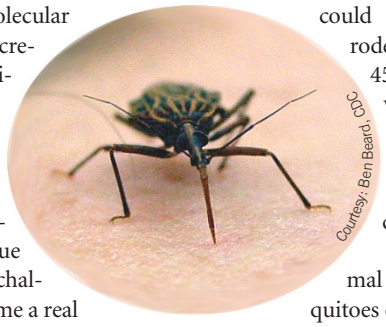
Biologists try to work out bugs in GM insect technology



Advances in insect molecular biology have allowed the creation of genetically modified (GM) insects for infectious disease control to step out of the realm of science fiction. But experts say the technology must clear unique scientific and political challenges before it can become a real solution.

"We have to do a lot more field biology. We need a touchstone of a real-life setting," says Kate Aultman, a program officer for Parasitology and International Programs at the US National Institute of Allergy and Infectious Diseases. "The science doesn't support the argument for release at this time," Aultman says.

GM technology offers tremendous potential to combat diseases such as malaria, dengue and trypanosomiasis. Since the mid-1970s, when the first signs of resistance to malaria drugs and insecticides appeared, scientists have scrambled to come up with new, more powerful drugs—with limited success. "We are clearly losing the battle with chemicals," says Janet Hemingway, director of the Liverpool School of Tropical Medicine in the UK. Malaria each year causes more than 1 million deaths, most of them young children.

Since scientists first created a mosquito that could not transmit malaria in a rodent model (*Nature* **417**, 452–455; 2002), they have used various strategies to engineer mosquitoes that attack the malarial parasite or prevent it from completing its life cycle.

But most projects use animal models of malaria and mosquitoes other than the natural vector *Anopheles gambiae*. "What we need now is a consolidation of all these models into legitimate human pathogen systems," says Anthony James, a GM mosquito researcher at the University of California in Irvine.

Work modifying kissing bugs to fight Chagas disease is further along. The insect's symbiotic bacteria are transformed with either the gene for cecropin—a small peptide with antiparasitic activity—or genes encoding antibodies that can prevent the parasite from colonizing the bug's gut.

"The idea is that you would put out the [GM] bacteria in a bait after spraying a house with insecticide," says Ben Beard, a consultant on the project at the US Centers for Disease Control and Prevention (CDC) office in Fort Collins, Colorado. "Any eggs that hatch would pick up the bait and spread the symbiont to other generations as well."

Secure greenhouse trials for the project use a mock house to test for the least number of bacteria needed to colonize 100% of the kissing bugs. The decade-long project is a collaboration between the CDC, Yale University and Universidad del Valle in Guatemala City. The involvement of Guatemalan scientists has also helped tackle political hurdles.

Releasing GM insects is fraught with dicey issues: once the insects are released, there is no way to control or recall them; if the strategy only works in the short term, it might exacerbate the situation by lowering people's natural immunity to the disease; and mosquitoes engineered for one disease might still transmit others. Scientists also need to first understand gene flow through natural vector populations, and improve the fitness of GM insects to compete in the wild (*PNAS* **101**, 891–896; 2004).

Ideally, says James, a design team would include ecologists, public health officials and epidemiologists, and would incorporate input from local scientists and the public.

It is not yet clear which agencies would regulate the release of GM insects, either. A recent report by the Pew Initiative on Food and Biotechnology notes that the authority to regulate GM insects and the expertise in areas of public health often rest with different agencies. The report urges scientists and regulators to begin discussions while a trial release is still 5 to 10 years away.

Kendall Powell, Denver

Studies linking breast cancer to deodorants smell rotten, experts say

Cancer experts are up in arms over two recent studies linking deodorant use to breast cancer, saying conclusions from the studies are flawed.

An e-mail hoax in the 1990s suggested that chemicals in antiperspirants can cause breast cancer, and quickly became a powerful urban legend. In 2002, a study of 1,600 women found that deodorant use—with or without shaving—is not associated with breast cancer. But deodorants continue to be linked to breast cancer at least in part because environmental factors contribute to risk, says Patrick Borgen, chief of breast cancer surgery at New York's Memorial Sloan Kettering Cancer Center.

Based on data from 437 breast cancer survivors, lead researcher Kris McGrath in December reported that women who used deodorant at least twice a week and shaved more than three times a week were diagnosed with breast cancer nearly 15 years earlier than those who did not shave or use antiperspirants (*Eur. J. Cancer Prev.* **12**, 479–485; 2003).

One possible explanation is that aluminum salts in deodorants can enter shaven skin and alter DNA, says McGrath, section chief of Allergy and Immunology at St. Joseph Hospital in Chicago. Animal studies show that aluminum can travel through the body and appear in the brain and in breast milk, he adds.

Data from animals can help build a hypothesis, but cannot be used as proof unless they are also observed in humans, notes Wendy Chen, an oncologist and epidemiologist at Harvard Medical School. The study has other limitations, such as a small sample size and a lack of proper controls, Chen says. By not including women who never had breast cancer, she adds, all the study shows is that women who use a lot of deodorant happen to be younger.

"This study seems particularly weak," says Michael Thun, head of epidemiological research at the American Cancer Society. "The analysis doesn't control for [body mass index], use of postmenopausal hormones and the age of first live birth, just for starters."

The second study, published in January, reported that preservatives called parabens, known to mimic estrogen, were also found in breast tumors (*J. Appl. Toxicol.* **24**, 5–13; 2004). But animal studies suggest parabens would have to be about 500 to 10,000 times more potent to equal oral estrogen.

The mere presence of parabens in tumors does not mean anything, says Borgen. Because breast tumors are highly vascular, he says, they are likely to have traces of everything in the bloodstream. "If I put blue dye into a vein in a foot and took a breast tumor out, it would be blue," Borgen says. "No one would think blue dye caused the cancer."

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