

Least Toxic Alternatives to DEET



This factsheet is intended for informational and not promotional least toxic alternatives to DEET. PAN does not recommend the use of DEET. PAN does not specifically endorse the use any of the following products contained in this factsheet.

What is DEET?

DEET (N, N-diethyl-m-toluamide) is a commonly used, yet controversial, insect repellent applied in and around domestic dwellings, to the human body and clothing, cats, dogs, horses, and pet living and sleeping quarters. Scientists have raised concerns about DEET's toxic properties when used alone and in combination with other chemicals.

Alternatives -- General

- Plant oils

University of California pest management guidelines note that plant oils such as those from birch, bluestem grass, geranium, pine, rosemary, spearmint, yarrow, lantana, and neem have been shown to be somewhat repellent to mosquitoes, but most are not available in commercial mosquito repellents [i]

Studies published by the *New England Journal of Medicine* have shown that repellents containing oil of eucalyptus provided protection for an average of two hours, and a product containing soybean oil (bit Blocker for Kids HOMS) was effective for an average of 90 minutes[ii]

- **Citronella**

Citronella is the active ingredient most commonly found in "natural" or "herbal" insect repellents marketed in the United States. It is registered with the EPA as an insect repellent. Citronella oil has a lemony scent and was originally extracted from the grass plant *Cymbopogon nardus*.

Studies testing whether citronella is an effective mosquito repellent have variable results. Tests by manufacturers of citronella products show that they are effective, but their repellency lasts for a shorter time than DEET.[\[iii\]](#) Repellency is greatest in the first 40 minutes after application. Similar results were found by Consumers Union when this nonprofit consumer group tested mosquito repellents.[\[iv\]](#)

Canadian researchers studied, under field conditions, the efficacy of three citronella-based products (lotion, milk, and sun block formulations) to protect against biting mosquitoes. All of the repellents 'reduced the number of mosquitoes biting by 95% over the 1st and 2nd 30 minutes after application.'[\[v\]](#)

Citronella has not been extensively tested for its health hazards, but is mildly irritating to the skin, mouth, and throat. It can be a sensitizing agent and act as a sedative.[\[vi\]](#)

Individual name brand repellents and their websites

- **Natrapel:** This lotion and pump spray product contains 10% citronella as the active ingredient. It was introduced in 1986 as an effective alternative for those concerned about using chemical-based repellents.
- **Herbal Armor:** This pump spray contains active ingredients of citronella and oils of clove, cedar wood, eucalyptus, lemongrass, peppermint, and garlic. It offers their new and improved Time Release technology that makes it longer lasting and very effective.
- **Buzz Away:** Made from pure, natural essential oils -- cedar wood, citronella, peppermint, eucalyptus and lemongrass. This product comes in towelette, pump spray, and lotion.
- **Green Ban:** This 100% herbal insect repellent, includes healing extracts and emollients to soothe insect bites and irritated skin. This product contains citronella and peppermint oil and comes in oil form.
- **Avon Skin-So-Soft:** This product comes in lotion form and contains citronella oil. The bath oil received considerable media attention several years ago when some consumers reported it to be effective as a mosquito repellent. When tested under laboratory conditions against *Aedes aegypti* mosquitoes, this product's effective half-life was 30 minutes. Against *Aedes albopictus*, Skin-So-Soft oil provided 40 minutes of protection from bites, a duration 10 times less than that

of 12.5% DEET.^[vii] Avon now markets products under the Skin-So-Soft label that contain an EPA-recognized repellent.

- **Bite Blocker:** Bite Blocker provides an all-natural blend of plant oils; the active ingredient is soybean oil, that offers protection from 4 to 8 hours. This product comes in the form of lotion, oil, and pump spray. It has been available in the U.S. since 1996. EPA lists the ingredients as minimum risk ingredients and most are food grade. Bite Blocker can be used safely on young children. As published in the New England Journal of Medicine (July 2002), Bite Blocker For Kids provided better protection than the DEET based product for Kids with 5% concentration. Studies conducted at the University of Guelph, Ontario, Canada, showed that this product gave more than 97% protection against Aedes mosquitoes under field conditions, even 3.5 hours after application. During the same period, a 6.65% DEET-based spray afforded 86% protection, and Avon Skin-So-Soft citronella-based repellent gave only 40% protection.^[viii]

[i]Bruce Eldridge, UC Davis, "Pest Notes: Mosquitoes," February 1998.

[ii]Mark Fradin M.D. and John Day Ph.D., "Comparative Efficacy of Insect Repellents Against Mosquito Bites," New England Journal of Medicine 347:13-18, 4 July 2002.

[iii]Fradin, M.S. 1998. Mosquitoes and mosquito repellents: A clinician's guide. Ann. Intern. Med. 128:931-940.

[iv]Consumers Union. 2000. Buzz Off! Consumer Reports (June). 14-17.

[v]Lindsay, L.R., et al, "Field Evaluation of the Efficacy of Three Druide Reg. Citronella Based Repellents to Protect Against Aedes Species Mosquitoes in Ontario," 1996.

[vi] Hazardous Substances Data bank. 2001. Citronella. <http://toxnet.nim.nih.gov>.

[vii]Schreck C.E, McGovern T.P. Repellents and other personal protection strategies against Aedes albopictus. J Am Mosq Control Assoc. 1989;5:247-50.

[viii]Lindsay RL, Heal JD, Surgeoner GA. Comparative evaluation of the efficacy of Bite Blocker, Off! Skintastic, and Avon Skin-So-Soft to protect against Aedes species mosquitoes in Ontario. Guelph, Ontario: Department of Environmental Biology, University of Guelph; 1996. Sponsored by Chemfree Environment, Inc.