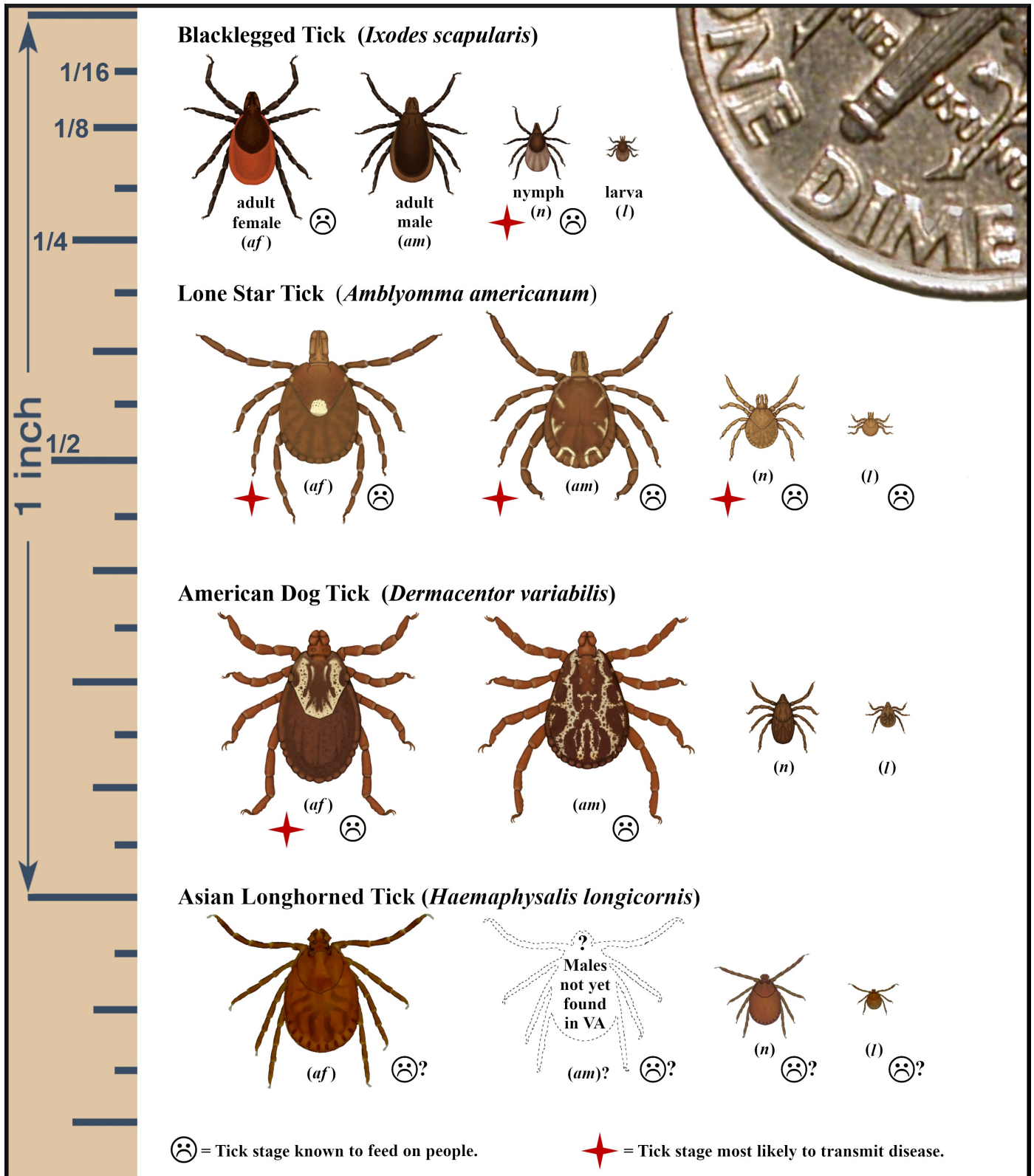


Ticks and Tick-borne Diseases of Virginia

Tick Identification Chart

VDH VIRGINIA
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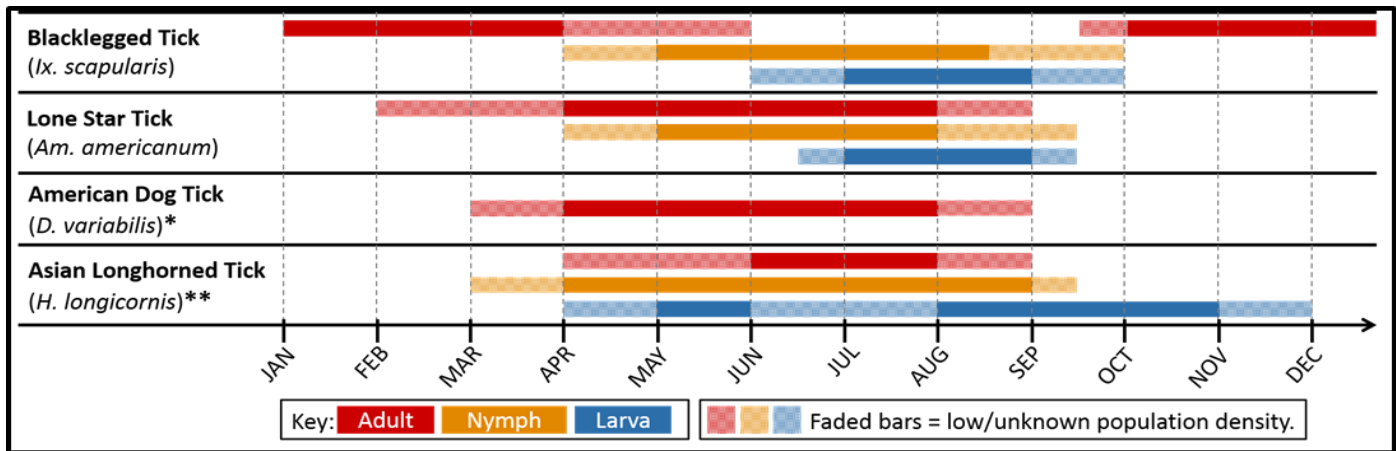


Original image by Litwak for CDC; modifications and *Haemaphysalis longicornis* illustrations by D. N. Gaines, J. N. Bernick, and J. C. Broyhill for VDH.



Actual size of ticks

Times of Year When Tick Stages in Virginia are Active



*Only the adult life stage of the American Dog Tick is known to bite humans.

**Seasonality data across all life stages for the Asian Longhorned Tick is currently incomplete.

Chart of Tick Species and Tick-borne Diseases

Illness or Condition	Vector Tick Species	Tick Stage(s) Transmitting Disease	Minimum Feeding Time for Disease Transmission
