

# BEE YET

## Another Arachnid

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### 'Tis the season

Spring is an exciting time of renewal for nature and beekeepers. Everything is coming to life and the business of the bee yard awakens from long months of Winter slumber. **Everything...** is waking up, including things we would prefer never to emerge. This month, I would like to take some time to discuss an arachnid of concern for beekeepers... no, not *Varroa* mites...but ticks. While ticks do not directly affect honey bees, they certainly can affect the safety and health of beekeepers and a wide variety of our other animals. Since beekeepers spend so much time outdoors tending our bees, we are at a higher risk of encountering ticks and tick-borne diseases.

Before researching honey bees, my research involved ticks and tick-borne diseases. Since Pennsylvania has had the largest number of reported cases of Lyme Disease in the U.S. in the last decade or so, it was a worthy public health pursuit. My research students and I worked with several PA state agencies to collect and speciate about 3000 ticks from around the Commonwealth of PA. We also tested these ticks for five tick-borne disease agents, *Borrelia burgdorferi* (Lyme Disease), *Borrelia miyamotoi*, *Anaplasma phagocytophilum*, *Babesia microti*, and *Bartonella*. In summary, I can tell you that we

found evidence of these diseases throughout the state. We published several papers, increased tick-borne illness awareness in PA, and found the **first evidence of the Powassan virus** in the tick population in Pennsylvania.

I am happily "retired" from our tick research work and have found honey bees to be a much more attractive research subject. However, I still sit on a tick task force of such, the Tick Surveillance Community of Practice for the State. These public health meetings help to keep me "embedded" in the current status of tick-borne diseases and I would like to pass the latest information on to you.

### Tick species

First, here is a quick review of various tick species that can transmit disease. The following link provides some helpful pictures and descriptions of common ticks. <https://www.cdc.gov/ticks/tickbornediseases/tickID.html>

*Ixodes scapularis* commonly known as the Black-legged tick (locally as a deer tick, many tick species are locally known as "deer ticks," fyi), is well-established in the Eastern United States, west of the Rockies. *Ixodes pacificus* dominates the west coast of the U.S. And do not feel left out if you live in the Rocky mountains, *Dermacentor andersoni* or the Rocky Mountain wood tick would like to keep you company. Brown dog ticks, *Rhipicephalus sanguineus*, are distributed everywhere. There are several other species of ticks located around the country and all of them are

capable of vectoring various diseases. Here is a great resource for checking out the ticks prevalent in your area. <https://www.cdc.gov/ticks/geographic-distribution.html>

In clinical practice, I used to get a lot of people bringing me ticks, asking me to identify the tick, and asking if the tick could be carrying diseases (and if they could be exposed). While the identification of ticks is a fun academic practice and can have some historical clinical significance to disease diagnosis, the short answer here is –"Yes!" If you have been bitten by a tick, any tick, whether deer tick, dog tick or damned tick, get checked, ASAP.

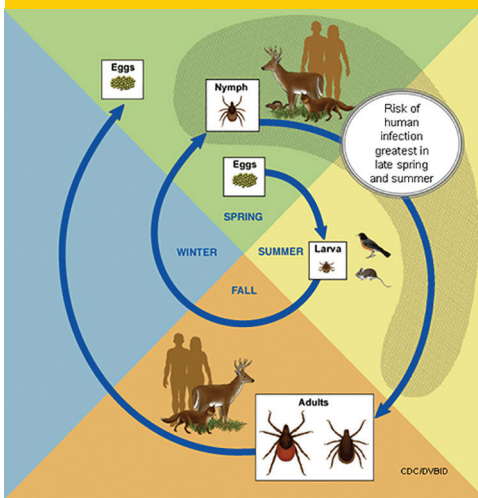
### Tick appearance and Lifecycle

Ticks have four life stages: egg, larvae, nymph, and adult. All stages, except the egg, can carry and transmit pathogens. Eggs, larvae, and nymphs are very small and can be difficult to see with an unaided eye. Nymphs are less than two millimeters in size and are therefore the most common stage to parasitize humans without you even knowing it. Even adults can be tricky to find.

