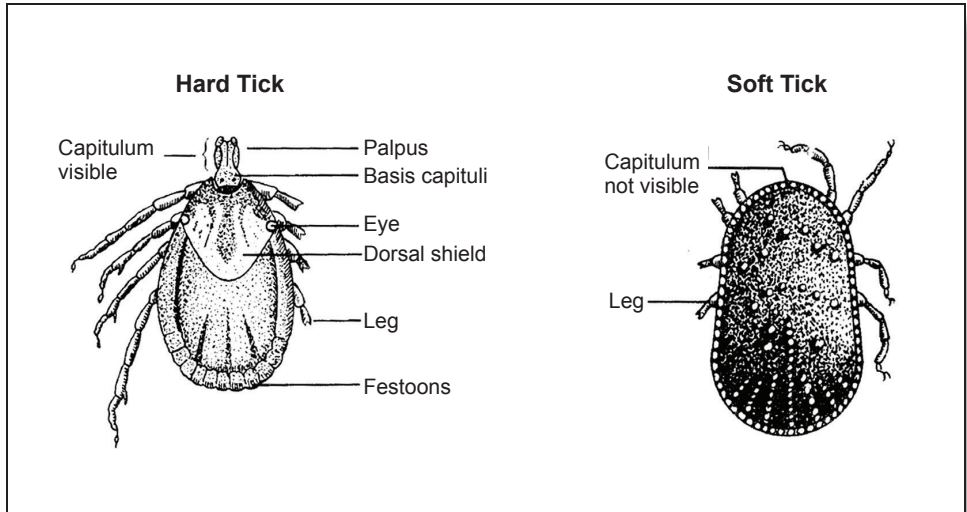


Comparison of Hard (Ixodid) and Soft (Argasid) Ticks



Differentiation of hard versus soft ticks includes:

- Mouthparts (capitulum) visible from above in hard ticks (left) and not visible from above in soft ticks (right).
- Presence of a dorsal shield (scutum) in hard ticks (left) that is absent in soft ticks (right).

Image credit: DPDx – Laboratory Identification of Parasitic Diseases of Public Health Concern. Centers for Disease Control and Prevention. www.cdc.gov/dpdx.

Hard (Ixodid) Ticks: Introduction

Hard ticks belong to the family Ixodidae and represent one of the most medically important groups of arthropods. They are responsible for transmitting a variety of viral, bacterial, rickettsial, and protozoan agents of disease while taking a blood meal from their host. Often, these disease-causing agents are transmitted by a select genus or species of tick. As such, it is important to identify hard ticks to at least the genus, if not species, level. Some hard ticks can also elicit tick paralysis, caused by a salivary toxin released while feeding.

Hard ticks have a 4-stage life cycle: egg, larva, nymph, and adult. Most hard ticks that parasitize humans have a 3-host life cycle, whereby the tick leaves the host between each blood meal during the larval, nymphal, and adult stages. Depending on the species, the host for each stage may be different species or the same species (sometimes same individual).

Typically, nymphs and adults are submitted to the diagnostic laboratory for identification. With some ticks, it can be important to document the stage and degree of engorgement, for example with *Ixodes* species, in which nymphs are more-likely to transmit disease-causing agents of Lyme borreliosis and babesiosis.

Removal of Embedded Ticks

When a tick is observed attached to an individual, it should be removed as quickly and safely as possible. Removing a tick is best accomplished by using curved, nonpointed forceps or a commercially available tick removal device. With the forceps, grasp the tick as close as possible to the skin and gently pull the tick away at an approximately 45° angle. Avoid twisting and jerking the specimen, as it may cause the mouthparts to detach and remain embedded in the host. Avoid crushing or puncturing the tick, as its body fluids may contain infectious agents. Do not use fire or petroleum jelly to remove the tick, as this may be dangerous or cause the tick to regurgitate infectious agents into the host. Following removal, clean the bite site with soap and water, rubbing alcohol, or an iodine scrub.

