



Tick Safety and Ecology

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Thesis: Urban Ecology of Ticks



Agenda

- 1) Why are we here?
- 2) Tick Basics
- 3) Ticks and Tickborne Diseases
- 4) Tick Prevention
- 5) Tick Removal
- 6) Q&A



Why Should You Care About Ticks?

From 2004 and 2019, the Centers for Disease Control and Prevention (CDC) reported that tick-borne diseases rose from about 22,500 cases to about 50,800 cases

Tickborne Disease Surveillance Data Summary

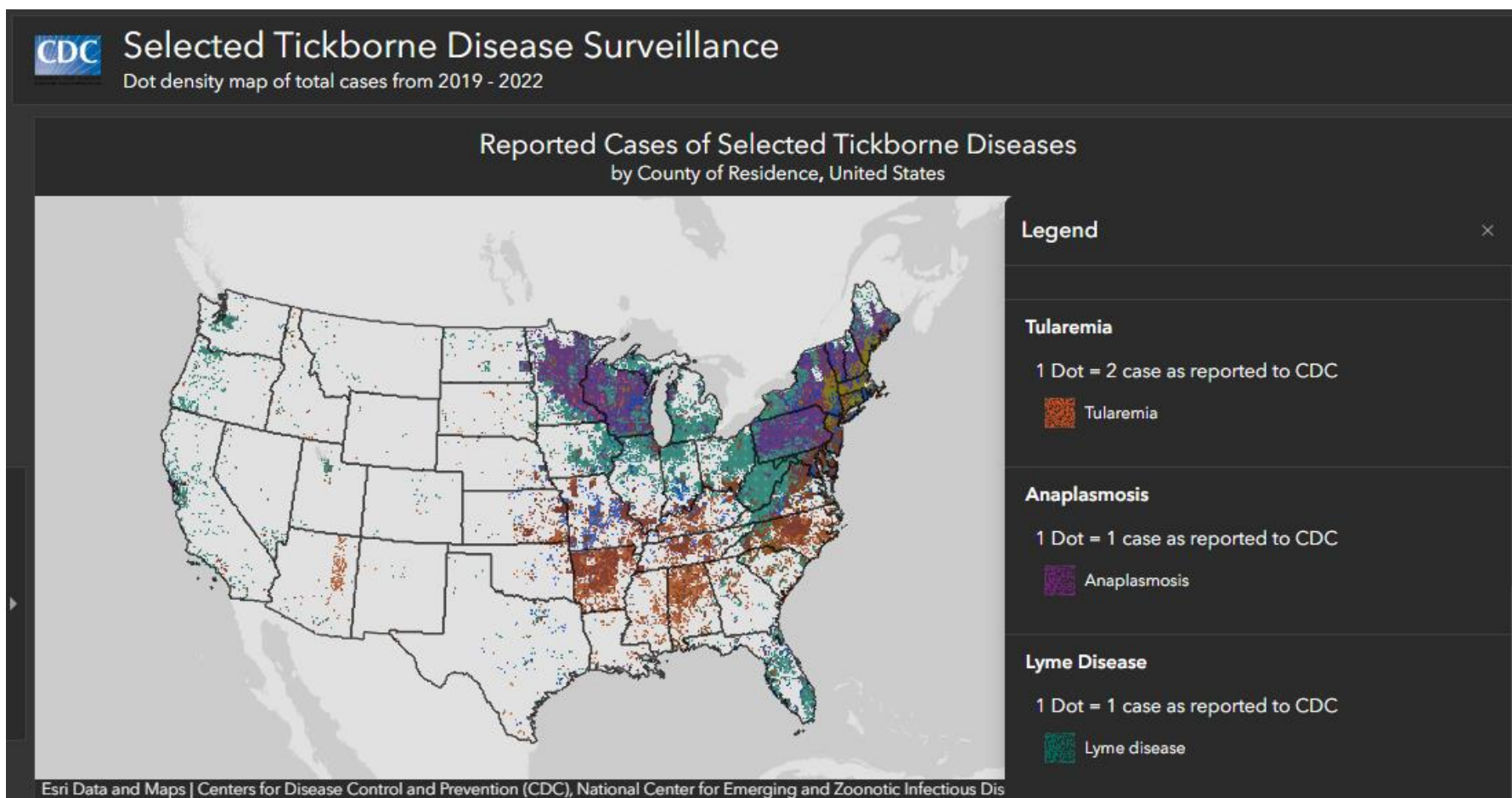
Total Reported Cases by Tickborne Disease, 2019-2022

