About hard ticks in general

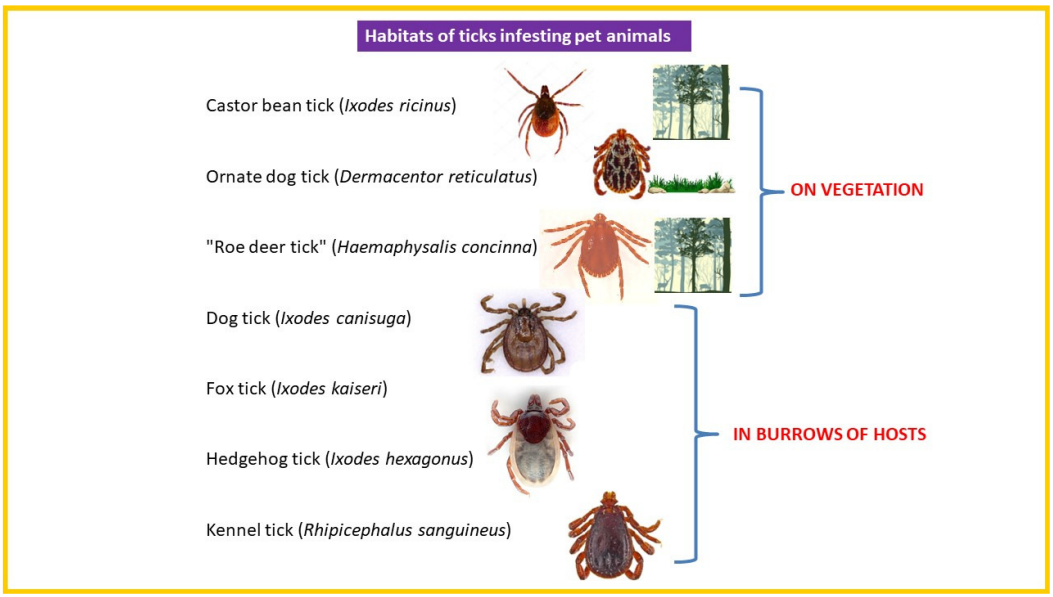
Hard ticks (family Ixodidae) are blood-sucking external parasites belonging to the subclass of mites (Acari). Their hosts are mainly mammals, birds and reptiles. More than 760 ixodid tick species are known worldwide. Their sizes vary from a few tenths of a mm (larva) to over 1 cm (engorged female). A pair of their respiratory openings is located laterally behind the 4th coxae. Their sensory organ, the so-called Haller's organ, is located near the end of their first pair of legs. The shield (scutum) covers the entire dorsal surface of males, and only the anterior part of females. At the front of the capitulum they have chelicerae, modified for cutting through the host's skin. Underneath the chelicerae we find the hypostome ("feeding tube"), bearing several rows of backward-facing teeth to fix it into the skin.