Ticks can have varying lifecycles; some will stay on one host their entire life but others will use different hosts throughout their lifecycle. These three host ticks have the greatest potential to transmit diseases, since they move from host to host during their life stages. Ticks **do not** perish over Winter but have lifecycles that last two to three years. Eggs are deposited in the leaf litter by female ticks typically in the Fall. Larvae then emerge in the Spring and typically feed on smaller animals, like rodents. This stage is typically where the ticks pick up most of their vectored diseases. Nymphs typically feed on larger animals, including humans and commonly emerge in the second Spring of the lifecycle. Fed nymphs will morph into adults by Fall, a time when adult ticks become the most active. Female adults take a blood meal from a host, mate with a male, and deposit a few thousand eggs into the leaf litter to start the lifecycle again. Both ticks die soon after mating, but if thousands of offspring are produced, one can see how an area can be infiltrated with ticks very quickly.

**So, especially look for nymphs in the Spring and Summer and**

Three tick lifecycle from the CDC website. <https://www.cdc.gov/lyme/transmission/index.html>, accessed March 3, 2022





Try to avoid ticks by avoiding tall grasses.

**adults in the Fall, but host-seeking ticks can be active in temperatures above freezing all year long.**

Here is a link describing a three-host tick lifecycle. <https://www.cdc.gov/lyme/transmission/index.html>

### Tick bites hypersensitivity

In addition to vectoring many diseases, the tick bite themselves can cause a local hypersensitivity in the skin and subcutaneous tissue. Tick paralysis is a rare but dangerous neurological complication that can affect humans and most mammals. I have taught my students to add this unlikely event to their differential list. If an otherwise healthy patient presents with sudden onset of unexplained paralysis... check them for ticks.

### Tick-borne diseases – Sorry, it is not just Lyme Disease

Many people and medical professionals are aware of the prevalence of Lyme Disease. According to insurance claims and the CDC, the number of people *diagnosed and treated* for Lyme Disease is 476,000 per year. They are not sure if this represents the true number since many people exposed to Lyme are asymptomatic or do not seek medical care. Also, many tick-borne diseases look clinically similar to Lyme Disease and may be misdiagnosed as such.

Your risk may vary depending on your geographical location. For migratory beekeepers, you may achieve exposure to the entire smorgasbord. Many of these diseases are bacterial in nature and others are caused by viruses. Here is a list of common tick-borne agents or diseases in the U.S.

*Borrelia burgdorferi* (Lyme Disease)  
*Borrelia miyamotoi*  
 Anaplasmosis  
 Babesiosis

Bartonellosis  
 Rocky mountain spotted fever  
 Colorado Tick Fever Virus  
 Ehrlichiosis  
*Rickettsia parkeri*  
 Tularemia

Check out this link for the details on each of these diseases.  
<https://www.cdc.gov/ticks/tickbornediseases/index.html>

### Similar clinical signs, diagnosis, and treatment

The typical clinical signs tick-borne diseases can cause can be remarkably similar. This can make exact diagnosis difficult. The good news is that many people exposed to tick-borne disease may never become symptomatic and clear the infection on their own. However, “flu-like” symptoms like fever, fatigue, malaise, gastrointestinal signs, headache are also quite common. Skin rashes may occur, **but they are not diagnostic!** Unfortunately, some people, including medical professionals, still believe that if a “bull’s eye rash” is not found on a patient, they can rule out tick borne disease – **this is completely false!** Joint pain and neurological signs can also be found. Changes in blood work can include varied blood cell values and increases in liver enzymes.

Exact diagnosis depends on a keen medical professional picking up on your diagnosis possibilities. Incubation for many tick-borne diseases can be weeks after a tick bite, so it may be several weeks until signs show up. Also, specific and antibody blood testing will likely be negative in the initial stages of infection, so testing may need to be done weeks to months after the initial tick bite. However, treatment should be started immediately.

More, sort of, good news... many tick-borne diseases can be successfully treated with antibiotics. Doxycycline is one of the most helpful. Sound familiar? It should as this is one of the approved and most popular antibiotics used by beekeepers on their honey bees. Tick-borne diseases are a perfect illustration of why we should use antibiotics judiciously to reduce antibiotic resistance and keep doxy working for all of us. Tick-borne viral diseases are primarily treated using supportive care.

### Powassan update

The main inspiration for authoring this article is an update I received about Powassan, or the Deer Tick Virus (DTV). The state of PA Department of Environmental Protection issued a precautionary statement in January 2022 based on 2021 findings within the state. A portion of the release is below.