Disease	2019	2020	2021	2022
Lyme disease	34,945	18,010	24,611	62,551
Anaplasmosis	5,655	3,639	6,744	5,633
Spotted fever rickettsioses	5,207	1,175	1,278	1,271
Ehrlichia chaffeensis ehrlichiosis	2,093	1,180	1,347	1,557
Babesiosis	2,418	1,827	1,915	
Tularemia	274	150	162	167
Undetermined ehrlichiosis/anaplasmosis	185	50	77	95
Powassan virus disease	43	21	24	47
Ehrlichia ewingii ehrlichiosis	43	21	19	25
Total	50,863	26,073	36,177	71,346



Why Should You Care About Ticks?

Pennsylvania is one of the worst states for tickborne diseases





Why Should You Care About Ticks?

Outdoor workers are at increased risk!

- Construction
- Landscaping
- Forestry
- Land surveying
- Farming
- Railroad work
- Oil field work
- Utility line work
- Park or wildlife management

List of jobs at risk of exposure to tickborne diseases from the Center for Disease Control



Why Should You Care About Ticks?

Tickborne disease prevalence has been increasing in urban areas, too!

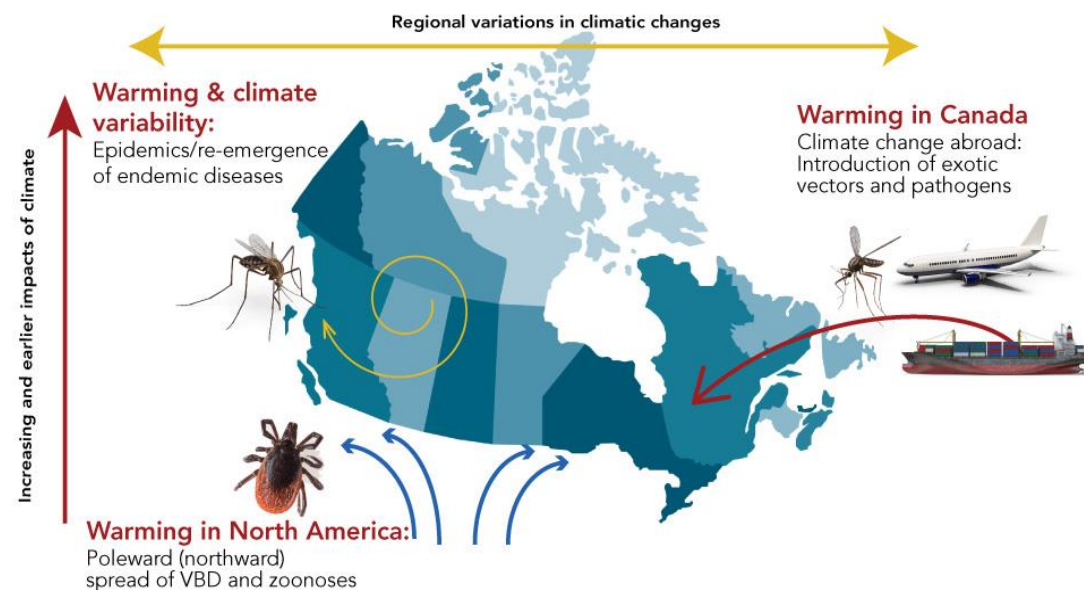




Why Should You Care About Ticks?

