Biotechnology

Ingrid Wickelgren reports from Ithaca, N.Y., at the Boyce Thompson Institute for Plant Research workshop on genetically engineered plants

New genes for complete-protein beans

Legumes and grains provide plenty of protein for a healthy meal, but neither alone provides a complete set of the amino acids humans (and all single-stomached animals) need to build and repair their tissues. Beans are low in the sulfur-containing amino acids methionine and cysteine; grains are low in lysine.

But genetic engineering could change that. For the first time, scientists have genetically manipulated a plant to increase its content of the essential amino acid methionine. The work was done in tobacco plants; now other scientists are seeking to develop a technique to insert the gene into legumes such as soybeans. Transgenic methionine-enriched soybeans should be available to consumers within two to three years, predicts plant molecular biologist Samuel Sun of the University of Hawaii in Honolulu, who developed the new tobacco plant with co-workers at the Plant Cell Research Institute in Dublin, Calif.

High-methionine beans would help prevent nutritional deficiencies in regions of the world where people depend on a single crop as their protein source. And in the United States, such legumes would prevent the need to supplement poultry and pig soybean feed with synthetic methionine, Sun says.

To create methionine-rich tobacco plants, Sun and his associates inserted into tobacco seeds a Brazil-nut gene coding for a protein high in methionine. The seeds grew into plants with 30 percent more methionine than control tobacco plants. The transgenic tobacco plants looked normal and contained normal amounts of other tobacco-plant proteins, Sun says.

In the 1960s, conventional breeding attempts to add lysine to corn and barley altered several proteins and resulted in textural and yield problems. Sun's genetic manipulation is more precise and less likely to result in such undesirable effects, he told SCIENCE NEWS.

Pesticidal plants face legal hurdle

As scientists prepare genetically altered plants for commercial sales, federal policymakers are planning a difficult regulatory obstacle for plants genetically engineered to kill viral or insect pests. The Environmental Protection Agency has proposed considering a pesticidal product produced by a plant gene to be a chemical pesticide, subject to the exposure tolerance and registration requirements under the pesticide law, says Fred S. Betz of EPA's Office of Pesticide Programs.

Before EPA proposed the new rule, the only regulatory certainty regarding pesticide-producing transgenic plants was that the U.S. Department of Agriculture has jurisdiction over small-scale field trials, says Robert B. Nicholas, a Washington, D.C.-based attorney. No large-scale trials have yet been conducted with pesticidal plants, Betz says.

Under the new rule, genetically engineered plants would be treated differently from similar, traditionally bred plants, which do not have to go through the pesticide review process. The engineered varieties also would undergo more legal scrutiny than biological pest-control agents, whose approval process typically takes one to two years and costs less than $500,000. This contrasts with the five to 10 years and $10 million to $50 million required for approval of chemical pesticides, Nicholas says.

In its new delivery system, the *Bacillus thuringiensis* toxin gene — the insect-killing molecule most frequently inserted into plants — may have to be partially reevaluated as a chemical pesticide despite the toxin's long history of use in its natural form — from bacteria — as a biological pest-control agent, Nicholas told SCIENCE NEWS.

An EPA working group must now draft the specifics of the proposed regulation before it can become official policy, Betz says.

Food Science

What's that wiggling in my sushi?

Physicians diagnosed appendicitis in a 24-year-old college student with severe abdominal pain. But nothing looked unusual during surgery — until the surgeon spied a 1.5-inch, bright red worm with a slit-like mouth crawling onto the surgical drape near the patient's incision. With his inadvertent ingestion of this curlicue worm — from the genus *Eustrongylides* — the student joined the small but rapidly growing ranks of Americans who consume live parasites in raw fish delicacies such as sushi and sashimi.

This case, reported in the April 27 NEW ENGLAND JOURNAL OF MEDICINE, should remind both patients and physicians of the dangers of eating unprocessed fish, write Murray Wittner of the Albert Einstein College of Medicine in New York City and his colleagues. Though the patient recovered, such worms can perforate intestinal linings and cause life-threatening infections.

Happily, adds Peter M. Schantz of the Centers for Disease Control in Atlanta, most parasitic worms "are coughed up or regurgitated within hours of ingestion, producing astonishment but no disease." To ensure the safety of raw fish, he says, it should be frozen for at least five days at -20°C (-4°F). That temperature kills all relevant parasitic worms so far tested.

Sounding out worms in fish

Fish fans may find fewer squirmy surprises in their fillets if acoustical diagnosis gains widespread use. In the March/April JOURNAL OF FOOD SCIENCE, a team of scientists from the United States, Britain and Iceland reports that 10-megahertz ultrasound scanning is almost seven times better than the eye at finding worms in fresh fish.

These researchers focused on sealworms (*Phocanema decipiens*), 0.02-inch-long nematode larvae commonly found in the flesh of cod and other ground-feeding North Atlantic species. Canada and Iceland together spend an estimated $62 million annually to rid their fish of these worms. But visual inspection — the normal technique — can miss larvae embedded more than 0.2 inch deep, so 25 percent of the worms may go undetected. In contrast, the best-performing ultrasound technology detected larvae embedded 1.4 inches deep in fresh fish and 0.8 inch deep in fish that had been frozen and then thawed, says Syed Rizvi, who participated in the investigation at Cornell University in Ithaca, N.Y.

Warning: If you eat Great Lakes fish . . .

Weekly consumers of Great Lakes sport fish — primarily lake and brown trout, coho, chinook and king salmon — may face "high" excess cancer risks from chemical contaminants, even when contaminant levels in the fish are only one-fifth those triggering state health warnings, according to researchers with the National Wildlife Federation and the Environmental Protection Agency.

When states issue health warnings on fish, they base them on Food and Drug Administration action levels. Designed to indicate the maximum contaminant level allowed in commercially marketed foods, the FDA levels — set in the 1960s and '70s — were never based on cancer risk assessments, notes National Wildlife Federation scientist Jeffery A. Foran of Ann Arbor, Mich. Instead, FDA's action levels were based largely on a cost-benefit analysis, on background levels of contamination and on existing detection limits for the tainting chemicals. In the March AMERICAN JOURNAL OF PUBLIC HEALTH, Foran and his co-workers compute cancer risk assessments for two pesticides — DDT and dieldrin — that have periodically spurred state warnings to fish consumers. The new risk data, Foran says, show that FDA action levels used to trigger state warnings "clearly do not protect human health."