“Among tick samples recently taken by DEP at Lawrence Township Recreational Park, 92%, or twenty-three out of twenty-five sampled ticks, were positive for DTV. The previous highest DTV infection rate found at a single location in Pennsylvania was 11 percent, and the highest infection rate reported nationally in scientific literature was approximately 25 percent. The statewide average infection rate for DTV was 0.6 percent in 2021 when adult tick samples were collected. The Deer Tick Virus, which is a type of Powassan virus, is rare in the United States, but positive cases have increased in recent years. It is spread to people primarily by bites from infected ticks and does not spread person-to-person through coughing, sneezing, or touching. Powassan virus can be transmitted from tick to human in **as little as 15 minutes after a bite** occurs, while other tick-borne diseases, such as Lyme Disease, take much longer to cause infection, typically 24 hours or more after the tick attaches to the host. Initial symptoms of a DTV infection may include fever, headache, vomiting, and weakness. Some people who are infected with DTV experience no symptoms, and therefore infection may go undetected. However, according to the CDC, 91 percent of patients treated for DTV infections develop severe neuroinvasive disease. Those who exhibit severe disease from Deer Tick Virus may experience encephalitis or meningitis and require hospitalization, with symptoms including confusion, loss of coordination, difficulty speaking, or seizures. About 12 percent of people with severe disease have died, and approximately half of survivors of severe disease have suffered long-term health impacts. There are no vaccines to prevent or medicines to treat Powassan viruses. Preventing tick bites is the best way to reduce risk of infection and disease.”



### Preventative strategies for Beeks

Some good news... we can take several steps to reduce our exposure to ticks.


1. Preventative Sprays. Maybe you do not like chemicals or are allergic, but preventatives like permethrin applied to clothing, and EPA-registered insect repellents such as DEET applied on exposed skin are proven to be the most effective in reducing tick exposure. Please read instructions and reapply as needed according to product label instructions. Here is a helpful link on tick preventative sprays. <https://www.epa.gov/insect-repellents/find-repellent-right-you>
2. Avoid tall grass and wood edges where ticks especially quest for hosts. Keeping the grass down around your bee hives is a good preventative health practice for your bees, too.
3. Ticks are less attracted to light clothing, so white clothing is good! Beeks are already ahead of the curve here. And do not forget to tuck into your boots.
4. Pets. If you have a canine friend that likes to ride along to bee checks remember, pets can pick up ticks, bring them in the house to us, and our pets can suffer from many of the same tick-borne diseases we get. Be sure to use a veterinary approved tick preventative on your pets and check over any

pets exposed to tick habitats each time they return indoors.

5. Strip. This is the sexy part of the show. After returning home from the bee yard, remove all clothing, take a shower, and place clothing into the dryer on high heat to kill any lingering ticks. Examine gear such as backpacks for ticks.
6. Tick checks. Conduct a full-body tick check, including hidden areas such as the scalp, ears, armpits, belly button, and between the legs. It helps to have a partner.
7. Proper tick removal. If you happen to find a tick, do not just rip it off. Get a hemostat, tick removal key/tool, or thin tweezers to grasp the tick as close to the skin as possible and pull straight up to remove. It is possible to leave some mouth parts but just leave them alone if you do. The body will take care of it. Clean the area with alcohol, apply

an antibiotic ointment, wash your hands, and consider making an appointment with your doctor. Do not use fire, teeth, petroleum products or any other kind of voodoo to try to remove a tick. Trust me, I have heard them all.

8. Find a good doc. Talk to your PCP about tick-borne diseases. Knowledgeable physicians should be happy to discuss any concerns in your area.

Wow, I know that is a lot of information. Truth is there are many disease threats that beekeepers and our honey bees face every day. But you gotta get out there and live your life! Hopefully, this article gives you some awareness and tools to mitigate tick-borne threat within reason and perhaps it can provide us with greater empathy to what our bees are going through with *Varroa* and the diseases it vectors. 

Caught in the "act of love." This picture demonstrates the size difference between male and female Ixodes ticks. (The male is the little one)



Engorged female Ixodes scapularis or Black-legged tick.



### Other references utilized

<https://www.merckvetmanual.com/dog-owners/brain,-spinal-cord,-and-nerve-disorders-of-dogs/tick-paralysis-in-dogs>, accessed March 3, 2022.  
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