**CAP health & wellness:** HSO Briefing: Tick Protection

**Purpose:** To provide an update on the protective steps you can take to protect yourself from the bite from ticks that can transmit Lyme disease, Rocky Mountain spotted fever, and other tick-borne infections.

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| (U) **Bottom Line:*** Risk to populations**: very low** **| low** | **moderate** | **high**
* **While it is a good idea to take preventive measures against ticks year-round, be extra vigilant in warmer months (April-September) when ticks are most active.**
* **Avoid contact with ticks by staying on trails when possible, using the proper tick repellent on skin and clothing, and look for and remove ticks from your body regularly.**
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**Recommendations: From CDC: www.cdc.gov/lyme**

**Overview:**

* Most tick bites do not transmit harmful microbes.
* There are a variety of tick-borne diseases.
* In some cases, there is a wide range of symptoms that usually develop days to weeks after the tick bite. The symptoms depend on the particular microbe that is transmitted.
* For all tick bites, local cleansing is indicated and antibiotic cream may be applied.
* There are safe and effective methods for the removal of all types of ticks.

***Recommendations:***

## **1) Avoid Direct Contact with Ticks**

* Avoid wooded and brushy areas with high grass and leaf litter, when possible.
* Walk in the center of trails.

## **2) Repel Ticks on Skin and Clothing**

* **Use repellent that contains 20 percent or more of DEET, picaridin, or IR3535 on exposed skin** for protection that lasts several hours. Reapply every few hours.
* Always follow product instructions and avoid hands, eyes, and mouth and consider washing hands after applying.
* **Use products that contain permethrin on your clothing**. Treat clothing and gear, such as boots, pants, socks and tents with products containing 0.5% permethrin. It remains protective through several washings. Pre-treated clothing is available and may be protective longer.
* The Environmental Protection Agency (EPA) has an online tool to help you select the repellent that is best for you and your family found at www.epa.gov/insect-repellents/find-insect-repellent-right-you

## **3) Find and Remove Ticks from Your Body**

* Bathe or shower as soon as possible after coming indoors (preferably within 2 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 daypacks.
* Tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors.
* If the clothes require washing first, hot water is recommended. Cold and medium temperature water will not kill ticks effectively. If the clothes cannot be washed in hot water, tumble dry on low heat for 90 minutes or high heat for 60 minutes.

**4) Tick Removal from Yourself**

* If you find a tick on yourself, removing and preserving it for identification and possible testing are important.
* Use fine-tipped tweezers to grasp the tick as close to the skin’s surface as possible.
* Pull upward with steady, even pressure. Don’t twist or jerk the tick; this can cause the mouth-parts to break off and remain in the skin. If this happens, remove the mouth-parts with tweezers. If you are unable to remove the mouth easily, leave it alone and let the skin heal.
* After removing the tick, thoroughly clean the bite area and your hands with soap and water.
* Check with your local health department to see if they identify and test the tick for disease.

**Questions**: **Contact your Region/Wing/Unit Health Services Officer or**

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### **What causes Lyme disease?**

Lyme disease is caused by infection with a bacterium called a spirochete (*Borrelia burgdorferi*) and is transmitted to humans by infected ticks (*Ixodes scapularis* and *I. Pacificus*). Lyme disease is the most common vector-borne disease in the U.S. Patients with early stage Lyme disease have a characteristic rash (erythema migrans) accompanied by nonspecific symptoms (for example, fever, malaise, fatigue, headache, myalgia, and arthralgia). Lyme disease can usually be treated successfully with standard antibiotics.

### **Who gets Lyme disease?**

The U.S. Centers for Disease Control and Prevention (CDC) reports that over 30,000 Americans were diagnosed with Lyme disease in 2014, representing more than a 30% increase in the annual rate in the past decade. It is suggested that the increase in reported cases is probably a result of both a true increase in incidence within known high-risk areas as well as more complete reporting as a result of enhanced Lyme disease surveillance. They noted that surveillance capabilities and public awareness of Lyme disease have increased during this period. Additionally, there has been an increase in the number of clinically diagnosed cases of Lyme disease that are not substantiated by laboratory testing.

