



New York State

Integrated Pest Management
Program



Cornell Cooperative Extension

Frequently Asked Questions About Ticks

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Frequently Asked Questions About Ticks

INTRODUCTION

Ticks and tick-borne diseases have become a significant public health issue in New York State, with different tick species and diseases currently present and spreading within the state and region. This document addresses frequently asked questions about tick biology, the prevention of tick bites, and management of tick populations. If you have a question that is not answered in this document, please submit your question at nysipm@cornell.edu.

TICK BIOLOGY

What is a tick?

Ticks are arachnids closely related to mites and spiders. They have four life stages: egg, larvae, nymph and adult. All stages of ticks (except eggs) feed on blood for energy to grow and later to reproduce. Larval ticks have six legs, while nymph and adult ticks have eight legs. Three tick species are a human health concern in New York: the blacklegged tick, the lone star tick, and the American dog tick.

What does a tick look like?

Unfed ticks are flattened, teardrop shaped arachnids with eight legs (adult **insects** have 6 legs and antenna on their head, which is how you can tell them apart). Depending on the species, life stage and sex (male versus female), they have different color patterns on their body. After taking a blood meal, ticks can expand their abdomen, making identification difficult for most people. To have your tick professionally identified, consider the following resources (most include a fee):

- Cornell University Cooperative Extension office in your county: <http://cce.cornell.edu/>
- Cornell University Insect Diagnostic Laboratory: <http://idl.entomology.cornell.edu/>
- IdentifyUS: <https://identify.us.com/>
- TickEncounter Resource Center: http://www.tickencounter.org/tick_identification

How big is a tick?

Tick size depends on the species, life stage, if the tick has fed and how long it has fed. Larval ticks hatch from an egg, develop into a nymph, then into an adult. For the blacklegged and lone star ticks, larvae are about the size of a grain of sand, nymphs about the size of a poppy seed, and adults about the size of a sesame seed. When fully fed, an adult female blacklegged and/or lone star tick can be as large as a raisin. American dog ticks are larger than blacklegged and lone star ticks. For a look at the various life stages of ticks and their sizes, see http://www.tickencounter.org/tick_identification.

Are ticks a new problem? Why have I been hearing so much more about them lately?

Ticks are not new, and recent evidence suggests that ticks were carrying pathogens 15- to 20-million years ago (<https://www.scientificamerican.com/article/lyme-diseases-possible-bacterial-predecessor-found-in-ancient-tick/>). What is new, however, is the distribution (geographic spread) and abundance (number) of ticks found throughout the northeast, which is greater than any time in recorded history. More ticks in more parts of the region increases your risk of encountering a tick. While there is no definitive answer for how and why ticks are moving beyond their previous boundaries, it is likely a combination of factors. For example, changes in land use such as construction of new neighborhoods and shopping centers leave small patches of wooded areas, and these are great

habitat for deer and mice (see [What role do deer play in tick-borne disease?](#) and [What role do mice play in tick-borne disease?](#)). More hosts means more ticks! In addition, a warming climate makes northern areas more hospitable for ticks, and creates longer seasons when ticks are active to feed and reproduce.

Where do ticks live?

The three main tick species have different habitat preferences and tolerances:

- The blacklegged tick requires high humidity or moisture to survive. Therefore, this tick is most often found in the forest and at the forest edge where tree cover, dense vegetation and leaf litter provide a moist environment. This tick will search for hosts typically below adult knee-height by holding onto vegetation with their front legs out as hosts pass by — a behavior known as questing. Because adult ticks feed on larger animals, this life stage might quest higher above the ground to find a host — up to adult waist-height.
- The lone star tick is able to survive in a wide range of habitats, from the shade of the forest to the sun of a lawn. Unlike the blacklegged tick that quests and waits for prey to brush past it, the lone star tick may actively walk toward its prey, even across pavement or sandy areas.
- The American dog tick can survive in warm, dry locations such as roadsides, trails and lawns. Larvae and nymphs mostly feed on small mammals; the adult climbs grass, brush, or twigs to find medium-sized mammals and humans.

Where am I likely to encounter a tick?

You don't have to be an outdoor adventurer to encounter a tick. In fact, people can encounter ticks where they live, work, learn and play, making it difficult to know exactly where the tick came from. Any time you step off the pavement, you could possibly encounter a blacklegged tick. Even if you don't step off the sidewalk or driveway, lone star ticks you could be present in parking lots and board walks, or you could brush against groundcovers such as pachysandra that might contain blacklegged ticks. Or a pet could bring ticks into your home. This is not a scare tactic, but justification for doing a daily tick check. With that in mind, you can reduce your chance of encountering ticks by avoiding areas with dense vegetation, thick leaf litter or other debris that you might have to walk through. When walking in a park or hiking, stay in the center of the path and avoid trailside vegetation (although not proven scientifically to reduce your risk of encountering ticks, this practice may help).

How does a tick find me?

Ticks have evolved over millions of years to find their prey. In the case of the blacklegged tick, they use a behavior called questing to find a host. Questing ticks stand on the edge of vegetation and extend their first pair of legs, which have sensors to detect temperature, carbon dioxide (that we exhale), and odors or sounds specific to their hosts. As a host brushes past the tick, they simply grab on.

