



COLORADO TICK FEVER

Disease Plan

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Last updated: May 22, 2018, by Dallin Peterson.

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ **CRITICAL CLINICIAN INFORMATION**

Clinical Evidence
Signs/Symptoms <ul style="list-style-type: none">• Fever• Chills• Headache• Body aches• Feeling tired• Acute symptoms last about one week but fever may recur several days later.
Period of Communicability <ul style="list-style-type: none">• CTF is not transmitted from person to person except rare instance by blood transfusion. Patients should not donate blood or bone marrow for 6 months following infection.
Incubation Period <ul style="list-style-type: none">• The mean incubation period ranges from 1-14 days.
Mode of Transmission <ul style="list-style-type: none">• Transmission is through the bite of an infected tick, <i>Dermacentor andersoni</i>.
Laboratory Testing
Type of Lab Test/Timing of Specimen Collection <ul style="list-style-type: none">• Polymerase chain reaction (PCR) testing is most effective early in the course of disease and may be diagnosed from the first day of symptoms.• Serologic testing is most effective 10-14 days after symptom onset.
Type of Specimens <ul style="list-style-type: none">• Whole blood (purple, yellow, or blue top tube) is preferred for PCR testing. Serum can also be used if only sample available. Minimum sample volume of 4 mL and shipped frozen on dry ice in a plastic tube.• Serum (red top tub or serum separator) or whole blood (purple, green, or blue top tube) is most effective for serologic testing. Minimum sample volume 4 mL and shipped refrigerated or on ice packs.
Treatment Recommendations
Type of Treatment <ul style="list-style-type: none">• There are no medications to treat Colorado tick fever virus infection; clinical management is supportive care.
Contact Management
Isolation of Case <ul style="list-style-type: none">• None
Quarantine of Contacts <ul style="list-style-type: none">• None
Infection Control Procedures
<ul style="list-style-type: none">• None

✓ WHY IS COLORADO TICK FEVER IMPORTANT TO PUBLIC HEALTH?

Colorado tick fever is a viral infection transmitted through a bite from an infected *Dermacentor andersoni* wood tick. This tick species is more commonly referred to as the Rocky Mountain wood tick. Death from Colorado tick fever is extremely uncommon, but has been reported in a few pediatric cases. Ongoing surveillance is needed to establish the burden of disease and better define the epidemiology of the various infections caused by tick species. This information will be used to better inform medical professionals about the disease and tailor prevention messages for the public.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Colorado Tick Fever (CTF) is an acute, nonspecific febrile illness with infrequent rash. The most common symptoms of CTF are fever, chills, headache, body aches, and feeling tired. Some patients have sore throat, vomiting, abdominal pain, or skin rash. About half of patients have a “biphasic” fever. This means they have several days of fever, feel better for several days, and then have a second short period of fever and illness. Most people who become ill have mild disease and recover completely. However, weakness and fatigue may last several weeks. In rare cases, some patients may develop more severe illness that affects the central nervous system with symptoms that include stiff neck and confusion. Life-threatening illnesses or deaths due to CTF virus are rare.

Causative Agent

Colorado tick fever is a viral infection transmitted by the bite of the wood tick *Dermacentor andersoni*. The disease occurs almost exclusively in the western U.S. and Canada. The causative agent is an RNA virus that belongs to the genus *Coltivirus* (belonging to the *Reoviridae* family), and its vector is limited to *D. andersoni*. A closely related *Coltivirus* has been implicated in human disease in Europe. Attempts to isolate this agent from other species of ticks have failed, although closely related viruses have been isolated from Ixodes ticks in Europe.

Differential Diagnosis

Encephalitis and myocarditis should be considered along with CTF; also, some strains of CTF can cause hepatitis.

Laboratory Identification

Laboratory confirmation for CTF is made by isolation of virus from blood or by demonstration of antigen in erythrocytes by indirect immunofluorescence. Serologic tests are often not positive for 14-21 days after symptom onset. In comparison, reverse transcriptase polymerase chain reaction (PCR) may be diagnostic from the first day of symptoms. The virus infects marrow erythrocytic precursors, which accounts for the ability to recover the virus from peripheral blood

up to six weeks after illness onset. Diagnostic methods for confirming other tick-borne viral fevers vary only slightly, except that serum is used for virus isolation instead of erythrocytes.

