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THE EFFECTIVENESS OF PERMETHRIN AND DEET, ALONE OR IN COMBINATION, FOR PROTECTION AGAINST *AEDES TAENIORHYNCHUS**

C. E. SCHRECK,† D. G. HAILE,‡ AND D. L. KLINE†

Insects Affecting Man and Animals Laboratory, Agricultural Research United States Department of Agriculture, Gainesville, Florida 32604

Abstract. Field tests were conducted to compare the degree of protection from bites by the mosquito *Aedes taeniorhynchus* (Wiedemann) provided by wearing clothing treated with permethrin [(3-phenoxyphenyl)methyl (±) *cis/trans* 3-(2-dichloroethenyl)2, 2-dimethylcyclopropanecarboxylate] with that provided by applying deet (*N,N*-diethyl-*m*-toluamide) to exposed skin or by applying deet and wearing the treated clothing. Human test subjects were exposed to natural populations of mosquitoes for a 9-hour daytime period (total of 8 days/treatment) while using one or both protection methods. Unprotected test subjects were also exposed for short periods each day as a check to determine the overall biting rate of mosquitoes. The combined use of both protection methods was the most effective treatment in preventing bites, resulting in an average of 1.5 bites/9-hour day, compared with 53.5 and 98.5 bites on subjects protected only with treated clothing or deet, respectively, and 2, 287 bites (extrapolated) on subjects who wore untreated clothing during the same time period. Measurements also indicated that the toxic effect of permethrin reduced biting rates by >90% within the immediate area where subjects wore permethrin-treated uniforms for 9 hours.

Personal protection from the bites of blood-feeding arthropods has usually been accomplished by the use of chemical repellents applied to skin of clothing, or both.[1] Currently used repellents are effective only when applied in relatively large quantities, and their use may cause problems of acceptance because they are oily, offensively odorous, and can soften some plastics. A repellent mixture (M-1960) developed for impregnation of military clothing[2] was not widely accepted due to its odor and reports of skin irritation.

Studies by Schreck et al.[2,3] indicated that the use of clothing treated with the pyrethroid permethrin [(3-phenoxyphenyl)methyl (±) *cis/trans* 3-(2-dichloroethenyl)2, 2-dimethylcyclopropanecarboxylate] offers a highly effective method for preventing insect bites because of its toxic action. In addition, the use of permethrin has many advantages over the use of conventional repellents. As a clothing impregnant, it is long lasting, because it resists washing and wear and is stable in light.[4,5] Also, permethrin is not greasy, is not a plasticizer, and is nearly odorless. Permethrin protects by its insecticidal action rather than by repellency; therefore, it reduces the biting population in the immediate area.

Permethrin has been subjected to extensive testing to determine its toxicity to mammals from ingestion or from chronic topical and inhalation exposure.[6–8] Repeated applications to the skin of various mammals caused no eye or skin irritation, and no skin sensitivity or histological lesions. The authors of a 13-week study with various mammals, including beagle dogs, concluded that inhalation of permethrin does not present an acute toxic hazard to humans.[8] In a study of

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* This paper reports the results of research only. Mention of a pesticide does not constitute a recommendation for use by the U.S. Department of Agriculture, nor does it imply registration under FIFRA as amended. Tests with human volunteers were approved by the University of Florida, University Committee for the Protection of Human Subjects, in accordance with procedures for human testing given in Section 46-103 (b), Federal Register, Vol. 41, No. 125, 28 June 1976.

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Address reprint requests to: C. E. Schreck, Insects Affecting Man and Animals Research Laboratory, ARS, USDA, P.O. Box 14565, Gainesville, Florida 32604.

† Research Entomologist.

‡ Agricultural Engineer.