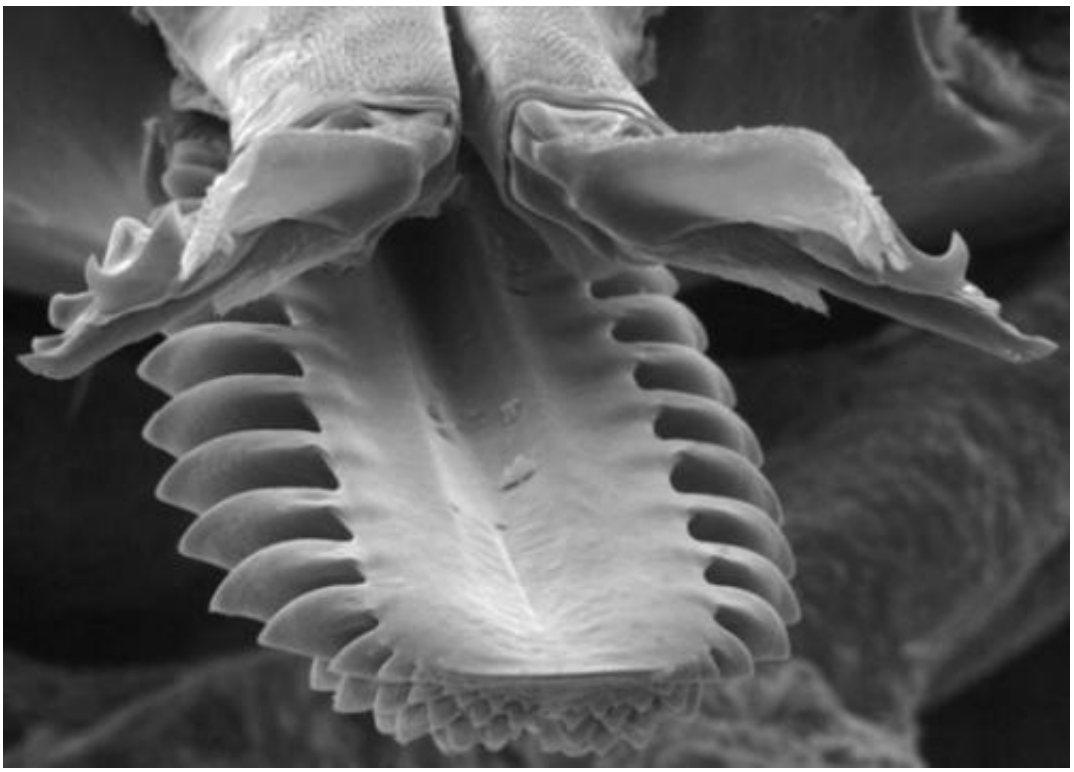
Researchers use microscope equipped camera to learn how ticks pierce and adhere to skin (w/ Video)

October 30 2013, by Bob Yirka



Credit: Dania Richter, *Proceedings of the Royal Society B: Biological Sciences*

(Phys.org) —A team of researchers from the U.S. and Germany has succeeded in filming ticks as they pierce the skin of a mouse ear, attach themselves and then start sucking blood. In their paper published in *Proceedings of the Royal Society B: Biological Sciences*, the team

describes how they filmed the ticks and what they learned in analyzing the video they created.

Most people know about ticks, the tiny insects that pierce the skin, insert the tip of their head, then hold on tightly while they suck out blood for days at a time. Ticks have also been found to be carriers of Lyme disease. Though it might seem strange, up until now, no one had really known for sure the exact mechanism ticks use to pierce, stick and then suck blood. Some believed they inserted a needle like appendage, others suggested they sawed through the skin then pushed in their sucker. With the video made by the researchers, all arguments have been put to rest—as it turns out, ticks have novel body parts they use to work their way into the skin, and then to stay there.

Ticks, it turns out, have dual appendages attached to the top of their heads, called chelicerae—each is like a little saw—the two of them are lined up together and slide back and forth against each other on their smooth sides. The back and forth motion causes the chelicerae to slowly pull themselves into the skin. Once in deep enough, the chelicerae bend like wall hangers and push back against the inside of the skin. This is how they stay stuck so hard. Next, a harpoon-like appendage (called a hypostome) is pushed between the chelicerae into the skin, where it is used like a straw to suck blood. As part of the overall process, the ticks also push chemicals into the skin to prevent the prey from feeling what is happening so that it won't be interrupted.

Unfortunately, the filming process was not able to reveal another of the tick's secrets: how it disengages once sated (if the host hasn't discovered its presence and pulled it out)—possibilities included severing its appendages, or perhaps, relining them, and reversing the process they underwent to get in.

More information: How ticks get under your skin: insertion mechanics of the feeding apparatus of Ixodes ricinus ticks, Published 30 October 2013. DOI: 10.1098/rspb.2013.1758

Abstract

The tick Ixodes ricinus uses its mouthparts to penetrate the skin of its host and to remain attached for about a week, during which time Lyme disease spirochaetes may pass from the tick to the host. To understand how the tick achieves both tasks, penetration and attachment, with the same set of implements, we recorded the insertion events by cinematography, interpreted the mouthparts' function by scanning electron microscopy and identified their points of articulation by confocal microscopy. Our structural dynamic observations suggest that the process of insertion and attachment occurs via a ratchet-like mechanism with two distinct stages. Initially, the two telescoping chelicerae pierce the skin and, by moving alternately, generate a toehold. Subsequently, a breaststroke-like motion, effected by simultaneous flexure and retraction of both chelicerae, pulls in the barbed hypostome. This combination of a flexible, dynamic mechanical ratchet and a static holdfast thus allows the tick to solve the problem of how to penetrate skin and also remain stuck for long periods of time.

Citation: Researchers use microscope equipped camera to learn how ticks pierce and adhere to skin (w/ Video) (2013, October 30) retrieved 27 April 2024 from https://phys.org/news/2013-10-microscope-equipped-camera-pierce-adhere.html