



# Entomological Programs and Services

## Program Summary

Army public health entomological services encompass all aspects of pest management, including surveillance, pesticide-use reporting and monitoring, pesticide-resistance testing, and the provision of entomological subject matter expertise and training. Entomological support considers both the direct impact of pests on the military and the potential environmental impacts of intervention efforts. Army public health entomological services adhere to integrated pest management principles that consider and promote non-chemical measures over the use of chemical measures. Pest prevention, identification, surveillance, management, documentation, and analysis are key areas of emphasis.

Individual's / Unit's requiring pest control services must submit a work order through their local installation DPW Office.

For technical advice or training, please contact the Environmental Health Office.

*According to the Centers for Disease Control and Prevention (CDC), integrated pest management reduces the risk from pests while also reducing the risk from the overuse or inappropriate use of hazardous chemical pest-control products.*

## Military Tick Identification/Infection Confirmation Kit (MilTICK)

MilTICK is a free tick testing and identification service available for ticks removed from DoD personnel (Active Duty Service Members, National Guard personnel, Reservists in all services, Civilians personnel working for the DoD or any of the Services, Contractors supporting the DoD or any of the Services, and Retired Service Mem-bers) and their Family members. Any tick found biting an eligible person can be submitted to MilTICK by health care providers through tick kits available at Fort Campbell's Environmental Health Office, DoD health care facilities (i.e., Fort McCoy's Occupational Health Clinic and Rock Island's Army Health Clinic), or by individuals through a simple mail-in process (for training personnel).

Ticks will be identified to species, assessed for how long they have been attached, and tested for human patho-gens. The results will be reported back to the point of contact provided on the MilTICK form, and will be used to assess the risk of tick-borne disease to Military personnel. For additional information or to request services, contact the Environmental Health Office for program details.

### Environmental Health Contact Information

#### Fort Campbell

(270) 412-3979/3990

#### Fort McCoy & Rock Island

(270) 461-4650

### Installation Work Order Contact Information

#### Fort Campbell

(270) 798-1200/3966

#### Fort McCoy

(608) 388-4357

#### Rock Island Arsenal

(309) 782-2387





## DoD Insect Repellent System

The DoD Insect Repellent System is a safe and proven method to reduce disease and annoyance associated with insects. Whether deployed in combat operations, engaged in humanitarian relief, or conducting training in the United States, U.S. military personnel are subject to insect-borne diseases and pest threats that can adversely affect their health and compromise the mission.

The DoD Insect Repellent System incorporates: (1) Permethrin on the uniform; (2) DEET or Picaridin repellent on exposed skin; (3) A proper worn uniform; and (4) Using permethrin-treated bed nets when appropriate.

Approved insect repellents for use on exposed skin include:

|   |                       |
|---|-----------------------|
| Ultrathon™                                | NSN: 6840-01-284-3982 |
| Ultra 30 Insect Repellent Lotion™         | NSN: 6840-01-584-8393 |
| Cutter Pump Spray®                        | NSN: 6840-01-584-8598 |
| Sunsect Combination Sunscreen & Repellent | NSN: 6840-01-288-2188 |
| Natrapel Pump Spray®                      | NSN: 684001-619-4795  |

Use of trademark name does not imply endorsement by the U.S. Army or Environmental Health but is intended only to assist in identification of a specific product. For more information, please consult the Environmental Health Office.

*According to the Army Public Health Center (APHC), avoid contact with all animals whenever possible; assume that they are infested with parasites, parasitic diseases, or potential venomous stings or bites. Never pick up a friendly, sick, injured, or dead animal.*

## Vector-Borne Disease, Surveillance, and Control Informational Products

According to the Centers for Disease Control and Prevention, North Americans are currently at risk from numerous vector-borne diseases, including: Lyme, Dengue Fever, West Nile Virus, Rocky Mountain Spotted Fever, Plague, and Tularemia.

Unit's inquiring about local disease vectors, pests, and surveillance efforts please contact your supporting Command Surgeon's Office for further details and support during deployment and training exercises. For additional assistance, Fort Campbell's Environmental Health Office maintains subject matter expertise in which encompasses inspections, surveys, and routine surveillance for any organism that poses a public health or nuisance threat.

General information on protecting the Soldier from the health threat posed by vector-borne disease and medically important pests and to minimize the adverse effects of pesticides can be found within the attached fact sheets provided by the Army Public Health Center.

### Contact Information

**Fort Campbell  
Division Surgeon's Office**  
(270) 798-5880

### Environmental Health

**Fort Campbell**  
(270) 412-3979

**Rock Island Arsenal & Fort  
McCoy**  
(270) 461-4650

**Rock Island Arsenal  
Army Sustainment Command  
Surgeon's Office**  
(309) 782-1824

**HQ, First Army, Office of the  
Command Surgeon**  
(309) 782-9607



*Just the Facts...* It is important to control mosquitoes around the home because this area often provides ideal conditions for mosquitoes to develop. Human vaccines are not available for many of the diseases that mosquitoes transmit, such as West Nile virus and Dengue. The best way to prevent these diseases is to control mosquitoes and eliminate their breeding habitat. By following the guidance provided in this factsheet, homeowners can significantly reduce the risk of mosquito bites and the diseases they transmit in their community.

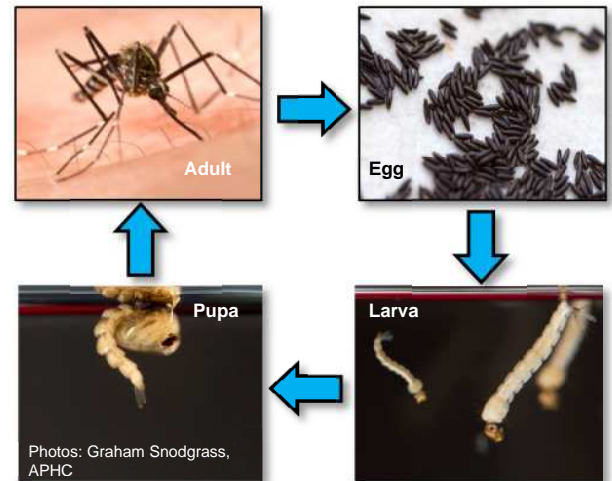
## What do mosquitoes look like and how do they develop?