Global change impacts everything, including ticks, their hosts, and the pathogens they are infested with

- Many models predict range shifts of ticks due to changing climate
- Many models predict increasing tickborne disease prevalence due to changing climate
- Increasing global connectedness means new tick species are more likely to be introduced – think long-horned tick!





Why Should You Care About Ticks?

It's not a matter of *if* you'll encounter a tick, but *when*.

Diagnosis of tickborne disease is difficult.

Prevention and education is key.

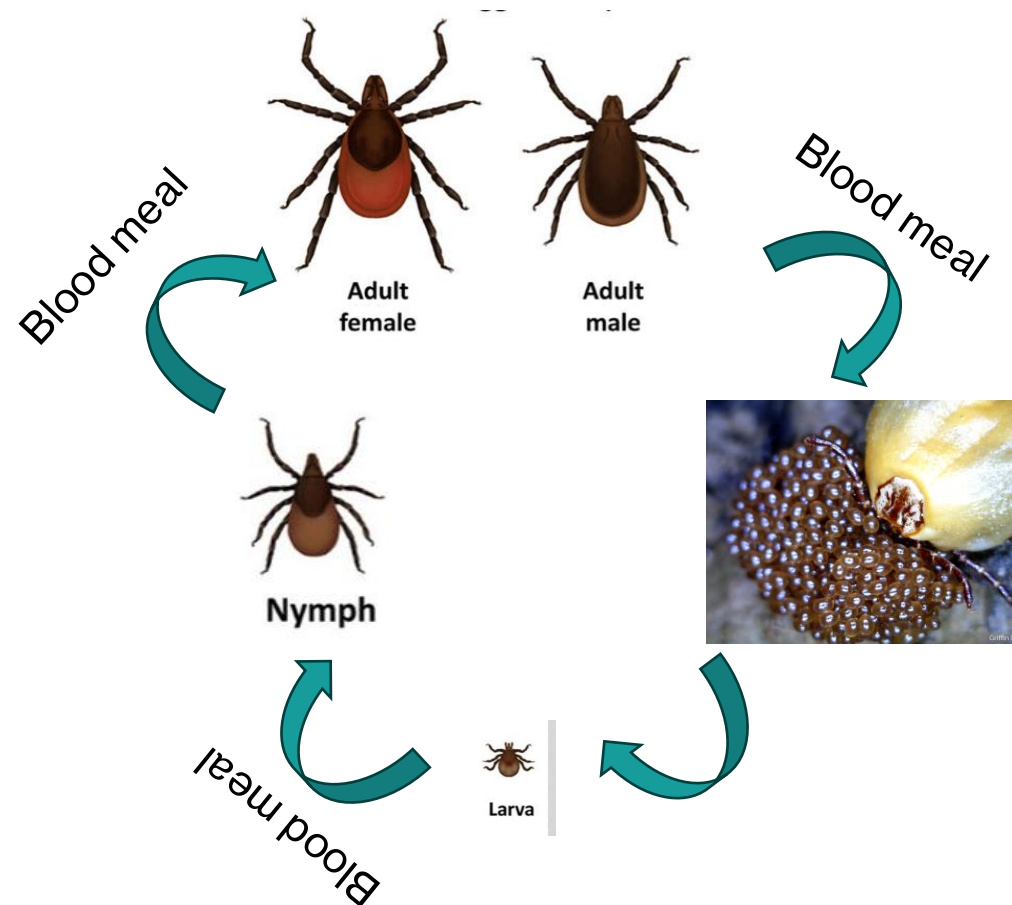


Tick Basics



What is a Tick?

- Parasitic member of the arachnid class
 - Two major families: **hard ticks (Ixodidae)** and soft ticks (Argasidae)
 - Found on every continent
- Four stage life cycle
 - Vectors for pathogens that can cause disease in humans and companion animals
 - Carry more zoonotic pathogens than any other vector





What is a Tick?



