

“TICKS: KNOW YOUR ENEMY!”

This is Doug Rafferty with WGME-TV in Portland, Maine. Deer ticks and Lyme disease are increasing in Maine, so this presentation was created to increase awareness of deer ticks and help you reduce your risk of getting Lyme disease.”

Teacher Notes:

Vocabulary

Disease - a condition of the living animal or plant body or of one of its parts that impairs normal functioning and is typically manifested by distinguishing signs and symptoms: sickness, malady

**TICKS:
Know Your Enemy!**

By the end of **TICKS: KNOW YOUR ENEMY!** you'll be able to:

- 1) Identify a deer tick, and
- 2) Name three behaviors that will help lower your risk of getting Lyme disease

Photo: Iowa State University

“By the end of TICKS: KNOW YOUR ENEMY! you’ll be able to:

- 1) Identify a deer tick, and**
- 2) Name at least three behaviors that will help lower your risk of getting Lyme disease.”**

Teacher Notes:

In 1975 a cluster of children and adults residing in the Lyme, Connecticut area experienced uncommon arthritic symptoms. By 1977, the first 51 cases of Lyme arthritis were described, and the deer tick (*Ixodes scapularis*) was linked to the transmission of the disease. *Borrelia burgdorferi*, the bacterium that causes Lyme disease, was discovered in 1982.

Vocabulary

Risk - possibility of loss or injury

Tick anatomy

Q: Are deer ticks arachnids or insects?

A: Arachnids.

The scientific name is *Ixodes scapularis*. *Ixodes* is Greek for 'stickiness'.

8 legs

no antennae

flat, hard body

Photo: Brown University

“Do you think deer ticks are arachnids or insects? They’re arachnids—along with mites, spiders, and scorpions. Adult deer ticks have eight legs, no antennae, and a flat, hard body. The scientific name is *Ixodes scapularis*. *Ixodes* is Greek for ‘stickiness’ which makes sense because ticks easily stick to you if you brush against them while you’re walking by.”

Teacher Notes:

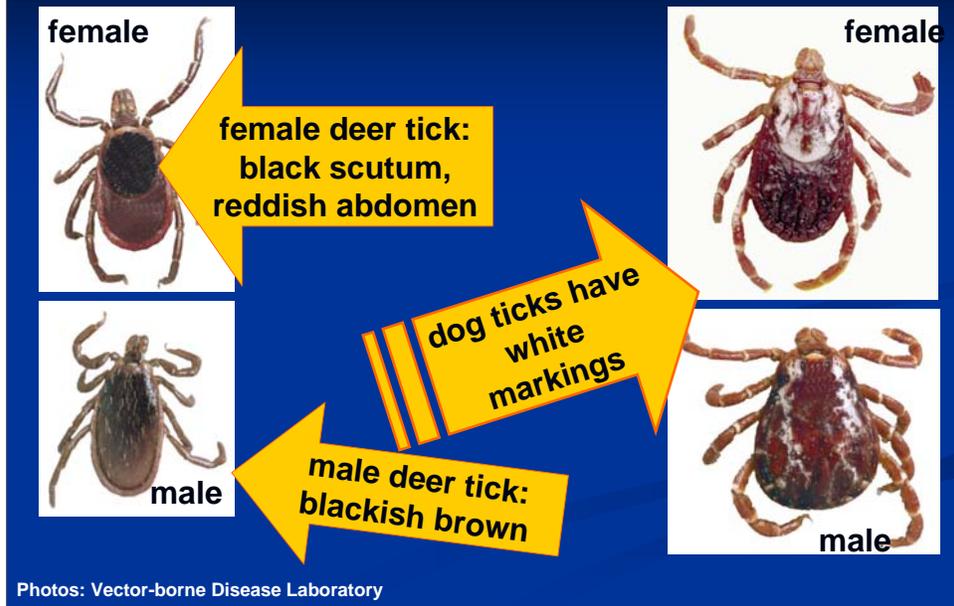
Ticks are subdivided into two types: hard bodied (ticks found in Maine), and soft bodied. There are ~850 tick species in the world, ~80 in the United States, and ~14 species found in Maine within the past fifteen years

Vocabulary

Arachnid - any of a class (Arachnida) of arthropods comprising chiefly terrestrial invertebrates, including the spiders, scorpions, mites, and ticks, and having a segmented body divided into two regions of which the anterior bears four pairs of legs but no antennae

Anatomy - a branch of morphology that deals with the structure of organisms

Tick anatomy – deer ticks vs. dog ticks



“Deer ticks transmit Lyme disease, but dog ticks don’t, so it’s a good idea to know the difference. Deer tick females have a black scutum—the part on the back near the head—and a reddish abdomen. Deer tick males appear dark brown or black. Female and male dog ticks have whitish markings on their backs. So to distinguish between dog ticks and deer ticks, don’t go by size. Go by presence or absence of whitish markings. With practice it becomes easier to distinguish between deer and dog ticks.”