When are ticks active?

Ticks can be active any time of the year when temperatures are above freezing, including winter. There are even anecdotes of ticks being active when the air temperature is as low as 26° F and the sun has warmed a particular patch of ground. For the blacklegged tick, the peak in larval activity is August to late September; peak nymphal tick activity is June to July, and adults are active in spring (March to late April) and fall (October to December). Most cases of Lyme disease are reported in the summer, after people were exposed to nymph-stage ticks. For additional information, see: <http://blogs.cornell.edu/nysipm/2017/11/01/its-still-tick-season-and-always-will-be/>. For up-to-date tick activity in your region of the U.S., visit http://www.tickencounter.org/current_tick_activity.

Do ticks die in the winter?

Ticks are adapted to the Northeast climate, having lived here for thousands of years. Therefore, they have behavioral and physiological adaptations that allow them to survive adverse conditions including winter cold and summer heat. While some additional ticks may die during extremely cold winters, this is not likely to have a major impact on tick populations. (For more information: <http://blogs.cornell.edu/nysipm/2018/01/05/ticks-and-the-freezing-weather/>)

Do ticks fly? Jump? Drop from trees?

No, no, and no. Ticks crawl and can climb vegetation. However, they do not have wings, do not have jumping legs, and are not behaviorally adapted to drop from trees on passing hosts (think of the timing and energy that would require!). When ticks find a host, they tend to crawl upward, which is why attached ticks are often found in armpits, behind the ears, and at the base of the scalp.

How long can a tick survive indoors?

The answer depends on the tick species in question. Because of its requirement for high humidity (see [Where do ticks live?](#)) the blacklegged tick is unlikely to survive for more than one day (24 hours) indoors (unless it is in a pile of damp laundry or similar setting). However, the brown dog tick (a relative of the American dog tick) can complete its entire lifecycle indoors, and often infests kennels. The lone star tick and American dog tick may survive for a few days, but not long enough to develop to its next life stage and therefore not long enough to feed again.

Do ticks burrow under the skin?

No. When ticks feed, they insert their mouthparts into skin and use a cementing substance to keep themselves attached while feeding. However, no other part of their body enters the skin, and they do not latch on to the skin with their feet while feeding. This video shows how the tick inserts its mouthparts: https://www.npr.org/sections/goatsandsoda/2018/03/20/594922001/watch-how-a-tick-digs-its-hooks-into-you?utm_campaign=storyshare&utm_source=twitter.com&utm_medium=social

TICK-BORNE DISEASE

How common are tick-borne diseases?

The risk of acquiring a tick-borne disease depends on where you live in the country. For example, data from 2015 showed that more than 95% of all Lyme disease cases were reported from 14 Northeast and Midwest states. Even though the disease is reported from a limited area, Lyme disease is the most common vector-borne disease in the United States, and is the second most commonly reported National Notifiable Disease, second to Chlamydia (#1) and before Gonorrhea (#3), which are both sexually transmitted diseases that occur throughout the country. Each year in the US, approximately 30,000 cases of Lyme disease are reported to the Centers for Disease Control and Prevention (CDC). But recent estimates suggest that this is only a fraction of the actual incidence rate. The CDC currently estimates that between 300,000 and 400,000 people are infected with the bacteria that cause Lyme disease each year, with children aged 5 to 9 at the greatest risk of exposure. In addition to Lyme disease, ticks in the northeast transmit the pathogens that cause Anaplasmosis, Babesiosis, Ehrlichiosis, Powassan Virus, Rocky Mountain Spotted Fever, Tularemia and a bacteria related to the agent of Lyme disease called *Borrelia miyamotoi*. Tick-borne disease is very common in the Northeast. For more information: <http://blogs.cornell.edu/nysipm/2017/10/05/lyme-disease-by-the-numbers/>

Who is at risk of tick-borne disease?

You don't have to be an outdoor adventurer to encounter a tick and be exposed to a tick-borne disease. In fact, people encounter ticks where they live, work, learn and play. Fetching a ball from

the woods edge, pushing a friend on the swings, walking near the edge of the sidewalk, running or biking on the side of the road, gardening, having a barbeque or picnic, raking leaves, or any other perfectly normal activity could put you in contact with a tick. One group that is most at risk of exposure to tick-borne disease is children, because of their play outdoors (<https://www.cdc.gov/lyme/stats/graphs.html>). Any person that encounters a tick has the same level of risk of acquiring tick-borne disease.

What diseases do ticks transmit?

Different tick species transmit different disease-causing pathogens, and the list of tick-borne pathogens continues to grow. Importantly, ticks can transmit more than one pathogen at a time. This means that the blacklegged tick (the only tick that transmits the bacteria that cause Lyme disease in the northeast and midwest) can transmit the pathogens that cause Lyme disease, Anaplasmosis and Babesiosis all at the same time (Note: a different tick, the Western blacklegged tick, transmits the pathogens that cause Lyme Disease on the Pacific Coast). Below is a list of the common tick species and the major diseases they are associated with.