All mosquitoes pass through four life-stages: egg, larva, pupa and adult. Eggs hatch into larvae after a few days of being in contact with water. The larvae feed on debris in the water, grow rapidly and will turn into pupae within one to two weeks. Pupae take only a few days before they hatch into adult mosquitoes. Only the adult female mosquitoes bite. Adult female mosquitoes require blood so that they can produce eggs and start the life-cycle again.

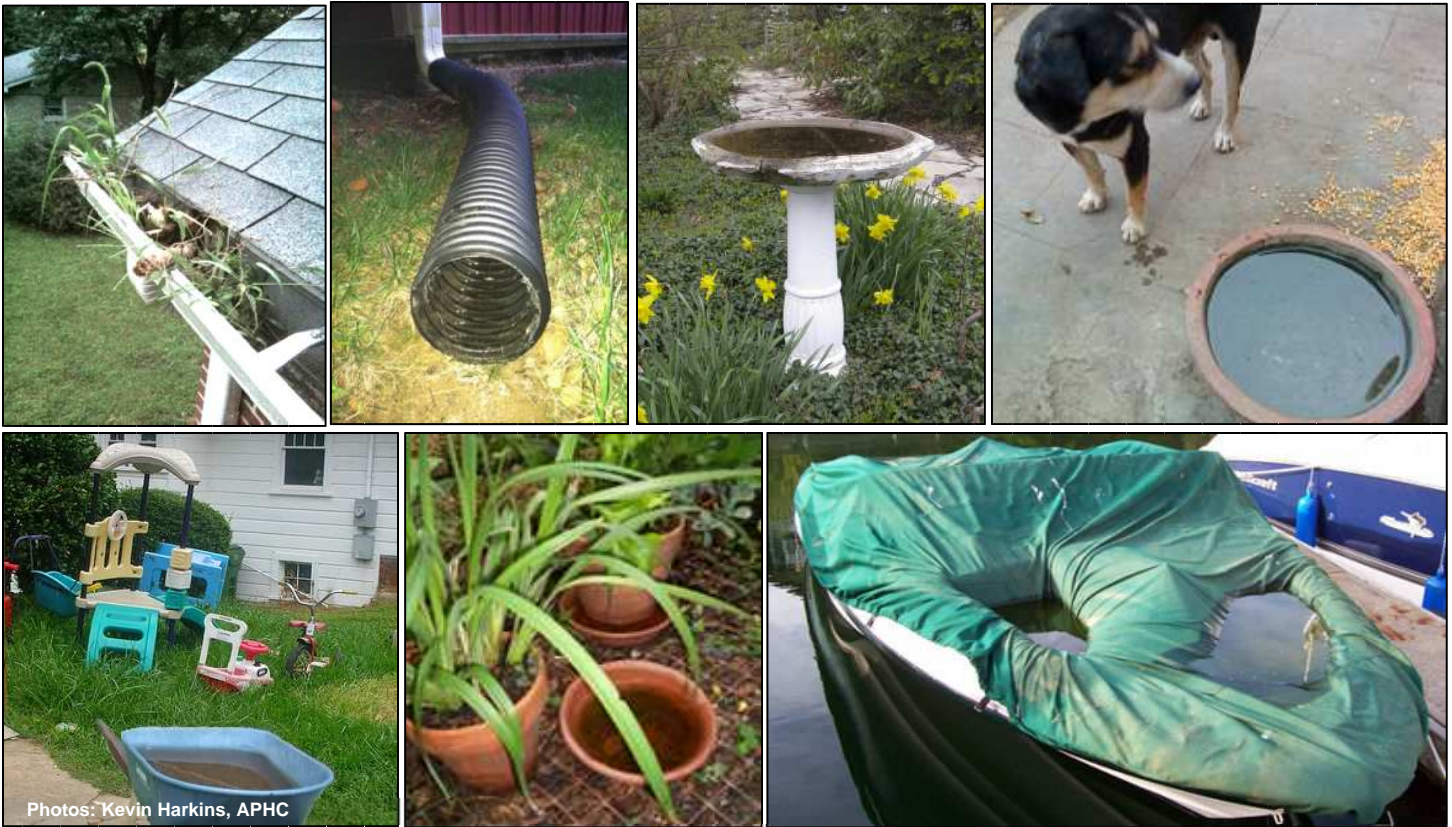
## What is the most effective way to control mosquitoes around my home?

The most effective way to control mosquitoes around the home is to eliminate or treat the water where mosquitoes lay their eggs and their larvae live and grow. Because mosquitoes are able to lay hundreds of eggs, in very small amounts of water, eliminating even the smallest areas where water collects around the home can dramatically reduce mosquito populations:

- Check rain gutters and make sure they are free of debris and working properly
- Ensure that garbage cans and other receptacles have tight fitting lids and do not collect water
- Drill holes in the bottom of recycling bins and outdoor storage containers for drainage
- Seek out and remove unneeded items that collect water such as plastic containers, flower pots, children's toys, old tires or any other items that can hold water
- Check holes and cavities in tree trunks for water, if present fill with sand or cement
- Drain or replace corrugated plastic pipe used for downspout drainage
- Empty and refresh pet water dishes, watering troughs and birdbaths at least once a week
- Check around faucets and air conditioner units and repair any leaks that result in puddles
- Keep swimming pools and spas chlorinated
- Aerate ornamental pools and ponds
- Empty children's wading pools after use
- Store small boats upside down
- Make sure that water does not collect on covers used for grills, spas, pools, boats, cars, or woodpiles
- Fill in any depressions and low-lying areas in the yard that accumulate water
- Keep drainage ditches and culverts free of debris to allow water to drain properly



**Life-cycle of a Mosquito.** All mosquitoes have four life-stages. The first three life-stages; egg, larva and pupa, must have water in order to develop into adults. Mosquitoes can complete their entire life-cycle, in as little as a teaspoon of water, as quickly as one week.



Photos: Kevin Harkins, APHC

**Locations around the home that frequently breed mosquitoes.** Mosquitoes will seek out any areas around the home where water collects to lay their eggs. Clogged roof gutters and corrugated drain pipe are important mosquito breeding sites that are often overlooked (top left). Water in birdbaths and outdoor pet dishes should be changed weekly (top right). Tarps and equipment covers will sag, accumulate water and breed mosquitoes if not properly secured (bottom right). Trays for potted plants, children's toys and any other outdoor items holding water should be drained or removed to prevent mosquito breeding (bottom center, left).