CDC
@CDCgov

Follow



Ticks can be the size of a poppy seed.
Can you spot all 5 ticks in this photo?
Learn how to prevent tick bites.

bit.ly/2rjox6U



1:30 PM - 4 May 2018

© Twitter CDC



How Do Ticks Find Hosts?

- Questing
- Can detect vibrations, temperature changes, CO₂
- Anti-immunomodulatory, anti-vasodilatory, anti-coagulants

Common Misconception:

Ticks do not climb trees or jump.





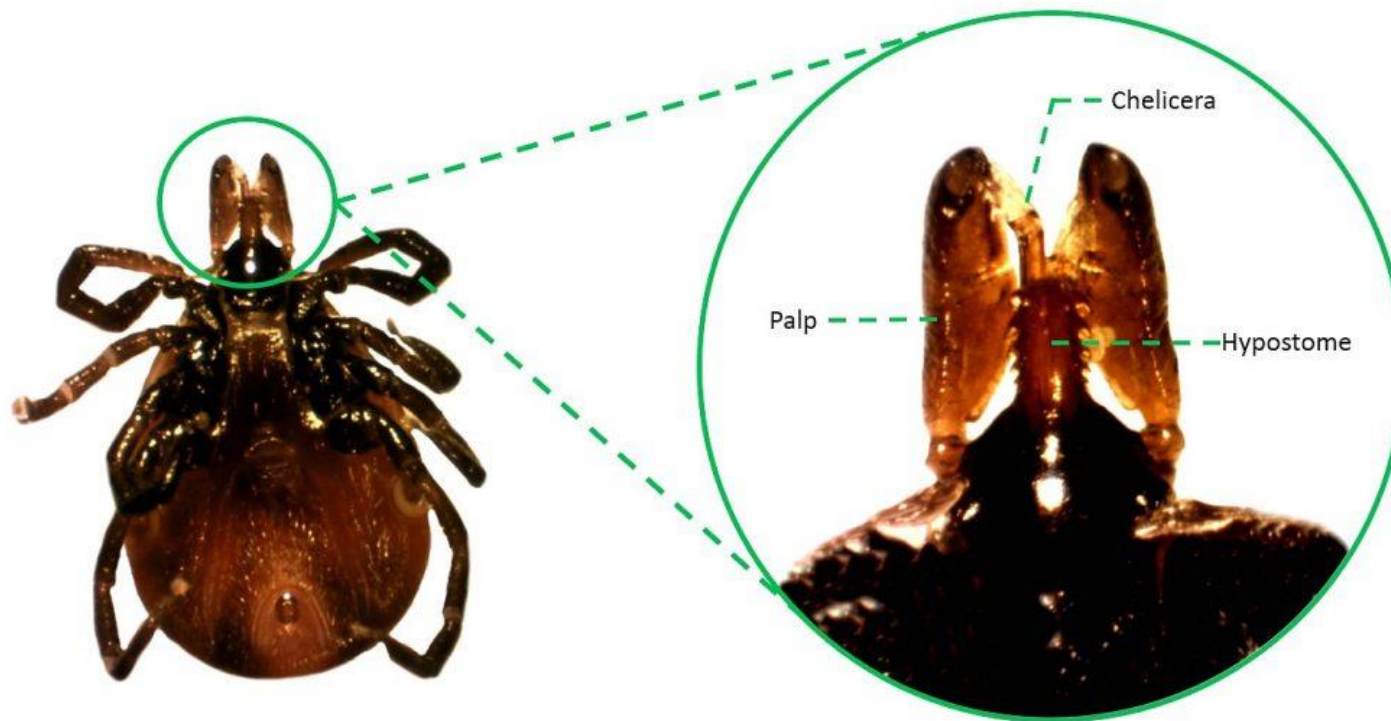
How Do Ticks Find Hosts?