Treatment

There is no specific treatment for CTF. Persons with severe CTF illnesses may need to be hospitalized. Treatment may include symptomatic relief, such as intravenous fluids and medications to reduce pain and fever. Salicylates should not be used because of thrombocytopenia, and the rare occurrence of bleeding disorders, following CTF virus infection. Complications are extremely rare and include aseptic meningitis, encephalitis, and hemorrhagic fever.

Case Fatality

Although prompt recovery is the expected outcome, rare fatalities are reported. Complications seem to occur more frequently in children than in adults, most often in patients whose conditions are diagnosed late.

Reservoir

Reservoirs for CTF include small mammals such as ground squirrels, porcupines, mice, chipmunks and deer mice (*Peromyscus* spp.). The *D. andersoni* tick becomes infected and passes the virus to other hosts (including humans) while it feeds. The principal mammalian hosts vary according to local geography. Once infected, ticks harbor the virus for life, and in turn infect other mammals when taking a new blood meal.

Transmission

CTF is transmitted through the bite of an infected tick. Immature ticks (*D. andersoni*) acquire CTF virus by feeding on viremic animals. The virus remains with the tick transstadially and is transmitted to humans when adult ticks feed. The virus is not transmitted from person to person, except in rare instances by blood transfusion. People who have CTF should not donate blood or bone marrow for six months after their illness. The virus may stay in red blood cells for several months and can be passed to others by blood transfusion or bone marrow transplant.

Susceptibility

Susceptibility is apparently universal. Secondary attacks are rare.

Incubation Period

Incubation period for CTF ranges from 1-14 days.

Period of Communicability

Not directly transmitted from person to person except in rare instances by blood transfusion. Patient should not donate blood or bone marrow for 6 months following infection.

Epidemiology

Several hundred cases are reported to the Centers for Disease Control and Prevention annually. These cases are contracted in the states of California, Colorado, Idaho, Montana,

Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming, as well as the Canadian provinces of British Columbia and Alberta. People who live in or visit areas in the western United States or western Canada that are 4,000–10,000 feet above sea level may be at higher risk of becoming infected. More than 90% of all CTF cases in the U.S. are reported from Colorado, Utah, and Montana. The number of reported cases likely represents a small fraction of actual cases, since reporting is not mandatory. Furthermore, in endemic areas, the disease is sufficiently common that it might not be conscientiously reported. Many cases of this nonspecific illness likely remain undiagnosed or unproven. A seasonal peak exists from April through August. Most cases of CTF occur during spring and summer months when ticks are most active. Currently, Utah averages 1-2 cases of CTF a year, but saw 10-30 cases per year in the 1990's.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.

Prevention

The longer a tick remains attached to someone, the higher the likelihood of disease transmission. Individuals should promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out using steady pressure. Whenever an attached tick is removed from the body, one should monitor one's health for the appearance of rash, fever, or flu-like symptoms, and should immediately seek the advice of a health care provider should any symptoms occur, especially if the tick was attached for more than 24 hours. It may be helpful to save the tick after removal for two reasons: 1) if the person who was bitten goes on to develop signs or symptoms such as fever, flu-like symptoms, or a rash, it may be helpful for the physician to know the type of tick; and 2) depending on the circumstances of the bite (i.e., when a person was bitten, the type of tick, how long it was attached), a physician may choose to treat the person who was bitten. The tick may be kept either securely sealed in a small plastic bag or attached, with clear tape, to a piece of paper. For individuals who do not wish to keep the tick, it can be either drowned in alcohol or flushed down the toilet.

Preventive Measures

Environmental Measures

Prevention of diseases spread by ticks, involves making the yard less attractive to ticks.

- Keep grass cut short.
- Remove leaf litter and brush from around the yard.
- Prune low lying bushes to let in more sunlight.
- Keep woodpiles and bird feeders off the ground and away from the home.