Teacher Notes:

Another name for deer tick is ‘blacklegged tick’ and another name for dog tick is ‘wood tick’.”

Vocabulary

Scutum - a bony, horny, or chitinous plate: scute

Tick anatomy

Q: Are the deer ticks in the top or bottom row?



Top row

Bottom row

A: Deer ticks are in the top row. The dog ticks in the bottom row have white markings. Dog ticks do not transmit Lyme disease. The ticks on the right are larger because they are engorged with blood.

Photo: Vector-borne Disease Laboratory

“Here’s a pop quiz. Are the deer ticks in the top or bottom row of ticks? Look carefully for the white markings of the dog tick. The markings can be readily seen with a little practice. The ticks in the top row are deer ticks, and the ones in the bottom row, dog ticks. Remember, dog ticks do not transmit Lyme disease. If you were wondering why the ticks on the far right are so big, it’s because they are engorged with blood.”

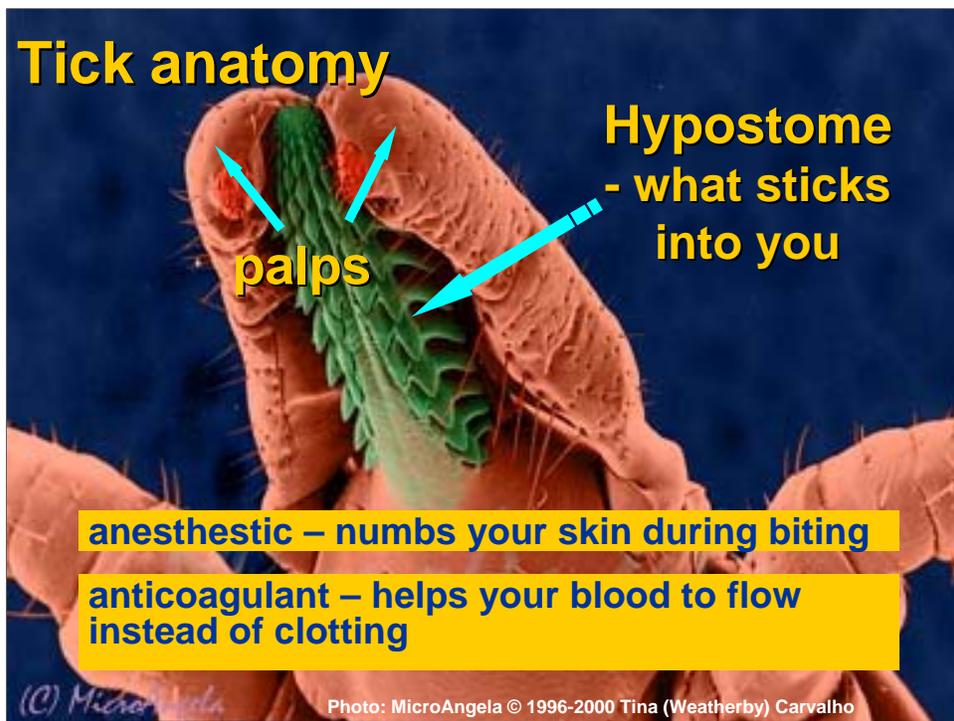
Teacher Notes:

Dermacentor variabilis is the scientific name of dog tick, which does NOT transmit Lyme disease.

Vocabulary

Transmit - to cause or allow to spread

Engorge - to suck blood to the limit of body capacity



“The tick has two palps used to brace the tick’s head against the your skin. The hypostome is the part that sticks into you. It’s covered with barbs - teeth that curve backwards - which help keep the hypostome in your skin. The tick has anesthesia in its saliva to numb your skin so you don’t know it is starting to bite. It also has an anticoagulant so your blood flows uninterrupted from you into the tick.”