- Blacklegged Tick: Lyme disease, Anaplasmosis, Babesiosis, Powassan Virus
- Lone star Tick: Ehrlichiosis, Southern Tick Associated Rash Illness (STARI), Tularemia
- American Dog Tick: Rocky Mountain Spotted Fever, Tularemia

Do all ticks transmit pathogens that cause human disease?

In the Northeastern US, we are primarily concerned with three tick species that transmit pathogens to humans: blacklegged, lone star and American dog ticks. However, not every tick in an area carries pathogens that cause human disease.

- Larval ticks, the stage that hatch from eggs and have only six legs (nymphs and adults have eight legs), are not thought to play a major role in pathogen transmission. However, when larval ticks take their first blood meal, they can potentially acquire pathogens if they fed on an infected animal. Once pathogens have been acquired through feeding on an infected animal, the tick can now transmit pathogens as a nymph and adult (Note: there is some evidence that Powassan virus, carried by the blacklegged tick, can be transmitted from a female to her offspring, and that larval blacklegged ticks can transmit *Borrelia miyamotoi*, a bacteria that is related to the pathogen that causes Lyme disease).
- Nymph blacklegged ticks are responsible for the greatest number of cases of tick-borne disease. This life stage is about the size of a poppy seed and is active in the spring when people are not thinking about ticks. For this reason, daily tick checks are needed year round.
- Some nymphs and adults never acquire pathogens. Not every tick in nature is infected, and the rate of infection among ticks differs throughout the region.

If I find a tick crawling on me, am I at risk for disease?

No. Ticks transmit pathogens while they are attached and feeding, with their mouthparts inserted into your skin (see [How do ticks transmit disease?](#)). After feeding the tick typically drops off, and would not be found crawling on your skin. If you find a tick crawling on you, you can quickly kill the tick by placing it in a small jar or bottle with rubbing alcohol. You may wish to keep such a jar close by while spending time outdoors or hiking. It is never a good idea to squish ticks with your fingers, and brushing them off your clothing may not work.

How do ticks transmit disease?

Ticks are considered disease vectors because they acquire pathogens from one organism and transmit them to another. For this to occur, ticks have to insert their mouthparts into the host organism and drink the host's blood. As ticks feed, there is an exchange of fluids between the host and the tick: blood is drawn out of the host and some saliva enters the host bloodstream, possibly carrying pathogens. The time required for pathogens to pass from tick to host is variable. While viruses such as Powassan virus can be transferred within minutes, some bacteria may take longer to transmit. Feeding ticks will be firmly attached to the host, and require proper technique to remove (see [How do I remove a tick?](#))

How long does a tick have to be attached to transmit disease?

The short answer to this complicated and elusive question is *minutes to hours*, depending on the pathogen. There is some question in the medical literature about the time required for transmission of the bacteria that causes Lyme disease. However, the same blacklegged tick can transmit Powassan virus in a matter of minutes. Therefore, **safe** removal as soon as possible is the best recommendation. Note: it may take a tick up to two hours to find an ideal location to attach, and ticks can remain attached to the host for several days to feed.

What are the signs and symptoms of tick-borne disease?

As a pest management program, we do not offer medical advice about tick-borne disease treatment and diagnosis. In truth, this is a complicated topic. Rashes may or may not develop, and disease symptoms, including rashes, vary among people. However, a few thoughts:

- If you remove a tick, place it in a zippered plastic bag and label with the date, the species, if the tick was attached (versus walking on your skin), and if the tick had fed and was partially engorged. This is useful if you decide you'd like to test the tick for pathogens.
- Be aware of flu-like symptoms occurring a week or more after activity that might have put you in contact with ticks. This is true all year round, but especially after the peak of nymphal blacklegged tick activity in the spring and adult activity in the fall.
- See your physician and mention the possibility of a tick encounter. Bring any ticks that you might have collected.

Can tick bites really cause a red meat allergy?

There is strong evidence that a bite from the lone star tick can cause an allergic reaction to red meats. This is known as alpha-gal syndrome, which is named from a substance secreted by the tick as it feeds on humans. In some cases, the human body recognizes this substance as an allergen, and mounts an allergic response the next time it enters the system. Unfortunately, this same substance is found in most red meats, causing an allergic reaction when red meat is consumed. It is not known how long this sensitivity lasts, but there is some evidence that it may not be permanent as long as the individual is not exposed to the bite of a lone star tick again.

Can tick bites really cause paralysis?

Tick Paralysis is a worldwide phenomenon caused by different tick species across the globe. In the US, cases of tick paralysis are most often diagnosed from the Northwest from May to June ([Diaz 2015](#) verified 55 cases in the US from 1946-2014, including two from NY and two from NJ). In the Northeastern US, female American dog ticks are most often associated with the syndrome. Tick Paralysis occurs when a tick attaches to a host and initiates feeding. The female tick secretes a toxin that can cause paralysis starting in the feet and moving upward. If the tick is found and removed, the symptoms go away with no long-term damage. However, if the tick is not found, paralysis can affect

the respiratory system and become life threatening. Symptoms typically appear in two to six days of attachment, highlighting the need for daily tick checks. Tick paralysis is sometimes misdiagnosed as Guillain-Barré syndrome due to similar symptoms.

