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Spring to Summer: The Risks of Bug-Borne (Vector) Diseases in MN

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Objectives

- Define Vector-borne diseases
- Recognition of Common Carriers
- Common Diseases
- Symptoms
- Treatment
- Prevention

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Vector-Borne Diseases

- A **vector-borne disease** is one in which the pathogenic microorganism is transmitted from an infected individual to another individual by an arthropod or other agent, sometimes with other animals serving as intermediary hosts. The transmission depends upon the attributes and requirements of at least three different living organisms: the pathologic agent, either a virus, protozoa, bacteria, or helminth (worm); the vector, which are commonly arthropods such as ticks or mosquitoes; and the human host. In addition, intermediary hosts such as domesticated and/or wild animals often serve as a reservoir for the pathogen until susceptible human populations are exposed.

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Common Carriers

- Ticks

- Mosquitoes

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Polling Question

Where do you find mosquitoes, ticks and other vectors that may carry diseases affecting your workers?

A. Outside in the deep woods or swamps
B. At a construction site
C. Indoors in areas with grasses, trees and other plants
D. Outdoors at baseball, soccer fields
E. All the above

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Polling Question

Where do you find mosquitoes, ticks and other vectors that may carry diseases affecting your workers?

Answer: All the above

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Identifying Ticks

- **Black-legged ticks** - also known as deer tick or bear tick can transmit several tick-borne diseases, such as anaplasmosis, babesiosis, and Lyme disease.

- **Lone star ticks** - have been linked to ehrlichiosis and Southern Tick-Associated Rash Illness (STARI).

- **American dog tick** - can carry diseases such as Rocky Mountain spotted fever and tularemia.

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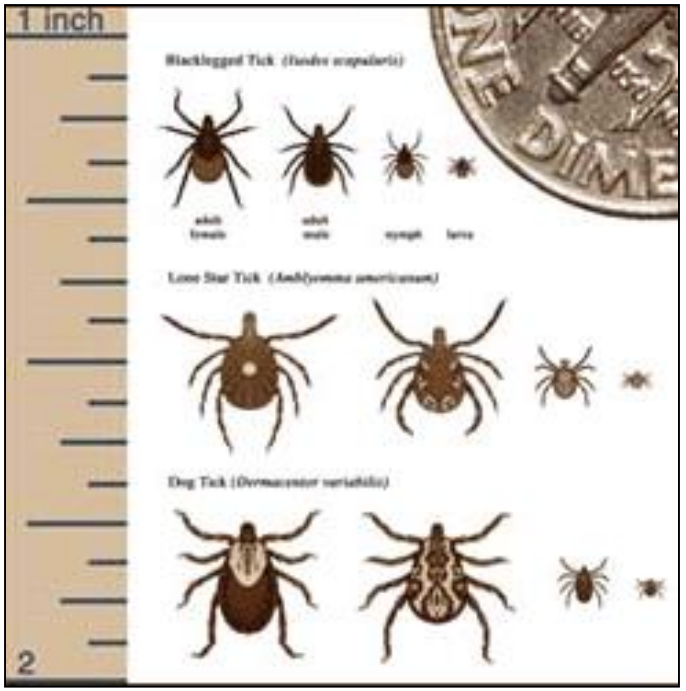
Common Sizes

- Deer Tick
- Lone Star Tick
- Dog Tick



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Commonly Recognized Tick-borne Diseases

- **Lyme Disease -** Lyme disease is a potentially serious bacterial infection affecting both humans and animals. The incidence of Lyme disease in Minnesota has been increasing in recent years.
- **Human Anaplasmois (HA) -** Human anaplasmosis, formerly known as human granulocytic ehrlichiosis (HGE) is a bacterial disease that was first recognized in Minnesota in the early 1990s. It is transmitted to people by deer ticks, the same ticks that transmit Lyme disease. HA is less common than Lyme disease, however.
- **Babesiosis -** Babesiosis is a protozoan infection that occurs infrequently in Minnesota. Approximately 20% of patients diagnosed with Babesiosis also have Lyme disease from the same deer tick bite.
- **Rocky Mountain Spotted Fever (RMSF) -** Rocky Mountain spotted fever is extremely rare in Minnesota, but isolated cases have been reported from the southern section of the state.
- **Southern Tick-Associated Rash Illness (STARI) -** CDC; While STARI is not a public health concern in Minnesota, people who travel to the south-central United States may be at risk for the disease. Attention: Non-MDH link
- **Human Monocytic Ehrlichiosis -** CDC; Human monocytic ehrlichiosis (HME) is not a public health concern in Minnesota, but residents who travel to the southern United States may be at risk for the disease. Attention: Non-MDH link
- **Powassan (POW) Virus -** Powassan (POW) virus is a tick-transmitted flavivirus.

