# Pesticides Change 'Hands' and Risks

Evolving climates and farming practices may undermine scientists' efforts to predict the toxicity and persistence of many long-lived pollutants, a new study concludes.

Some one-quarter of all commercial pesticides are chiral, that is, their molecules come in mirror-image twins, or enantiomers. The variations arise during manufacturing and can be described as left- or right-handed.

The activity of chiral structures can vary dramatically—as can their palatability to pollution-degrading microbes. When chemists and regulators evaluate pollution risks, they try to account for the preferential removal of one twin. However, which twin a microbe prefers can unexpectedly switch as environmental conditions change, according to a study in the Oct. 28 NATURE.

Such a change can have important implications for public health and the environment, observes study leader David L. Lewis, an Environmental Protection Agency microbiologist at the University of Georgia in Athens.

In some cases, he notes, one twin may kill pests but leave humans and other nontargeted species unharmed, while its chiral sibling does the opposite. If microbes switch their preference, "the residues they leave behind, and which can end up on food, may become more toxic than tests had predicted," Lewis says. However, if only one of the twins is toxic and it suddenly becomes the one that appeals to microbes, pollutant residues might turn harmless.

In the new study, Lewis and his colleagues sampled soils from sites of long-running studies. In Norway and New England, scientists have artificially heated some fields for up to 7 years to model global warming. In Brazil, other researchers are comparing woodlands with adjacent deforested pastures.

Back in Georgia, Lewis' team applied one of three pesticides to each soil sample. To half the soils that had been fertilized in situ with inorganic amendments, the scientists also added an organic fertilizer.

Soils from the warmed sites harbored microbes that showed a preference for one pesticide twin while those from adjacent unheated sites preferred the other, the researchers report. In some cases, the organic fertilizer also triggered a breakdown of the twin that microbes had previously ignored. This was especially evident, Lewis notes, in soils treated with longer-lived pesticides: the insecticide ruelene and the weed killer dichlorprop.

The new findings point out how unreliable studies conducted with a mix of enantiomers can be, Lewis says. He argues that pesticide manufacturers should take a cue from drug makers and eliminate inactive twins from the final product—especially if they prove toxic.

Microbial communities that can switch-hit from one enantiomer to the other "make sense but are not something that I had considered," says Daniel M. Sheehan of the National Center for Toxicological Research in Jefferson, Ark. Certainly, they greatly complicate safety evaluations, he says.

This study indeed suggests that scientists can't expect data from the lab to model what will happen just anywhere in the environment, says Liisa M. Jantunen of Environment Canada in Downsview, Ontario.

Recently, some manufacturers have begun producing single-enantiomer versions of a few chiral pesticides. However, microbes can sometimes sabotage such developments, notes Hans-Rudolf Buser of the Swiss Federal Research Station in Wädenswil. His team finds that microbes can convert a single-twin form of the herbicide mecoprop into its missing enantiomer. —*J. Raloff*

Lewis/Univ. of Ga.

*Left-handed form of dichlorprop leaves the upper weed hale and hearty, while its right-handed version kills the lower plant.*

## Galileo takes close-up snapshots of Io

Swooping within 671 kilometers of the hottest volcano known in the solar system, the Galileo spacecraft has recorded the sharpest images ever taken of Jupiter's moon Io.

These images are all the more remarkable because Galileo had to fly through Jupiter's belts of intense radiation, which shut down the craft just hours before the observations. Researchers revived it in the nick of time.

One of the close-up portraits, taken Oct. 10 and released by NASA late last week, reveals features as small as 9 meters across in the lava field surrounding the volcano, called Pillan. That's a resolution 50 times higher than that of the previous record holder, Io pictures taken by the Voyager spacecraft 20 years ago.

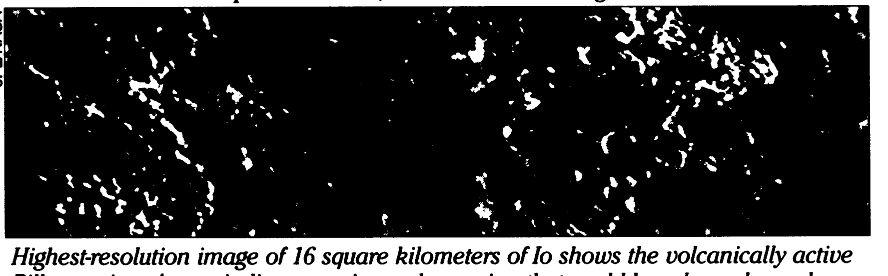
Io is the solar system's only volcanically active moon, and in 1997, Galileo caught Pillan in the act of erupting. The fresh lava had a temperature of 1,900 kelvins, several hundred degrees higher than any known eruption on Earth during the past 2 billion years.

Intrigued by the findings, scientists selected Pillan for one of the close-up studies the craft is now conducting. The single image of the Pillan lava field presents several puzzles, says Laszlo Keszthelyi of the University of Arizona in Tucson.

One puzzle concerns a zigzag depression that could represent a preexisting channel on Io's surface through which lava flowed. Alternatively, it could be a sinkhole, created when sulfur dioxide gas spewed by Pillan condensed as snow on Io's chilly surface, became buried under other material, and then evaporated.

On Nov. 25, Galileo will attempt the next close-ups, flying 300 km above Io. If it survives, the craft will have a last glimpse of Io next year about the same time that the Saturn-bound Cassini craft takes a fleeting look. —*R. Cowen*

JPL/NASA



*Highest-resolution image of 16 square kilometers of Io shows the volcanically active Pillan region. Arrow indicates a zigzag depression that could be a lava channel.*