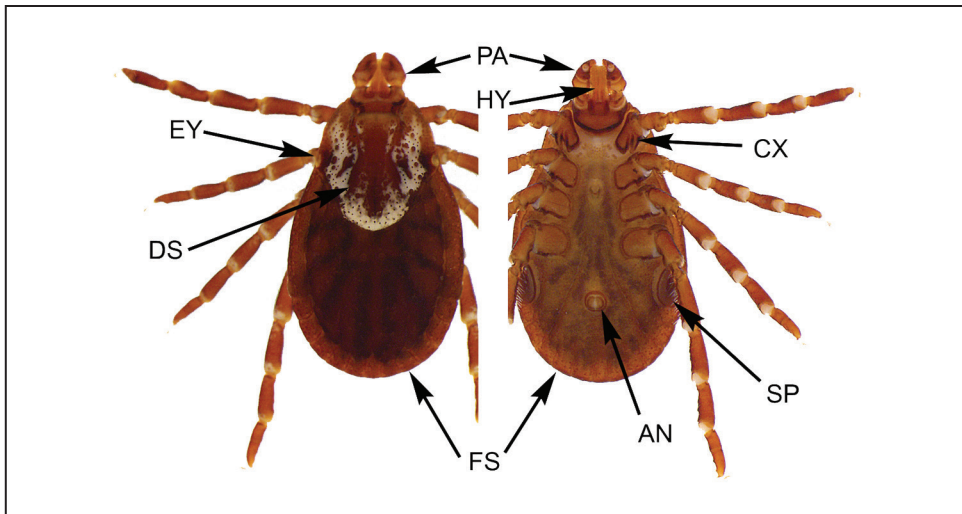
Note: Always use gloves and other appropriate PPE when removing embedded ticks.

Hard (Ixodid) Ticks: Medical Importance

The following table summarizes important tick-borne diseases and their primary vector(s) in North America. In the United States, most hard ticks submitted to the laboratory belong to the genera *Amblyomma*, *Dermacentor*, *Ixodes*, or *Rhipicephalus*. Note that many other hard ticks transmit diseases throughout the world; readers should refer to literature on their specific geographic region for further information.

Tick-Borne Disease (agent)	Primary Vector(s)
Viral Diseases	
Colorado tick fever	<i>Dermacentor andersoni</i>
Powassan virus/deer tick virus disease	<i>Ixodes cookei</i> , <i>I. scapularis</i>
Bacterial and Rickettsial Diseases	
Lyme borreliosis (<i>Borrelia burgdorferi</i>)	<i>Ixodes pacificus</i> , <i>I. scapularis</i>
Relapsing fever borreliosis (<i>Borrelia miyamotoi</i>)	<i>Ixodes scapularis</i>
Human monocytic ehrlichiosis (<i>Ehrlichia chaffeensis</i>)	<i>Amblyomma americanum</i>
Human granulocytic ehrlichiosis (<i>Ehrlichia ewingii</i>)	<i>Amblyomma americanum</i>
<i>Ehrlichia muris</i> -like (EML) organism ehrlichiosis	<i>Ixodes scapularis</i>
Tularemia (<i>Francisella tularensis</i>)	<i>Amblyomma americanum</i> , <i>Dermacentor andersoni</i> , <i>D. variabilis</i>
Tidewater spotted fever (<i>Rickettsia parkeri</i>)	<i>Amblyomma maculatum</i>
Rocky Mountain spotted fever (<i>Rickettsia rickettsii</i>)	<i>Dermacentor andersoni</i> , <i>D. variabilis</i> , <i>Rhipicephalus sanguineus</i>
Protozoan Diseases	
Babesiosis (<i>Babesia</i> species)	<i>Ixodes pacificus</i> , <i>I. scapularis</i>

Hard (Ixodid) Ticks: Morphology



Key Morphologic Features: Hard (ixodid) ticks are characterized by the following:

- 8 legs in the adult and nymphal stages (6 legs in the larval stage)
- Dorso-ventrally flattened body (when not engorged)
- Dorsal shield (scutum) that covers the anterior third or so of the immature stages of both genders and adult females, and nearly the entire dorsum of adult males
- Mouthparts directed anteriorly (prognathous) that are visible from above

Important features for genus-level identification include the length of the mouthparts (the hypostome and palps) in relation to the basis capituli, presence/absence of eyes, presence/absence of festoons, shape and location of the anal groove, and presence/absence of pale maculae (markings) on the dorsal shield.

Key: AN, anus; CX, forecoxa; DS, dorsal shield (scutum); EY, eye; FS, festoons; HY, hypostome; PA, palps; SP, spiracular plate.