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Lyme Disease

- **Lyme Disease** (LD) is an infection caused by *Borrelia burgdorferi*, a type of bacterium called a spirochete (pronounced spy-ro-keet) that is carried by deer ticks. An infected tick can transmit the spirochete to the humans and animals it bites. Untreated, the bacterium travels through the bloodstream, establishes itself in various body tissues, and can cause a number of symptoms, some of which are severe.

- **Transmission** - In order to get **Lyme Disease**, a person must be bitten by a blacklegged tick (also known as deer tick or bear tick) that is infected with the **Lyme Disease** bacteria.

  - Remember– not all blacklegged ticks are infected with the bacteria, so not all blacklegged ticks transmit disease.
  - The tick must be attached for at least 24-48 hours to transmit the bacteria.
  - The chance of getting **Lyme Disease** increases the longer the tick is attached.

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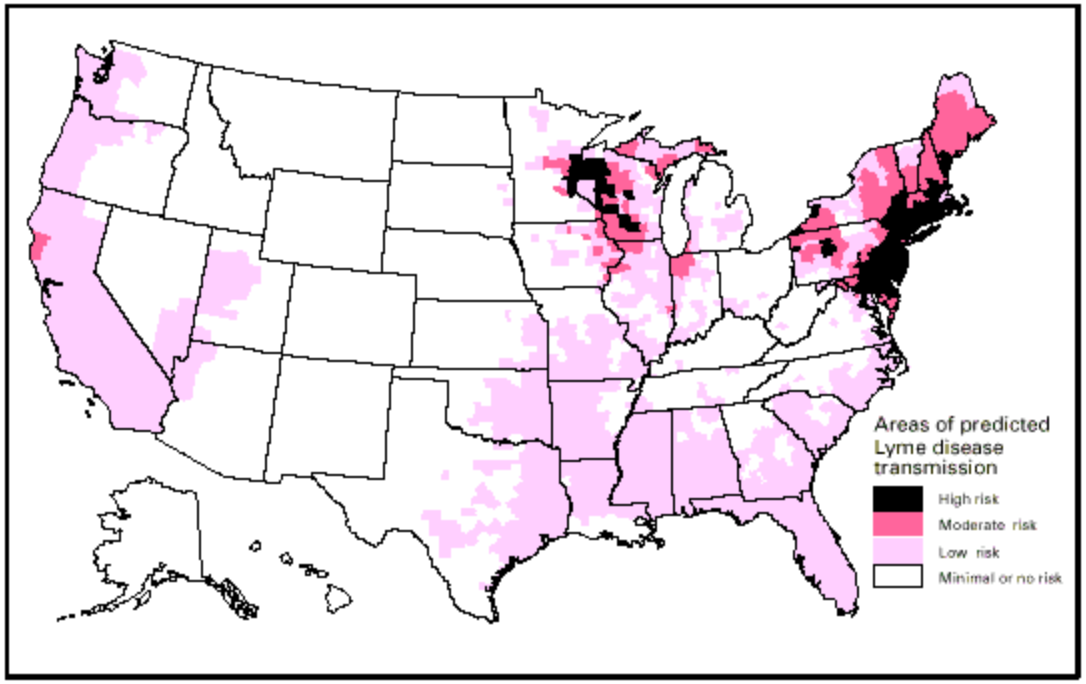
Highest Risk Areas In the U.S.

National Lyme disease risk map with four categories of risk



Note: This map demonstrates an approximate distribution of predicted Lyme disease risk in the United States. The true relative risk in any given county compared with other counties might differ from that shown here and might change from year to year. Risk categories are defined in the accompanying text. Information on risk distribution within states and counties is best obtained from state and local public health authorities.