Researchers also note that Lyme disease remains underreported with an estimated seven to 12 cases for each reported case.

Geographic and seasonal patterns of disease correlate with the distribution and feeding habits of the vector ticks. Most cases of Lyme disease occur in states that are known to be high risk. A total of 92% of cases was reported from eight northeastern and mid-Atlantic states and two north-central states. Less than 8% of cases were reported from states with low or no known risk for Lyme disease. The majority of reported cases had onsets of disease in June, July, or August -- the months when humans most commonly engage in outdoor activities. Researchers believe that a majority of human cases result from young ticks. Because the attached young tick (nymph) is approximately the size of a poppy seed, it might not be noticed and, therefore, not removed before disease transmission occurs. It has been suggested that factors contributing to the rise in reported cases of Lyme disease include proliferation of the animal hosts of the ticks and Lyme bacterium, including rodents and deer, as well as warmer weather during the season of tick reproduction during the summertime.

Children 5-10 years of age and adults 35-54 years of age are most commonly affected. The risk of Lyme disease increases with increasing exposure to wooded, brushy, or overgrown grassy areas in high-risk states. States reporting the highest incidence of Lyme disease in the study were New York, Connecticut, Pennsylvania, New Jersey, Wisconsin, Rhode Island, Maryland, Massachusetts, Minnesota, and Delaware.

### **How can Lyme disease be prevented?**

Prevention and educational programs in endemic areas have stressed the use of personal protective measures. Wearing long clothing can protect the skin. Clothing, children, and pets should be examined for ticks. Ticks can be removed gently with tweezers and saved in a jar for later identification. Bathing the skin and [scalp](https://www.medicinenet.com/hair_and_scalp_pictures_slideshow/article.htm) and washing clothing upon returning home might prevent the bite and transmission of the disease. Other prevention strategies attempt to reduce the density of *I. scapularis* in the environment and include deer exclusion or removal, application of acaricides or desiccants to vegetation, landscape management (for example, removal of leaf litter), host-targeted acaricides, and the use of vaccine (none currently available). To make the most efficient use of limited resources, prevention strategies should consider the geographic and temporal distribution of Lyme disease risk and appropriately target communities at moderate and higher risk.

### **What are ticks? What do ticks look like?**

Ticks are small arachnids. Ticks require blood meals to complete their complex life cycles. Ticks are scientifically classified as *Arachnida* (a classification that includes spiders). The fossil record suggests ticks have been around at least 90 million years. There are over 800 species of ticks throughout the world, but only two families of ticks, *Ixodidae* (hard ticks) and *Argasidae* (soft ticks), are known to transmit diseases or illness to humans. Hard ticks have a scutum, or hard plate, on their back while soft ticks do not.

Ticks have a complex life cycle that includes eggs, larvae, nymphs, and adult male and female ticks. The larvae, nymphs (also termed seed ticks), and adults all need blood meals. Usually, the female adult (hard tick) is the one causing the most bites as males usually die after mating. Ticks do not jump, fly, or drop. They simply reach out with their legs and grab or crawl onto a host. Although some larvae have preferred hosts, most ticks in the nymph or adult phase will attach a get a blood meal from several different kinds of animals, including humans. Except for a few species of larval ticks, the immature phases (larvae, nymphs) usually are even less selective about where they get a blood meal and are known to bite snakes, amphibians, birds, and mammals. Larvae are very small (about 1/32 of an inch with six legs), while nymphs are about 1/16-1/8 inch with eight legs and adults about 3/16-1/4 inch with eight legs. The complex life cycles are described in the last web citation below, and all of the web citations include pictures of various species of ticks. Although ticks will die eventually if they do not get a blood meal, many species can survive a year or more without a blood meal. The hard ticks tend to attach and feed for hours to days. Disease transmission usually occurs near the end of a meal, as the tick becomes full of blood. It may take hours before a hard tick transmits pathogens. Soft ticks usually feed for less than one hour. Disease transmission can occur in less than a minute with soft ticks. The bite of some of these soft ticks produces intensely painful reactions.

