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FIELD EVALUATION OF AN AVVAA MOSQUITO REPELLENT TO REPEL MOSQUITOES IN SOUTZHERN ONTARIO, 2004

FINAL REPORT

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by

James D. Heal
Arcturus Testing
R.R. #6 Stn. Main
6866 Conc. 4
Guelph, Ontario, Canada
NIH 6J3

to

Jack Farley
3018 Schaeffer Rd.
P.O. Box 335
Falkland, BC
VOE 1 W0

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INTRODUCTION

The purpose of this study was to assess, under field conditions, the efficacy of an AVVAA mosquito repellent (components unknown) to protect humans for 30-120 minutes post-application against various mosquito species in southern Ontario.

MATERIALS AND METHODS

Site

The Study was conducted in a meadow bordering a large mixed deciduous/coniferous woodlot (e.g. maples, poplars, birch, tamarack, white cedar, and white pine are predominant species) with secondary growth under the canopy in a rural area four km south of the southern city limit of Guelph, Ontario. Adjacent of the study area was a cattail marsh (>four hectares) approximately 30 meters from the center of the study area, which is a source of Aedes an Anopheles mosquito species and the mosquito Coquillettidia perturbans. Previous unpublished studies have shown the site to provide sufficient numbers of adult mosquitoes for repellent evaluations. The evaluation took place on the evenings of July 26, 27, and 28, 2004.

Repellency evaluation

Six subjects and a supervisor were used in this evaluation. To adjust for size differences among subjects, the surface area of the forearms (wrist to elbow) of each subject was measured and surface area was calculated. The product was applied evenly to the forearms of each subject using latex gloves at a rate of 1.0 ml per 660cm² of forearm. During each evening of the evaluation, two subjects applied the product 1.5 hours before the start of the 30 minute evaluation. Also during each evening of the evaluation two subjects were treated 4.75 minutes before the start of the biting counts. Two subjects were non-treated and served as control. Biting counts were performed over a 30 minute period and therefore the duration of protection that was measures was 2 hours for two subjects and 30 minutes for two other subjects (this latter duration time lasting from 4.75 minutes to 34.75 minutes post-application). Hence during the three-evening study, the product was evaluated on each subject twice for a total of six replications for both duration times.
Subjects dressed in identical green overalls, head nets and white cotton gloves. The six subjects were randomly assigned to one of six positions on a grid located within the study site. All grid positions were at least 10 m from each other. Biting counts were initiated just prior to dusk (=20:30h) to correspond with peak mosquito biting activity and consisted of 6, 4.75-minute biting counts. During each biting count, subjects aspirated all mosquitoes landing and

probing on two exposed forearms. Mosquitoes were aspirated into 150 ml clear plastic vials. Following the biting count, the subjects recorded the number of mosquitoes captured. Subjects rotated to the next position on the grid within 18 seconds when the next 4.75-minute biting count began. In this manner, each subject was at each grid position once each night and the duration of exposure was 30 minutes.

Ambient air temperature and wind speed within the study site were measured at the start and end of the biting counts each evening. Biting counts were not conducted on evenings when air temperature was below 10°C or when strong wind (> 25 kph) or rain occurred because these conditions limit mosquito host-seeking activity.

Data analysis

Percent repellence provided by the product was calculated using the formula: ((number of mosquitoes biting non-treated subjects – number biting treated subjects)/ number biting non-treated subjects) X 100%. Percent repellence was calculated for the complete 30 minutes exposure period (i.e. total repellence provided after each subject had been at each of the six grid positions) on a nightly basis. Percent repellence was also calculated for the last 4.75-minute count on a nightly basis.

The mean number of mosquitoes biting treated and non-treated subjects over the three-evening study was compared using analysis of variance and a Scheffe´s comparison of means. The analysis was completed using Statistical Analysis Systems version 6.12 (SAS Institute Inc., Cary, NC.).

RESULTS

The results are summarized in Tables 1. and 2. AVVAA repellent provided 99.6% reduction in bites, versus non-treated control subjects, beyond 30 minutes post-application (Table 1). This difference was statistically significant (P<0.05). AVVAA repellent provided a mean of 96.7% reduction in bites, versus non-treated control subjects, from 90 to 120 minutes post-application. This difference was also statistically significant (P<0.05). When the data was broken down by count (Table 2). AVVAA repellen provided greater than 95% reduction for the duration time 90 to 115.25 minutes. During the last count (duration time 115.25 to 120 minutes) repellence had fallen to 93.2%.

The mean air temperature during the three-evening study was 16.8°C (range = 16.7, 17.2) and the mean relative humidity was 87.2% (range = 67.0, 100.0). wind speed remained below 5 kph during testing on all three dates.

Table 1. Mean number 1,2 (= one standard deviation) and percent reduction of mosquitoes biting human subjects[3] during 30 minute mosquito biting counts in field test conducted near Guelph, Ontario, 2004.

Treatment	Minutes post-application (duration time)	Mean number of mosquitoes per 4.75 minutes	Percent reduction 4
Control	-	7.17 = 3.48 a	-
AVVAA	34.75	0.03 = 0.17 b	99.6
AVVAA	120	0.22 = 0.48 b	96.7

1 Values followed by different letter in the same column are significantly different (P<0.05).
2 Number of repetitions equalled six.
3 Mean biting pressure over three nights equalles 46. I mosquitoes per 30 minutes.
4 Calculated from nightly mean numbers, not from data in column three.

Table 2. Mean number 1,2 (= one standard deviation) of mosquitoes biting human subjects during each 4.75 minute interval during 30 minute mosquito biting counts in field tests conducted near Guelph, Ontario, 2004.

Count	Repellent Treatments and Percent Reduction				
	Control	34.75 min[3]	34,75 min % Reduction	120 min 4	120 min % Reduction
1	9.60 = 4.51 a	0.0 = 0.0 b	100.0	0.0 = 0.0 b	100.0
2	7.20 = 2.77 a	0.0 = 0.0 b	100.0	0.33 = 0.52 b	95.4
3	7.20 = 3.27 a	0.0 = 0.0 b	100.0	0.17 = 0.41 b	97.6
4	5.00 = 3.39 a	0.0 = 0.0 b	100.0	0.17 = 0.41 b	96.6
5	6.60 = 0.89 a	0.17 = 0.41 b	97.4	0.17 = 0.41 b	97.4
6	7.40 = 4.83 a	0.0 = 0.0 b	100.0	0.50 = 0.84 b	93.2

1 Values followed by different letters in the same row are significantly different (P<0.05).
2 Number of repetitions equalled six.
3 Represents duration time from 4.75 to 34.75 minutes
4 Represents duration time from 90 to 120 minutes.

CONCLUSIONS

AVVAA repellent provided greater than 95% protection from blood-seeking mosquitoes in a field test using human subjects for 115.25 minutes post-application.