

Article

The Efficacy of Ultrasonic Pest Repellent Devices against the Australian Paralysis Tick, *Ixodes holocyclus* (Acari: Ixodidae)

Amonrat Panthawong¹, Stephen L. Doggett²  and Theeraphap Chareonviriyaphap^{1,*}

¹ Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand; aor_bio@hotmail.com

² Department of Medical Entomology, NSW Health Pathology-ICPMR, Westmead Hospital, Westmead, NSW 2145, Australia; Stephen.Doggett@health.nsw.gov.au

* Correspondence: faasthc@ku.ac.th; Tel.: +66-81-563-5467

Simple Summary: Ultrasonic repellents are widely available and marketed to protect against tick bite. To date, there has been no research on the effectiveness of ultrasonic devices against the Australian paralysis tick, *Ixodes holocyclus*. Thus, this study tested the effectiveness of nine ultrasonic devices with different sound frequencies against female *I. holocyclus*. Testing found that ultrasonic devices produced less than 19.5% repellency. The low-level repellency from ultrasonic repellents means that they cannot be recommended for prevention against tick bite.

Abstract: Ultrasonic pest repellents are often promoted as a means of protecting people and pets from the bites of hematophagous arthropods, such as ticks. However, to date, there has been no published research on the effectiveness of these devices against the Australian paralysis tick, *Ixodes holocyclus* Neumann. The purpose of this study was to test the effectiveness of nine ultrasonic devices against female *I. holocyclus*. Two arenas were constructed, one for the test (with the ultrasonic device) and one for the control (no device). Each arena had a test and an escape chamber, connected by a corridor. Twenty ticks were placed in each test chamber. After the ultrasonic device was operated for 1 h, the number of ticks in both chambers was recorded. Ten replicates were conducted for each device. The average number of ticks that moved from the test to the escape chamber was greater in all the test arenas, with three devices being statistically different from the control. However, the highest percent of ticks that escaped was only 19.5%. This amount is insufficient to offer adequate protection against tick bites and this study adds further weight to previous investigations that ultrasonic devices should not be employed in pest management.

Keywords: efficacy testing; non-chemical control; tick bite prevention; tick repellent; ultrasonic repellents



Citation: Panthawong, A.; Doggett, S.L.; Chareonviriyaphap, T. The Efficacy of Ultrasonic Pest Repellent Devices against the Australian Paralysis Tick, *Ixodes holocyclus* (Acari: Ixodidae). *Insects* **2021**, *12*, 400. <https://doi.org/10.3390/insects12050400>

Academic Editors: Kirby C. Stafford III, Scott C. Williams and Megan A. Linske

Received: 7 April 2021

Accepted: 28 April 2021

Published: 30 April 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Worldwide, ticks are important vectors in the transmission of a range of pathogenic microorganisms, including protozoa, rickettsiae, bacteria and viruses, to their host animals and to humans [1,2]. In Australia, *Ixodes holocyclus*, commonly known as the Australian paralysis tick, is the most common species that bite humans and is the main species responsible for inducing tick-related morbidity in humans and pets [3,4]. Not only is the species capable of transmitting rickettsia such as *Rickettsia australis* Philip (etiological agent of Queensland tick typhus) [3], the bite of the tick can cause potentially life-threatening toxicosis, tick paralysis, and induce a range of allergic reactions, such as α -Gal syndrome (mammalian meat allergy) [5,6]. With the controversy surrounding the existence (but unproven) presence of Lyme disease in Australia [7,8], much of the contemporary research on *I. holocyclus* has focused on potential pathogens the tick may carry. Indeed, a range of bacteria [9] and viruses have been identified from *I. holocyclus* [10,11], although none of the microbes have yet been linked to human disease.