

Rogue Fruit Fly DNA Offers Protection From Insecticides

Genomes are full of DNA that doesn't belong there. Called transposons, these small bits of sequence jump between chromosomes, often disrupting genes in the process. But sometimes, these interlopers do some good. Dmitri Petrov, a population geneticist at Stanford University in California, and his colleagues have discovered a transposon that, by changing a gene, seems to help fruit flies evolve resistance to certain insecticides. The work, reported on page 764 of this issue of *Science*, is one of a growing number of examples of natural selection preserving transposons, indicating that "they may play a much larger



A little help from ... Although transposable elements tend to be harmful, one has helped make *Drosophila melanogaster* tougher to kill.

role in evolutionary novelty than is currently appreciated," says Todd Schlenke, an evolutionary geneticist at Cornell University.

Typically, researchers have stumbled on such beneficial transposons while searching for mutations involved in disease or traits such as resistance to toxins. The general assumption has been that these movable DNA elements have long been intertwined with the gene in question. But Petrov and his colleagues demonstrated that transposon-mediated evolution can happen in real time to create novel solutions to changing conditions.

Working with Petrov, Stanford graduate student Yael Aminetzach had determined which of the 16 members of the *Doc* family of transposable elements were common in populations of the fruit fly *Drosophila melanogaster*. One stood out, *Doc1420*. Unlike other *Doc* transposons, which proved to be quite rare, this one appeared in 80% of fruit flies tested from eight different countries, suggesting that it plays some useful role. "The paper is a tour de force of population

genetics," says David Heckel, a geneticist at the Max Planck Institute for Chemical Ecology in Jena, Germany.

When the Stanford researchers then looked more closely at this transposon, they found that it had landed in a gene that, to date, has defied characterization. The gene exists intact in distantly related fruit flies, suggesting that it has a key function—one that was disrupted as *Doc* elements jumped around the *D. melanogaster* genome. By comparing *Doc1420* to the other *Doc* sequences, Aminetzach and graduate student Michael MacPherson estimate that *Doc1420* buried itself in this gene 90,000 years ago but did not become widespread until between 25 and 240 years ago, when human activities began to alter the environment dramatically. This recent expansion suggested that, rather than rendering the gene nonfunctional, the transposon altered it, possibly resulting in a different protein product—one that became important to the species' survival.

The sequence of the unaltered gene provided a clue to this new gene's role. That sequence resembles that of genes for choline metabolism, which operate in nerves affected by organophosphate pesticides. To test whether the new protein was involved in this pathway, the researchers bred fruit flies to create strains that differed only in whether they carried the *Doc1420* insertion. The *Doc1420* strain fared much better when Aminetzach and her colleagues treated the insects with an organophosphate insecticide: 19% died, compared to 68% of the fruit flies lacking *Doc1420*.

Researchers have already identified a few other examples of transposon-induced insecticide resistance, but this is the first to disrupt a gene whose protein is not a target of the pesticide, Petrov says. But Schlenke, Heckel, and others say that more work is needed to verify the transposon's role in resistance. "The data showing pesticide resistance [are] very weak," notes Richard French-Constant, a molecular entomologist at the University of Bath, U.K.

Nonetheless, Martin Feder of the University of Chicago is quite enthusiastic. "The paper is the latest in a series of recent discoveries that transposons can play a role in 'real time' microevolution in natural populations," he says. "The phenomenon is [now] difficult to ignore." —ELIZABETH PENNISI

Wilmut Seeks Fresh Eggs

Cloning researcher Ian Wilmut of the University of Edinburgh and his colleagues are asking for permission from a national oversight board in the U.K. to use freshly donated human oocytes from volunteers in their attempts to create stem cells through nuclear transfer. South Korean research has suggested that it's much more efficient to create cloned embryos from the oocytes of healthy young donors than those left over from fertility treatments (*Science*, 17 June, p. 1777). Oocyte donation can lead to serious medical complications, but Wilmut's colleague Christopher Shaw of King's College London says the group has already been approached by several potential donors. The Human Fertilisation and Embryology Authority must approve the donations. —GRETCHEN VOGEL

Nuke Reprocessing Inches Ahead

U.S. negotiators reportedly agreed earlier this month to drop a key demand that was blocking a treaty with Russia to reprocess 34 metric tons of weapons-grade plutonium in both nations. The United States had wanted to protect contractors making the fuel suitable for Russian power plants from lawsuits, a provision found in a 1992 nonproliferation agreement. "We've essentially lost 2 years of time," said a spokesperson for the nonprofit Russian American Nuclear Security Advisory Council in Washington, D.C., which had opposed the immunity clause. The agreement, which has not been finalized, must be approved by the Duma, although under U.S. law it does not require congressional approval. —ELI KINTISCH

Help for Russian Science

Following months of closed-door negotiations, the Russian government and scientific community leaders have struck a compromise to restructure the underfunded Russian Academy of Sciences (RAS) and streamline federal research. For their part, the academicians have agreed to discuss a concept that initially proposed reducing the number of RAS institutions from more than 450 to between 100 and 200. In turn, the government has reportedly agreed to raise researchers' monthly salaries, currently between \$100 and \$200, to about \$1050 by 2010. This fall, a Duma committee will try to hammer out details. —ANDREY ALLAKHVERDOV AND VLADIMIR POKROVSKY