### What can I do to protect myself against mosquitoes that are actively flying around my home?

Homeowners should follow these recommendations to protect themselves from adult mosquitoes that are flying around their home:

- Use an Environmental Protection Agency (EPA) registered insect repellent on exposed skin when outdoors.
- Clothing can be an effective barrier against mosquito bites. Wearing clothing with long sleeves and long pants will reduce the amount of exposed skin and make it harder for adult mosquitoes to bite.
- EPA labeled products that contain permethrin can be used to treat clothing to prevent adult mosquitoes from biting through fabric. Permethrin treated garments are also commercially available. Be sure to read and follow all labeled instructions before use.
- Ensure that screens on doors and windows are properly installed and free of holes and tears.
- Bright lights attract mosquitoes; consider using lower wattage bulbs or turn off exterior lighting when not needed.
- Adult mosquitoes will rest on weeds and other vegetation around the home. Homeowners can reduce adult mosquito resting sites by keeping ornamental plants and lawns well maintained.
- EPA registered products for controlling adult mosquitoes, such as aerosol foggers, should only be used as a last resort; their effect is temporary and adult mosquitoes can quickly invade areas after treatment.

### What items are not recommended for use to control adult mosquitoes around my home?

Electromagnetic exclusion devices, ultrasonic repellent products, and outdoor devices for electrocuting flying insects are not recommended for use to control adult mosquitoes around the home. These devices often attract and kill more non-target and beneficial insects than adult mosquitoes.

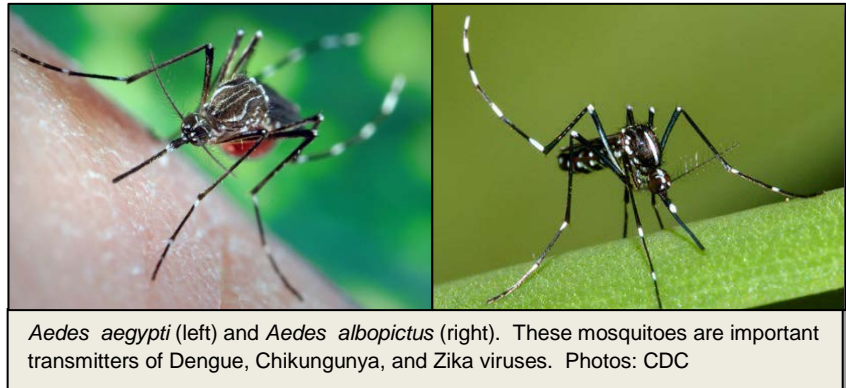
## Just the Facts...

*Zika (zee-kah) virus is primarily spread from an infected person to an uninfected person through the bite of an infected Aedes species mosquito. Although most infections do not cause symptoms, Zika virus infection may result in fever, rash, joint pain, and red eyes. The illness is usually mild with symptoms lasting from several days to a week. Zika virus was first isolated from a rhesus monkey in the Zika forest, Uganda, in 1947. Outbreaks of Zika have occurred in parts of Africa, Southeast Asia, and the Pacific Islands. Zika spread to the Western Hemisphere in 2015 and has affected more than a million people in South and Central America, Mexico, and the Caribbean. With the recent outbreaks, the number of Zika cases among travelers visiting or returning to the United States will likely increase. These imported cases may result in local spread of the virus in some areas of the United States. Zika virus infection can be prevented by protecting against mosquito bites and eliminating mosquito breeding areas.*

### How do people become infected with Zika virus?

The disease is spread to people primarily through the bite of an infected *Aedes* species mosquito. These are the same mosquitoes that spread dengue and chikungunya viruses.

These mosquitoes are aggressive daytime biters with peak activity at dawn and dusk. They will bite indoors, around the outside of homes. The yellow fever mosquito (*Ae. aegypti*), and the Asian tiger mosquito (*Ae. albopictus*) have been implicated in large outbreaks of Zika virus. Other *Aedes* mosquito species, notably *Ae. africanus*, *Ae. hensilli*, and *Ae. polynesiensis*, are also considered potential vectors of Zika virus. Some evidence suggests that Zika virus can also be spread from mother to child during pregnancy. The U.S. Centers for Disease Control and Prevention (CDC) is aware of increased numbers of babies with microcephaly (smaller than expected head size) in Brazil and is currently supporting the investigation into a possible link with Zika virus infection. There are currently no reports of infants getting Zika virus through breastfeeding. The CDC is also investigating a possible link between Zika virus and Guillain-Barre syndrome, a rare disorder in which the body's immune system attacks part of the nervous system.



### What are the signs and symptoms of Zika virus infection?

Symptoms usually begin 2-7 days after being bitten by an infected mosquito. Common symptoms include fever, rash, joint pain and red eyes. Other symptoms include muscle pain, headache, pain behind the eyes, and vomiting. As symptoms are often mild, infection may go unrecognized or be misdiagnosed as dengue. A high rate of Zika infection with no symptoms is expected, similar to dengue and chikungunya. About one in five people infected with Zika virus will develop symptoms. Most people fully recover without severe complications, and hospitalization rates are low. To date, there have been no reported deaths associated with Zika virus.

### Is there a diagnostic test available to confirm Zika virus infection in humans?

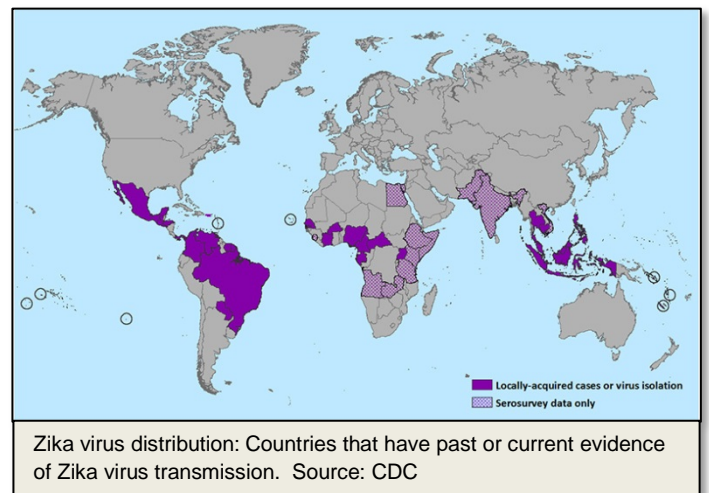
Your healthcare provider may order blood tests to look for Zika or other similar viruses like dengue or chikungunya. The symptoms of Zika are similar to those of chikungunya and dengue, which are diseases caused by other viruses spread by the same type of mosquitoes. See your healthcare provider if you have recently traveled to affected areas and have developed the symptoms described above.