Acquired Red Meat Allergy	Lone Star Tick	Larva, Nymph, Adult	Unknown
Anaplasmosis	Blacklegged Tick	Nymph, Adult	24 Hours
Babesiosis	Blacklegged Tick	Nymph, Adult	36 hours
<i>Borrelia miyamotoi</i> Disease	Blacklegged Tick	Larva, Nymph, Adult	24 Hours
Ehrlichiosis	Lone Star Tick	Nymph, Adult	24 Hours
Heartland Virus	Lone Star Tick	Nymph, Adult	Unknown
Lyme Disease	Blacklegged Tick	Nymph, Adult	36 Hours
Powassan Virus	Blacklegged Tick	Nymph, Adult	15 minutes
<i>Rickettsia parkeri</i> Disease	Gulf Coast Tick	Adult	Unknown
	Lone Star Tick	Larva, Nymph, Adult	
Rocky Mountain Spotted Fever	American Dog Tick	Adult	2-20 hours
	Brown Dog Tick	Nymph, Adult	
	Lone Star Tick	Larva, Nymph, Adult	
Southern Tick Associated Rash Illness (STARI)	Lone Star Tick	Nymph, Adult, ?	Unknown
Tularemia	American Dog Tick	Adult	Unknown
	Lone Star Tick	Nymph, Adult	