Teacher notes:

Vocabulary

Palp - a segmented usually tactile or gustatory process on an arthropod mouthpart

Hypostome - a rodlike organ that arises at the base of the beak in various mites and ticks

Barb - a point or pointed part projecting backward

Anesthesia - a substance causing loss of sensation/pain reliever

Anticoagulant – a substance that hinders the clotting of blood

Lyme disease basics

Q: What happened to this person's arm?

A: This is the site of a tick bite. Three days to three weeks after a bite from an infected tick, a rash may appear and expand, caused by Lyme bacteria migrating through the skin. The rash may resemble a bulls-eye. But not everyone who gets Lyme disease gets a rash.”



Photo: Pfizer

“What happened to this person's arm? This is the site of a tick bite. Three days to three weeks after a bite from an infected tick, a round or oval rash may appear and expand, caused by Lyme bacteria migrating through the skin. The rash may resemble a bulls-eye. But not everyone who gets Lyme disease gets a rash.”

Teacher Notes:

Deer ticks are capable of transmitting diseases other than Lyme (such as anaplasmosis and babesiosis).

Vocabulary

Infect - to contaminate with a disease-producing substance or agent (as bacteria)

Lyme disease basics



“Here are some more examples of bulls-eye rashes, and also a swollen knee—as you can see, Lyme disease can be very serious.”

Teacher Notes:

Health care practitioners often use the term erythema migrans (EM) for the bulls-eye rash.

Lyme disease basics

Q: What are other symptoms of Lyme disease besides a rash?



A: Fever



A: Headache/stiff neck



A: Joint pain

“What are other symptoms of Lyme disease besides a rash? Symptoms are flu-like and may include a fever, headache, stiff neck, or joint pain. Not everyone has all symptoms, and not everyone gets a bulls-eye rash. Medical diagnosis is very important, so if you think you have been exposed to Lyme disease, your parent or guardian may want to contact a doctor.”

Teacher notes:

Lyme disease does not cause diarrhea, vomiting, coughing, or a runny nose.

Vocabulary

Symptom - subjective evidence of disease or physical disturbance;
broadly: something that indicates the presence of bodily disorder

Diagnosis - the art or act of identifying a disease from its signs and symptoms

Lyme disease basics

Q: How does a deer tick make you sick?

A: As it feeds on your blood,
it injects bacteria.



“How does a deer tick make you sick? As it feeds on your blood, it injects bacteria IF it is infected with the bacteria that cause Lyme disease, .”

Lyme disease basics

Q: What are Lyme disease spirochetes?

A: They are spiral-shaped bacteria that pass from the tick into your body.



Graphics: Massachusetts Department of Health; Photo: Georgia Southern University

“What are Lyme disease spirochetes? They are spiral-shaped bacteria that pass from the tick into your body. This is a microscopic view of spirochetes. They live in the tick’s midgut.”

Teacher Notes:

The scientific name for the Lyme disease spirochete is *Borrelia burgdorferi*. After spirochetes enter the bloodstream they are transported throughout the body and may persist in a joint.

Vocabulary

Spirochete - any of an order (Spirochaetales) of slender spirally undulating bacteria

Midgut - the middle part of an alimentary canal

Tick ecology

Q: How do spirochetes get into ticks?



Photo: Vector-borne Disease Lab



Photo: Dana Heath



Photo: Vector-borne Disease Lab

A: Ticks feed on host animals such as mice, deer, squirrels, and birds. If the host animal is infected, it may pass the infection on to the tick.



Photo: Sara Morris

“How do spirochetes get into ticks? Ticks feed on host animals such as mice, squirrels, and birds. If the host animal is infected, it may pass the infection on to the tick. Then if the infected tick feeds on another host, it may infect the host. Passing from one host to the next is how Lyme disease bacteria persist in nature.”

Teacher notes:

