



## DEET: Still the Best Mosquito Repellent

July 17, 2002

Mosquitoes are more than just summer pests. When these insects bite, they can transmit diseases such as malaria, encephalitis and yellow fever. [West Nile virus](#), one cause of encephalitis that is carried by mosquitoes, made its first appearance in the Western Hemisphere in 1999.



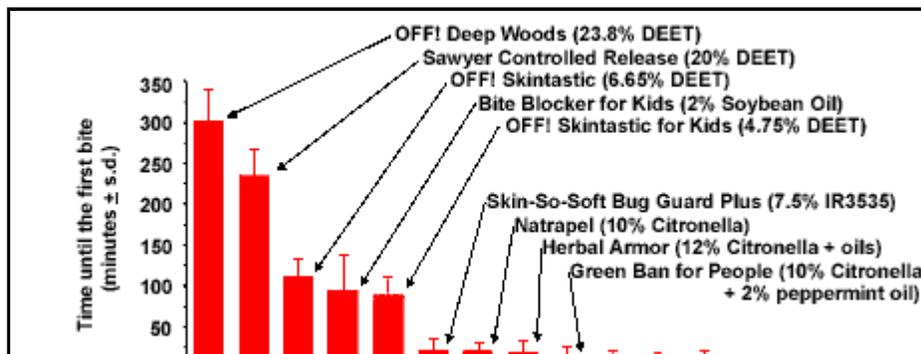
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Agricultural Research  
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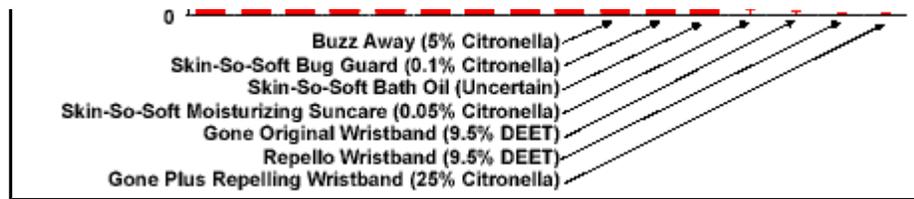
Sometimes it is not easy to avoid mosquito bites. To reduce the chance of a bite, you should stay away from places where mosquitoes live, wear clothing to cover your skin and use insect repellent (avoiding eyes, nostrils, and lips.) Insect repellents should be applied sparingly to your skin and washed off after you come indoors. What is the best insect repellent to use against mosquitoes? To find out, researchers recently tested the effectiveness of 16 insect repellents.

### The Experiment

Dr. M.S. Fradin (Chapel Hill Dermatology, Chapel Hill, NC) and Dr. J.F. Day (Florida Medical Entomology Laboratory, University of Florida, Vero Beach, FL) tested the insect repellents on 5 men and 10 women volunteers. The volunteers put their arms into a test cage that contained 10 hungry female mosquitoes and the researchers recorded the time until the first bite.

As seen in the graph, the most effective insect repellents were those that contained the chemical called **DEET**. The product that performed best was *OFF! Deep Woods* (23.8% DEET) which prevented mosquito bites for an average of 301.5 minutes (just over 5 hours). The second best repellent, *Sawyer Controlled Release* with 20% DEET, kept people bite-free for an average of 234.4 (almost 4 hours). However, DEET products were effective only when they were applied to the skin. Wristbands with DEET provided no protection: people wearing wristbands with DEET were bitten in less than one minute. The best non-DEET product, *Bite Blocker for Kids* with 2% soybean oil, was effective for 94.6 minutes (about 1.5 hours). Repellents with citronella did not work very well: *Natrapel* with 10% citronella and *Herbal Armor* with 12% citronella kept mosquitoes away for less than 20 minutes.





DEET probably works by disrupting the olfactory sense of mosquitoes so they can't find you. Some people might criticize the new experiments because they were performed in a laboratory and not outside. Some non-DEET repellents may work better in the natural environment where mosquitoes live. Some data show that DEET may be toxic and even cause neurological damage. However, in an editorial in the *New England Journal of Medicine* that accompanied the new research paper, Drs. R.J. Pollack, A.E. Kiszewski and A. Spielman of the Harvard School of Public Health state:

"DEET is far less toxic than many people believe. Adverse effects, though documented, are infrequent and are generally associated with gross overuse of the product."

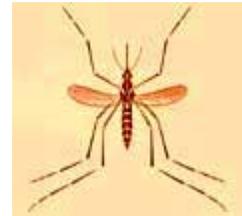
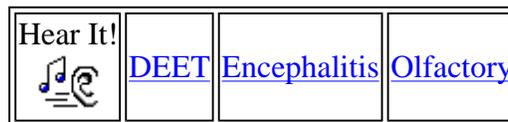


Image courtesy of the CDC, James M. Stewart



Did you know?



- The full chemical name for DEET is N,N-diethyl-3-methylbenzamide.
- DEET was developed by the US Department of Agriculture and was patented by the US Army in 1946.
- Only female mosquitoes bite.
- There are more than 2500 species of mosquitoes in the world. The U.S. is home to 200 species; Florida alone is home to 77 species. (Source: [The American Mosquito Control Association](#))
- Mosquitoes transmit disease to more than 700,000,000 people each year. (Source: Fradin, M.S., Mosquitoes and mosquito repellents: a clinician's guide, *Annals of Internal Medicine*, 128:931-940, 1998)
- Sweat, carbon dioxide and lactic acid attract mosquitoes.
- The nickname for the state of New Jersey is "The Mosquito State." (Source: [State nicknames](#))

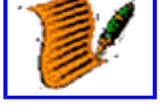
References and further information:

1. Fradin, M.S. and Day, J.F. Comparative efficacy of insect repellents against mosquito bites. *New England Journal of Medicine*, 347:13-18, 2002.
2. Pollack, R.J., Kiszewski, A.E. and Spielman, A. Repelling mosquitoes. *New England Journal of Medicine*, 347:13-18, 2002.

3. [Mosquitoes: How to Control Them](#) - US EPA

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