How old is Lyme disease?

Lyme disease was recognized for the first time in 1975 from patients in Old Lyme, Connecticut, despite a long history in Europe. However, the disease and bacteria that cause it have likely been around for millions of years – even if doctors did not have a name for it or understand how it was transmitted. The bacteria responsible for causing Lyme disease, *Borrelia burgdorferi*, was identified in 1981, but there is evidence that it has been present on the North American continent for 60,000 years (<https://www.nature.com/articles/s41559-017-0282-8>). Ötzi the iceman may be the oldest human body showing evidence of Lyme disease from 5,300 years ago (<https://www.live-science.com/18704-oldest-case-lyme-disease-spotted-iceman-mummy.html>), and an ancient tick preserved in amber contains what is likely an ancestor of the Lyme bacteria from 15-20 million years ago (<https://www.scientificamerican.com/article/lyme-diseases-possible-bacterial-predecessor-found-in-ancient-tick/>). Lyme disease is also prevalent across Europe and Russia.

What role do deer play in tick-borne disease?

Deer are the primary host of lone star and adult blacklegged ticks, which gives them the special designation as **reproductive hosts** because the female tick will create and lay eggs after feeding on a deer. Based on their ability to move great distances, deer are also important dispersal hosts for ticks, moving them to new locations. Deer do not play a role in infecting ticks with the pathogens that cause Lyme disease and several other diseases, although they are the reservoir host of *Ehrlichia chaffeensis*. In the transmission cycle of Lyme disease, ticks most often acquire pathogens from mice, small mammals and even some birds, which are known as **reservoir hosts**.

What role do mice play in tick-borne disease?

Field mice (and other small, outdoor mammals) are the primary **reservoir hosts** of tick-borne disease. This term means that ticks acquire pathogens after feeding on the mice, and are then infected for the rest of their lives with the ability to transmit pathogens that cause disease. As reservoir hosts, mice are not negatively affected by the pathogens, and individual mice can be infected with multiple pathogen types. It is important to note that field mice (white-footed mice and deer mice: *Peromyscus* species) live outdoors most of the year, and may enter homes during the winter. They have two distinct fur tones: a gray or tan back and a white belly, along with large ears and eyes. They are different than house mice (*Mus* species), which have the same color fur on their whole body, and smaller eyes and ears than field mice. House mice are typically indoor pests that live in buildings year round.

- Research from the [Cary Institute of Ecosystem Studies](#) suggests that there is an interaction between mice, acorns and tick populations. Acorns are an important food source for field mice, and mast years occur sporadically when a huge crop of acorns are produced (Year 1). Because of this surplus in food availability, field mouse populations are often very large the next year (Year 2). With plenty of hosts to feed on, tick populations are often high in Year 3. Thus, after a mast year, tick populations are predictably high two years later if other weather-related conditions are ideal for ticks (for example, no drought). It is important to note that acorn masts may not occur across broad regions and can vary by oak (tree) species. In addition, other factors like winter temperatures can influence subsequent nymphal populations. Therefore, the ability to predict tick populations can vary across a region and depends on other environmental factors.

What role do other wildlife play in tick-borne disease cycles?

A number of small and medium-sized mammals, and even some birds, are important hosts for ticks. One animal that is less ideal as a host is the opossum. These animals have been shown to destroy over 90% of the ticks on their bodies. Foxes serve as hosts to ticks, but foxes hunt, kill and eat white-footed mice, the primary reservoir of Lyme disease. For the lone star tick, wild turkeys are an important alternate host that may play a role in moving ticks great distances.

PREVENTION

How can I avoid ticks?

You can reduce your chance of encountering blacklegged ticks by avoiding areas with dense vegetation, leaf litter or other debris that you might have to walk through. When walking in a park or hiking, stay in the center of the path and avoid trailside vegetation (although not proven scientifically to reduce your risk of encountering ticks, this practice may help). These tips might not protect you from lone star ticks, which can follow potential hosts across paved surfaced and sandy, hot trails.

Will I feel a tick crawling on me?

Ticks are very small arthropods that walk on even smaller 'feet'. As parasites, they are adapted to be secretive and avoid detection by their host. These traits make it unlikely for you to feel them crawling on your skin. Therefore, it is important to check yourself for ticks every day: multiple times a day if you are spending time in tick habitat.

Will I feel a tick bite me?

No. Ticks, like most blood-feeding critters are adapted to feed on their host without being detected. Once a blood-feeding critter is detected, its chance of survival decreases (think of that mosquito biting your arm, then splat!). Ticks walk very lightly on your skin, and use an anesthetic to prevent you from feeling the bite.

Why do a daily tick check?

A daily tick check is your best defense against long-term tick attachment. While yard treatments, clothing treatments, and repellents help you to avoid ticks, none of these approaches are 100% effective at keeping ticks off of you. However, a detailed, daily tick check, or an examination of your whole body, can help you detect a tick that somehow got past other efforts. Even if you did not go into tick habitat, daily tick checks can help you to find a tick that you might have missed the day before, but is now larger after feeding. Make daily tick checks part of your routine after you get out of the shower, when you get up in the morning, before you go to bed, or all of the above. For more information, see: <http://blogs.cornell.edu/nysipm/2015/05/13/ticks-are-disgusting/>; <http://blogs.cornell.edu/nysipm/2014/04/17/tick-checks-and-more-stay-healthy-and-happy-while-youre-outside/>.