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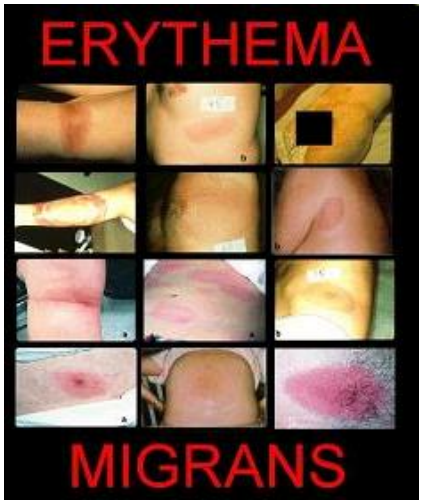
Symptoms

- **Three to 30 days after a blacklegged tick bite, look for:**
  - A Distinctive Rash
  - Fever
  - Chills
  - Headache
  - Muscle and joint pain
  - Fatigue

- **Days to weeks after onset of illness, one or more of these signs and symptoms may occur:**
  - Multiple Rashes
  - Facial paralysis on one side of the face
  - Fever
  - Stiff neck
  - Headache
  - Weakness, numbness or pain in arms or legs
  - Irregular heart beat
  - Persistent weakness and fatigue

- **Weeks to months after onset of illness, some of these signs or symptoms may appear:**
  - Arthritis in one or more joints, usually the knees
  - Problems with the nervous system
  - Persistent weakness and fatigue



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Treatment

- Early treatment of **LD (**within the first few weeks after initial infection) is straightforward and almost always results in a full cure. Treatment begun after the first three weeks will also likely provide a cure, but the cure rate decreases the longer treatment is delayed. **Doxycycline, amoxicillin and ceftin** are the three oral antibiotics most highly recommended for treatment of all but a few symptoms of **LD**. If neurological or severe cardiac abnormalities are present, studies recommend immediate intravenous (IV) treatment. Combinations of antibiotics may also be warranted.

- Treatment of late-**Lyme** (chronic) patients can be more complicated. Usually **LD** in its later stages can be treated effectively, but individual variation in the rate of disease progression and response to treatment may, in some cases, render standard antibiotic treatment regimens ineffective. In a small percentage of late-Lyme

Treatment of late-Lyme (chronic) patients, the disease may persist for many months or even years.

These patients will experience slow improvement and resolution of their persisting symptoms following oral or IV treatment that eliminated the infection. *Some of the treatment methods and data currently collected are under further study and can be controversial*

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Rocky Mountain Spotted Fever

- **Rocky Mountain spotted fever (RMSF)** is the most severe tick-borne rickettsial illness in the United States. This disease is caused by infection with the bacterial organism *Rickettsia rickettsii*. Rocky Mountain spotted fever can be a severe or even fatal illness if not treated in the first few days of symptoms.

- **Transmission** - The organism that causes **Rocky Mountain Spotted Fever** is transmitted by the bite of an infected tick. The American dog tick and Rocky Mountain wood tick are the primary athropods (vectors) which transmit **Rocky Mountain Spotted Fever** bacteria in the United States. The brown dog tick has also been implicated as a vector.

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Symptoms

Patients infected with ***R. rickettsii*** usually visit a physician in their first week of illness, following an incubation period of about 5-10 days after a tick bite. The early clinical presentation of Rocky Mountain spotted fever is often nonspecific and may resemble many other infectious and non-infectious diseases.

- Initial symptoms of **Rocky Mountain Spotted Fever** may include:
- fever
- nausea ,vomiting
- muscle pain
- lack of appetite
- severe headache

Later signs and symptoms of **Rocky Mountain Spotted Fever** include:

- rash
- abdominal pain , joint pain
- diarrhea

Three important components of the clinical presentation are fever, rash, and a previous tick bite, although one or more of these components may not be present when the patient is first seen for medical care. **Rocky Mountain Spotted Fever** can be a severe illness, and the majority of patients are hospitalized.