### Is there a treatment for Zika virus infection?

There is no vaccine or specific treatment available. Persons with Zika virus should rest and drink plenty of fluids. Take medicines, such as acetaminophen (TYLENOL®), to relieve fever and pain. Aspirin and other non-steroidal anti-inflammatory drugs should be avoided until dengue can be ruled out to reduce the risk of excessive bleeding.

### What should I do if I think I am infected with Zika virus?

Seek medical attention if you experience the symptoms described above and have traveled to an area where Zika occurs. Be sure to tell your healthcare provider your recent travel history. If you think you have Zika, avoid mosquito bites to prevent the virus from spreading to others.



## What can I do to reduce my risk of becoming infected with Zika virus?

If you are pregnant or trying to become pregnant and traveling to areas where Zika virus transmission is ongoing the CDC has provided the following interim recommendations (<http://wwwnc.cdc.gov/travel/notices>):

- Women who are pregnant (in any trimester): Consider postponing travel to any area where Zika virus transmission is ongoing. If you must travel to one of these areas, talk to your doctor first and strictly follow steps to prevent mosquito bites during your trip. Use of approved insect repellents is safe during pregnancy.
- Women who are trying to become pregnant: Before you travel, talk to your doctor about your plans to become pregnant and the risk of Zika virus infection. Strictly follow steps to prevent mosquito bites during your trip, including use of approved insect repellents.

**AVOID MOSQUITO BITES!** Using the DoD Insect Repellent System provides the best protection from mosquito bites. It incorporates permethrin repellent on the uniform, DEET or picaridin repellent on exposed skin, a properly worn uniform and sleeping inside a permethrin-treated bed net. Civilian personnel can also purchase or treat clothing with permethrin.

Stay in air-conditioned areas or make sure door and window screens are in place and do not have holes. If practical, minimize time spent outdoors during daylight hours which are the peak biting times for the *Aedes* spp. mosquitoes that transmit Zika virus.

**ELIMINATE MOSQUITO BREEDING SITES!** Search and remove unneeded items that collect water such as plastic containers, flower pots, vases, children's toys, old tires or any other items that can hold water.

### How do I know if my uniform is treated with permethrin repellent?

Factory-treated permethrin Army Combat Uniforms (ACU Permethrin) are now available to all Soldiers. The ACU Permethrin trouser and coat will have a sewn-in label indicating the uniform is factory-treated with permethrin. If not factory-treated, Soldiers can field-treat using either the IDA Kit (NSN 6840-01-345-0237), which can last up to 50 washings, or the 0.5% aerosol spray can (NSN 6840-01-278-1336), which should be reapplied after 6 weeks and the sixth washing. When applying permethrin, always read and follow the label directions. Permanently mark the uniform label with the permethrin field-treatment date. **Never apply permethrin to the skin.** Aerosol products containing 0.5% permethrin and clothing factory-treated with permethrin are also commercially available for civilian use.

### What standard military insect repellent products are available for exposed skin?

Approved military insect repellents for use on exposed skin come in a variety of formulations. Always refer to the label to determine frequency of repellent application based on activity. **Do not apply repellent to eyes, lips, or to sensitive or damaged skin.** Available military repellents are:

- **Ultrathon™** (NSN 6840-01-284-3982) contains 33% controlled-release DEET lotion; one application protects for 12 hours.
- **Ultra 30™ Insect Repellent Lotion** (NSN 6840-01-584-8393) contains 30% Lipo DEET; one application protects for up to 12 hours.
- **Cutter® pump spray** (NSN 6840-01-584-8598) contains 25% DEET; one application protects for up to 10 hours.
- **Sunsect** combination sunscreen & repellent (NSN 6840-01-288-2188) contains 20% DEET with SPF 15 sun protection.
- **Natrapel® pump spray** (NSN 6840-01-619-4795) contains 20% picaridin; one application protects for up to 8 hours.

### What is considered a “properly worn combat uniform”?

Worn properly, military combat uniforms act as a physical barrier against insects, ticks and other disease transmitters and biting nuisance pests. Wear uniforms with the sleeves rolled down; tuck pants into boots and undershirt into pants. Wear uniform loosely since mosquitoes can bite through fabric that is pulled tight against the skin. A permethrin-treated uniform does not provide protection to exposed skin; protect exposed skin with an approved skin repellent.

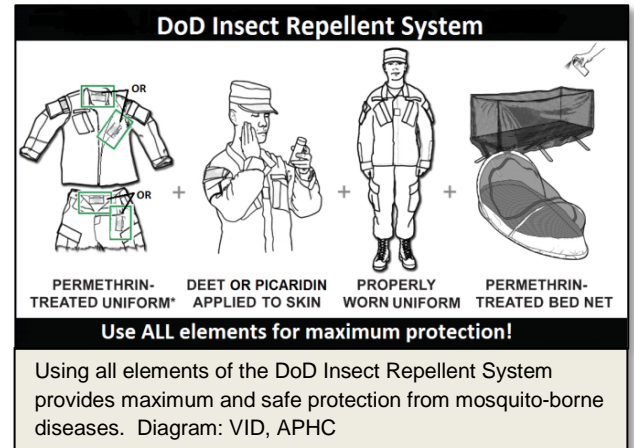
### What standard bed nets are available to help protect Soldiers from mosquito bites while sleeping?

Treated bed nets provide a barrier between a sleeping Soldier and pests (e.g., mosquitoes/ticks). Lightweight, self-supporting, pop-up bed nets factory-treated with permethrin are available in coyote brown (NSN 3740-01-518-7310) or green camouflage (NSN 3740-01-516-4415) or the Egret bed net (NSN 3740-01-644-4953). Untreated mosquito bed nets (NSN 7210-00-266-9736) should be treated with 0.5% permethrin aerosol spray and assembled properly on a cot. Check for holes in netting and keep loose edges off the ground by tucking them under the sleeping bag.