What is involved in a daily tick check?

The goal of a daily tick check is early detection and safe removal of attached ticks. The best way to think about a thorough tick check is to get to know all of your freckles and other skin blemishes. Every. Single. One. Use your fingers and your eyes to search all parts of your body for any *new* freckles (with legs) that might be ticks. A hand mirror and a wall-mounted mirror can help you see the backs of your legs, your armpits, behind your ears, and other, more private regions. Ticks prefer to attach in areas that are dark and warm, so special attention should be given to your groin, bellybutton, under the breasts and the nape of your neck. Make daily tick checks part of your routine both during and after a shower, when you get up in the morning, before you go to bed, or all of the above.

How do I remove a tick?

The Internet is full of suggestions on how to remove a tick. Unfortunately, most of those techniques have never been tested and may do more harm than good. Techniques that agitate ticks could increase the risk of them injecting a pathogen into your blood. Therefore, only one technique is currently recommended for tick removal: the use of ultra-fine tweezers to pluck the tick out of your skin. Fine-tipped tweezers should be placed on the skin, with the narrowest part used to grab the tick as close to the skin as possible (Note: if tweezers are not fine enough, they may squeeze contents of the tick abdomen into your body, which you want to avoid). Once the mouthparts are between the two prongs of the tweezers, pull away from the skin with steady, even pressure. An attached tick will not come out easily, but will pull free with steady pressure: do not jerk or twist the tick. Once the tick has been removed, place it in a zippered plastic bag and label with the date, the species, if the tick was attached (versus walking on your skin), and if the tick had fed and was partially engorged, which might be useful information for a physician if symptoms arise. After you have removed the tick, clean the bite site with rubbing alcohol, an iodine scrub, or soap and water. Anyone involved in the tick removal should clean their hands and the tweezers in the same manner. For more information, see: <http://blogs.cornell.edu/nysipm/2016/04/26/its-tick-season-put-away-the-matches/>.

What happens if the head of the tick gets stuck in my skin?

The 'head' of the tick, or the part that is sometimes left inside skin, is actually the tick mouthparts. Based on our current understanding of tick-borne disease, the mouthparts alone cannot lead to transmission of the tick-associated pathogens. Therefore, while effort should be made to keep the tick intact and remove the mouthparts with the rest of the tick, your body will heal and eventually force out the mouthparts if they accidentally break off. In either case, the site should be cleaned with rubbing alcohol, an iodine scrub, or soap and water to prevent secondary infection.

What should I do after I remove a tick?

Once a tick has been removed, place it in a zippered plastic bag and label with the date, the species, if the tick was attached (versus walking on your skin), and if the tick had fed and was partially engorged, which might be useful information for a physician if symptoms arise. After you have removed a tick, clean the bite site with rubbing alcohol, an iodine scrub, or soap and water. Anyone involved in the tick removal should clean their hands and the tweezers in the same manner. Tick testing services are available from universities and private entities to determine if the tick is carrying any pathogens (for example: the [Animal Health Diagnostic Center](#) at Cornell University). However, just because a tick is carrying a pathogen doesn't mean it was transferred to you. Therefore, it is important to be mindful of symptoms that may be associated with tick-borne disease, and to speak with your physician (see [What are the signs and symptoms of tick-borne disease?](#)).

How can I kill a tick that was crawling on me?

If you find a tick crawling on you, you can quickly kill the tick by placing it in a small jar or bottle with rubbing alcohol. You may wish to keep such a jar close by when spending time outdoors or hiking. It is never a good idea to squish ticks with your fingers, and brushing them off your clothing may not work.

Will swimming or bathing for a long period of time kill an attached tick?

No. Ticks have a different system of breathing than humans, and can survive total submersion in water for hours without dying. Furthermore, swimming or bathing may not be enough to remove an unattached tick crawling on your body. The best way to kill a tick is to remove it safely with pointy tweezers, then place it in a jar of rubbing alcohol.

How do I know if there are ticks questing in my yard?

Monitoring is an important part of a tick management program. It can tell you if questing ticks are present and what species are on site. The most common method of monitoring is to use a tick drag: a one meter or one yard square piece of fabric (flannel or corduroy) fastened to a piece of wood and pulled behind you on a string. As you walk through an area with questing ticks, some will grab on to the fabric thinking it is a passing host. You can hang the drag cloth on a branch, railing or fence to examine it for ticks, and use tweezers to grab and place them in a vial of alcohol to kill and preserve them for later identification. Do your best to not hold the cloth, as ticks might crawl onto you.

