Canola could provide a new fat on the farm

Healthier margarine is on its way. Researchers at Calgene in Davis, Calif., have genetically engineered canola plants to make large amounts of a saturated fat called stearic acid. A solid at room temperature, stearic acid is used to make margarine, chocolate, baked goods, and many other foods.

Food manufacturers need saturated fat to keep margarine solid at room temperature, and stearic acid is the only one in use that doesn't raise blood cholesterol concentrations (SN: 12/24&31/94, p. 442). Canola oil naturally contains just 1 percent stearic acid.

To create more of this fat, manufacturers chemically process unsaturated plant oils—hence the words "partially hydrogenated vegetable oil" on many ingredient lists. This process also produces large amounts of unsaturated, *trans* fatty acids, which studies have linked to high blood cholesterol concentrations and heart disease (SN: 8/10/96, p. 87).

The Calgene researchers set out to genetically engineer canola to make abundant stearic acid, so manufacturers can avoid producing *trans* fatty acids.

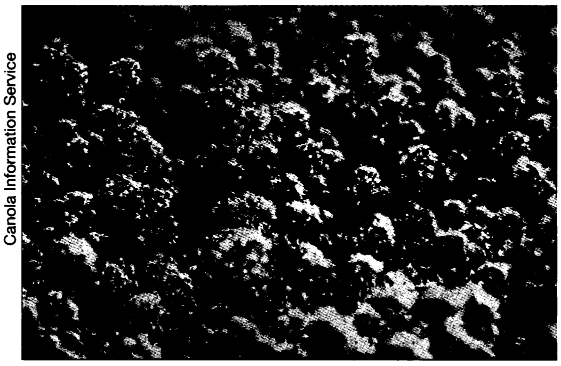
Ling Yuan, now at Maxygen in Redwood City, Calif., and his colleagues Marc T. Facciotti of the University of California, Berkeley and Paul B. Bertain of Calgene report their findings in the June NATURE BIOTECHNOLOGY. The researchers built upon earlier work by another Calgene group led by Jean C. Kridl. From a tropical plant called mangosteen, whose seeds contain large amounts of stearic acid, she and her coworkers isolated an enzyme that helps make the fatty acid.

Inserting the gene for this enzyme, one of a family known as thioesterases, into canola boosted stearic acid production. "But it wasn't that high," says Yuan.

His group then created mutant genes and tested which of their enzymes were most active in making stearic acid. They found several with a "dramatic increase in activity," says Yuan. Canola plants into which the team had introduced the best of these genes produce oil with almost 40 percent stearic acid.

The enzymes allow stearic acid to accumulate in the plant by interrupting the biosynthesis of oleic acid, which makes up most of the fat in commercial canola oil. Oleic acid, a monounsaturated fat, consists of an 18-carbon chain containing one double bond. Stearic acid also has 18 carbons but no double bonds.

During the biosynthesis of these two fatty acids, a protein supports the growing carbon chain as various thioesterases lengthen it. When the chain reaches 18 atoms, an enzyme called desaturase puts in the double bond to form oleic acid (SN: 5/31/97, p. 335). However, the thioesterase derived from mangosteen releases stearic acid before desaturase can turn it into oleic acid, explains Yuan.



Canola Information Service

New technology turns canola plants into factories for a saturated fat used in margarine, chocolate, and baked goods.

"The technology is terrific," says John Shanklin, a lipid biochemist at Brookhaven National Laboratory in Upton, N.Y. "It not only works in the test tube, but it works in the plant, and that's an important step.

"The new paradigm is to figure out the activity you want, create an enzyme, and then put that in the plant," he says. "You're not constrained by the availability of enzymes in nature."

The engineered canola will need further development before becoming a salable product. "In order to achieve really useful varieties, it requires a breeder to do classical genetic breeding," says Yuan. "What we do is just the beginning." —*C. Wu*

Powdered platinum sheds all resistance

At temperatures near absolute zero, most metals become superconductors—substances that offer no resistance to electric current. However, a handful of metals has refused to transform into superconductors, no matter how cold researchers make them. Ironically, these holdouts include elements that rank among the best conductors at ordinary temperatures, such as gold, silver, copper, and platinum.

Investigators in Germany now report finally observing superconductivity in platinum—when they weren't looking for it. Their unexpected success came about because they happened to be experimenting with platinum in powdered form. Their aim was to explore how platinum's magnetic properties might assist in the cooling of liquid helium.

"Beginning these magnetic measurements, we just found this superconductivity," says Thomas Herrmannsdörfer. He, Reinhard König, and Alexander Schindler, all of the University of Bayreuth, report their discovery in the May 31 PHYSICAL REVIEW LETTERS.

The finding "is important because it leads to further understanding of superconductivity in general and of the relationship between superconductivity and magnetism," comments M. Brian Maple of the University of California, San Diego.

In previous attempts to make platinum superconduct, researchers simply cooled the metal to the lowest possible temperatures. In 1997, Herrmannsdörfer and other colleagues failed to spur superconductivity even when they chilled solid pieces of platinum to approximately 1.5 microkelvins.

By contrast, cylindrical blocks of compressed powder began superconducting at roughly 1,000 times that temperature. Because the latter temperature is still close to absolute zero, platinum has little appeal as a commercial superconductor, the scientists say.

The Bayreuth team is now testing other powdered metals. Powdered silver cooled to 100 microkelvins has shown no switch to superconductivity. The group also plans to test platinum powder pressed into thin films and wires.

"We have ideas how this [transformation] can occur in powder while not in bulk platinum," Herrmannsdörfer says. Even the purest platinum contains a smattering of impurities such as iron, he notes. Scientists have long suspected that magnetic interactions among such atoms might prevent superconductivity. Pulverizing the metal may break up those interactions, Herrmannsdörfer speculates.

Conversion to a powder might also increase the number of vibration modes in the metal's crystal lattice, he says. In other materials, vibrations are known to facilitate superconductivity. Because the ratio of surface area to volume soars when materials are powdered, surface vibrations absent in the bulk metal become abundant in the powder, the Bayreuth researchers suggest.

Finally, the most tantalizing but least likely explanation for the superconductivity, according to Herrmannsdörfer, is that magnetically enhanced electron pairing is taking place (SN: 6/7/97, p. 351). If so, the new finding could shed light on a mechanism that researchers suspect occurs in cuprates, materials of enormous scientific and commercial interest that superconduct electricity at temperatures up to 133 kelvins (SN: 8/15/98, p. 111).

Although the evidence so far favors the less provocative reasons for superconductivity in platinum powder, "it doesn't rule out the possibility there is something more exotic happening," Maple says. —*P. Weiss*