Asian Longhorned Tick: In Asia, this tick has been known to transmit Lyme disease, anaplasmosis, ehrlichiosis, spotted fever rickettsiosis, Powassan virus and other related Flaviviruses, as well as a close relative of the Heartland virus known as Severe Fever with Thrombocytopenia Syndrome virus. Although related diseases occur in North America, this tick has not yet been proven to transmit these native diseases here. The potential for this tick's transmission of native diseases is currently being investigated. If you suspect that you have been bitten by the Asian Longhorned Tick, please send an email to va.ticksurvey@vdh.virginia.gov.

Gulf Coast Ticks: These ticks are found sporadically in Virginia and only the large adult stage ticks bite people, albeit rarely.

Brown Dog Ticks: These ticks are uncommon in Virginia and are only found in doghouses, kennels, and on the walls of other structures that dogs live in.

Tick-borne Illnesses of Virginia

Acquired red meat (alpha-gal) allergy: This allergy can occur in people bitten by lone star ticks of any life stage. Lone star ticks have a substance called alpha-gal in their saliva, and this substance is also found in all red meats (e.g., beef, lamb, venison, pork). A small percentage of people bitten by lone star ticks may develop an allergic reaction to red meat. The onset of symptoms is different than most food allergies because symptoms begin about three to six hours after eating the offending meal. Allergic reactions range from mild to severe; persons with severe allergic reactions, such as anaphylaxis, may require emergency medical treatment. It is likely the red meat allergy will diminish in an affected person over time, particularly if that person has no further exposures to lone star tick bites. Lone star tick bites are allergenic and often cause bite wounds that can itch for a week or longer. Testing for alpha-gal allergy can be done through some commercial laboratories.

Anaplasmosis and Ehrlichiosis: The symptoms of the bacterial diseases ehrlichiosis and anaplasmosis typically begin 7 to 14 days after an infectious tick bite. Illness appears as a sudden onset of fever that may be accompanied by one or more symptoms such as severe headache, muscle pain, nausea and vomiting, rash, and confusion. Rashes are uncommon with anaplasmosis. Antibiotic treatment should begin as soon as possible to reduce the risk of severe or fatal illness. Severe illness can result in neurological symptoms, difficulty breathing, DIC, or organ failure. Asplenic and immune-compromised patients are more likely to suffer a severe or fatal illness. Ehrlichiosis is the second most commonly confirmed tick borne disease in Virginia after Lyme disease. A multiplex PCR test on whole blood specimen collected in the early stage of illness is the preferred diagnostic test for ehrlichiosis and anaplasmosis. Blood should be drawn for PCR testing prior to antibiotic (doxycycline) therapy.

Babesiosis: Symptoms of the parasitic disease babesiosis can begin as early as one week after tick bite, but typically develop within a few weeks to months after exposure. Many cases of Babesiosis are asymptomatic. Those with clinical infections may experience fever, chills, muscle pains, joint pain, fatigue and jaundice. Severe cases often include anemia and thrombocytopenia. Asplenic or immune-compromised patients are at a higher risk of a severe or fatal disease. While most babesiosis infections identified in Virginia residents were acquired while patients were traveling in northeastern states, several recent infections have been acquired locally on the Eastern Shore of Virginia. Diagnostic testing is available through commercial laboratories.

***Borrelia miyamotoi* Disease:** The bacteria *Borrelia miyamotoi*, is carried by the blacklegged tick, and is known to cause a relapsing fever disease. This bacteria is not closely related to the *Borrelia* bacteria that causes Lyme disease. Patients suffering from a *B. miyamotoi* infection may experience fever, chills, headaches, body aches, joint pains and fatigue; patients are often diagnosed with sepsis. The fever may subside and relapse every 2 to 4 days. Some patients develop neurological symptoms such as meningoencephalitis. Unlike the Lyme disease agent, *B. miyamotoi* circulates in the patient's blood and is detectable by microscopy or by PCR testing of whole blood. *Borrelia miyamotoi* is carried by a small percentage of blacklegged ticks throughout Virginia. Diagnostic testing for this disease is now available through some commercial laboratories.

