The only way to tell if the microbe is triggering heart disease through molecular mimicry, Penninger says, is to do epidemiological studies to see if people who have antibodies against the bacterial peptide have a higher rate of the disease. Boston University's Jick agrees. "One of the obvious limitations is that, so far, the effect has been shown only to occur in mice," he says. –TRISHA GURA

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NEUROBIOLOGY

Fruit Fly Odor Receptors Found

Although researchers identified the receptors mammals use to detect odors almost a decade ago, they've been unable to sniff out those of any insect. Now, the impasse has been broken. Two teams, one led by John Carlson of Yale University and the other by Richard Axel of Columbia University, have independently discovered the first odor receptors in the fruit fly, *Drosophila melanogaster*.

The work, described in the February *Neuron* by Carlson and his colleagues and in the 5 March issue of *Cell* by Axel and his, has so far pulled out a total of 17 genes encoding *Drosophila* odor receptors. Given that these came out of the 15% of the *Drosophila* genome that has been sequenced, the insect may have 100 to 200 odor receptor genes in all.

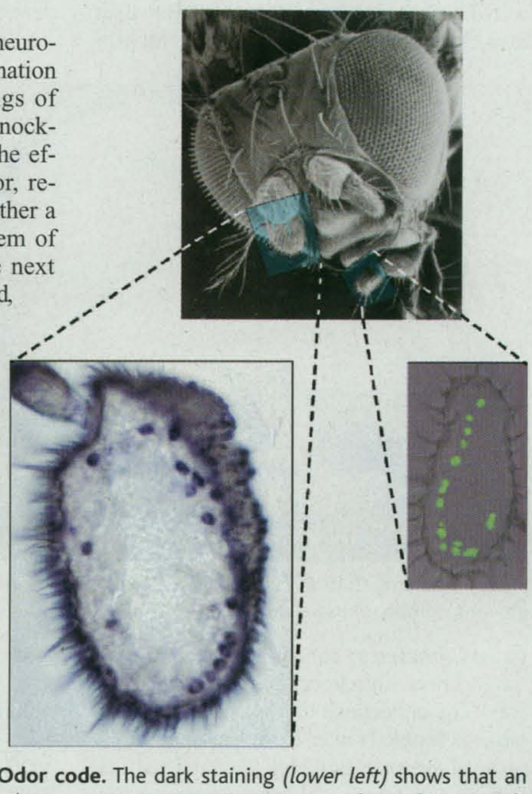
Their discovery will be a boon to neurobiologists, who hope to use the information to probe the more complex workings of mammal brains. By systematically knocking out the fly genes and observing the effects on odor sensitivity and behavior, researchers should be able to piece together a wiring diagram of the olfactory system of the fruit fly. "One can expect in the next few years that a lot will be discovered, providing important new insights into olfaction and probably into sensory coding," predicts Harvard University neurobiologist Catherine Dulac.

The first payoff, however, may be explaining how other insects behave. Already, researchers are using the sequences of the newfound *Drosophila* genes to track down odor receptors in insects that damage crops or transmit human diseases. Having these receptors in hand will make it much easier to find specific compounds that interfere with the insects' ability to detect odors. Because insects depend on smell to find mates and food, such substances could "really enhance our ability to control insect pests," notes Tim McClintock, a neurobiologist at the University of Kentucky College of Medicine, Lexington.

The key to success for both the Yale and Columbia groups was finding the first olfactory receptor gene. For years, others had tried to find these genes by looking for fruit fly genes whose sequences resemble those of known mammalian odor receptor genes. But those searches all came up empty. "These guys came up with a better way," says neurobiologist Dean Smith of the University of Texas Southwestern Medical Center, Dallas. They used a new method to search a growing fly DNA data set: the sequences accumulated by the Berkeley *Drosophila* Genome Project.

Aware that the odor receptor proteins would have to be embedded in the membranes of olfactory nerve endings, Yale's Peter Clyne, Junhyong Kim, and Coral Warr first looked for DNA sequences in the Berkeley data that might encode transmembrane domains, strings of hydrophobic amino acids that can tolerate insertion into fatty membranes. They then eliminated the nonsense DNA and the known genes. This got them down to 34 candidates. Two turned out to be elusive odor receptor genes, as evidenced by their location in the olfactory neurons.

At Columbia, Leslie Vosshall and her colleagues found their first *Drosophila* odor receptor gene by searching for genes that are active only in the fruit fly olfactory organs, the antennae, and a rod-shaped projection on the head called a maxillary palp. The researchers did this by comparing messenger RNAs (mRNAs), which indicate active genes, from the olfactory organs with mRNAs from the whole body and the head. Vosshall gradually homed in on a small set of genes, which she could begin sequencing and testing whether they are active only in the olfactory sensory nerve cells. She found one such gene, and like the Carlson team, used it to find related genes in the sequence database.



CREDIT: CARLSON *ET AL.*

Odor code. The dark staining *(lower left)* shows that an odor receptor gene is active in just a subset of *Drosophila* olfactory nerve cells, and the light blue staining *(lower right)* shows that the same is true for a gene regulating odor receptor expression.

Both groups now have clues about how the fruit fly brain perceives odors. They've shown that the genes are expressed differently in the various olfactory nerve cells. These data suggest that fruit flies, like vertebrates, may discriminate odors by decoding patterns of nerve activation that reflect the responses of many individual cells, each attuned to a single sensation.

Carlson's team also learned something from flies with a damaged sense of smell. In a separate study, they found a defective gene in the flies that codes for a protein that regulates gene expression. The defect appears to turn off certain receptor genes in some olfactory nerve cells. "The fact that some receptors are gone is pretty cool," Smith says, as it suggests this DNA regulatory protein helps set up the pattern of gene activity—and odor sensitivity—in the fly. In addition, as in vertebrates, Carlson notes, various fly odor receptor genes appear to be active at different times during development and may help organize the olfactory system.

He and his team plan to continue to look for more odor receptor genes and try to understand how these genes are regulated. "I feel like a kid in a candy store," Carlson says. "There's a million things we can now do."

–ELIZABETH PENNISI

ARCHAEOLOGY

Kennewick Man Gets His Day in the Lab

More than 30 months after a 9000-year-old skeleton was found on the banks of Washington's Columbia River, a government-appointed team of scientists has begun an examination to decide, once and for all, whether Kennewick Man qualifies as a Native American. Scientists are happy that the skeleton has made it into the lab, but they are worried that the government could put a crimp on the way the work is done and reported.

On 17 February, the Interior Department announced that five scientists have been appointed to help Frank McManamon, chief archaeologist of the National Park Service, perform a systematic analysis of Kennewick's 300-plus bone fragments. The work is being done at Seattle's Burke Museum,