Ticks are transmitters (vectors) of diseases for humans and animals. Ticks can transmit disease to many hosts; some cause economic harm such as Texas fever (bovine babesiosis) in cattle that can kill up to 90% of yearling cows. Ticks act as vectors when microbes in their saliva and mouth secretions get into the host's skin and blood. Ticks were understood to be vectors of disease in the mid-1800s, and as investigative methods improved (microscopes, culture techniques, tissue staining), more information showed the wide variety of diseases that could be transmitted by ticks.

There are many common names for various ticks (for example, dog tick, deer tick, and African tick), and these names appear in the scientific literature, too. Most common names represent a genus of ticks. However, the common name "red" may be used by people to describe almost any tick that has had a blood meal.

### **What are tick bite symptoms and signs?**

Unfortunately for the purpose of detection, the tick bite is usually painless and remains that way even after the tick stops the blood meal and falls off of the skin. Later, the bite site may develop

* itching,
* burning,
* redness or red spot, and
* rarely, localized intense pain like in the joints (some soft tick bites) in some individuals.

A few individuals may be sensitive or allergic to tick bites (tick saliva secretions) and develop

* rash near bite,
* shortness of breath,
* swelling,
* numbness, or
* paralysis (for example, neck stiffness).

However, the majority of individuals with tick bites develop no symptoms, and many people do not remember getting bitten.

Some immediate symptoms that infrequently or rarely develop during or immediately after a tick bite may be

* fever,
* shortness of breath,
* weakness and/or achiness,
* vomiting,
* swelling at the bite site and/or lymph nodes,
* weakness or paralysis,
* headache,
* confusion, or
* palpitations.

Individuals with these symptoms should be seen immediately by a doctor.

Recently, researchers have found that the tick bite (mainly the saliva produced by the lone star tick) has caused thousands of people to become allergic to red meat, termed a meat allergy (beef, pork, venison, and occasionally, milk). People can eat poultry (chicken, turkey) and have no allergic reactions. When they eat red meat, they develop swelling and hives. Some may develop anaphylaxis. The reaction is thought to be due to an alpha-gal antigen in the tick's gut and/or saliva that stimulates an immune response that results in an allergic reaction when red meat is consumed. Occasionally, a tick bite may become red, swollen with red streaks; these are signs that the bite has become infected.

**What diseases do ticks transmit (act as vectors) to humans?**

Although most tick bites do not transmit pathogens, some bites do. It is not possible to determine if a tick is carrying pathogens visually. The following is a list of all of the major tick-borne diseases, the usual tick vector(s), and the pathogen(s) the tick transmits that may occur in the United States.

* **Tularemia** -- *Dermacentor variabilis* (American dog tick; several species are also known as a wood tick) (hard tick) and *Amblyomma americanum* or lone star tick (hard tick) -- vectors for *Francisella tularensis* bacteria
* **Anaplasmosis** (human granulocytic anaplasmosis or HGA) -- *Ixodes* species (hard tick) -- vectors for *Anaplasma phagocytophilum* bacteria
* **Colorado tick fever** -- *Dermacentor andersoni* (hard tick) -- vectors for *Coltivirus*, a RNA virus
* **Powassan encephalitis** -- *Ixodes* species and *Dermacentor andersoni* (both hard ticks) -- vectors for Powassan encephalitis virus, an RNA arbovirus
* **Babesiosis** -- *Ixodes* species (hard ticks) -- vectors for *Babesia*, a protozoan
* **Ehrlichiosis** -- *Amblyomma americanum* or lone star ticks; see photo below with "lone star" mark on the dorsal surface (hard ticks) -- vectors for *Ehrlichia chaffeensis* and *Ehrlichia ewingii* bacterial species
* **Rocky Mountain spotted fever** -- *Dermacentor variabilis* (American dog tick, see picture below) and Rocky Mountain wood tick (*Dermacentor andersoni*) (hard tick) are the primary vectors and occasionally the brown dog tick (*Rhipicephalus sanguineus*); *Amblyomma cajennense* (hard tick) is the vector in countries south of the U.S. -- vectors for *Rickettsia* bacteria
* **Lyme disease** -- *Ixodes* species including deer ticks or also known as black-legged ticks (hard ticks, see photo below) -- vectors for *Borrelia* species of bacteria
* **Heartland virus** -- a viral disease discovered in 2012 transmitted by *Amblyomma americanum* or lone star tick
* **Tick-borne relapsing fever** -- *Ornithodoros moubata* or African tick; see illustration below (soft tick) -- vectors for *Borrelia* species of bacteria
* **Q fever** -- *Rhipicephalus sanguineus*, *Dermacentor andersoni* (see photo below), and *Amblyomma americanum* (all three are hard ticks) -- vectors for *Coxiella burnetii*, a bacterium
* **Southern tick-associated rash illness (STARI)** -- *Amblyomma americanum* or lone star tick (hard tick) -- infectious agent not yet identified according to U.S. Centers for Disease Control and Prevention (CDC)