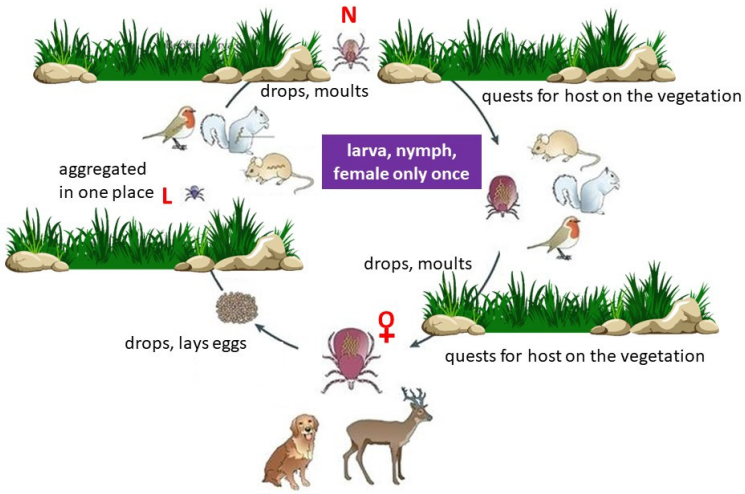
During their development, ticks reach sexual maturity through a larval and a nymphal stage. These developmental forms, similar to females, suck a large amount of blood relative to their body size once (for days); compared to males, which suck a lesser amount of blood but several times. In Hungary, with the exception of two exotic (*Hyalomma*) tick species, only so-called three-host ticks occur, which feed on different hosts as larvae, nymphs and adults. The blood-sucking larvae and nymphs drop into the environment where they molt to the next developmental stage. Their entire development takes usually one or two years (*Dermacentor* species) or two to three years, occasionally even longer ("castor bean tick": *Ixodes ricinus*). They spend most of their lives off the host, in the environment (i.e., vegetation, soil, burrows). Altogether 27 species of ixodid ticks were reported so far in Hungary, of which 22 are considered native and capable of breeding. According to their habitat, they can be either so-called forest ticks that prefer rich undergrowth and high humidity. These have no eyes and typically the females are larger. In contrast, the so-called open country ticks prefer open areas (meadows, pastures) and tolerate well partially dry vegetation. These have eyes (on either side of the shield, at the front) and their males tend to be larger than females.

The importance of ticks in terms of public and animal health is primarily significant because of the pathogens (viruses, bacteria, unicellular parasites) transmitted during blood-sucking. In this context ticks usually play a so-called biological vector role, i.e., these tick-borne pathogens develop in their tissues, frequently for an extended period of time. Primarily, the nymph (infected in the larval stage) and the sexually mature adult (infected as a nymph) can transmit the pathogen transstadially from one host to another but depending on the pathogen

even the larva hatched from the egg can be infectious, if infected from the previous generation transovarially. Larvae and nymphs mainly pick up these pathogens from their rodent, insectivorous and bird hosts, and can later pass them on to our pets, livestock animals or even to humans. Since the density of pathogen-carrying wild animals serving as a source of infection for ticks is different in rural environments and in big cities, the prevalence of tick-borne pathogens can differ significantly between these areas. In Europe, the tick-borne encephalitis virus is one of the most pathogenic agents transmitted by ticks. Based on in-house tests, 0.05-0.1% of the individuals of the castor bean tick (*Ixodes ricinus*) carry this virus. Viral encephalitis can be prevented by vaccination. Another important tick-borne disease is Lyme borreliosis, or Lyme disease. The causative agents are bacteria (*Borrelia burgdorferi* s. l.), carried by about 10-40% of castor bean ticks in Europe. There is no preventive vaccine against Lyme disease, but the infection recognized in time can be well treated with antibiotics, thus a more serious illness can be prevented.

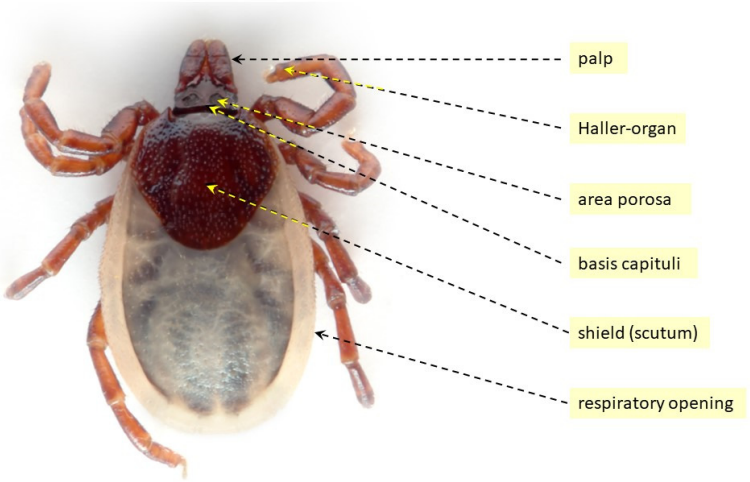
Tick species with high veterinary importance include *Ixodes ricinus* (which, in addition to the above, spreads the bacterium *Anaplasma phagocytophilum*, the cause of granulocytic anaplasmosis in humans and tick-borne fever in ruminants, horses; and the unicellular parasites *Babesia divergens*, *Babesia microti*); the "ornate dog tick" *Dermacentor reticulatus* (the vector of *Babesia canis* affecting dogs); the "red sheep tick" *Haemaphysalis punctata* (which transmits *Babesia* and *Theileria* species that infect cattle) and the so-called "brown dog tick" or "kennel tick", *Rhipicephalus sanguineus*.