- Keep the plants around stone walls cut short.
- Use a three-foot wide woodchip, mulch, or gravel barrier where the lawn meets the woods, and remind children not to cross that barrier.
- Ask a landscaper or local nursery about plants to use in the yard that do not attract deer.
- Use deer fencing (for yards 15 acres or more).

If an individual chooses to use a pesticide to reduce the number of ticks on his/her property, he/she should be advised to hire a licensed applicator who is experienced with tick control. A local landscaper or arborist may be a licensed applicator. In general, good tick control can be achieved with no more than two pesticide applications in any year. Advise individuals to ask, when selecting an applicator, if they will provide:

- A written pest control plan that includes information on the pesticide to be used.
- Information about non-chemical pest control alternatives.
- Signs to be posted around the property after the application.

Personal Preventive Measures/Education

There is no human vaccine for CTF. If someone lives, works, or spends leisure time in an area likely to have ticks, they should be advised of the following:

- The single most important thing one can do to prevent a tickborne disease is to check oneself for ticks once a day. Favorite places ticks like to go on the body include areas between the toes, back of the knees, groin, armpits, neck, along the hairline, and behind the ears. Remember to check children and pets too. Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted but grasped close to the skin and pulled straight out using steady pressure.
- Stick to main pathways and the centers of trails when hiking.
- Avoid wooded and bushy areas with high grass.
- Wear long-sleeved, light-colored shirts, and long pants tucked into socks.
- Talk to a veterinarian about the best ways to protect pets and livestock from ticks.

Use repellents containing DEET (N,N-diethyl-m-toluamide), and choose a product that will provide sufficient protection for the amount of time spent outdoors. Product labels often indicate the length of time that someone can expect protection from a product. DEET is considered safe when used according to the manufacturer's directions. The efficacy of DEET levels off at a concentration of 30%, which is the highest concentration recommended for children and adults. DEET products should not be used on children <2 months of age. The following precautions should be observed when using DEET products:

- Avoid using DEET products that combine the repellent with a sunscreen. Sunscreens may need to be reapplied too often, resulting in an over application of DEET.
- Apply DEET on exposed skin, using only as much as needed.
- Do not use DEET on the hands of young children, and avoid applying repellent to areas around the eyes and mouth.
- Do not use DEET over cuts, wounds, or irritated skin.
- Wash treated skin with soap and water after returning indoors, and wash treated clothing.
- Avoid spraying DEET products in enclosed areas.

Permethrin-containing products will kill mosquitoes and ticks on contact. Permethrin products are not designed to be applied to the skin. Clothing should be treated and allowed to dry in a well-ventilated area prior to wearing. Because permethrin binds very tightly to fabrics, once the fabric is dry, very little of the permethrin gets onto the skin.

Chemoprophylaxis

None. Infection with the Colorado tick fever virus almost always confers lifelong immunity.

Vaccine

None.

Isolation and Quarantine Requirements

Isolation: None.

Hospital: Standard body substance precautions should be followed for CTF. Cases should not donate blood, or blood products, for six months after illness.

Quarantine: None.

CASE INVESTIGATION

Reporting

Report all suspect and confirmed cases of CTF.

Case Definition

Colorado Tick Fever (Utah 2015)

Clinical description

An acute viral disease characterized by fever $\geq 99^{\circ}\text{F}$ and one or more of the following: chills, lethargy, headache and myalgia with infrequent macular or maculopapular rash. After initial onset, a remission is usual, followed by a second bout of fever lasting 2-3 days.

Laboratory criteria for diagnosis

Confirmatory

- Isolation of Colorado tick fever virus from blood or CSF, or
- Fourfold or greater change in serum antibody
- RT-PCR may help diagnose the disease in the acute stage of illness.

Probable

- Demonstration of single serological test result suggestive of recent infection with no history of previous infection, by use of hemagglutination, IFA or ELISA.

Epidemiological Criteria:

Within ≤30 days before onset of symptoms, history of tick exposure or having been in wooded, brushy, grassy areas

Case classification

Confirmed

A case that is laboratory confirmed with symptoms.

