EVALUATION OF DEET ALTERNATIVE REPELLENTS

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Excellence With Caring

ABSTRACT

Mosi-Guard provided 90-100% 6-hr repellency exceeding Off! Skintastic for *Culex quinquefasciatus*. WalkAbout performed similarly, but only lasted 2 hrs. The BugOff! wrist band was a poor performer against *Aedes albopictus* and *Cx. quinquefasciatus*. Experimental IBI repellents showed promise particularly for *Cx. quinquefasciatus*, however, a better carrier is needed to maintain the repellent on the skin surface.

INTRODUCTION

A renewed interest in repellents has emerged with the recent introduction and spread of West Nile Virus in the U.S. Repellents are widely accepted as the most effective first line defense against blood-feeding arthropods. DEET-containing repellents are undoubtedly the most recommended products in the U.S.; however, a significant public sector has developed an interest in alternatives. This is driven by concerns over negative chemical effects on plastics, skin sensitivity and perceived toxicity. A number of manufacturers have developed a wide range of such products to meet this demand.

PURPOSE

This display reports the long-term efficacy of several commercial and experimental DEET alternatives.

MATERIALS & METHODS

The following repellents (all except #6 are shown in Fig. 1) along with nontreated controls were evaluated:

1. Off! Skintastic® [6.65% DEET pump spray (standard)]
2. Off!® [14.25% DEET aerosol (standard)]
3. BugOff wrist band (citronella, geraniol and lemongrass oils)
4. Mosi-Guard Natural Insect Repellent Spray (citriodiol)
5. WalkAbout Insect Repellent (melaleuca, *Leptospermum petersonii*, and citronellal oils)
6. Three experimental Insect Biotechnology, Inc. formulations (5%-246, 20%-246 & 20%-247)

Figure 1. Commercial repellents tested.

Tests were performed in three separate laboratory experiments (I, II, III) conducted in March, August and Oct-November, 2001, respectively. Biting counts were converted to % repellency by the following formula:

$$\frac{\text{Control-Treatment}}{\text{Control}} \times 100$$

Experiment I Protocol:

1. BugOff! wrist band vs. Off! 14% aerosol
2. 100 *Aedes albopictus* in 6 cages
3. Six evaluators
4. Three treatments: BugOff!, Off! and control
5. One hand treated with repellent – other hand nontreated control
6. Treatment, cage and evaluator location randomly assigned
7. Each product tested twice by each evaluator over four days of testing
8. One-minute biting counts taken at 0, 1, 2, 4, 6 hrs post-treatment

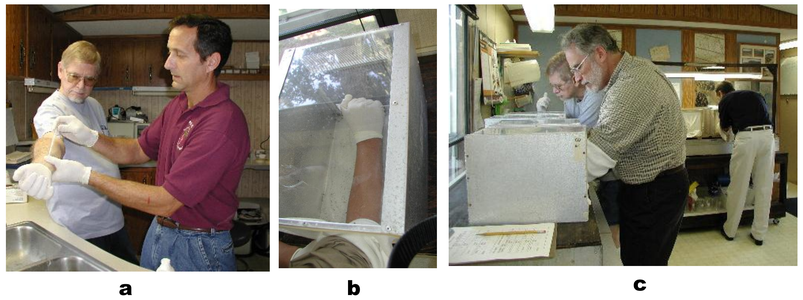
Experiment II Protocol:

1. Followed ASTM standards using BIB design
2. Four cages of 100 *Ae. albopictus* & four cages of 200 *Culex quinquefasciatus*
3. Three evaluators and one control person
4. Five treatments - three IBI formulations, Off! & control
5. Each evaluator tested two repellents at a time – one on each forearm
6. Each repellent was tested twice by each evaluator
7. One minute biting counts taken at 0, 1, 2, 4, 6 hrs

Experiment III Protocol:

Same as II except:

1. Repellents were tested against *Cx. quinquefasciatus*
2. Evaluators conducted pre- and post-treatment control counts
3. An additional person took control counts at intermediate 2 & 4 hr post-treatment time intervals
4. Evaluators were treated with 1 ml of the liquid repellents over 450 cm² of the forearm.



a b c

Fig. 2. (a) Repellent application; (b) arm exposure in cage; (c) evaluation underway

RESULTS

Experiment I:

Bugoff! was half as effective as Off! against *Ae. albopictus* throughout 6 hours(Fig. 3).

Experiment II:

For *Cx. quinquefasciatus*, all IBI formulations provided initial protection equivalent to Off!; thereafter, repellency declined dramatically over time (Fig. 4). Except for initial good repellency with the 5%-246, none of the IBI formulation worked well for *Ae. albopictus* (Fig. 5). This might be mitigated by mixing the repellent with a better carrier other than ethanol.

Experiment III:

Mosi-guard and WalkAbout outperformed Off! Skintastic against *Cx. quinquefasciatus* (Fig 6). Mosi-Guard provided 90% or better protection for 6 hours post-treatment. Although it worked well initially, WalkAbout ceased to provide satisfactory repellency after 2 hours.

Fig. 3 Percent repellency of Off! and BugOff! against Ae. albopictus

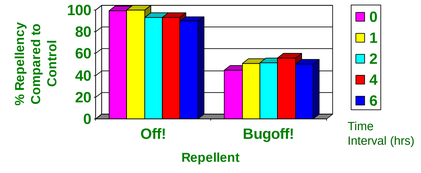


Fig. 4. Percent repellency of three IBI formulations and Off! against Cx. quinquefasciatus.

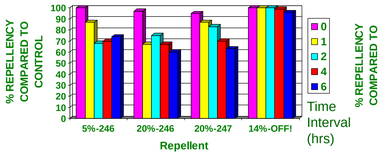


Fig. 5. Percent repellency of three IBI formulations and Off! against Ae. albopictus.

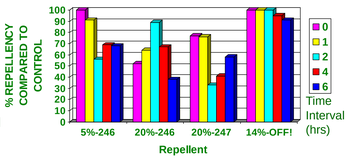
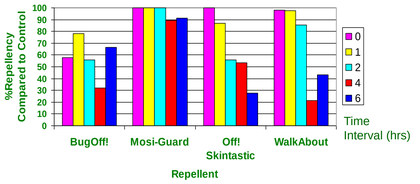


Fig. 6. Percent repellency of various repellents against Cx. quinquefasciatus



ACKNOWLEDGMENTS:

This research was funded by grants from industry and the Florida Department of Agriculture and Consumer Services.