Vocabulary

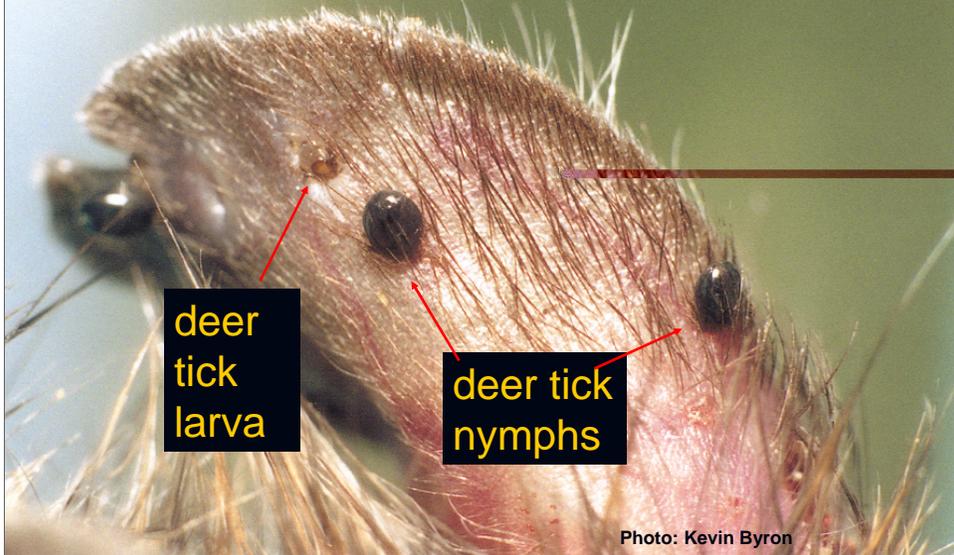
Host - a living animal or plant on or in which a parasite lives

Ecology - a branch of science concerned with the interrelationship of organisms and their environments

Persist – to continue to exist

Tick ecology

Q: What's on this mouse's ear?



“What’s on this mouse’s ear? The tiny tick is a deer tick larva. The larger ticks are deer tick nymphs. The ticks are engorging with the mouse’s blood. Engorged larvae molt into nymphs. Engorged nymphs molt into adults.”

Teacher Notes:

Vocabulary

Molt - to cast off an outer covering periodically

Tick ecology



Photo: Iowa State University

Q: What is questing?

A: Ticks quest for a blood meal by climbing vegetation and waiting for a host. Ticks don't fly or jump. They hitchhike.

“What is questing? A tick quests for a blood meal by emerging from the vegetation under which it sheltered, and climbing up on nearby vegetation, such as a blade of grass, or the branch of a shrub. There it will wait for a suitable host. Ticks don't jump or fly; they hitchhike. Once on a host, they crawl until they find a suitable place to bite.”

Teacher Notes:

Questing height is a function of species and stage. An adult deer tick can climb up to a height of three feet to quest.

Vocabulary

Quest - an act or instance of seeking

Tick ecology

Q: Why is the tick on the left bigger?



A: The tick fed on a host and is very engorged with blood. The tick on the right is unengorged because it has not fed.

Photo: Centers for Disease Control and Prevention

“Why is the tick on the left bigger? The tick on the left found a host and engorged with blood. The tick on the right has not fed. The size of an engorged female deer tick can approach that of a small raisin, and the tick will become a grayish color.”

Tick ecology

Q: Why are these deer ticks different sizes?



A: Some have fed longer. Engorgement increases from left to right: unengorged ('flat'), slightly, moderately, and very engorged. The longer an infected deer tick is attached to you, the greater the risk for Lyme disease.

“Why are these female deer ticks different sizes? Some have fed longer than others. From left to right, the engorgement levels are unengorged (or ‘flat’), slightly engorged, moderately engorged, and very engorged. Notice how the tick changes color as it engorges. The longer an infected deer tick is attached, the greater the risk for Lyme disease.”

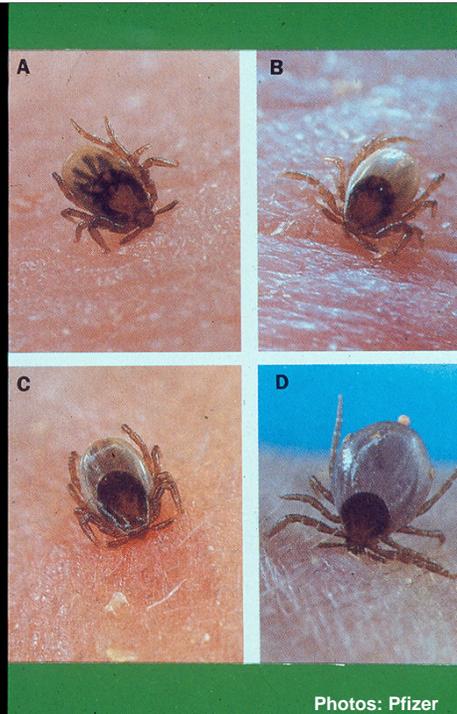
Teacher Notes:

The degree of engorgement reflects the time the tick was attached. Unengorged corresponds with ~0 hours, slightly engorged with ~24 hours, moderately engorged with ~48 hours, and very engorged with ~72 or more hours. If the tick is infected with Lyme disease bacteria, the risk of contracting Lyme disease is considered minimal if the tick is unengorged, slight if slightly engorged, and likely if moderately or very engorged.