Heartland Virus Disease: The Heartland virus, carried by lone star ticks, may cause a severe or fatal illness in immune-compromised or elderly people bitten by infected ticks. Heartland virus patients may have many of the same symptoms caused by ehrlichiosis, including: fever, fatigue, headache, and nausea, as well as low platelet and white blood cell counts and elevated liver function tests. Some patients may develop neurological symptoms or encephalopathy. Although Heartland virus patients have not yet been identified in Virginia, this virus is likely present in Virginia's lone star ticks because human patients have been identified in neighboring states. Testing for the Heartland virus should be considered in patients with ehrlichiosis-like symptoms that do not respond to doxycycline antibiotic therapy. Testing for Heartland virus is currently only available at the CDC and samples should be submitted through the Virginia Division of Consolidated Laboratory Services (DCLS).

Lyme Disease (LD): Lyme disease is caused by the bacteria *Borrelia burgdorferi*, and is the most common tick-borne disease in Virginia. Initial symptoms of LD typically include a circular or oval rash at least two inches in diameter called an erythema migrans (EM). The EM rash occurs at the tick bite site from 3 to 30 days after an infectious bite, can grow to 12 inches or more in diameter, and may have a uniform color or have a bull's-eye appearance. The EM rash generally does not itch or hurt, and may go unnoticed. The EM rash may be accompanied by a fever, headaches, joint or muscle aches, swollen glands and fatigue. Appropriate antibiotic treatment regimens in the early stages of LD result in rapid and complete recovery. When untreated, LD may progress to affect the nervous system or heart, and in some people may cause long lasting arthritis (pain and swelling) in large joints, and/or nervous system symptoms.

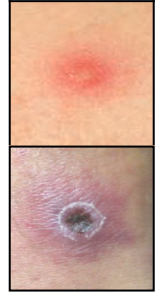


EM Rash

Powassan virus: Powassan virus is carried by a small percentage of blacklegged ticks in Virginia. This virus is distantly related to West Nile virus and St. Louis encephalitis virus. Many Powassan virus infections are asymptomatic. Those with clinical infections may experience fever, headaches, body aches, and vomiting, and may have more severe neurological symptoms of encephalitis or meningitis including: weakness, confusion, loss of coordination, speech difficulties, and seizures. Powassan virus has an estimated 10% case fatality rate and up to 50% of survivors may have permanent or long-term neurological symptoms such as recurrent headaches, muscle wasting, dizziness, or memory problems. Treatment of Powassan virus only includes supportive therapy as there are currently no specific medications or vaccinations for this illness. The Powassan virus can be transmitted by all stages of blacklegged ticks so infections may occur at any time of the year. Samples should be submitted to the CDC through the Virginia Division of Consolidated Laboratory Services (DCLS).

Southern Tick Associated Rash Illness (STARI): The main symptom of STARI is a rash that sometimes occurs after the bite of a lone star tick. This rash may sometimes be accompanied by short-term, self-limiting symptoms such as fever, headache, fatigue, and muscle or joints pains. The cause of STARI is unknown, but it might be an immune response to the allergenic lone star tick saliva. A STARI rash can look like the bulls eye rash associated with Lyme disease, and people with STARI symptoms are often mistakenly diagnosed as having Lyme disease.