- The size of the tick **sometimes** correlates to the size of the **host**...
 - Larva- Chipmunks, white-footed mice, birds, amphibians, reptiles
 - Nymph- Rabbits, Racoons, foxes, dogs, other medium sizes animals
 - Adults- Deer
- ...but all life stages feed on humans and domestic animals**





Tick Anatomy



Griffin Dill



Black-Legged Ticks



Blacklegged Tick or Deer Tick (*Ixodes scapularis*)



Larva



Nymph



Adult Male



Adult Female



Lyme Disease, anaplasmosis, babesiosis, Powassan Virus
Aka: Deer tick

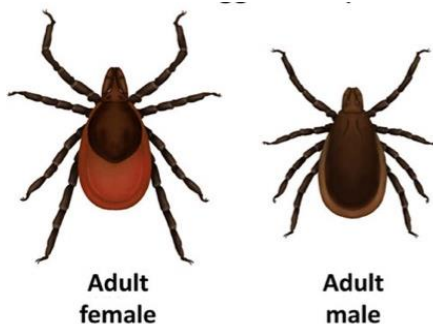


A special look at Black-Legged Ticks

Stage that infects most humans



Nymph



Adult female

Adult male

Transovarial transmission is possible with some bacteria, but not *Borrelia burgdorferi*



Larva

Tick is most likely to get infected with a pathogen



American Dog Tick



American Dog Tick (*Dermacentor variabilis*)



Larva



Nymph



Adult Male



Adult Female



Rocky Mountain Spotted Fever, tularemia, canine tick paralysis



Lone Star Tick



Lone Star Tick (*Amblyomma americanum*)



Larva



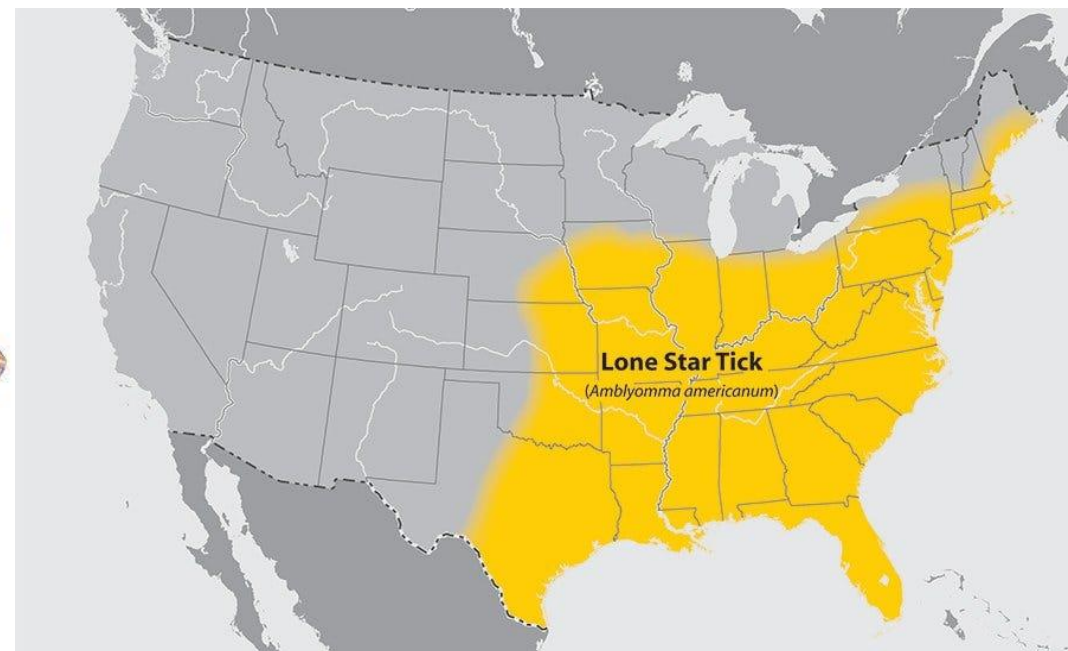
Nymph



Adult Male



Adult Female



Rocky Mountain spotted fever, ehrlichiosis, tularemia and STARI (southern tick-associated rash illness), Heartland virus, Bourbon virus
alpha-gal (red meat) allergy.