Probable

A compatible exposure history, plus clinical symptoms with supportive laboratory results.

Criterion	Confirmed	Probable
<i>Clinical Presentation</i>		
Fever	N	N
Chills	O	O
Lethargy	O	O
Headache	O	O
Myalgia	O	O
Infrequent macular or maculopapular rash	C	C
Remission of symptoms	C	C
<i>Laboratory Findings</i>		
Isolation of Colorado tick fever virus from blood or CSF	O	
Fourfold or greater change in serum antibody	O	
Demonstration of single serological test result suggestive of recent infection with no history of previous infection, by use of hemagglutination, IFA or ELISA		N
<i>Epidemiological Criteria</i>		
History of tick exposure (≤30 days before onset of symptoms)		O
Having been (≤30 days before onset of symptoms) in wooded, brushy, grassy areas		O

Notes:

N= This criterion in conjunction with all other “N” and any “O” criteria in the same column is required to classify a case.

O= At least one of these “O” criteria in each category in the same column (i.e., clinical presentation and laboratory findings) in conjunction with all other “N” criteria in the same column is required to classify case.

C= This finding corroborates the diagnosis of, or is associated with, Colorado tick fever.

Case Investigation Process

- Fill out morbidity form.
- Verify case status.
- Fill out disease investigation form.
- Determine whether patient had travel/exposure history consistent with acquisition of disease in Utah or elsewhere.
- If patient acquired disease in Utah, identify the source of transmission and implement measures to eliminate it.

Outbreaks

More than one case of CTF in a one month period of time would constitute an outbreak.

Identifying Case Contacts

None.

Case Contact Management

None.

✓ REFERENCES

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Red Book: 2012 Report of the Committee on Infectious Diseases (29th Edition), Larry K. Pickering MD, Ed; 2012.

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✓ VERSION CONTROL

Updated. Dec 15, 2016 Updated minimum data set. Updated laboratory criteria for diagnosis.

Updated. Apr 22, 2016: Added importance to public health section.

Updated. Apr 22, 2016: Added information to laboratory identification and treatment. Researched all other parts and no updates are needed.

Updated. Apr 19, 2016: General update to formatting (separated tick-borne disease into individual disease plans).

Updated. April 30, 2018: Added Critical Clinical Information and ELR grey/white list rules.



UT-NEDSS Minimum/Required Fields by Tab

Demographic

- County
- State
- Street
- City
- Zip Code
- Date of Birth
- Birth Gender
- Race
- Ethnicity
- First Name
- Last Name
- Phone Number

Clinical

- Date of Death
- Hospitalized
- Died
- Disease
- Onset Date
- Pregnant
- Clinician
- Diagnostic Facility
- Specific Disease Being Reported
- Did the patient have an underlying immunosuppressive condition?
- Did the patient experience any of the following life-threatening complications in clinical course of illness?
- Was the patient treated with antibiotics?

Laboratory

- Organism
- Specimen Source
- Test Result

- Test Type

Epidemiological

- Imported From

Investigation

- List date 14 days prior to disease onset
- Was patient bitten by a tick during the above time period?
- Was patient in a wooded, brushy or grassy area (potential tick habitat) <30 days prior to onset of symptoms?
- Was the patient camping during exposure period?
- Was the patient hunting during exposure period?
- Did the patient visit any parks during exposure period?
- Did the patient traveled outside of Utah during exposure period?

Contacts

- Last Name
- First Name
- Date of birth

Reporting

- Date first reported to public health

Administrative

- Outbreak Name
- Outbreak Associated
- State Case Status

✓ Colorado Tick Fever Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.

Test Type	Test Result	Create a New Event	Update an Existing Event
IgG Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
IgM Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
PCR/Amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Colorado Tick Fever Morbidity Whitelist Rule: If the specimen collection date of the laboratory result two years or less after the event date, the laboratory result should be added to the morbidity event.

Colorado Tick Fever Contact Whitelist Rule: Never added to contact.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Colorado Tick Fever Graylist Rule: If the specimen collection date of the laboratory result is 30 days before to seven days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other Electronic Laboratory Processing Rules

If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.