Rickettsia parkeri disease: *Rickettsia parkeri* is a spotted fever group bacteria related to the agent of Rocky Mountain spotted fever. *R. parkeri* causes an illness that can range from very mild to severe. Infected persons generally suffer a rash of widely separated spots across the body and may also experience fever, headache and body aches. Patients may develop low white blood cell and platelet counts and have mildly elevated liver function tests. All patients will develop an eschar at the site (or sites) of the infectious tick bite(s). The eschar begins as a puss-filled pimple that eventually ruptures and scabs over. In VA, *Rickettsia parkeri* is primarily transmitted by infected lone star ticks of all life stages, but it can also be transmitted by the bites of adult Gulf Coast ticks. *Rickettsia parkeri* infections can be confirmed by PCR testing of a punch biopsy from a rash spot (macule/papule), pimple, eschar, or a swab sample from a pimple or eschar, or a scab from an eschar. Samples should be submitted to the CDC through the Virginia DCLS. Appropriate treatment is by antibiotic (doxycycline) therapy.



Pimple/Eschar



Spotted Fever Rash caused by RMSF

Rocky Mountain Spotted Fever: RMSF is a very serious illness caused by the bacteria *Rickettsia rickettsii* and is characterized by a sudden onset of fever 2-14 days after an infectious tick bite. The fever may be accompanied by headache, muscle pain, nausea, vomiting, abdominal pain, and a red spotted rash. The rash typically appears 2 to 4 days after onset of illness, beginning at the wrists and ankles and spreading to the palms, soles of feet, and the rest of the body. Appropriate antibiotic treatment (doxycycline) should begin as soon as RMSF is suspected; delay of treatment may result in a severe illness, resulting in permanent damage to organs and limbs or a fatal outcome. Testing is best done in samples submitted through the Virginia DCLS.

Tularemia: This illness is caused by the bacteria *Francisella tularensis* which can be transmitted to people by several methods including: 1. inhalation of bacteria, 2. consumption of contaminated food or water, 3. bacterial contamination of a person's eyes, 4. direct bacterial wound contamination by contaminated soil, or 5. bacterial contamination from the bite of a contaminated insect or tick. The most common types of tularemia infection are caused by wound contamination or bites from infected ticks or flies. Symptoms of illness from tick bites/wound contamination include: the formation of an ulcer at the bite site, swelling of regional lymph glands in armpits or groin nearest to the ulcer, and a fever, which can be as high as 104 °F. Untreated infections can be fatal. Diagnostic testing can be done through several commercial laboratories or the CDC, and effective treatment can be done with one of several different antibiotics.

Preventing Tick Bites

- Recognize when you are in potential tick habitats such as leaf litter, vegetation in forest environments, or shady areas.
- Walk in the center of forest trails, keep grass cut and rake leaves/clear brush in wooded/shady yards.
- Wear long pants and shoes with socks and apply "repellent" containing 0.5% permethrin [*permethrin is actually an insecticide*] to shoes, socks, and clothing. Follow directions carefully and do not apply permethrin to skin. Clothing "repellents" are very effective.
- Tuck treated pant legs into socks or boots, tuck shirts into pants and wear light-colored clothing so ticks are visible.
- If wearing shorts or pants that are not tucked into socks, apply repellents to exposed skin such as lower legs and arms at elbows. Use repellent containing up to 50% DEET for adults or less than 30% DEET for children. Repellents containing other active ingredients such as bioUID, oil of lemon eucalyptus, IR3535, picaridin, or 2-undecanone may also be effective.
- Conduct thorough tick checks and shower with soap after you have been in tick habitat; remove ticks promptly.

How to Remove a Tick

- Using tweezers, grasp tick near mouth parts as close to the skin as possible.
- Be careful not to squeeze or rupture the tick's swollen abdomen.
- Pull tick in a steady, upward motion until the tick releases from the skin. This may take a minute.
- **Other methods of tick removal are unsafe.**
- Disinfect hand and bite site with soap and water; apply antiseptic to the bite site.
- It is advisable to identify the tick, so save it in alcohol or a plastic bag. If you become ill, the tick identification might help your doctor diagnose the illness.



If you become ill and have been exposed to ticks, tell your doctor about your tick exposure!