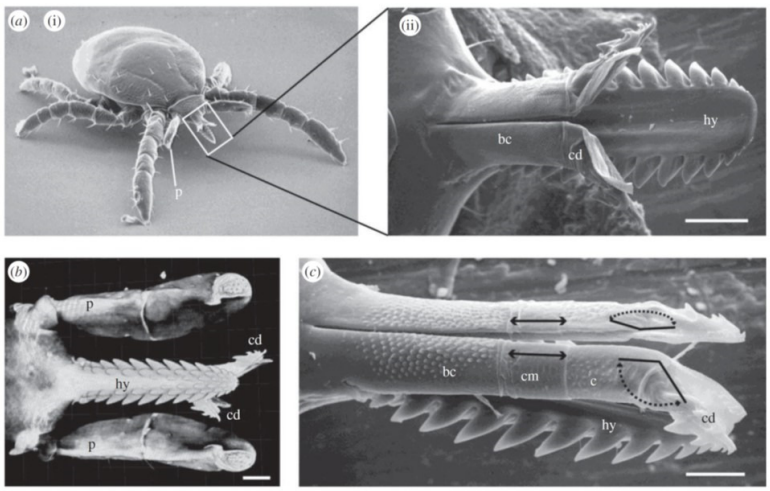


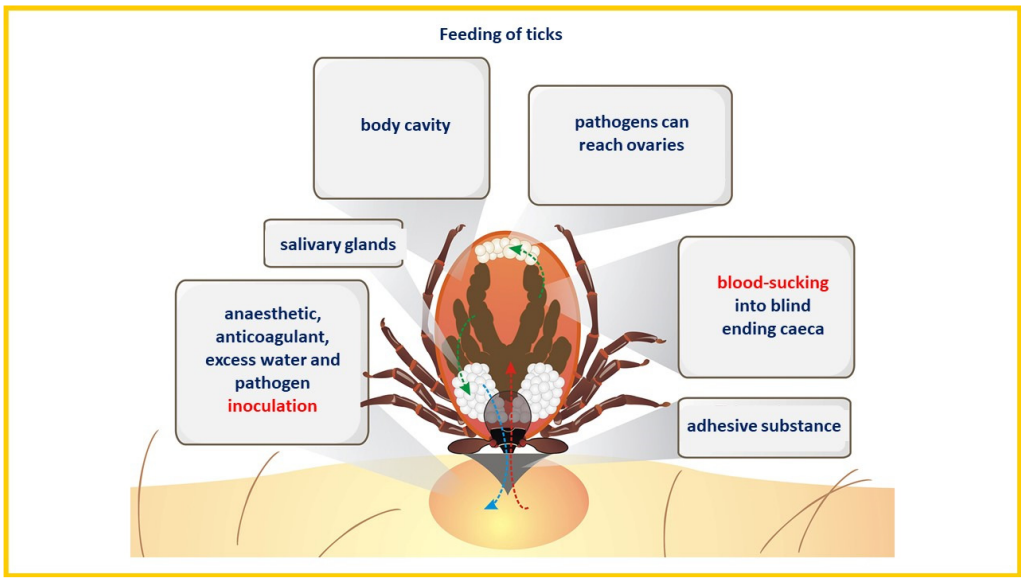
Development of ticks

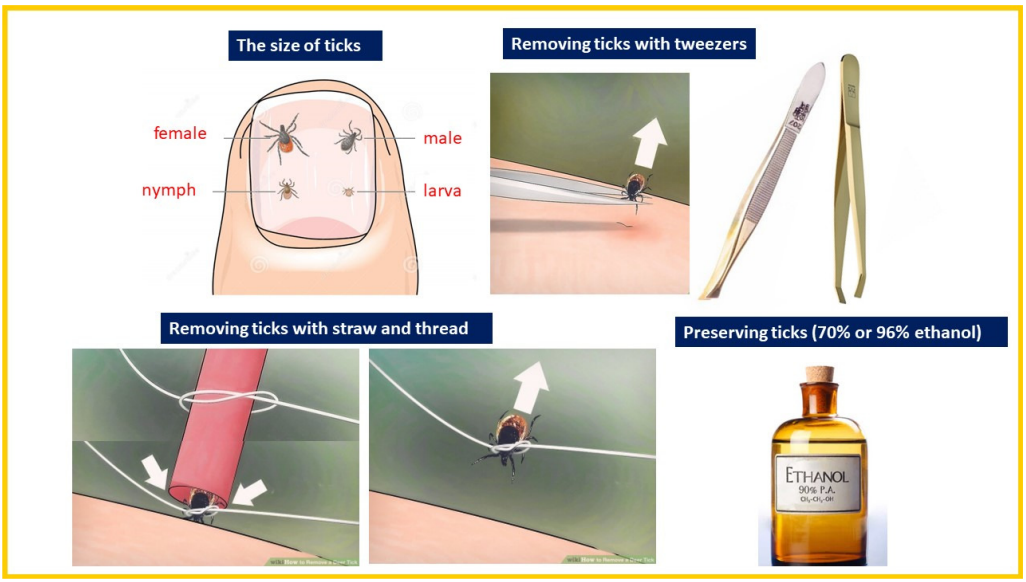
Morphology of female tick