### Where can I get more information on Zika virus?

- Centers for Disease Control and Prevention - <http://www.cdc.gov/zika/>
- World Health Organization - <http://www.who.int/mediacentre/factsheets/zika/en/>

Use of trademarked name does not imply endorsement by the U.S. Army but is intended only to assist in identification of a specific product.  
For more information please consult the APHC website - <http://phc.amedd.army.mil>



All standard approved skin repellents contain the active ingredient DEET or picaridin, and are registered by the U.S. Environmental Protection Agency (USEPA). These products are safe to use and effectively repel mosquitoes, sand flies, fleas, ticks and other potential disease vectors and pests. Photo: VID, APHC



# Tick Control Around The Home

FACT SHEET 18-001-0818

Ticks are small arachnids, relatives of spiders and insects. In order to grow and reproduce, ticks must feed on the blood of animals. Most ticks go through three stages (larva, nymph, and finally adult) in their life cycle. The tick must feed (take a blood meal) once at each stage and this blood meal takes several days to complete. The main species of ticks which readily bite humans in the United States are *Ixodes scapularis* (blacklegged tick, a.k.a. deer tick), *Ixodes pacificus* (western blacklegged tick), *Amblyomma americanum* (lone star tick) and *Dermacentor variabilis* (American dog tick). In Europe *Ixodes ricinus* (sheep tick) is the predominant species and *Ixodes persulcatus* (taiga tick) is common in Asia. Ticks don't fly or jump. Rather, a tick climbs to the ends of blades of grass, shrubs or weeds, and waits quietly with its front legs extended until it can grab onto a passing animal or human. This behavior is called questing. Ticks are most common in woods, brushy areas, and un-mowed fields or other overgrown places. These are the areas where ticks are not only protected from the harsh drying effects of the sun and wind, but also where their animal hosts (such as mice and deer) live. Ticks may sometimes be found on well-mowed lawns or even inside your home because they can drop off pets or other animals that cross over from tick habitat back into mowed areas or homes.



Courtesy Graham Snodgrass APHC  
The three major tick species of concern in the United States. Lone star tick (top), blacklegged or deer tick (bottom left), and American dog tick (bottom right).

### Should I be concerned about ticks and their bites?

Ticks can spread diseases to people, pets, and other animals. Pathogens that may be present in their saliva are transmitted as they feed on the person or animal. These pathogens include the bacteria and viruses that cause such serious diseases as Lyme disease, babesiosis, Rocky Mountain spotted fever and other rickettsioses, and human ehrlichiosis. Not all ticks are infected. You cannot tell if a tick is infected just by looking at it. Ticks need to be attached to a host before they are able to transmit any diseases they may be carrying; therefore, it is important to remove any ticks attached to your skin as soon as possible. **Ticks that are just crawling on you cannot transmit diseases.**



Left: Nymphal blacklegged tick questing for animal host. Middle: Deer are major hosts for blacklegged ticks (deer ticks). Deer populations can transport ticks to areas around the home. Right: Tall grass, woods, and wood lines provide suitable habitat for ticks around homes.

### What personal protective measures should I use to protect myself against ticks?

Use an insect repellent containing **DEET**, picaridin, or IR3535 on your exposed skin (skin that is not covered with clothing). Use an insect repellent containing **permethrin** on your clothing. Always **FOLLOW LABEL DIRECTIONS** when applying repellents. Be sure to check your clothing and body for ticks when you have been outdoors. Shower after activities in tick habitat and be sure to check your clothing and body for ticks. Ticks can ride into the home on clothing and pets, then attach to a person later, so carefully examine pets, clothing, and gear. Immediately wash and dry clothing, or just tumble dry on high heat for an hour to kill any remaining ticks.

## What are the best ways to control ticks around the home?

- Create 'tick-free' zones around your home by cutting back wooded areas and removing any high grass, weeds, leaf litter and undergrowth from around your home.
- Keep your lawn well mowed to a height of 3 inches or less. This lowers the humidity at ground level, making it difficult for ticks to survive. Also, mice and other small animal hosts avoid these neatly trimmed areas because they cannot easily hide or find food and nesting materials.
- Move woodpiles as far from your house as possible. Mice and chipmunks can hide and nest in woodpiles.
- Place picnic tables, lawn furniture, and children's play areas as far from any woods, shrubs, and undergrowth as possible.

## Are there chemical control options I can use around the home?

Widespread application of pesticides for tick control is less effective than habitat modification techniques mentioned above. On-post residents should consult with Preventive Medicine staff to survey your area for ticks and determine if chemical control is needed. Applying pesticides should be considered only as a last resort. If living off-post, it is best to hire a professional pest control company.

## What are the standard military insect repellent products available for use on exposed skin?

Approved military insect repellents for use on exposed skin come in a variety of formulations. Always refer to the label to determine frequency of repellent application based on activity. **Do not apply repellent to eyes, lips, or to sensitive or damaged skin.** Available military repellents are:

- Cutter® pump spray (NSN 6840-01-584-8598) contains 25% DEET; one application protects for up to 10 hours.
- Bullseye™ Bug Repellent pump spray (NSN 6840-01-656-7707) contains 20% IR3535®; provides protection for up to 8 hours.
- Natrapel® pump spray (NSN 6840-01-619-4795) contains 20% picaridin; one application protects for up to 8 hours.
- Ultra 30™ Insect Repellent Lotion (NSN 6840-01-584-8393) contains 30% Lipo DEET; one application protects up to 12 hours.
- Ultrathon™ (NSN 6840-01-284-3982) contains 34% controlled-release DEET lotion; one application protects for up to 12 hours.

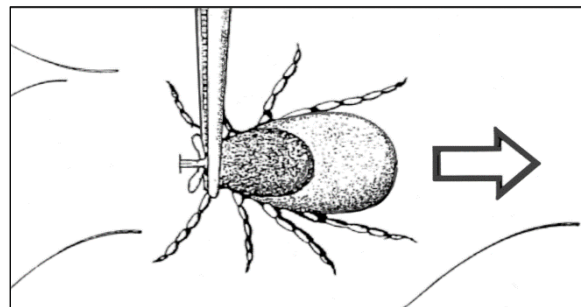


## What can I use to treat my clothing with permethrin?

Aerosol products containing 0.5% permethrin and permethrin-impregnated garments are commercially available for civilian use.