Scientific tick drags are typically made over a given distance or for a certain amount of time. You can decide if this is meaningful for you, or you can sample areas where people spend time in your yard. Keep in mind that ticks can grab on to you during this process also, so *be sure to check yourself while dragging and afterward, putting clothes in a hot dryer for 20 minutes, and taking a shower when finished for the day.* **An important note: in some cases, tick dragging was only shown to pick up 10-15% of the ticks present. Therefore, just because you do not find ticks on a drag cloth, does not mean your yard is tick free.** When spending time outdoors, you should act as if ticks are everywhere and take precautions to prevent tick bites.

How do repellents work against ticks?

Ticks use specialized sensors to detect hosts (see [How does a tick find me?](#)). Repellents work by blocking the tick's ability to detect host cues. In other words, wearing a repellent can decrease the likelihood that a tick will notice you. Skin-based repellents such as DEET do not kill ticks, but products such as permethrin have some repellency but also tick-killing properties.

What repellents are effective against ticks?

As ticks and tick-borne diseases continue to be recognized as a threat to human health, the number of products marketed for repelling or killing ticks will increase. Therefore, it is important to carefully consider the available information when selecting a tick repellent. To date, the most effective repellents are products containing 20-30% DEET. Additional active ingredients recommended by the CDC include picaridin, IR3535 and oil of lemon eucalyptus, which will be listed on the product label. In general, higher concentrations of these active ingredients will provide longer protection. Repellents are registered pesticides, so be sure to read and follow the label when using these products. As with all repellents, these products do not kill ticks, so you may want to combine their use with permethrin treatments to clothing. For more information, see: <http://blogs.cornell.edu/nysipm/2015/06/02/understanding-over-the-counter-sprays-for-mosquitoes-and-ticks/>.

What natural products can I use to repel ticks?

This is a difficult question to answer due to a lack of available information. The Environmental Protection Agency (EPA) is the group that registers new pesticides in the United States (tick repellents are considered to be pesticides by the EPA). Before EPA will register a pesticide for sale, the manufacturer has to provide data showing that the product works. The data may come from laboratory studies, field trials, or both. However, many natural products with essential oil active ingredients are exempt from registration and are not required to provide the same type of data to the EPA. In other words, they can sell a product that hasn't been shown to be effective. The same is true for home remedies – nobody has objectively examined the concoctions to determine if or how effective they are. A common comparison is that pesticides registered by the EPA are like prescription drugs, which must be tested and approved by the Food and Drug Administration (FDA) before they can be sold. Essential oil based pesticides are like herbal supplements that do not have to be registered and may or may not work. There needs to be more evidence that natural products available today will

effectively repel ticks. Importantly, there are also concerns about some natural oil products causing chemical burns on skin, and some products can mimic hormones and affect child development. For more information about natural products, see: <https://www.epa.gov/insect-repellents/skin-applied-repellent-ingredients>.

How can I kill ticks on my clothes or gear?

There are two methods that can be used to kill ticks on clothing and gear. The first is a proactive treatment that will provide protection when you are in areas where ticks are found. The second is a method to rid items of ticks after exposure.

- Permethrin is an acaricide (a pesticide that kills ticks and mites) that can be applied to clothing, footwear and gear before exposure. It can be purchased at many sporting goods and big box stores as a liquid or aerosol spray. Be sure to read the label on all products before use: importantly, permethrin needs to be applied and dry on items before wearing them again. In addition to applying the products yourself, there are services available from a number of companies that will professionally treat your clothing or provide pre-treated clothing for sale. The difference between do-it-yourself (DIY) treatments and professional treatments is that professional treatments last about ten times longer. Specifically, while DIY treatments can protect clothing for a few washes, professional treatments can last one or more seasons (http://www.tickencounter.org/prevention/should_i_wear_tick_repellent_clothing). After clothing has been treated, ticks that walk over the material may obtain a lethal dose and die before finding a place to attach to your skin. NOTE: cats are particularly sensitive to permethrin. Do not apply products near cats, and do not let cats touch clothing wet with permethrin. Once the products are dry and bound to clothing, the risk to cats is reduced.
- Whether or not your clothing and gear has been pretreated, if you were exposed to ticks and want to make sure your items are tick free, you can place them in a clothes dryer for 20 minutes on high heat (read label instructions, as some items should not be placed in a hot dryer). Importantly, do not overload the dryer: items must be able to tumble and circulate in the hot air. Hot, dry air will desiccate or dry out ticks.
- For additional information, see: <http://blogs.cornell.edu/nysipm/2017/10/10/steer-clear-of-ticks-and-the-diseases-they-carry/>.

How should I dress to avoid ticks?

You are probably aware of how to dress to avoid ticks: light colored clothing with a long-sleeve shirt tucked into pants, pant legs tucked into long socks and wearing a sturdy pair of boots. However, this look is not very fashionable, and most people are not likely to dress in this manner. Also, pants tucked into socks serves little protection against larvae, which are so small they can [slip through the weave of fabric in some socks](#). While the larval stage is usually not associated with tick-borne disease, lone star larvae have been implicated in allergies to red meat (see [Can tick bites really cause a red meat allergy?](#)). Some studies have shown that pre-treating sneakers, socks, shorts and a T-shirt with permethrin can reduce the number of ticks that attach, so be sure to take some precautions if going outdoors into tick habitat (see [How can I kill ticks on my clothes or gear?](#)).