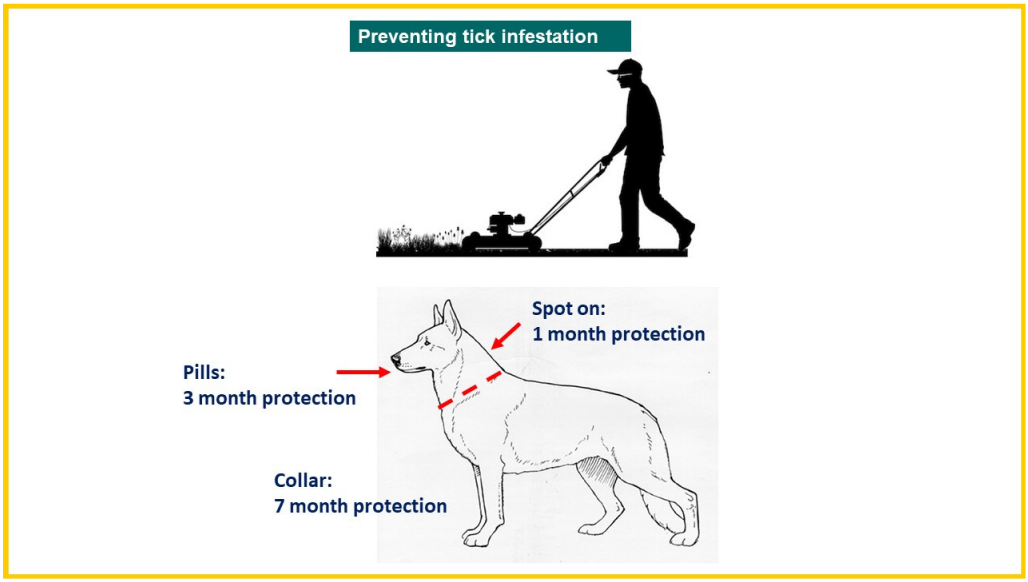


Mouthparts of ticks









Compiled by: Dr. Sándor Hornok (University of Veterinary Medicine, Department of Parasitology and Zoology)