

Dinnertime. Unprotected by DEET, this man's arm draws hungry mosquitoes.



NEUROSCIENCE

Hiding From Biting Insects in Plain Scent

For backpackers, the insect repellent DEET makes hikes bearable by protecting against mosquitoes and other blood-sucking pests. For people who live in malaria-prone areas, it can be a lifesaver. Although people have been spraying and dabbing DEET on for more than 50 years, nobody knew exactly how it works until now. Researchers report online in *Science* this week (www.sciencemag.org/cgi/content/abstract/1153121) that instead of driving away biting bugs, DEET actually conceals us from them. The compound dulls the insects' sensitivity to certain body odors, explains co-author Leslie Vosshall, a molecular neurobiologist at Rockefeller University in New York City.

Although DEET's insect-deterrent abilities are formidable, it can be toxic, especially to infants. Unraveling how DEET fends off attacks "is a first step" toward developing more specific alternatives, says neuroscientist Richard Axel of Columbia University, who wasn't involved in the research. The work "affords the possibility of rational approaches to confounding the olfactory system of insects." But first, more behavioral studies of mosquitoes are needed, cautions medical entomologist Willem Takken of Wageningen University in the Netherlands, as Vosshall's behavioral experiments focused on fruit flies.

To female mosquitoes, our body odors mean food. These insects sniff out lactic acid in our sweat and carbon dioxide and 1-octen-3-ol alcohol in our breath. "It's wildly attractive to mosquitoes," says Vosshall.

She and her colleagues netted key evidence about DEET's mode of action from fruit flies, whose neurobiology is better understood than that of mosquitoes. For these behavioral studies, the researchers gave the flies a chance to enter either of two small

vials. If both tubes held food, flies piled into them in about equal numbers. If one tube also contained DEET at the 10% concentration found in many sprays, the insects preferred the DEET-free vial. However, when the choice was between an empty tube and an empty tube dosed with 10% DEET, the flies made no distinction, suggesting that they weren't just shunning the compound. With DEET wafting around, they apparently couldn't smell the food, says Vosshall.

To bolster this suspicion, her team took a close look at fly odor receptors. The team engineered frog eggs to make these receptors, a technique that effectively "can turn a frog egg into a fly nose," says Vosshall. Exposure to certain odor molecules activated the receptors and triggered a surge of positive ions into the egg. But DEET reduced the flow, indicating that the receptors are less responsive in DEET's presence. The compound hides food scents by blunting the sensitivity of specific odor receptors, the researchers conclude.

But that conclusion is premature, says Takken, until the researchers determine whether mosquitoes react the same way as do fruit flies in the tube-choice tests.

However, Vosshall and colleagues did show that their results held true for mosquito receptors and neurons. Using the frog-egg method, the team discovered that DEET suppresses three body-odor-detecting receptors from *Anopheles* mosquitoes, which transmit malaria. They also saw a dampening of electrical activity in mosquito neurons that typically respond to 1-octen-3-ol, confirming that DEET disrupts the insects' perception of some attractive smells.

Calling DEET a "repellent" is a misnomer, says Vosshall: "It doesn't smell bad to insects; it masks or inhibits their ability to smell you."

—MITCH LESLIE

More Wins for Wisconsin

The U.S. Patent and Trademark Office (PTO) has upheld two key patents, on primate and human embryonic stem cells, held by the Wisconsin Alumni Research Foundation, giving WARF a solid victory in its hotly contested patent battle. Last month, PTO upheld a third patent, on stem cell culture techniques (*Science*, 7 March, p. 1323). The WARF patents, granted in 1995, 1998, and 2001, were challenged 2 years ago by two nonprofits that said the work was obvious and therefore unpatentable. The patent office disagreed, although it narrowed the patents slightly. "We applaud this final decision on our two most important base stem cell patents," said the foundation's Carl Gulbrandsen.

—ELI KINTISCH

New Panel Tackles Boston Peril

Responding to state and public concerns about the safety of a new biodefense lab being built by Boston University, the National Institutes of Health (NIH) has set up a blue-ribbon panel to provide an independent assessment of the \$128 million facility. "We will thoroughly examine any potential risks to the community associated with this project," says Anthony Fauci, who directs NIH's National Institute of Allergy and Infectious Diseases, which is funding the lab. The panel, which held its first meeting this week in Boston, is chaired by Adel Mahmoud, a Princeton University biologist and former president of Merck Vaccines. The lab, which will handle highly toxic and infectious biological materials, has drawn widespread criticism for its location in a densely populated and mostly minority area of downtown Boston.

—ANDREW LAWLER

Research Funds Granted

BEIJING—China's premier research labs have many advances to their credit, including super-hybrid rice varieties, new dinosaur species, and instruments on the Chang'e lunar spacecraft. Now the government is showing its appreciation with a huge cash injection. Last week, the science and finance ministries announced the creation of a special fund for China's 220 key state laboratories. The fund will hand the labs \$280 million in 2008, primarily for research materials and new equipment. The money is expected to liberate key-lab scientists from the drudgery of grantsmanship. "Our scientists have wasted a lot of time applying for funds," says Chen Changjie of Beijing's Institute of Biophysics, which has key labs on biological macromolecules and brain and cognitive science. Now, Chen says, China's top scientists "will have more time to do research."

—LI JIAO