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## Tick Removal

The discovery of an attached tick on a child can provoke great anxiety in parents. Here are concise instructions for completely removing those tiny, stubborn subjects of worrisome scrutiny in your office. Includes a Guide for Parents.

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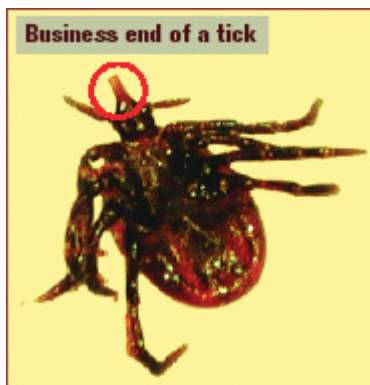
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The tick takes its blood meal through the hypostome (circled). Use a large-gauge needle or forceps to remove a hypostome that is left behind as you remove the tick.



Through its bite, a tick can transmit the spirochete, virus, rickettsiae, bacteria, and protozoa that cause a wide array of infectious diseases in children, including Lyme disease, Q-fever, ehrlichiosis, babesiosis, Rocky Mountain spotted fever, and tularemia.<sup>1</sup> Some ticks secrete a neurotoxin that produces tick paralysis, with neurologic manifestations and ascending paralysis.<sup>2</sup>

Not all species of tick attach to humans and, of those that do, the likelihood that one will transmit a pathogen depends on its developmental stage and prevalence of infectious pathogens in a particular geographic area. Estimates are that the prevalence of the spirochete responsible for Lyme disease, *Borrelia burgdorferi*, in the nymphal stage of *Ixodes scapularis*, the deer tick, in endemic areas of the Northeast and Midwest, is 15% to 30%. (The responsible vector in the western states is *I. pacificus*, a deer and cattle tick.) The likelihood of disease transmission from the bite of an infected tick is only 1% to 3%.<sup>1</sup> A patient who develops a tick-borne disease is unlikely to recall a tick bite-generally because a tick drops off its host after feeding.

Whether any pathogen is transmitted by the bite of a tick is determined by the location of that organism in the tick's gut and the duration of the tick's attachment to its host. A pathogen residing in the salivary glands of the tick will pass to its host more quickly and efficiently than one in the tick's lower gastrointestinal tract. The principal determinant of disease transmission, however, is the duration of the tick's attachment: The longer a tick is attached, the greater the likelihood that the pathogen will transmit to host.

Each pathogen requires a different duration of attachment.<sup>3</sup> Transmission of *B burgdorferi* from an infected deer tick is unlikely with less than 24 hours of attachment, more likely after 48 hours than after 24, and highly likely after 72. Shorter periods of attachment may suffice for an infected tick to transmit *Ehrlichia chaffeensis* and *E ewingii*, the pathogens responsible for ehrlichiosis.<sup>1</sup> This research confirming the relationship between duration of attachment and the spread of infectious agents underscores the importance of timely tick removal.<sup>1</sup> The table provides a snapshot of common tick-borne diseases in the US.

The tick employs several appendages to achieve its tenacious grip on your patient host.<sup>4,5</sup> On each side of the hypostome—a rod-shaped structure through which the tick sucks blood from the host—are cheliceral digits that painlessly penetrate the host epithelium (see figure). Hundreds of barbs on the outer surface of the hypostome grip the skin like fishhooks as it enters the break in the epithelium. To strengthen its hold, the tick secretes a ring of cement around the cavity, fixing itself in place for a feast. It is while the tick feeds—a meal that can last several days or a week—that pathogens may be transferred to the host. Meal complete, the tick detaches from the patient's epidermis, leaving the cement behind. (Depth of attachment varies by tick; dog ticks, for example, attach superficially, whereas lone star ticks and *Ixodes* species attach more deeply within the epidermis.<sup>3</sup>)

### Petroleum jelly? Gasoline? How about angled forceps?

The definitive treatise of tick removal has yet to be published, despite the abundance of anecdotal suggestions in the medical literature.<sup>6-10</sup> The few randomized trials that have compared removal techniques have significant limitations; most studies used animal models, and others were underpowered.

The primary goal of tick removal is to remove the tick's body, head, mouth and mouth parts, and the cement—anything left in the skin can cause infection and local irritation or lead to a granuloma.<sup>4,5,10</sup> The best technique is one that allows you to:

- remove the tick as soon as possible to minimize or interrupt the transfer of infectious material
- prevent the tick from regurgitating infectious material into the patient
- minimize damage or pain to the patient undergoing the procedure.

Techniques to remove an embedded tick employ either mechanical force to pull it out or application of agents such as viscous lidocaine, petroleum jelly, nail polish, isopropyl alcohol, or gasoline that irritate or suffocate the tick and cause it to spontaneously detach. Because a tick breathes at a rate of three to 15 breaths an hour, suffocation methods are rarely effective.<sup>4,11,12</sup> Animal studies have demonstrated that irritating the tick with a lighted match, heated nail, or pocketknife—which may burn the child or cause the tick to regurgitate its contents into the host—do not stimulate the tick to detach.<sup>4</sup> Researchers who injected lidocaine and lidocaine with epinephrine below the site of attachment also failed to induce the tick to detach.<sup>5</sup>

**Click on the** Although no technique will remove completely every tick, one that employs slow,

**Click on the image below to see a larger version.**





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