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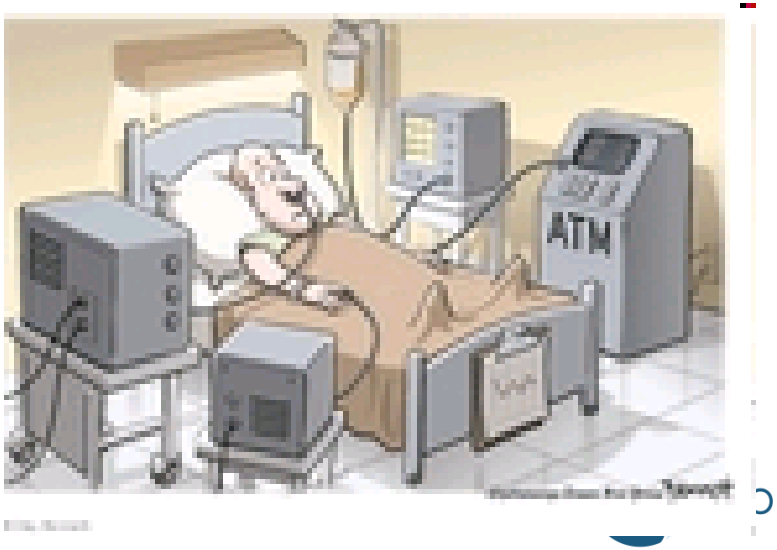
Treatment

- **Rocky Mountain Spotted Fever** is best treated by using a tetracycline antibiotic, usually doxycycline. This medication should be given in doses of 100 mg every 12 hours for adults or 4 mg/kg body weight per day in two divided doses for children under 45 kg (100 lbs). Patients are treated for at least 3 days after the fever subsides and until there is evidence of clinical improvement. Standard duration of treatment is 5 to 10 days. Because laboratory confirmation is generally not available during acute illness, treatment is initiated based on clinical and epidemiological information.



Where Do You Find Ticks

- Blacklegged ticks live in wooded, brushy areas that provide food and cover for white-footed mice, deer and other small or large mammals.
- This habitat also provides the humidity ticks need to survive.
- Exposure to ticks may be greatest in the woods (especially along trails) and the fringe area between the woods and border.
- Blacklegged ticks search for a host from the tips of grasses and shrubs, not from trees.
- Generally, ticks attach to a person or animal near ground level.
- Blacklegged ticks crawl; they do not jump or fly. They grab onto people or animals who brush against vegetation they are sitting on

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Prevention & Control

- Wear a hat and light-colored clothing, including long-sleeved shirts and long pants tucked into boots or socks.
- Use insect repellents that provide protection for the amount of time you will be outdoors:
  - Follow repellent label directions for use.
  - Use repellents containing 20%-30% DEET on your exposed skin and clothing to prevent tick bites.
  - Reapply repellents as needed.

- Use repellents such as Permethrin for greater protection.
  - Permethrin kills ticks on contact.
  - Permethrin can be used on clothing but should not be used on skin.
  - One application of permethrin to pants, socks, and shoes typically stays effective through several washings.

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Prevention & Control, cont.

- Check your skin and clothes for ticks every day. The immature forms of these ticks are very small and may be hard to see.
  - Remember to check your hair, underarms, and groin for ticks.
  - Immediately remove ticks from your body using fine-tipped tweezers.
  - Grasp the tick firmly and as close to your skin as possible.
  - Pull the tick's body away from your skin with a steady motion.
  - Clean the area with soap and water.

- **Separate**, wash and dry work clothes in a hot dryer to kill any ticks present.
- Learn the symptoms of tick-borne diseases.
- If you develop symptoms of a tick-borne disease seek medical attention promptly.
- Be sure to tell your health care provider that you work outdoors in an area where ticks may be present.

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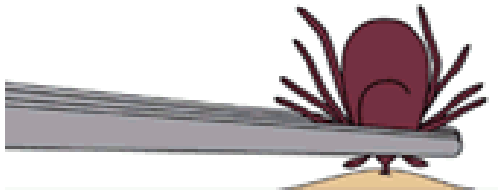
Developed & Presented by Integrated Loss Control, Inc.

Removing Ticks

To remove a tick, follow these steps:

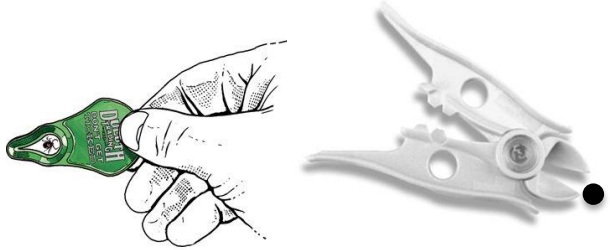


- Using a pair of pointed precision* tweezers, grasp the tick by the head or mouthparts right where they enter the skin. **DO NOT** grasp the tick by the body.