This list shows that some ticks (for example, *Ixodes*) can transmit more than one type of pathogenic microbe (virus, bacteria, and protozoa). It is possible to transmit more than one pathogen in a single tick bite, although this rarely occurs. Outbreaks of tick-related illnesses follow seasonal patterns (about April to September in the U.S.) as ticks evolve from larvae to adults.

### **What is the best method of tick removal?**

The following is a step-by-step method that is suggested for safe and effective removal of all types of ticks.

1. Wear hand protection such as gloves so you don't spread pathogens from the tick to your hands; use forceps or tweezers to grab the tick at skin level.
2. Grasp the tick firmly with the tweezers as close to the skin as possible without crushing the tick. Apply gentle pulling motion upward until the tick comes free. Twisting or turning the tick does not make removal easier because the mouthparts are barbed; in fact, such actions may break off the head and mouthparts, thereby increasing the chances for infection. The second web citation illustrates the proper removal of a tick.
3. Once the tick is removed, don't crush the tick because it may release pathogens. Consider keeping it in a tightly closed jar or taped to a piece of paper. Show the tick to the doctor if the person bitten becomes ill after the tick bite. Flush any removed ticks not kept for identification down the toilet or sink.
4. The area of the bite should leave a small crater or indentation where the head and mouthparts were embedded. If portions of the head or mouthparts remain, they may be removed by a doctor.
5. Thoroughly cleanse the bite area with soap and water or a mild disinfectant. Observe the area for several days for development of a reaction to the bite (rash or signs of infection). Apply antibiotic cream to the area as a precaution. Application of an antibiotic to the area may help prevent a local infection but usually does not affect the chance of developing diseases transmitted by the tick.
6. Wash hands thoroughly after handling any tick or instruments that touched a tick. Clean and disinfect any instruments that were used.

To remove the tick without tweezers, there have been several suggestions that may or may not work. The following are two examples that individuals claim work well and cause the tick to release itself from the skin with all of its mouthparts intact:

* Find the tick on the skin, and with your finger (preferably a gloved finger), rotate the body of the tick clockwise or counterclockwise for about a minute or so. This irritates the tick enough to cause it to let go of the skin and then the tick can be removed by simply touching the tick to scotch tape.
* Put liquid soap on a cotton ball and cover the tick with the soaked cotton ball for about 15 to 20 seconds; the tick will supposedly release itself from the skin and get caught up in the cotton ball. You can dispose of the tick by placing it and the cotton ball in a sealable plastic bag.

These methods are mentioned because sometimes tweezers are not available; nonetheless, if these methods remove the tick along with its intact mouthparts, individuals should thoroughly wash their hands and disinfect any areas with which the tick may have come in contact.

Other ways to remove ticks, such as using a hot match head or painting the tick with nail polish, gasoline, or other materials, **are not advised.** Such treatments can cause the tick to release more fluids back into the bite and increases the chance to transmit disease before the tick releases itself from the skin.