

## Permethrin-treated clothing causes “hot foot” effect in ticks

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<http://danielcameronmd.com/permethrin-treated-clothing-causes-hot-foot-effect-ticks/>

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The [effectiveness of permethrin treated clothing](#) in repelling ticks has been demonstrated in several studies. A recently published study recruited state and county park employees from North Carolina to wear long-lasting permethrin-impregnated (LLPI) clothing. [The authors found that the clothing](#) "retained permethrin and bioactivity against ticks after three months of use in real-world conditions." [1]

Another study in Rhode Island concluded that people wearing permethrin-treated sneakers and socks were 73.6 times less likely to have a tick bite than those wearing untreated footwear. [2]

*But what is the actual behavior of ticks when they encounter permethrin treated clothing? How did they react?* Using a model that mimicked a pant leg or the arm of a long-sleeved shirt, scientists studied the behavior and fate of ticks when exposed to permethrin-treated clothing. [3]

“Ticks approaching a textile impregnated with a strong non-contact spatial repellent (DEET) very rarely made physical contact with the treated textile,” according to [Eisen and colleagues from the Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases at the Centers for Disease Control and Prevention in Colorado](#). [3] However, permethrin-treated textiles did not repel ticks without contact, as seen with DEET. In fact, the majority (88%) of nymphal ticks chose to move onto permethrin-treated textile versus DEET-treated textile.

After coming in contact with the treated clothing, the ticks dislodged through a “hot-foot” effect. “Ticks readily walked onto a permethrin-treated textile,” states Eisen.

But the “laboratory-reared ticks became visibly agitated, displaying a hot-foot effect, and escaped contact with the permethrin-treated textile by tumbling downwards until they dislodged themselves completely from a textile-covered assay card.”

Unfortunately, field-collected ticks were hardier than laboratory-reared ticks and able to sustain longer contact with the treated textile. The authors postulated that field-collected ticks have been exposed to highly variable temperatures and humidity conditions which may result in slower absorption of permethrin.

“However, by 1 and 24 hours post-exposure very few ticks displayed normal movement, thus presenting minimal risk to bite, regardless of whether they were reared in the laboratory or collected in the field.”

“Contact with permethrin-treated textiles negatively impacts the vigor and behavior of nymphal ticks for

>24 hours,” according to Eisen, “with outcomes ranging from complete lack of movement to impaired movement and unwillingness of ticks displaying normal movement to ascend onto a human finger.”

*One day after exposure, a majority of ticks were completely motionless.* The remaining ticks were able to recover. “Ticks having recovered normal movement 1 day after exposure in our study most often ascended onto a finger when given the opportunity (and presumably also were capable of biting),” Eisen points out.

“In a real-life scenario, prolonged periods of time where ticks having fallen off a human host after contact with permethrin-treated textile are unable to move will undoubtedly increase the risk of mortality due to desiccation or predation.”

“A scenario more difficult to address in a bioassay is when a tick makes initial contact with bare skin and subsequently approaches loose-fitting summer-weight permethrin treated garments, such as shorts or a T-shirt,” states Eisen.

“In this case, the tick may walk underneath the treated textile and be contacted primarily from the dorsal side as the person moves and the clothing comes in and out of contact with the tick and the person’s skin.”

Permethrin is acutely toxic in high doses. The authors did not address the potential toxicity of permethrin to humans. “Acute signs of toxicity to the central nervous system include incoordination, ataxia, hyperactivity, convulsions, and finally prostration, paralysis, and death,” according to a review by the National Research Council (US) Subcommittee to Review Permethrin Toxicity from Military Uniforms. [4]

*Note: Users have been advised not to inhale permethrin when treating clothes and not to apply permethrin to the skin.*

## **Related Articles:**

[Only a minority of children with Lyme disease recall a tick bite](#)

[Are Lyme disease prevention methods really working?](#)

[How concerned are people about tick bites and tick-borne diseases?](#)

## **References:**

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2. Tick Encounter. <http://www.tickencounter.org/prevention/permethrin>
3. Eisen L, Rose D, Prose R, et al. Bioassays to evaluate non-contact spatial repellency, contact irritancy, and acute toxicity of permethrin-treated clothing against nymphal *Ixodes scapularis* ticks. *Ticks Tick Borne Dis.* 2017.
4. Health Effects of Permethrin-Impregnated Army Battle-Dress Uniforms (1994) by National Research Council. 1994. Washington, DC: The National Academies Press. <https://doi.org/10.17226/9274>. at <https://www.nap.edu/catalog/9274/health-effects-of-permethrin-impregnated-army-battle-dress-uniforms>. Last accessed 8/12/17.

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