- Without jerking, pull firmly and steadily directly outward. **DO NOT** twist the tick out or apply petroleum jelly, a hot match, alcohol or any other irritant to the tick in an attempt to get it to back out.

  •Place the tick in a vial or jar of alcohol to kill it.

  •Clean the bite wound with disinfectant.



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Mosquitoes Diseases

- **West Nile Virus (WNV)** - West Nile virus is a disease transmitted to people, horses, and birds. It is the most commonly reported mosquito-transmitted disease in Minnesota. Most people infected with West Nile virus show no symptoms or flu-like symptoms, but some (primarily elderly) have more severe illness.

- **LaCrosse Encephalitis (LAE)** - LaCrosse encephalitis, which is transmitted by the Tree Hole mosquito, is responsible for 3 to 13 cases of severe illness (primarily in children) each year in Minnesota.

- **Western Equine Encephalitis (WEE)** - During 1941, there was a large regional outbreak of Western equine encephalitis. There may have been as many as 791 cases in Minnesota that year with 90 deaths. In more recent years, Minnesota has had infrequent and smaller outbreaks of WEE (15 human cases in 1975, single cases in 1983 and 1999).

- **Eastern Equine Encephalitis (EEE)** - Eastern equine encephalitis is a rare illness in humans, and only a few cases are reported in the United States each year. EEE is quite severe and typically fatal among infected horses.

- **St. Louis Encephalitis (SLE)** - CDC; Cases of St. Louis encephalitis are usually the result of unpredictable and intermittent localized epidemics. Attention: Non-MDH link

- **Malaria** - CDC; Malaria is not a public health concern in North America, but people who travel to or have lived in other areas of the world may be at risk and should be familiar with the symptoms of the disease and the drugs used to prevent infection.

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West Nile Virus

- **The West Nile virus (WNV)** is most often spread to humans from the bite of an infected mosquito. The virus may also be transmitted in other ways—through organ transplants, blood transfusions, and breast milk, and from mother to fetus. But the risk of such transmission is very low. **WNV** was first reported in the United States in 1999, and occupational exposures have been documented. By 2004, the virus was reported throughout the continental United States.

- **Transmission**
  - **Infected Mosquitoes.** Most often, **WNV** is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread **WNV** to humans and other animals when they bite.
  - **Transfusions, Transplants, and Mother-to-Child.** In a very small number of cases, **WNV** also has been spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.
  - **Not through touching. WNV** is not spread through casual contact such as touching or kissing a person with the virus.

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Symptoms

- The typical incubation period for **West Nile** is 2-6 days, although it can be as long as 15 days.
- Most people infected with **West Nile Virus** will be asymptomatic or experience a flu-like illness
- 20% of those bitten by an infected mosquito will develop the symptoms of **West Nile Fever**
- 1 out of 150 people bitten by an infected mosquito will develop the more severe form of **West Nile, West Nile Encephalitis**

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West Nile Fever

West Nile Fever symptoms include:

- sudden onset of high fever (usually >102°F)
- severe headache
- nausea
- vomiting
- sore throat
- backache
- joint pain
- prominent muscle aches and weakness
- prolonged fatigue
- rash (more commonly associated with **West Nile Fever** than encephalitis)
- swollen lymph nodes

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West Nile Encephalitis

- Less than 1% of those infected with **West Nile** will develop severe neurological symptoms consistent with encephalitis or meningitis.
- **West Nile Encephalitis** symptoms include:
  - mental status changes
  - vomiting
  - sensitivity to light
  - altered reflexes
  - seizures (less frequent)
  - 15% progress to coma
  - Acute flaccid paralysis (AFP) occurs in a small percentage of severely affected patients

- The death rate among those showing symptoms of severe **West Nile** infection (encephalitis or meningitis) is around 10% and most severe cases are elderly people.

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Risks & Treatment of WNV

- **People over 50 at higher risk to get severe illness.** People over the age of 50 are more likely to develop serious symptoms of **WNV** if they do get sick and should take special care to avoid mosquito bites.

- **Being outside means you're at risk.** The more time you're outdoors, the more time you could be bitten by an infected mosquito. Pay attention to avoiding mosquito bites if you spend a lot of time outside, either working or playing.

