Comparative Efficacy of BioUD to Other Commercially Available Arthropod Repellents against the Ticks *Amblyomma americanum* and *Dermacentor variabilis* on Cotton Cloth

**Introduction**

*Amblyomma americanum*, and *Dermacentor variabilis* are ticks that bite and feed on humans. They can pass illness and disease to humans. Insect repellents are used to prevent tick bites and their attachment. The *A. americanum* tick carries human pathogens including, *Ehrlichia chaffeensis* and *E. ewingii*. The *D. variabilis* tick carries pathogens that are known to cause Rocky Mountain spotted fever.

Safe and effective alternatives to DEET and other repellents are needed for people who don’t want to use DEET or other synthetic repellents. DEET has been used for many years, but some people worry about its safety. There are only two other CDC recommendations for repellents besides DEET that can be used, they are IR3535 and Picaridin.

BioUD is a botanical based insect repellent that has been shown to work well against ticks.

“BioUD is a new plant-based arthropod repellent registered by the U.S. EPA for use on human skin and clothing against mosquitoes and ticks. The active ingredient in BioUD, 2—undecanone (methyl nonyl ketone), was originally isolated from the glandular trichomes of the wild tomato.” (Bissinger, et. Al 2009)

There wasn’t a hypothesis for this study. It was done to see how effective BioUD was against *A. americanum* and *D. variabilis* compared other repellents that are recommended by the CDC that are labelled for use against ticks and mosquitoes. Little is known about BioUD, so additional testing was done to see how long it remained repellent for a period of 7 weeks. This study was conducted specifically on cloth to see how it would work on gear and clothing, and for how long, because applying repellents to clothes instead of skin increases the amount of time that a repellent remains effective.
Methods and Materials

During the study samples of hungry adult ticks were put into enclosures with samples of cheese cloth that were treated with repellents and untreated samples that were connected by a junction. The ticks were evenly distributed among the treated cloths and the controls by putting 6 ticks on the junctions between the treated and untreated cloths. “Repellency bioassays were conducted with seven commercially available arthropod repellent products. All products purchased at commercial stores.” (Bissinger, et. Al 2009) Course trials were performed for treated versus un-treated surfaces, BioUD versus other commercial repellents, and weekly timed trials for 7 weeks. Then, head to head trials compared BioUD with the four repellents that were the most active in the previous trials.

Results

All of the experiments with repellent were very different when compared to the untreated controls. The overall repellency of BioUD 7.75% 2-undecanone, 98.1% DEET, 19.6% IR3535, and 30% oil of lemon eucalyptus, and a 15% concentration of Picaridin wasn’t very different. The ticks tended to go rest on the untreated cloth and stay away from the cloth with repellent. In head to head trials, BioUD fared better than IR3535, oil of lemon eucalyptus, Permethrin and as good as DEET, even for long periods of time. BioUD’s “mean percentage repellency” didn’t fall until the 6th week.

Discussion

This study was done to see if BioUD could be used as an alternative to DEET, specifically when used on clothing. The results showed that plant based BioUD is an effective option for those who don’t want to use DEET. BioUD doesn’t need a large % of active ingredient to be effective, like most botanical repellents. It also last longer and doesn’t need to be reapplied as frequently as repellents that use plant
essential oils like Lemon Eucalyptus, which are highly volatile. Less of the active ingredient was also needed in it than in the other repellents that were tested.

The limitations were that these products are used by humans in different environments and under different conditions. So, further trials and testing would need to be done in the field, to really understand how well BioUD holds up. Also since these tests were done using cloth, further testing on human skin would lead to a better understanding of how this repellent does when used specifically on the skin.
Works Cited