What can I do to limit ticks in my yard?

Habitat management is one way to reduce the number of ticks in your yard, or help you to avoid ticks. These recommendations are especially helpful for reducing encounters with blacklegged ticks, but may be less effective against lone star ticks.

- Create Tick-Free Zones. Make areas of the yard where you and family spend time as open and

sunny as possible. Prune overhanging branches, keep the lawn mowed to a reasonable height (three inches is ideal for turf health), limit groundcover, and remove leaf litter and other organic debris. If possible, swing sets, gazebos, and other yard attractions should be kept away from the woods edge. These measures are especially helpful when dealing with blacklegged ticks, which have a high humidity requirement (see [Where do ticks live?](#)).

- **Create Borders.** Knowing that blacklegged ticks are most common in wooded areas, borders can be used to set boundaries around areas that people should avoid. For example, a three-foot wide mulch or stone border can be used to teach children not to enter wooded areas. These borders are not designed to kill ticks, but to alter human behavior.
- **Keep Wildlife Away.** Ticks are often moved on their hosts, which range from small mammals such as mice, chipmunks and birds, to large animals including deer. Because ticks drop off their host after feeding, it is possible that ticks can be dropped wherever wildlife roam. Therefore, it might be a good idea to keep bird feeders, garbage cans, stacked firewood, and other potentially attractive items as far away from the home as possible (Note: this recommendation is not based on scientific research, but rather on tick biology and best practices for pest management). Deer fencing may also reduce the number of ticks on a property, but does not exclude other hosts such as small mammals that can transport ticks.
- For more information: <http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1010.pdf>.

Are some people more susceptible to ticks?

It has been shown that people differ in their chemical profiles, emitting more or less of certain compounds from their skin that are attractive to biting arthropods. In addition, metabolic rates differ, and people with higher metabolic rates exhale more carbon dioxide. For a blood-feeding organism that detects their host based on odors, temperature and carbon dioxide cues, some people are more attractive (or easier to find) for ticks. Some people also have greater exposure to ticks based on their jobs, hobbies or where they live, which can also make them more susceptible to ticks. Currently there is no proven method available for how people can reduce their individual attractiveness to ticks, except for the use of repellents.

MANAGEMENT

What can my village/town/county/state do to control ticks?

While municipalities offer area-wide mosquito management, many do not have comprehensive plans for tick management. Part of the challenge is a lack of evidence that large-scale management is effective. Three large-scale projects are currently underway to address this question (see [Do pesticide sprays kill ticks in my yard?](#)). Methods that have been used by municipalities include deer population reduction (<https://deeradvisor.dnr.cornell.edu/sites/default/files/resources/IntegratedApproachForManagingWTDeerInSuburbanEnvironments-28ax086.pdf>) and use of the 4-Poster system that treats deer with a tick-killing product (<https://www.cdc.gov/climateandhealth/docs/4PosterTickBorneDisease.pdf>). While population reduction is often a controversial topic, the 4-Poster device tends to be prohibitively expensive for many communities. As a result, tick management often depends on homeowners, but one study suggests that treating individual properties may not reduce tick encounters or the incidence of disease, despite a reduction in the number of questing ticks on the property (<https://academic.oup.com/jid/article/214/2/182/2572107>). This is probably because tick encounters happen in non-treated locations on the property (e.g., ball chased into the back woods) or at areas other than the homeowner's yard.

Can I make a “tick tube” to reduce populations in my yard?

Tick tubes are a product marketed for tick management made of a cardboard tube filled with permethrin-treated cotton balls. The theory behind these products is that field mice will find the cotton balls and use them as a nesting material. When spending time in the nest, mice expose themselves to the tick-killing products. Although permethrin is available for use as a clothing and gear treatment (see [How can I kill ticks on my clothes or gear?](#)), the label does not provide instructions for making tick tubes. Because it is illegal to use a pesticide product in a manner that is not listed on the label, you cannot legally make your own tick tubes at home. (Note: the research on tick tubes has provided inconsistent results, partially due to varying use of the cotton by the mice. Some studies have shown that using tick tubes in a systematic manner on properties of a certain size can reduce the number of ticks on mice. In other cases, however, the use of tick tubes was shown to have no effect on the number of questing ticks.)

What is the Tick Box Tick Control System (Select TCS)?

The Tick Box Tick Control System is a device that lures field mice and chipmunks inside with non-toxic food bait and treats them with a tick-killing product as they feed. The active ingredient is fipronil, which is found in some spot-on/topical treatments for pets. One short-term study demonstrated that these boxes can reduce the number of questing blacklegged tick nymphs. Several large-scale studies are currently evaluating the use of these boxes over large areas (see [Do pesticide sprays kill ticks in my yard?](#)).

Do pesticide sprays kill ticks in my yard?