- **Risk through medical procedures is very low.** All donated blood is checked for **WNV** before being used. The risk of getting **WNV** through blood transfusions and organ transplants is very small, and should not prevent people who need surgery from having it. If you have concerns, talk to your doctor.

- **Treatment.** There is no specific treatment for **WNV** infection. In cases with milder symptoms, people experience symptoms such as fever and aches that pass on their own, although even healthy people have become sick for several weeks. In more severe cases, people usually need to go to the hospital where they can receive supportive treatment including intravenous fluids, help with breathing and nursing care.

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Polling Question:

Is it possible to have multiple infections (co-infections) from the same vector (e.g. tick) or from multiple vectors?

A. No, once you have a disease from one vector you can't get another.

B. Yes, but you can only get several tick diseases at the same time.

C. It depends on the exposure, on-going treatment and prevention tactics.

D. The doctors don't know.

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Polling Question:

Is it possible to have multiple infections (co-infections) from the same vector (e.g. tick) or from multiple vectors?

Answer: It depends on the exposure, on-going treatment and prevention strategies AND The doctors don’t completely know

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Co-infections

- It is possible to have multiple infections (co-infections) from the same vector (e.g. tick) or from multiple vectors which can complicate diagnosis and treatment making the illnesses more severe.
- The disease can strike more than once if persons are re-infected
- If possible, consult a vector-borne specialist if symptoms persist or treatment is ineffective

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Polling Question

What prevention measures does your company take to prevent mosquito and other insect bites?

A. Stay indoors if at all possible during early morning and late evening hours
B. Bug netting, special clothing
C. Use of bug zappers and other deterrents
D. Use of foggers, other treatment before workers enter the area
E. All of the above

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Polling Question

What prevention measures does your company take to prevent mosquito and other insect bites?

Answer-Discussion : Staying indoors all the time is probably not feasible for many organizations, plus the vectors can follow workers indoors (by flying or attachment, etc.).

Foggers may introduce additional hazards, or are not feasible. Zappers work at fixed locations only.

Use of repellents in combination with scheduling work outdoors at non-peak periods, special clothing and bite treatment can all be effective to reduce the risk of contracting vector borne-diseases.

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Prevention & Control

Use insect repellent if you work outdoors when mosquitoes are biting:

- Apply insect repellent containing **DEET** (more than 20% DEET for longer protection), picaridin, or oil of lemon eucalyptus to exposed skin and to clothing.
- Use permethrin on clothing only.
- Carefully follow label directions for repellent use.

- Do not apply pump or aerosol products directly to the face. Instead, spray these products onto the hands and carefully rub them over the face, avoiding the eyes and mouth.
- Use a repellent that provides protection for the amount of time that you will be outdoors and reapply it as needed. The percentage of active ingredient in the repellent determines the length of protection.
- Wash skin treated with insect repellent with soap and water after returning indoors.

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Prevention & Control Continued

Use protective clothing if you work outdoors when mosquitoes are biting:

- Wear long-sleeved shirts, long pants, and socks.
- Spray clothing with products containing **DEET**, picaridin, oil of lemon eucalyptus, or permethrin, as mosquitoes may penetrate thin clothing.
- Use permethrin repellents on clothing as directed; do not apply them directly to skin.
- Wash clothing treated with insect repellent before wearing it again.
- Do not apply repellent to skin that is covered by clothing.




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Prevention & Control Continued

- Avoid handling dead animals when possible. If you must handle them, take the following precautions:
- Use tools such as shovels to avoid direct contact with the animals.
- Wear medical examination gloves that provide a protective barrier between your skin and blood or other body fluids:
  - Wear two pairs of gloves if one pair alone might tear.
  - Wear the medical examination gloves as the inner pair.
  - Make sure that any latex gloves used are reduced-protein, powder-free gloves to reduce workers' exposure to allergy-causing proteins.
  - Wear cotton or leather work gloves as the outer pair when heavy work gloves are needed.
  - Remember that cotton, leather, and other absorbent gloves are not protective when worn alone.
- If gloves are not available, use a plastic bag, which may act as a protective barrier between the animal and your skin.

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New Vectors

- Invasive Species
- Indigenous species with new Infections (Kissing Bug Chagas Disease)
- Returning travelers with disease (Zika)
- Most are rare but can be quite serious

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Questions?

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