## What do I do if there is a tick on me?

Unattached ticks do not present a threat by crawling on you. Remove attached ticks as soon as you find them. Use tweezers to grasp the tick's mouthparts up against the skin, and pull back firmly and steadily. Do not pull back abruptly, or the tick's mouthparts may break off, leaving them embedded in the skin. If the mouthparts do break off, don't panic – the mouthparts alone cannot transmit disease because the infective body of the tick is no longer attached. However, to prevent secondary infection, remove the mouthparts like you would a splinter. Never squeeze the body of the tick or use methods to "make the tick let go". Do not use such things as petroleum jelly, fingernail polish remover, or a lighted match: these methods could force more infective fluid into the skin. Wash the wound site and apply an antiseptic after removal. See the picture to the right about effectively removing an embedded tick from your skin. For more information on tick removal, view <http://www.tickencounter.org/>, and [https://www.youtube.com/watch?v=3bl37ceSZ\\_s](https://www.youtube.com/watch?v=3bl37ceSZ_s). Ticks removed from military personnel, their dependents, or DOD civilians can be turned in for identification and disease testing through the Army Public Health Center's DOD Human Tick Test Kit Program. For more information visit our website at: <http://phc.amedd.army.mil/topics/envirohealth/epm/Pages/HumanTickTestKitProgram.aspx>



## What can I do to protect my pets from ticks?

Consult your veterinarian about products and treatments to protect your pets from ticks. Always check your pets for ticks after they have been in wooded or overgrown grassy areas.

Reference: <https://www.cdc.gov/ticks/index.html>





**Bed bug adult**

Photo: G. Snodgrass, VID, APHC

## What are bed bugs and where are they found?

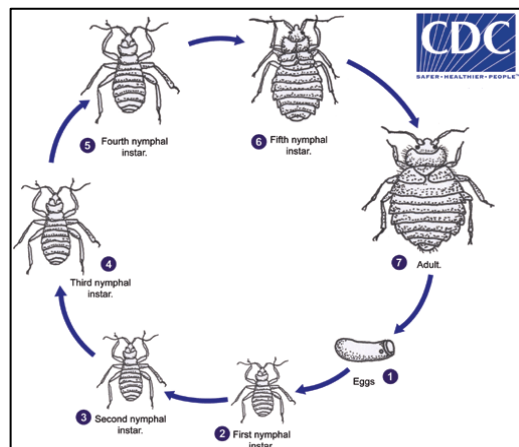
Bed bugs (*Cimex lectularius*) are insects that have cohabitated with humans throughout history. Bed bugs were essentially eradicated in the United States and many European countries through the use of the insecticide DDT. However, bed bugs have undergone a dramatic resurgence beginning in the 1990s. Worldwide, bed bug populations have been increasing, which is thought to be due to several factors including increased international travel, pesticide resistance, and a lack of bed bug awareness. Knowledge of bed bugs is the key to reducing the spread of populations.

## What do bed bugs look like?

Adult bed bugs are flat, oval-shaped, wingless insects approximately 1/4 to 3/8 inch long and rusty red or mahogany in color. Newly hatched bugs (called “nymphs”) appear similar to adults but are much smaller and nearly colorless.

Bed bugs grow by shedding their skin (molting). Each nymph must have a blood meal to molt to the next stage. Bed bugs feed every 5–7 days if a host is present, but can survive extended periods without feeding.

Female bed bugs lay their eggs in secluded areas, depositing up to 500 eggs throughout their lifetime. There are several closely-related species that can be misidentified as bed bugs, including the eastern bat bug (*Cimex adjunctus*) and western bat bug (*Cimex pilosellus*). These species require bats to reproduce, but in the absence of a bat host, they may feed upon humans. However, since humans are not the preferred hosts, reproduction is unlikely to occur.



**Bed bug life cycle:** nymphs need to feed on blood to grow. Diagram: CDC

## What are the signs and symptoms of a bed bug infestation?

Bed bug infestations are often difficult to identify early due to their cryptic nature. Bed bugs commonly live in inaccessible areas, such as behind the headboard, tufts and seams of the mattress, and inside the box spring. It should be noted that bed bugs will harbor wherever hosts spend a significant amount of time, sofas, recliners, and other such furniture are commonly infested as well as beds. They are highly mobile and often move beyond the bed area to other rooms. In heavier infestations, bed bugs can be found hiding along, inside, or behind: edges of carpeting, baseboards, window- and door-casings, pictures, moldings, loosened wallpaper, cracks in plaster and partitions, furniture, and electrical outlets. The area behind the headboard is often the first place that the bugs become established. Look for black and brown spots of dried excrement. These can help pinpoint bed bug harboring areas. Shed skins are often found in conjunction with dried excrement and eggs. Occasionally, engorged bed bugs get smashed on bed linens leaving blood smears. Heavily infested areas may have a distinctive, sweetish odor.

## How do I get bed bugs?

Bed bugs are expert hitchhikers, often stowing away in unsuspecting hosts' luggage, purses, boxes, furniture, and other belongings. Although bed bugs are wingless and cannot fly, recent research shows that bed bugs will quickly move throughout a structure and relocate to adjacent rooms. Once inside a dwelling, bed bugs hide in cracks and crevices close to areas where people sleep. Bed bugs are becoming common in non-traditional areas like offices, theaters, clothing stores, hospitals, and any other place where people gather. Because people are not always available to feed on in these areas, bed bugs will migrate in search of hosts, which makes an infestation more difficult to identify and manage.