Tick ecology

Q: How long does it take for a tick to become fully engorged?

A: 2 – 3 days (nymphs), 4-7 days (adults). Usually it takes 36 hours for a tick to infect you, IF it has Lyme bacteria.



“How long does it take for a tick to become fully engorged? It takes two to three days for nymphs and four to seven days for adults to become fully engorged. Usually it takes 36 hours for a tick to infect you, IF it has Lyme bacteria. Remember, not all deer ticks are infected.”

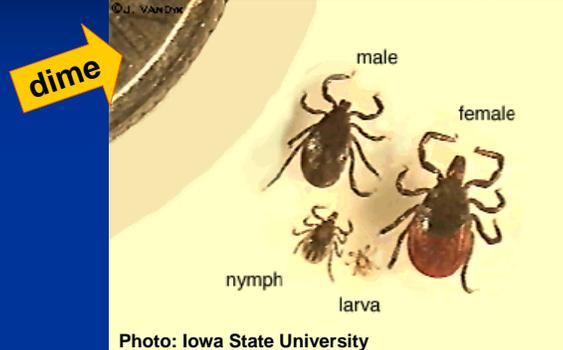
Teacher Notes:

Transmission of *Borrelia burgdorferi* from an infected tick is unlikely to occur before 36 hours of tick attachment (Centers for Disease Control and Prevention, Atlanta, Georgia).

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Tick ecology

Q: What are a tick's life stages?



A: Stages are: egg, larva, nymph, and adult. A larva is the size of a grain of sand. A nymph is the size of a poppy seed. Nymphs and adults can transmit Lyme disease to people.

“What are a tick’s life stages? The stages are egg, larva, nymph, and adult. A larva is the size of a grain of sand. A nymph is the size of a poppy seed. Nymphs and adults transmit Lyme disease to people.”

Teacher Notes:

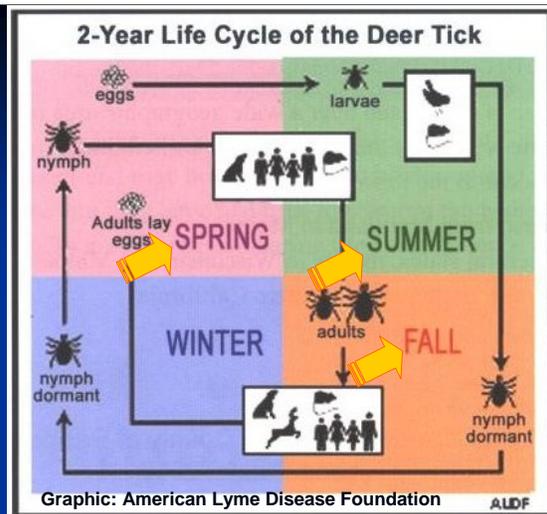
-Larvae appear mostly in August, have six legs, and are tiny, about the size of a grain of sand. They usually feed on small mammal hosts such as mice.

-Nymphs appear mostly in May and June, have eight legs, and are about the size of a poppy seed. They are barely noticeable until engorged with blood. They typically feed on small mammal hosts such as mice. However, they will bite humans. They can be infected with Lyme disease bacteria if, as larvae, they fed on an infected host.

-Adults appear mostly in spring and fall and have eight legs. They typically feed on deer, but also larger mammals such as dogs, cats, horses, and humans. They can be infected with Lyme disease bacteria if, as larvae or nymphs, they fed on an infected host.

Tick ecology

Q: In which season are you most likely to come in contact with deer ticks?



A: Nymphs are out mostly in late spring, and adults mostly in spring and fall. You can even encounter a tick in winter if it's warm and there is no snow on the ground.

“In which season are you most likely to find deer ticks? Nymphs are out in *mostly* in the late spring months of May and June, and adults are out *mostly* in spring and fall. But you can encounter a tick even in winter if it's warm and there's no snow on the ground. It takes two years for the deer tick to complete its life cycle from egg to adult.”

