The Medical Letter®
On Drugs and Therapeutics

Published by The Medical Letter, Inc. • 1000 Main Street, New Rochelle, NY 10801 • A Nonprofit Publication

Volume 47 (Issue 1210)
June 6, 2005

www.medicalletter.org

IN THIS ISSUE

Picaridin – A New Insect Repellent

Picaridin (KBR 3023), which has been used as an insect repellent for years in Europe and Australia (*Autan Repel*, and others), is now available in the US in a 7% solution as *Cutter Advanced* (Spectrum Brands). The US Centers for Disease Control and Prevention (CDC) is recommending it as an alternative to DEET.

DEET — DEET is available in the US in many formulations with concentrations of 5%-40% and 100%; higher concentrations offer complete protection for a longer period of time, but the duration of effectiveness reaches a plateau at a 50% concentration. A long-acting DEET formulation, originally developed for the US Armed Forces (US Army Extended Duration Topical Insect and Arthropod Repellent, EDTIAR) is available in the US as *Ultrathon* (3M). *Ultrathon* contains 25% (in aerosol) or 33% (in cream) DEET in a polymer formulation, which prevents loss from the skin surface through absorption and evaporation. Studies have shown that it provides complete protection against mosquitoes for 6-12 hours.

Safety and Acceptability – Despite earlier concerns, toxic and allergic reactions to DEET have been uncommon, and serious adverse effects are rare.[1] Some patients dislike its odor and find it irritating or uncomfortably oily or sticky on the skin. DEET can damage clothes made from synthetic fibers such as spandex or rayon and can also damage leather and plastics on eyeglass frames and watch crystals.

PICARIDIN — Laboratory and field studies documenting the efficacy of picaridin are summarized in the table on page 47. No published data are available on the efficacy of the 7% solution now available in the US. Insect repellents are registered by the Environmental Protection Agency (EPA); they do not require FDA approval.

Safety and Acceptability – In Australia and in Europe, no serious toxicity has been reported with picaridin. It has shown no evidence of dermal, organ or reproductive toxicity or carcinogenicity in animals, except for some hepatic toxicity in rats at extremely high doses.[6,7] Unlike DEET, it is odorless, does not feel greasy or sticky, is less likely to irritate the skin, and does not damage plastics or fabrics.

DOSAGE AND COST — The manufacturer recommends spraying picaridin on the skin every 3 to 4 hours. *Cutter*

SOME CLINICAL STUDIES OF PICARIDIN

STUDY	REPELLENT	DESIGN/VECTOR	RESULTS
AM Pretorius et al (2003)[2] South Africa	20% picaridin lotion vs. 20% DEET lotion	Laboratory tests/ticks: *Amblyomma hebraeum* (African tick bite fever)	Protection after 1,2,3 and 4 hours: Picaridin: >85%, 56%, 55%, 54% DEET: >85%, 84%, 68%, 71%
A Badolo et al (2004)[3] Burkina Faso	Picaridin vs. DEET (varying concentrations)	Laboratory tests/mosquitoes: *Aedes aegypti* (yellow fever & dengue) *Anopheles gambiae* (malaria)	Relative potency: Picaridin at least as effective as DEET; both less effective against *An. gambiae* than *Ae. aegypti*
SP Frances et al (2004)[4] Australia	19.2% picaridin vs. 20% DEET and 35% DEET	Field trial/mosquitoes: *Culex annulirostris* (arbovirus) *Anopheles bancrofti* and *meraukensis* (malaria)	>95% protection: *Cx. annulirostris*: Picaridin 5 hrs; DEET >7 hrs *Anopheles* spp: Picaridin 1 hr, 20% DEET <1h, 35% DEET 1 hr
C Costantini et al (2004)[5] Burkina Faso	Picaridin vs. DEET (varying concentrations)	Field trial/mosquitoes: *Anopheles* spp. (98.5%) (malaria)	Relative potency after 10 hr: Picaridin similar to DEET

Advanced (with 7% picaridin) is the only formulation available commercially in the US; a 6-ounce pump-spray bottle can be purchased over the counter for about $4.

CONCLUSION — The 7% picaridin formulation currently sold in the US might be as effective in repelling mosquitoes as low concentrations of DEET, but no data are available. Higher strength products sold in Europe (with 20% picaridin) protect against mosquitoes for up to 8 hours and against ticks for a shorter period of time. If higher concentrations become available in the US, picaridin could replace DEET due to its superior tolerability, but its long-term safety is less well established. □

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2. AM Pretorius et al. Repellent efficacy of DEET and KBR 3023 against amblyomma hebraeum (Acari: Ixodidae). J Med Entomol 2003; 40:245.
3. A Badolo et al. Evaluation of the sensitivity of Aedes aegypti and Anopheles gambiae complex mosquitoes to two insect repellents: DEET and KBR 3023. Trop Med Int Health 2004; 9:330.
4. SP Frances et al. Field evaluation of repellent formulations containing DEET and picaridin against mosquitoes in Northern Territory, Australia. J Med Entomol 2004; 41:414.
5. C Costantini et al. Field evaluation of the efficacy and persistence of insect repellents DEET, IR3535, and KBR 3023 against Anopheles gambiae complex and other Afrotropical vector mosquitoes. Trans R Soc Trop Med Hyg 2004; 98:644.
6. BS Wahle et al. Chronic toxicity and carcinogenicity testing in the Sprague-Dawley rat of a prospective insect repellant (KBR 3023) using the dermal route of exposure. Toxicology 1999; 142:41.
7. AB Astroff et al. Conduct and interpretation of a dermal developmental toxicity study with KBR 3023 (a prospective insect repellent) in the Sprague-Dawley rat and Himalayan rabbit. Teratology 2000; 61:222.

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