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## Bioengineering the Mosquito Bite

When you spot a mosquito landing on your arm what do you do? You know that she will bite you if you don't act fast. She needs your blood to make her eggs fertile. (Male mosquitoes don't bite; they leave it to their females to gather all the blood that their species needs for reproduction.) If you are like me, you strike the mosquito with your open hand as fast as you can—hoping to crush the little bug before she can bite you.

Mosquitoes are attracted to carbon dioxide, so your breathing broadcasts your location. Holding your breath won't protect you because mosquitoes are also attracted to sweat, body heat, soap scents, and movement. A WebMD article indicates that one-tenth of the world's population are mosquito magnets. ([www.webmd.com/allergies/features/are-you-mosquito-magnet](http://www.webmd.com/allergies/features/are-you-mosquito-magnet)) Perhaps hanging out with the right friends, who happen to be mosquito magnets, can shield you from these pesky insects.

Medical professionals in the summer of 2012 indicated that Dallas, TX, was the epicenter of a serious six-state outbreak of West Nile virus. Some of the mosquitoes in these states are now carriers of this disease and infecting people. (Still, even if you are in one of the six states and you are bitten by a mosquito, you are most likely to only experience redness and itching in the area of the bite.) Throughout the world, infected mosquitoes spread other diseases, including malaria, yellow fever, meningitis, and encephalitis.

The current approach to stop-

ping mosquitoes involves spraying insecticides. That's an approach that many feel is as physically harmful to people as it is to mosquitoes.

In the war between people and mosquitoes, biotechnologists, at the



Jim Gathany / Centers for Disease Control & Prevention

**When a mosquito lands on us, we do anything possible to prevent them from biting. Perhaps bioengineering technologists now have a better solution?**

laboratory level, have found a way to eliminate the mosquito problem that doesn't involve the spraying of insecticides. They want to genetically alter huge numbers of mosquitoes in the laboratory and release them into the wild so they can, over time, physically alter their wild relatives. These scientists want to reduce or eliminate the one million malaria deaths and hundreds of thousands of other deaths that can be traced back to a mosquito bite.

The two different approaches to taking the bite out of mosquitoes were both tried under the leadership of Anthony James. He is a distinguished professor (microbiology, molecular genetics, and biochemistry) at the Irvine campus of the University of California. Working with colleagues at Irvine in collaboration with molecular biologists

at the Paris Pasteur Institute, the biotechnologists have successfully genetically altered mosquitoes. They created a genetically altered group with a female that can't hunt for people to bite and another group that cannot successfully transmit malaria.

To stop mosquitoes from biting, the biotechnologists genetically altered a laboratory batch so that their future female generations would be born without wings. If released into the wild, the flying males from this laboratory group would mate with wild mosquitoes and transmit their altered genes. Over time, more and more females would be born without wings. This approach, if allowed to move out of the laboratory, could place these pesky biting bugs on an endangered list.

The second approach created a batch of laboratory mosquitoes with flying females that can't transmit malaria. The biotechnologists are now searching for the genes that need to be altered to stop the transmission of other diseases.

Bioethicists think that wiping out mosquitoes is terribly wrong and environmentally dangerous. They argue that once laboratory genetically altered mosquitoes are released into the environment there is no way of telling how nature will continue to alter them—perhaps producing an even more dangerous insect.

## Recalling the Facts

1. What would you do if you had the authority to order or to stop the release of these altered mosquitoes into the environment? Why?
2. Why are bioethicists against genetically altering living organisms? ☹

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