Teacher Notes:

The complete life cycle of *Ixodes* ticks requires 2 years. Female adults lay eggs in the spring, and hatch as larvae in the summer. Larvae feed on mice, birds, and other small animals in the summer and early fall. The larvae may become infected with Lyme disease bacteria when feeding on these animals. Once a tick becomes infected, it stays infected for the rest of its life and can transmit the bacteria to other hosts. After this initial feeding, the larvae usually become inactive until the following spring, when they molt into nymphs. Nymphs seek blood meals to fuel their growth into adults. Nymphs feed on small rodents, birds, and other small mammals in late spring and early summer. Nymphs will also feed on humans, and if previously infected with the Lyme disease bacterium, they can transmit the disease to humans. Nymphs molt into adult ticks in the fall. Adult ticks feed in the fall and mate on large animals, such as deer. Ticks that don't feed in the fall may feed the next spring. In spring, adult female ticks lay their eggs on the ground, completing the 2-year life cycle.

Tick ecology

Q: What habitats do deer ticks favor?

A: Deer ticks need protection from sun and wind so they don't desiccate. Good habitats are the leaf litter and shrubs in a hardwood forest, and shrubs at the edges of forests.



Photos: Vector-borne Disease Laboratory and New England Wildflower Society

“What habitats do deer ticks favor? Deer ticks need protection from sun and wind so they don’t desiccate—that is, dry out. Good habitats for deer ticks are the leaf litter in a forest with hardwood trees (such as oaks and maples), and shrubs at the edges of forests.”

Teacher notes:

Vocabulary

Habitat - the place or environment where a plant or animal naturally or normally lives and grows

Litter - the uppermost, slightly decayed layer of organic matter on the forest floor

Desiccate – to dry up

Tick ecology

Q: What habitats are unfavorable for deer ticks?

A: Open and dry habitats are tough on tick survival. Examples are beaches, open fields, and the dry needle litter in forests of mostly softwood trees like pines and spruces.



Photos: Vector-borne Disease Laboratory

“What habitats are unfavorable for deer ticks? Open and dry habitats are tough on tick survival. Examples are beaches, open fields, and the dry needle litter in forests of mostly softwood trees like pines and spruces.”

Teacher notes:

Vocabulary

Survival - the continuation of life or existence

Prevention

Q: What is the most important thing you can do to prevent Lyme disease?

A: Perform a “Tick Check”! Inspect your body upon your return from the outdoors, and again a few hours later.

Especially check your head, hairline, nape of the neck, armpits, waist, private areas, thighs, and behind the knees. But, ticks can bite you anywhere!



Photo: Massachusetts Department of Health

“What is the most important thing you can do to prevent Lyme disease? Perform a Tick Check! Inspect your body upon your return from the outdoors. Do another tick check a few hours later. Especially check your head, hairline, nape of the neck, armpits, waist, private areas, thighs, and behind the knees. But remember, ticks can bite you anywhere! Check your pets, too.”

Prevention

Q: What do you do if a tick bites you?

A: Find an adult (like a parent, teacher, or school nurse) to help you remove and save the tick so it can be identified. If symptoms of Lyme disease develop after known exposure to a tick, your parent or guardian may consult a doctor.



“What do you do if a deer tick bites you? Find an adult (like a parent, teacher, or school nurse) to help you remove and save the tick so it can be identified. If symptoms of Lyme disease develop after known exposure to a tick, your parent or guardian may consult a doctor.”

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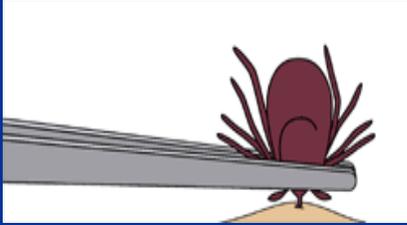
The Vector-borne Disease Laboratory of the Maine Medical Center Research Institute has a free service which supplies two pieces of information: 1) identification of tick to species, and 2) engorgement level. Ticks can be brought to the lab or mailed in a crush-proof container. The laboratory is located at 75 John Roberts Rd., Suite 9B, So. Portland, ME 04106, email: ticklab@mmc.org, website: <http://www.mmc.org/lyme/> . Submission instructions and a submission form can be found on the website.

The information the lab provides is useful to health care practitioners and patients in deciding upon a course of treatment.