Tick Prevention



Tick Prevention

- **You can get a tick anywhere outside – not just in tall grass, leaf litter, or "in the woods."**
- Check yourself thoroughly after each outing. Yes, even if you are just checking the mail!
 - Shower **immediately** after returning indoors
 - Check in hair and at the hairline, around the ears, under the arms, between the legs, and on the backs of the knees
 - Check at the waistband of pants and the cuffs of socks
 - Put clothing into the dryer, as high heat can kill ticks

This is the best way to prevent yourself from getting a tickborne illness! You should always do tick checks, even when using other preventative measures.



Tick Prevention



In addition to regular tick checks you can:

- Use EPA-registered repellents (e.g., DEET)
 - Must use exactly according to label, or else these are ineffective
- Treat clothing and gear with permethrin
 - Must use exactly according to label or ineffective
- Wear light colored clothing, where is it easier to see ticks
- Tuck your pants into your boots and socks to encourage ticks to climb on top of your clothing instead of underneath
- Make sure pets are tick-free



Tick Prevention

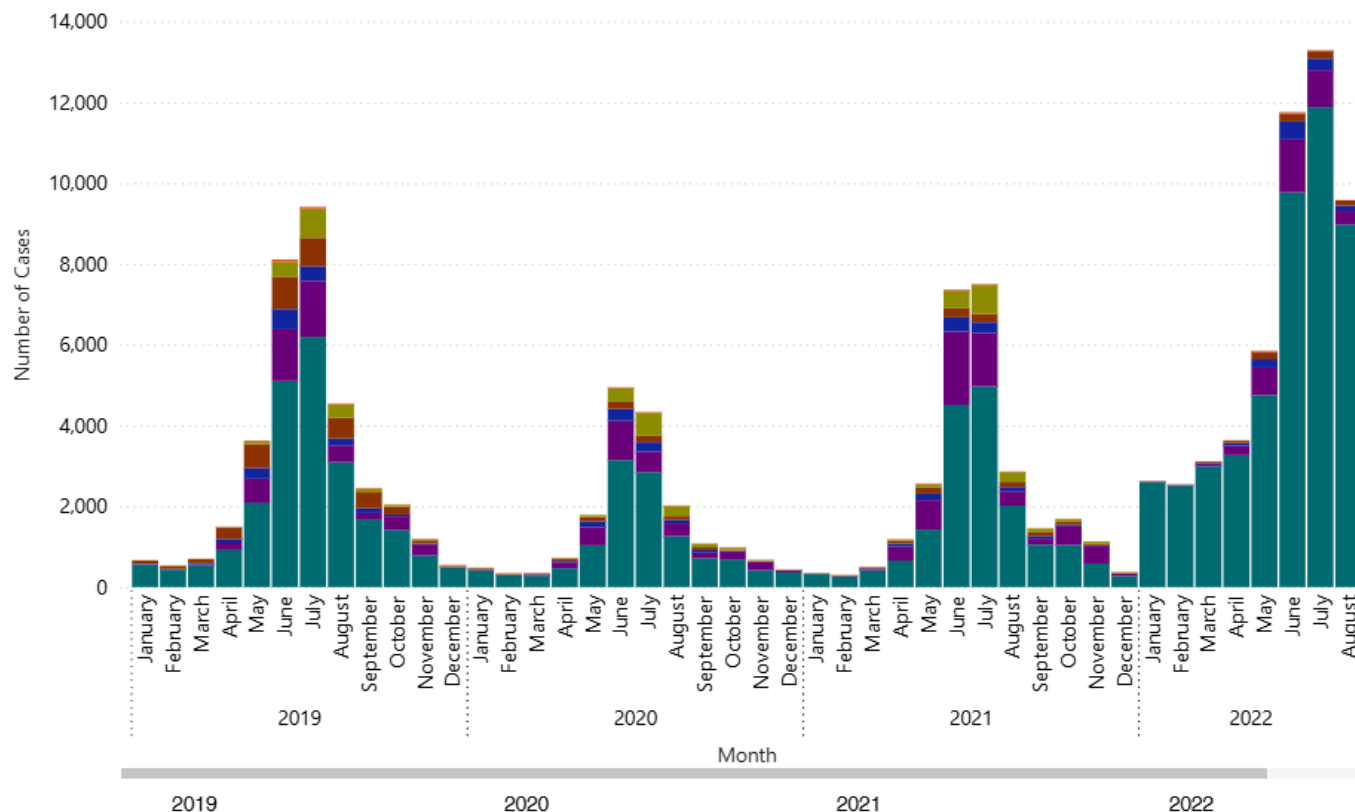
Tick season is year-round!

