported from the southern, eastern, and south-central United States, corresponding to the geographic distribution of the Lone Star tick. Cases may also be reported outside the expected range of this tick related to travel to endemic areas, or misclassification of cases that are more likely attributable to anaplasmosis. If you traveled to an ehrlichiosis-endemic area 2 weeks prior to becoming ill, you should tell your doctor where you traveled.

Who gets Ehrlichiosis?

Anyone can get ehrlichiosis, although the majority of known cases have occurred in adults. People who spend time outdoors, in tick-infested areas are at greatest risk.

How is it diagnosed?

Ehrlichiosis is diagnosed by demonstrating the bacteria in the blood, or by a specific antibody test.

How is Ehrlichiosis treated?

Antibiotics such as tetracycline or doxycycline are effective in treating this disease.

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 topic fact sheets.

How can you prevent Ehrlichiosis?

Limiting exposure to ticks reduces the likelihood of infection in persons exposed to tick-infested habitats. The following guidelines are provided:

- Avoid tick- infested areas, especially during the warmer months.
- Wear light colored clothing so ticks can be easily seen and removed. 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, and legs or where tight fitting clothing has been.
- Use insect repellents containing DEET on your skin or permethrin on clothing. Carefully read the manufacturer's label on repellents before using on children.
- Remove attached ticks immediately.

How should a tick be removed?

To remove attached ticks, use the following procedure:

- Use fine-tipped tweezers or shield your 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. Consult your healthcare provider if infection occurs.
- Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms.
- Do not handle the tick with your 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.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2 to 3 weeks. Your doctor can use the information to assist in making an accurate diagnosis. Place the tick in a plastic bag and put it in your freezer. Write the date of the bite on a piece of paper and place it in the bag.

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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