Chance Discovery Leads to New Vegetable Oil Uses

People have been known to bring strange things to work, though few are encouraged to do this by their supervisors.

But coworkers of Agricultural Research Service chemist Ching T. Hou always find him appreciative when they bring in some soil or water from their neighborhoods.

This bit of random sampling for bacteria paid off recently when Erika Hertenstein, a technician working with Hou, brought in some water from a pond on her family's hog farm near Morton, Illinois.

The water contained a bacterial strain known as *Pseudomonas aeruginosa*.

Using this bacterium, Hou developed a process to convert oleic acid found in soybean, corn, sunflower, and safflower oils to a compound called 7,10-dihydroxy-8-(E)-octadecenoic acid.

"Because of its molecular structure, this acid is an excellent starting material for creating different chemical compounds," he says.

The process Hou developed offers a better way to convert vegetable oils to compounds that can be used in plasticizers, lubricants, and paints or in the preparation of new antibiotics.

ARS and Hou applied for a patent on the oleic acid conversion process in 1996. Genencor International, a biotechnology company in San Francisco, California, is interested in the organism and the process for making the new compound.

Scientists at ARS' National Center for Agricultural Utilization Research at Peoria, Illinois, search for new uses for crops and their processing byproducts.—By **Linda Cooke,** ARS.

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Yeast Gene Accumulates Cadmium

No one really knows exactly how plants gobble up and store metals.

In trying to solve this puzzle, researchers at the Plant Gene Expression Center in Albany, California, discovered a gene that may hold a key to bioengineering plants that can clean metal-contaminated soil.

They uncovered the gene and dubbed it *hmt1*, for heavy metal tolerance, while working with one of nature's simplest organisms—the yeast *Schizosaccharomyces pombe.*

"As with plants," says geneticist David W. Ow, "*S. pombe* produces small molecules called phytochelatins that bind to metals such as cadmium.

"Simply put, the *hmt1* gene cues the yeast to manufacture a protein. The protein, in turn, pumps phytochelatin-bound cadmium through cell membranes and into cell compartments known as vacuoles."

Yeasts and plants seem to use vacuoles either for storing things they need or as tiny trash bags for dumping things they don't. When shuttled into vacuoles, the phytochelatin-bound cadmium apparently stays put—yet is harmless to the plant.

The researchers' next step: duplicate the yeast's metalworks in plants that might be used as metal scavengers.

Ow and colleagues succeeded in slipping *hmt1* into tobacco—a potential candidate for bioaccumulation chores. But they haven't been able to get the transferred *hmt1* to make the protein yet. Says Ow, "Tobacco apparently reads some signals within *hmt1* as stop signs."

To sidestep the problem, the scientists are streamlining the gene. If that tactic succeeds, high-tech plants with the improved *hmt1*—and perhaps other metal-transporting genes, as well—may be less than a decade away.

In the meantime, Ow's studies have won him a new, multiyear grant for environmental cleanup research from the U.S. Department of Energy.—By **Marcia Wood**, ARS.

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