- Do not stop tick prevention measures on you or your pets during colder months
- Ticks will take advantage of favorable weather conditions any time of year

Selected Tickborne Disease Cases by Month-United States, 2019-2022

Disease: All

Disease ● Lyme disease ● Anaplasmosis ● Ehrlichia chaffeensis ehrlichiosis ● Spotted fever rickettsiosis ● Babesiosis ● Tularemia





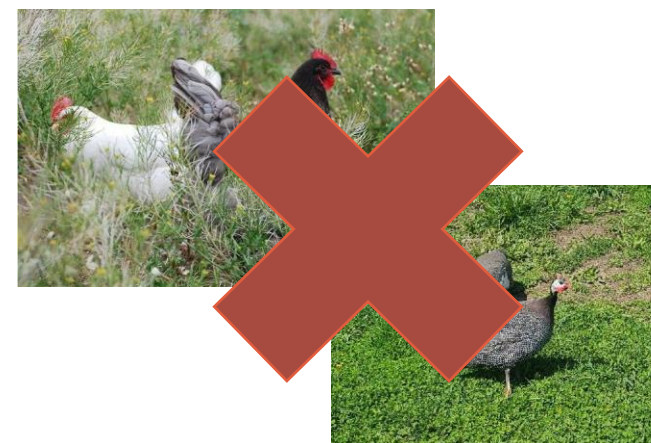
Tick Prevention

There are no studies that show that predation from chickens, guinea fowl, opossums, or other animals control tick populations.

- Although all these animals (and others) will eat ticks, they do not impact the overall population

There is evidence that **other** practices may be effective for area-wide tick control

- Eliminating tick habitats
- Creating mulch or stone barriers around lawns
- Tick tubes to kill ticks on wild mice
- Applying acaricides to infested areas