## Do bed bugs pose a health risk?

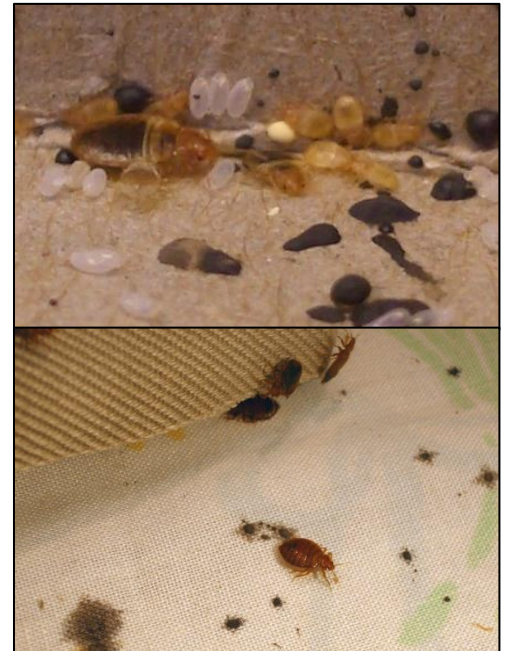
Bed bugs usually feed at night when people are asleep. They may bite anywhere on a human body, especially on exposed sites around the face, neck, upper torso, arms, and hands. It is a myth that bed bug bites always come in sets of three. Individual male and female bed bugs need 3–15 minutes to feed. Bed bugs feed mainly on the blood of humans, but also suck blood from other animals including birds and bats. While there is currently no evidence suggesting that bed bugs can cause disease, the bites themselves could become infected after scratching, so suspected bites should be thoroughly cleaned/disinfected. Bed bugs can have a psychological impact, especially since they feed when it is dark and during the vulnerable sleep period. This can lead to anxiety and sleeplessness which can last long after a bed bug infestation has been eliminated. If judicious and thorough management measures are implemented, this type of anxiety can be reduced.

## How can I prevent a bed bug infestation?

The key to preventing a bed bug infestation is education. You can reduce your chance of infestation by knowing what to look for and how to limit the ability of a bed bug to hitchhike home with you. Avoid acquiring rental or secondhand furniture, or, examine these items carefully before bringing them into your home. Reduce household clutter and vacuum frequently. If travelling, conduct an inspection of the room as soon as you arrive. If any evidence of bed bugs is present, notify management and request a different room. Keep luggage on racks or otherwise off the floor. Inspect the luggage prior to repacking. Upon returning home, launder all clothing using the highest heat settings for washing and drying for at least 30 minutes. Bed bug eggs, nymphs, and adults will be killed when exposed to temperatures of 115° F (46° C) for 15 minutes. Launder luggage if possible, otherwise examine it carefully under bright light. If bed bug evidence is detected, determine a treatment option appropriate for the size and type of luggage. Proactive measures can go a long way in preventing bed bug infestations in the home. When in public places, such as theaters and libraries, be aware of the potential for bed bug exposure.

## How are bed bugs infestations treated?

**Nonchemical Approaches:** Contact preventive medicine services at your supporting military health clinic to identify a suspected bed bug found in your home. Proper identification is essential to establish an effective management strategy.



**Top:** Bed bug adult, nymphs and eggs with dried excrement. **Bottom:** Adult bed bugs with fecal material on fabric.  
Photos: Dr. H. J. Harlan

Inspect your mattress, box spring, bed frame, and headboard using a bright flashlight. Pay particular attention to folds, seams, crevices, joints, and screw holes. Look not only for bed bugs but for shed skins, feces, and eggs. Vacuum all the crevices on your mattress, bed frame, baseboards and any suspected locations. Use a brush or crevice attachment with a scraping motion to dislodge bed bugs or eggs. Remove the mattress and box spring from the bed frame and inspect and vacuum all surfaces, removing all loose debris and visible bed bugs. Flip the bed frame over and vacuum any crevices where bed bugs may hide. Repeat the above for any location where people have been sleeping/resting including sofas, fabric-covered chairs, and recliners. Dispose of vacuumed contents in a sealed plastic bag. Launder all linens using the highest heat settings for washing and drying. Cover the mattress and box spring with a quality bed bug-impermeable case or cover. Encasing both mattress and box spring eliminates the need to discard bedding by trapping potential bed bugs inside. It also provides a smooth outer surface that can be inspected, vacuumed and cleaned easily.

Although heat and freezing can be used to kill bed bugs, these treatments should be conducted by pest management professionals to ensure they are both safe and effective.

**Chemical Approaches:** While active infestations of bed bugs can be effectively treated with pesticides, few chemicals provide effective long-term control, and preventive applications of pesticides for bed bug control are not recommended. Confirmed infestations should be treated by a pest management professional using pesticides targeting the cracks and crevices of dressers, wooden bed frames and headboards, door and window trim, baseboards, and similar sites. If applying pesticide yourself, always follow the directions on the pesticide label to ensure safety of occupants. If living on a military installation, always contact the residential housing office, who will coordinate pest management services with the Installation Pest Management Office.

## Where can I find more information on Bed Bugs?

Armed Forces Pest Management Board Technical Guide 44, Bed Bugs – Importance, Biology, and Control Strategies. March 2012. <http://www.afpmb.org/sites/default/files/pubs/techguides/tg44.pdf>

## What are chiggers and where are they found?

A “chigger” is a type of mite that feeds on birds, reptiles, amphibians, mammals, and humans. There are about 20 species of chigger mites around the world that are known to feed on humans, and of those, only two species are known to bite humans in the United States. Chiggers live in a range of habitats from meadows to swampy areas, but are most commonly found in grassy or scrubby vegetation, shaded areas, leaf litter, rotten logs, and stumps.

## What do chiggers look like?

Chiggers are the larval stage of a mite in the family Trombiculidae. The chigger mite has a lifecycle similar to a tick. Adult females lay eggs, which hatch into six-legged larvae. These 6-legged larvae are the only life stage that feeds on humans. The larvae develop into 8-legged nymphs and then into adults after feeding. Chigger larvae are extremely small (1/100 to 1/120 inch) and will appear red, orange, or yellow through a magnifying glass. The larvae are active from early spring through late fall. Chigger nymphs and adults do not bite humans; they feed on small, soil-dwelling insects and insect eggs. Adult chigger mites are figure-eight shaped and covered in dense red, yellow, or orange hairs. Adults are active in the fall, overwinter in the soil, and lay eggs early in the spring.



A magnified image of a chigger larva, with a close-up of the claws and blade-like chelicerae.  
Photo: D. Nielsen, ESB, USAPHCR-N

## How do chiggers bite?

Contrary to popular belief, chiggers do not burrow into the skin or suck blood. Using large claws located near their mouths, chigger larvae quickly attach to any exposed skin that contacts infested grass or soil in vegetated areas. The larvae then cut the skin with blade-like mouthparts called chelicerae and inject an enzyme into the cut that digests the skin at the bite site. This makes the cells around the bite site harden into a “drinking straw”, which the chigger uses to suck up the liquefied tissue. Chigger larvae will feed for several hours and then drop off the host to find a sheltered place to digest the meal. The bite site stays irritated by the digestive enzymes long after the chigger finishes feeding and detaches.