Yes. There are a few synthetic pyrethroid insecticides that are effective at killing ticks when applied correctly to areas where ticks are found. However, a 2016 study showed that pesticide sprays applied to a residential property did not reduce the homeowner’s exposure to tick-borne disease, likely because ticks are found in places other than the yard (<https://academic.oup.com/jid/article/214/2/182/2572107>). The study recommended that additional research is needed to examine how tick prevention methods affect human health in terms of tick-borne disease. In response to this study, there are currently three projects examining whether large-scale, or neighborhood-level interventions can reduce tick populations **and**, importantly, the incidence of disease: [The Tick Project](#), the [Backyard Integrated Tick Management Study](#), and [Integrated Tick Management for Suppression of Blacklegged Tick Populations in the Suburban Landscape](#).

PETS & LIVESTOCK

Can pets get sick from a tick?

Companion animals such as dogs and cats are susceptible to tick-borne diseases, including Lyme and ehrlichiosis. While the blacklegged tick is responsible for transmitting the bacteria that causes Lyme disease, a bite from an infected lone star tick can result in dog ehrlichiosis. Cats are efficient groomers and can remove ticks from most of their body (except around the face), but regardless are less likely to show clinical symptoms of Lyme disease. Speak to your veterinarian about steps you can take to protect your pet (see [What should I do to protect my pet from ticks?](#)).

Where do ticks usually attach on dogs and cats?

Ticks can attach to pets on any part of their body. However, ticks are most often found on or near the head, belly, anus, and between the pads of the feet. These areas have short or sparse fur, which may be easier for the tick to attach. Relying on their sense of smell, cats and dogs often walk through tall grass and other potential tick habitats with their head down, making this area the first to encounter ticks. In wooded areas, pets may sit down, allowing ticks to grab on to their hindquarters.

What should I do to protect my pet from ticks?

Several treatments are available to reduce the risk of tick-borne disease for your pets. Be sure to speak with your veterinarian to select the right product for your pet. This is especially important in the case of **cats, which can have fatal reactions if products containing permethrin or related insecticides are applied directly to them**, or if they are in close contact with dogs that have been recently treated with permethrin products (NOTE: cats can be exposed to permethrin applied to dogs up to three days after application).

- Spot-on (topical) treatments are applied monthly as a gel to an external portion of the pet's body (typically between the shoulder blades), and provide tick-killing activity that does not require the tick to feed. Treatments should be applied according to the product label, which often specifies that applications be made monthly. This helps to provide year-round protection for your pet. Some pet owners are inconsistent with applying products, either forgetting to apply at the same time each month, or skipping an application in 'winter' months. However, this lapse in treatment has been shown to permit flea populations and perhaps enable ticks to feed on the pet. Both fleas and ticks can be active all year long. Therefore, monthly applications are not only recommended, but required for full protection. Another mistake homeowners make is excessive bathing of their pets. Spot-on treatments are oil-based products that work by binding to oils in the pet's skin. Regularly bathing your pet with soapy water can remove these oils and reduce product efficacy.
- Oral treatments are administered to pets as pills. Similar to spot-on treatments, it is important that pets be provided with pills each month, and that pets are not excessively bathed to remove skin oils. Unlike spot-on treatments, however, oral treatments require the tick to feed to obtain a lethal dose of the acaricide. This means that the tick has to attach and initiate feeding, which can lead to the transfer of pathogens.
- Collars are available that provide several months of protection against ticks, killing them on contact (do not require feeding). As with other products, it's important to provide year-round protection and not wash products away.

A comparison of products can be found on TickEncounter's website: http://www.tickencounter.org/prevention/tick_control#top.

Can other animals get sick from ticks (horses, cows, etc.)?

Livestock and other animals can be exposed to ticks, and can develop symptoms of tick-borne disease. The Animal Health Diagnostic Center, part of the Cornell University School of Veterinary Medicine offers vaccination against Lyme disease for horses (and dogs), and performs diagnostic tests for tick-borne disease in a variety of animals: <https://ahdc.vet.cornell.edu/>.

Will chickens or guineafowl keep my yard tick-free?

Both adult and nymph ticks are able to transmit pathogens that cause tick-borne disease, with nymph ticks responsible for the greatest number of cases because they are small and active earlier in the year (see [Do all ticks transmit disease?](#)). This is important to keep in mind when answering the question about a potential role of guineafowl and chickens, because these birds feed mostly on adult stage ticks. At least one study has shown that the presence of guineafowl did not significantly reduce the number of nymph ticks in an area, despite a reduction in the number of adults (<https://academic.oup.com/bioscience/article/56/5/383/234709>, see also: http://www.tickencounter.org/tick_notes/turkeys_and_ticks).

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RESOURCES

Dutchess County Department of Health Presents: Frequently Asked Questions About Tick-Borne Disease Prevention: http://www.co.dutchess.ny.us/CountyGov/Departments/dbch/Tick_Borne_Disease_Prevention_FAQ_Final.pdf

Lyme Disease AMA (Reddit Question and Answer with Rick Ostfeld and Felicia Keesing): https://www.reddit.com/r/science/comments/6qo1h3/science_ama_series_i_am_michael_doucleva/

Connecticut Agriculture Experiment Station Tick Management Handbook: <http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1010.pdf>

University of Rhode Island TickEncounter Resource Center: <http://www.tickencounter.org/>

Sonenshine, D.E. (2014) The Biology of Ticks, second edition, Vol. 1 and 2. New York.: Oxford University Press.