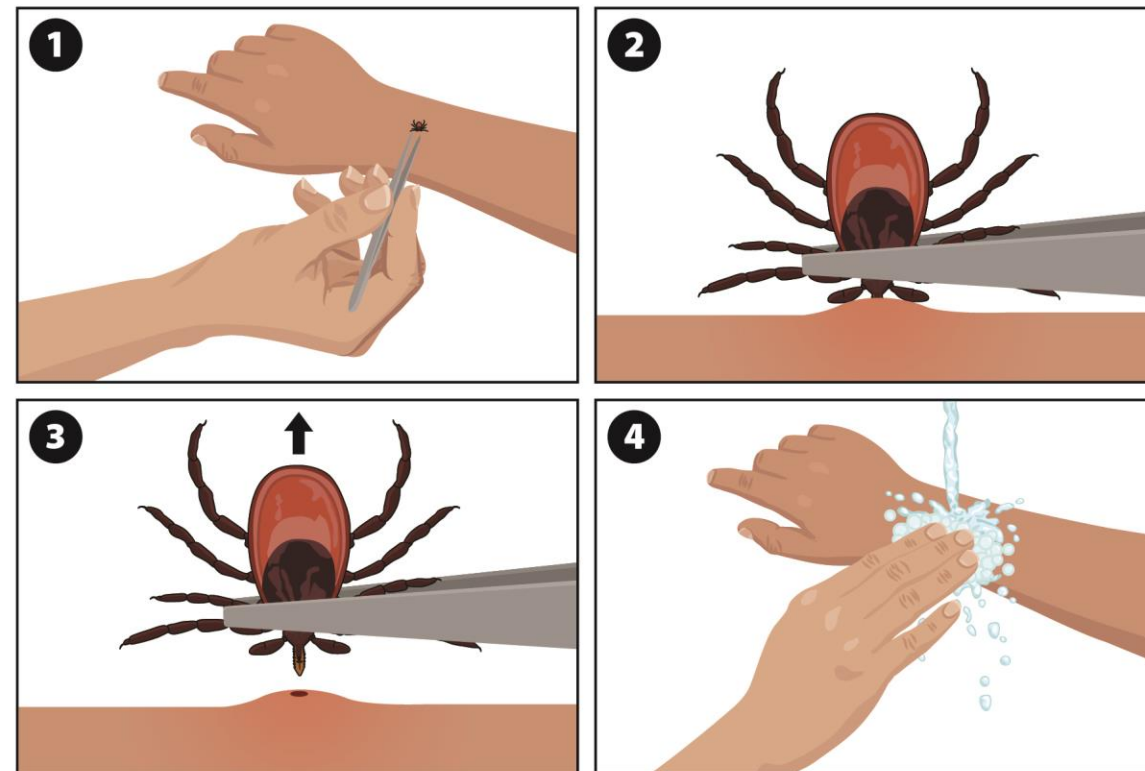
Tick Removal



Tick Removal

You've found a tick on you, now what?

- Do not panic
- If the tick is not attached, remove it and dispose of it
 - Place it in a sealed container, wrap it tightly in tape, or put it in alcohol
- If the tick is attached..
 - Grasp the tick as close to the skin's surface as possible, avoid squeezing the body
 - Pull tick away from the skin with steady, even pressure. Don't twist or jerk the tick.
 - Dispose of the tick and clean the area with soap and water





Tick Removal

Do not use petroleum jelly, heat, nail polish, or other substances to try and make the tick detach from the skin. This may agitate the tick and force infected fluid from the tick into the skin.

In most cases, a tick must be attached for more than 24 hours before the Lyme disease bacterium can be transmitted.

You can send ticks to a lab to be tested, however it is not recommended

- Do not delay treatment
- Just because a tick tested positive for a pathogen does not mean you are infected



You Removed an Embedded Tick, Now What?

- Monitor yourself for any symptoms of tickborne illness
 - Rash
 - Flu like symptoms- fever, body aches, headache, muscle pain, fatigue
- See a doctor immediately if you experience any of these symptoms
- **Always** tell your doctor if you've had a tick on you, even if you are there for something "unrelated"
- You can send ticks to a lab to be tested, however it is not recommended
 - Do not delay treatment
 - Just because a tick tested positive for a pathogen does not mean you are infected





Last Note on Lyme Disease

- Lyme Disease is a serious disease if left untreated
- Treatment with antibiotics is necessary
- A small amount of people experience "post-treatment Lyme disease," (not "Chronic Lyme"), but in most cases there is no laboratory proof the bacteria is still present
- No one knows why, but people are still suffering
 - Immune response?
 - Dysautonomia?
 - Reoccurring infections?
- More research is needed!



Sources

- Center for Disease Control
- Ogden NH, Gachon P. Climate change and infectious diseases: What can we expect? Can Commun Dis Rep 2019;45(4):76–80. <https://doi.org/10.14745/ccdr.v45i04a01>
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