## Can chigger bites make me sick?

In the United States, chiggers do not transmit diseases, but feeding larvae can cause extreme skin irritation. In parts of Southeast Asia and the islands of the southwest Pacific, chiggers transmit scrub typhus, a potentially life-threatening bacterial disease in humans. Scrub typhus can cause welts, swelling, and fever within several hours of chigger exposure. Seek medical attention if you think you may have been exposed to scrub typhus.

## What are the signs and symptoms of chigger bites?

Chiggers prefer to bite skin where clothing fits tightly, such as around waistlines, sock lines, and behind the knees. Skin begins to itch approximately 1-3 hours after being bitten by chigger larvae. The skin will eventually develop itchy, red or puss-filled bumps at the site of attachment which can be extremely irritating. The itching persists for up to a week and complete healing of the skin lesions can take up to 2 weeks.

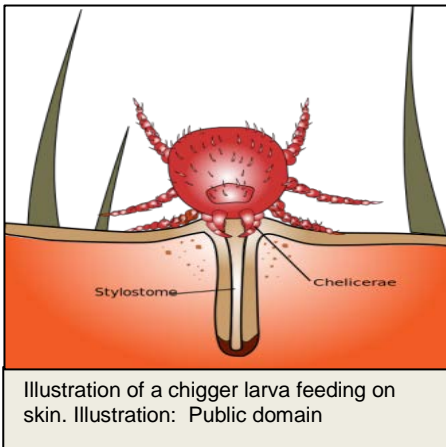


Illustration of a chigger larva feeding on skin. Illustration: Public domain

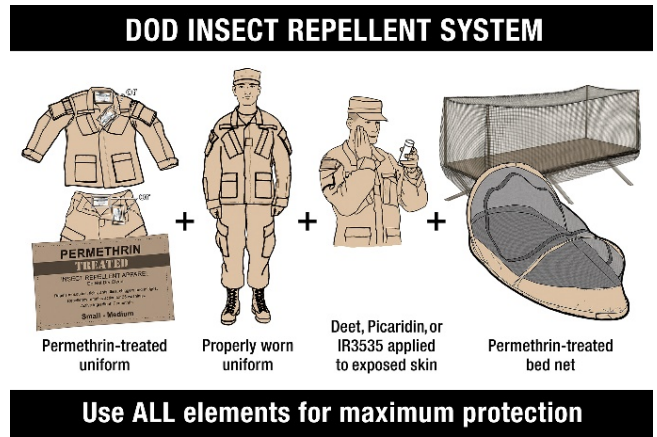


Reaction to bites from chigger larvae.  
Photo: © 2014 WebMD, LLC.

## How do I prevent chigger bites?

The best defense against chiggers is to avoid them. Chigger infestations are less common in maintained lawns and landscaped environments. Do not sit, lay down, or walk barefoot in chigger habitat. Cover your skin to limit access to your feet, ankles, and legs. Wear loose-fitting, tightly-woven fabrics to prevent chiggers from moving through clothing.

**Use the DOD Insect Repellent System for maximum protection from chigger bites.** This system incorporates permethrin repellent on the uniform; properly worn uniform; DEET, picaridin, or IR3535 repellent on exposed skin; and sleeping inside a permethrin-treated bed net. To keep chiggers on the outside of your clothing, tuck pant legs inside boots, and fasten your cuffs snugly at the wrist.



## What standard military insect repellent products will repel chiggers from exposed skin?

Approved military insect repellents for use on exposed skin come in a variety of formulations. Always refer to the label to determine frequency of repellent application based on activity. **Do not apply repellent to eyes, lips or sensitive/damaged skin.** Available military-approved repellents are:

- Cutter® pump spray (NSN 6840-01-584-8598) contains 25% DEET; one application protects for up to 10 hours.
- Ultra 30™ Insect Repellent Lotion (NSN 6840-01-584-8393) contains 30% Lipo DEET; one application protects up to 12 hours.
- Bullseye™ Bug Repellant pump spray (NSN 6840-01-656-7707) contains 20% IR3535®; provides protection for up to 8 hours.
- Natrapel® pump spray (NSN 6840-01-619-4795) contains 20% picaridin; one application protects for up to 8 hours.
- Chigg-Away® lotion (NSN 6804-01-137-8456) contains 10% precipitated sulfur and 5% benzocaine, relieve itching and repels chiggers.
- Ultrathon™ (NSN 6840-01-284-3982) contains 34% controlled-release DEET lotion; one application protects for up to 12 hours.



## How do I treat chigger bites?

Chigger bites can be extremely irritating and uncomfortable. If you suspect you have been exposed to chiggers, immediately take a shower and scrub your skin vigorously with a washcloth will dislodge any still-feeding mites. Once a pustule (bump) has formed, do not scratch it to avoid opening the bite to possible infection. **Note: bites will remain irritated for days after the chiggers are gone.** Kill any remaining larvae on clothing by washing in hot (125°F) soapy water for at least half an hour. Do not wear clothing previously worn in chigger areas until it has been laundered. Ointments containing benzocaine, hydrocortisone, calamine, or other products recommended by your doctor may help temporarily relieve itching from chigger bites. Never apply household products such as kerosene, turpentine, ammonia, alcohol, gasoline, salt, or dry cleaning fluid to an affected area.

## What can I do to prevent chiggers from infesting my yard?

Chiggers quickly dry out and die from water loss in areas with short vegetation. You can make your yard less attractive to chiggers by mowing your lawn and keeping other plants trimmed.

## References:

University of Maryland Extension, Home and Garden, Chiggers:  
[http://extension.umd.edu/sites/extension.umd.edu/files/docs/programs/hgic/HGIC\\_Pubs/Chiggers%20web%20hg79.pdf](http://extension.umd.edu/sites/extension.umd.edu/files/docs/programs/hgic/HGIC_Pubs/Chiggers%20web%20hg79.pdf)

Armed Forces Pest Management Board, Technical Guide 36, Personal Protective Measures against Insects and Other Arthropods of Military Significance: <https://www.acq.osd.mil/eie/afpmb/docs/techguides/tg36.pdf>