Static electricity attracts ticks to hosts, scientists find

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Tick. Credit: Sam England

Ticks can be attracted across air gaps several times larger than themselves by the static electricity that their hosts naturally accumulate, researchers at the University of Bristol have discovered.

This likely greatly increases their efficiency at finding hosts to parasitize because ticks are not capable of jumping, and therefore this is the only mechanism by which they would be able to make contact with hosts that are beyond the reach of their tiny legs.

Findings of the study, titled "Static electricity passively attracts ticks onto hosts," published in *Current Biology*, are the first known example of static electricity being implicated in the attachment of an animal to another animal.

Ticks carry a lot of nasty diseases, including Lyme disease, that make many people's and animal's lives miserable, and can even cause death. Therefore there is a huge social and economic benefit to trying to reduce the ability of ticks to attach onto people and the animals humans rely upon.

Lead author Sam England from Bristol's School of Biological Sciences explained, "We knew that many animals, including humans, can accumulate quite significant electrostatic charges.

"We see this when we get a static shock after bouncing on a trampoline, or when rubbing a balloon on our hair, for example. But this electrostatic charging also happens to animals in nature when they rub against objects in their environment like grass, sand, or other animals. These charges are surprisingly high, and can be equivalent to hundreds if not thousands of volts—more than you get out of your plug sockets at home! Importantly, static charges exert forces on other static charges, either attractive or repulsive depending whether they are positive or negative.

"We wondered whether the static charges that mammals, birds, and reptiles naturally accumulate could be high enough that parasitic ticks could be lifted through the air by electrostatic attraction onto these animals, therefore improving their efficiency at finding hosts to feed

on."

The team initially tested the idea by bringing statically charged rabbit fur and other materials close to ticks and observing whether they were attracted to them.

They witnessed the ticks being readily pulled through the air across air gaps of several millimeters or centimeters (the equivalent of humans jumping up several flights of stairs) by these charged surfaces, and so investigated further.

Sam continued, "First, we used previous measurements of the typical charge carried by animals to mathematically predict the strength of the electric field that is generated between a charged animal and the grass that ticks like to sit on and wait for hosts to pass by.

"Then, we placed ticks underneath an electrode, with an air gap in between, and increased the charge on the electrode until the ticks were attracted onto the electrode. By doing this we were able to determine the minimum electric field strength at which the ticks could be attracted. This minimum electric field was within the order of magnitude predicted by the mathematical calculations of the electric field between a charged animal and grass, therefore it is likely that ticks in nature are attracted onto their hosts by static electricity."

There are several wider implications and potential applications to these findings. Firstly, the phenomenon likely applies to many other parasitic species that want to make contact and attach to their hosts, such as mites, fleas, or lice, and so it could be a universal mechanism for animals to make contact with and attach onto each other.

Beyond the purely scientific implications, the discovery opens the door for new technologies to be developed to minimize tick bites in humans,

pets, and farm animals, such as developing anti-static sprays.

Sam concluded, "We have now discovered that ticks can be lifted across air gaps several times larger than themselves by the static electricity that other animals naturally build up. This makes it easier for them to find and attach onto animals that they want to latch onto and feed from. Until now, we had no idea that an animal could benefit from static electricity in this way, and it really opens up one's imagination as to how many invisible forces like this could be helping animals and plants live their lives."

Now the team plan to investigate whether the ticks are capable of sensing the approaching electrostatic charge of their prospective hosts.

More information: Sam J. England, Static electricity passively attracts ticks onto hosts, *Current Biology* (2023). DOI: 10.1016/j.cub.2023.06.021. www.cell.com/current-biology/f … 0960-9822(23)00772-8

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