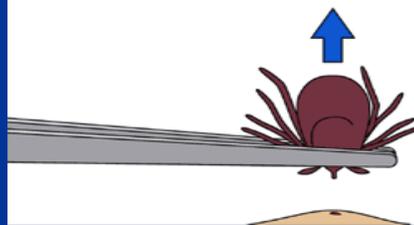
Prevention

Q: How do you remove a tick?

Step 1: Grasp with tweezers close to the tick's head and your skin's surface.



Step 2. Apply steady even pressure upwards; *slowly* pull the tick out.



Tips: Don't put petroleum jelly or alcohol on the tick, or try to burn it off. Try not to touch the tick. Save it in a sealable container. Disinfect the bite site.

“How do you remove a tick? Step 1: Grasp the tick with tweezers or a tick removal spoon close to the tick's head and your skin's surface. Step 2: Apply steady, even pressure upwards and slowly pull the tick out. Don't put petroleum jelly or alcohol on the tick or try to burn it off. This just makes the tick want to dig in deeper. Try not to touch the tick, and save it in a sealable container. Always save the tick so it can be identified. Disinfect the bite site.”

Teacher Notes:

Deer ticks don't burrow their entire bodies under the skin. It is the mouthparts that penetrate the skin. Sometimes after removal part of the hypostome will remain behind. The body will reject the fragment (similar to the way our bodies reject a splinter), but the fragment may carry germs. That is why it is important to disinfect the bite site.

Prevention

Q: Which person is dressed for defense against ticks?



- Light-colored clothing
- Long sleeves, pants
- Shirt tucked into pants
- Pants tucked into socks
- Closed-toe shoes
- Bug repellent

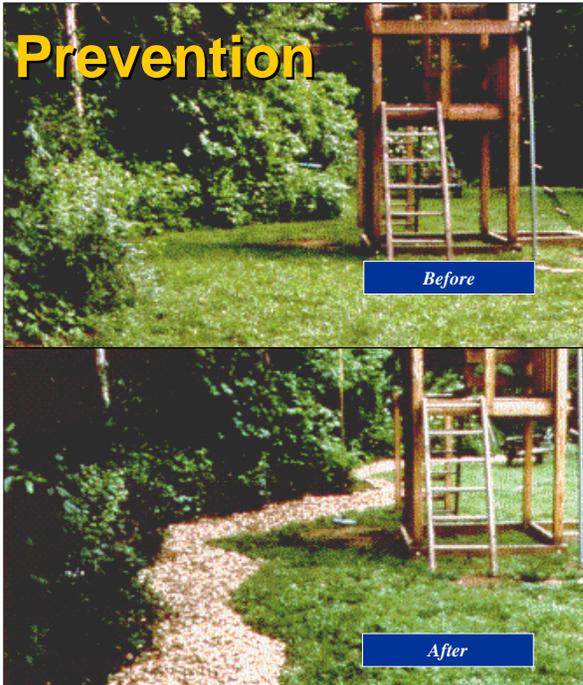
Photo: Vector-borne Disease Laboratory

“Which person is dressed for defense against ticks? The one on the right is right. Light-colored clothing makes it easier to spot a tick. Long sleeves and pants keep ticks off your skin. Tucking in your shirt and pants legs and closed-toe shoes helps keep ticks from getting under your clothes. Use a safe type of bug repellent help repel ticks.”

Teacher Notes:

Guidance on choice of repellent from parents or guardians is recommended. Link to repellent information:

Prevention



Knowing good and bad tick habitat means you can create tick-free zones.

Here is a woodchip barrier between woods and a swing set. Ticks are more likely to dry out and die if they try to cross the barrier.

Photos: K. C. Stafford III, Connecticut Agricultural Experiment Station

“Knowing good and bad tick habitat means you can create tick-free zones in your yard. Here is a woodchip barrier between the woods and a swing set. Ticks are more likely to desiccate and die if they try to cross the barrier, so it is safer on the yard side than the woods side.”

Teacher Notes:

More information on creating tick-free zones can be found in “MANAGING TICKS ON YOUR PROPERTY”, Prepared by Kirby C. Stafford III, Ph.D. (March 2005) The Connecticut Agricultural Experiment Station, 123 Huntington St.-Box 1106, New Haven, CT 06504 (203) 974-8485, Web site: <http://www.caes.state.ct.us>

Q: What kind of tick is this?

A: Deer tick.



Q: Name at least three behaviors that will help lower your risk of getting Lyme disease.



