



ScienceWatch – How Attractive Are You?

Why is it that some of us seem to be mosquito magnets when we go outdoors while others are hardly bothered? Is it merely our perception that we attract more mosquitoes than others? Or is it that those who do all the swatting are more paranoid about them? According to a review in the October 4, 2002 issue of *Science* paranoia has nothing to do with it. Some people are indeed more attractive to mosquitoes than others.

Besides factors like body heat and carbon dioxide, mosquitoes use body odor to home in on a victim. We might expect this, since mosquitoes are parasites highly adapted to finding their host. Entomologists are studying mosquito behavior in an attempt to discover just what odors attract them. It's a complex story because millions of years of evolution have produced highly sophisticated odor-based navigation systems that differ greatly among the many mosquito species depending upon where they live and what host they prefer. However, progress has been made by using simulated and real humans as bait.

In the 1950's Anthony Brown of the University of West London, Ontario, Canada built steel, human-shaped dummies, dressed them up and discovered that more mosquitoes landed on them when the surface temperature was warmed up to that of the human body, 37°C. No surprise there, but Brown also observed that the dummies were more attractive if they "exhaled" CO₂, and had a moist surface. Human body sweat applied to the surface made them even more enticing. The widespread use of DDT brought this research to a halt. But DDT was banned and there is renewed interest in mosquito research now fueled in part by West Nile.

Finding the attractants is not an easy task. Researchers are now examining the more than 300 compounds found on human skin. For example, Martin Geier of the University of Regensburg, Germany takes skin wipes and tries separating the compounds into their chemical groups. Fatty acids, which are generally smelly, (think cheese and feet) are likely candidates, but others, like peptides that may be odorless to us might drive mosquitoes mad with hunger. So each compound must be tested with mosquitoes. One simple way to do this is to place a Y-shaped tube in a small wind tunnel and blow a different compound through each short arm while allowing a hungry mosquito to fly upwind. By choosing to fly up one arm or the other, the mosquito demonstrates which substance is more attractive to her. By the way, only the female does the biting because she requires a blood meal to produce her eggs. Males are innocent. They live off nectar. A more complicated test requires hooking tiny electrodes to the mosquito's sensory nerves and seeing which substance elicits a response.



Recent studies confirm that heat, moisture and CO₂ are major attractants. After that it becomes more complicated. For example, *Aedes aegypti*, which transmits yellow fever and is found in Central and South America, preys exclusively on humans, while, *Culex*

pipiens, which occurs in our area, prefers birds. However, *Culex* mosquitoes are not fussy and will bite humans so they probably are attracted by a wide variety of compounds. Their lack of fussiness is the reason why West Nile has moved back and forth between birds and humans. In contrast, *Aedes aegypti* is quite specific. It loves lactic acid, which is found on human skin, but not the skin of other mammals. Another *Aedes* species likes ammonia, while *Anopheles gambiae*, which transmits malaria, loves the smelly fatty acids generated by the bacteria living on our feet. Similar bacteria produce Limburger cheese and, sure enough, the mosquitoes are attracted to it.

When the complete story is in it will surely tell us that *Anopheles* as well as other species are attracted to a suite of substances, and that the mix differs somewhat for each one. So don't go running out to get Limburger cheese for your backyard barbeque just yet. That is unless you really plan to eat it. As for those of us who are mosquito bait, a repellent with at least 30% DEET works well.

Saul Scheinbach

Female *Culex* laying eggs