**A: 1. Do a tick check
2. Remove ticks promptly
3. Wear the right clothing
Also:
4. Use bug repellent
5. Know good and poor deer tick habitats
6. Create tick-free zones**

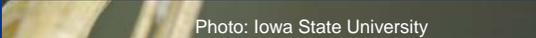
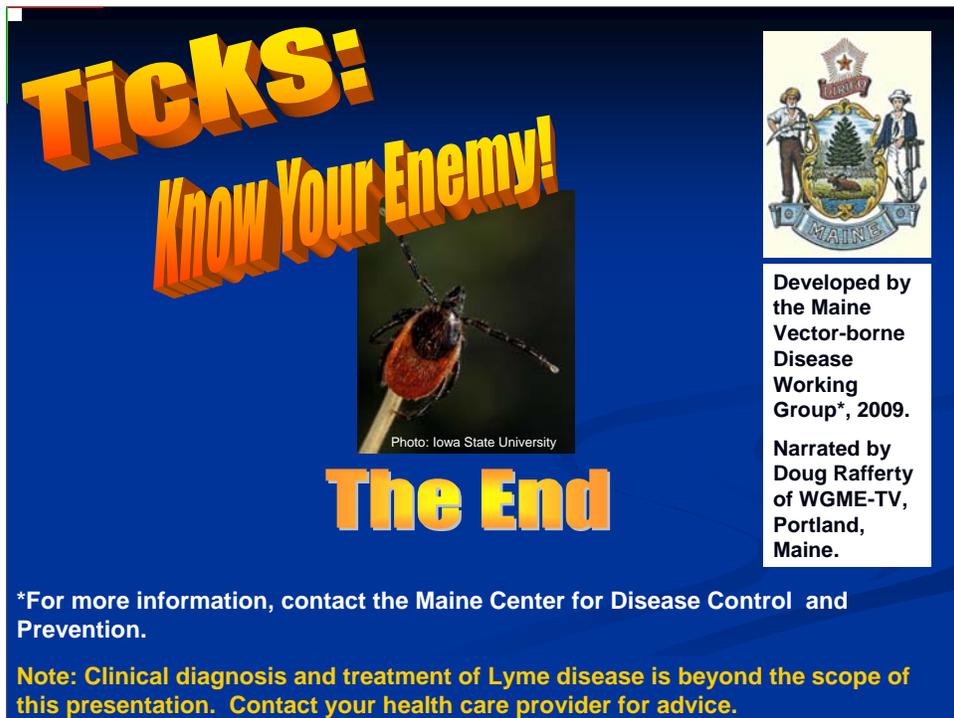


Photo: Iowa State University

“Okay, quiz time. What kind of tick is this? Now you know—this is a deer tick; a female questing for a blood meal. Name at least three behaviors that will help lower your risk of contracting Lyme Disease: 1. Do a tick check, 2. Remove ticks promptly, and 3. Wear the right clothing, Also: 4. Use bug repellent, 5. Know what is good deer tick habitat, and 6. Create a tick-free zone where you work and play.



TICKS:
Know Your Enemy!

Photo: Iowa State University

The End

Developed by the Maine Vector-borne Disease Working Group*, 2009.

Narrated by Doug Rafferty of WGME-TV, Portland, Maine.

*For more information, contact the Maine Center for Disease Control and Prevention.

Note: Clinical diagnosis and treatment of Lyme disease is beyond the scope of this presentation. Contact your health care provider for advice.

“TICKS: KNOW YOUR ENEMY! Thanks for listening to me, Doug Rafferty, of WGME-TV in Portland, Maine. Remember: DO YOUR TICK CHECK!”

Teacher Notes:

This presentation was narrated through the generosity of Doug Rafferty and WGME-TV, Portland, Maine.

The Maine Vector-borne Disease Working Group is chaired by the State Epidemiologist of the Maine Center for Disease Control and is an assembly public health professionals, scientists and policy makers who come together to discuss innovative ways to combat the spread of vector-borne diseases. Over the past 15 years, the number of Lyme disease cases identified in Maine has increased dramatically, with over 800 case reports received in 2008. For more information, contact the Maine Center for Disease Control and Prevention.

Website: http://www.maine.gov/dhhs/boh/ddc/_lyme/lyme_1.htm

This presentation focuses on awareness and prevention. Clinical diagnosis and treatment of Lyme disease is beyond the scope of this presentation. Contact your health care provider (e.g., primary care physician, emergency room, or free clinic) for medical advice.