Food Science

Rotting potatoes harbor harmful toxins

Shriveled brown spots on potatoes may indicate deadly trichothecene toxins. A new study suggests that potentially harmful levels of the poisons may occur in potatoes infected with a major fungal perpetrator of potato dry-rot, says coauthor Anne E. Desjardins, a biochemist at USDA's Agricultural Research Service in Peoria, Ill.

If a careful survey of store-bought potatoes confirms these preliminary findings, the safety of infected potatoes "may be something to think about," Desjardins says. However, she emphasizes that it is unclear how much harm the toxin levels found in the study would cause in humans.

"There's routine screening for toxins in corn and wheat . . . but potato farmers have never really thought about it," Desjardins says. She and co-worker Ronald D. Plattner were the first to show that strains of *Fusarium sambucinum* fungi from around the world can produce trichothecenes in potatoes. One previous study demonstrated that store-bought potatoes in France contain potentially dangerous levels of these toxins, but there have been no studies of toxin levels in naturally infected potatoes elsewhere, Desjardins says.

Trichothecene toxins take their toll on fast-growing cells, such as blood, by blocking protein synthesis. Even at low levels, they can cause symptoms in humans ranging from vomiting and hair loss to immunosuppression, central nervous system dysfunction, coma and death, Desjardins says.

Desjardins and Plattner infected potatoes with 15 fungal strains isolated from diseased potato tubers in North America, Australia, Europe and Asia. They found that 14 of the strains produced trichothecene toxins in inoculated tubers, indicating that the toxin production is very common among these fungi, Desjardins told SCIENCE NEWS.

"And the levels are quite high," she says. They found up to 5 micrograms of toxin per gram of fresh-weight potato tissue, a concentration higher than that allowed in Canadian grain for export and higher than that known to cause adverse effects in animals, she says. Because Desjardins and Plattner incubated their experimentally infected potatoes for only six days, in contrast to the months potatoes typically sit in bags, "we're [probably] only looking at the tip of the iceberg," she says. However, the levels in experimentally inoculated potatoes may be different from those in naturally infected potatoes, warns USDA organic chemist Odette L. Shotwell, also in Peoria.

Even apparently disease-free parts of infected potatoes contained the fungal toxin, at levels about 10 percent of those in the diseased portions. So removing rotted parts won't remove all of the toxin, says Desjardins. And since trichothecenes are heat stable, "it seems unlikely that [they] would be destroyed by the usual procedures to prepare potatoes for human consumption," the researchers write in the March/April JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY.

Researchers make low-cholesterol milk

In a few years, markets may carry nearly cholesterol-free but otherwise fatty milk if the yields recently achieved in the laboratory can be reproduced on a large scale. Refining a well-known technique called supercritical fluid extraction, U.S. researchers have produced 90-percent-cholesterol-free, 2-percent-fat milk with a recovery of about 85 percent, a level matched by only one other group, says study leader Syed S.H. Rizvi, a Cornell University food engineer.

To remove the cholesterol, the researchers first separate milk fat from the rest of the milk in a centrifuge. High-pressure carbon dioxide forced through the fat causes it to separate into cholesterol-poor and cholesterol-rich fractions. The low-cholesterol fraction is then put back into the milk, which can be used in such products as butter, ice cream, cheese and yogurt.

Oncology

Kathy A. Fackelmann reports from Irvine, Calif., at the American Cancer Society's 31st Science Writers' Seminar

Easing the sting of chemotherapy

Many patients come to dread chemotherapy so much that they vomit the night before treatment or in the waiting room, says Thomas G. Burish, a clinical psychologist at Vanderbilt University in Nashville, Tenn. While doctors can't erase side effects linked to the toxic properties of the drugs, psychological and educational techniques do seem to mitigate anticipatory illness, he reports.

Burish and his colleagues divided 60 just-diagnosed cancer patients into four groups. They gave the first group an educational program in which patients toured the oncology unit and had a chance to ask questions before their first chemotherapy session. The second group received behavioral training in which they learned a series of muscle tensing and relaxing exercises. In addition, these patients were taught to think about pleasant memories during chemotherapy infusion. A third group received both interventions, and a fourth group got no special training.

Compared with control patients, people who received some sort of training — whether educational, behavioral or both — reported fewer nausea and vomiting episodes and less depression and anxiety, Burish reports. Patients who got both educational and behavioral training did the best of all.

Vincent T. DeVita Jr., physician-in-chief at Memorial Sloan-Kettering Cancer Center in New York City, says the findings are significant because cancer patients often are reluctant to undergo full-dose chemotherapy. Programs such as Vanderbilt's might encourage people to stick with the recommended dosage, thereby improving their survival chances, he says.

Cancer-fighting tobacco plants?

Genetic engineering may turn ordinary tobacco plants into temporary "mini-factories" capable of producing anticancer drugs and other products.

Researchers at Biosource Genetics Corp. of Vacaville, Calif., have developed a virus-like vector system in which they spray tobacco plants with a solution or powder containing recombinant RNA molecules packaged in a protein coating. In laboratory tests, they report, the vector enters the tobacco plant through a cut in the leaf, where it begins to direct production of a specific protein such as the anticancer drugs interleukin-2 or interferon. In addition, scientists hope to get the tobacco plant to make serum albumin, a blood protein used in transfusions.

Conventional genetic engineers aim at producing a stable plant with foreign genes permanently inserted into the host plant's chromosomes. These new genes can be passed down from generation to generation. But Biosource has developed a transient system by using an RNA-based vector that does not get inserted into the plant's DNA. The vector remains in the cell's cytoplasm, where it directs protein production for a few days to a few weeks and then is broken down by the plant.

"There is no investment required by seed developers to stabilize the new genetic traits and breed them into commercially competitive varieties," says Robert L. Erwin, president of the firm. "The farmer's normal, commodity tobacco crop can be changed into a specialty crop for noncigarette use simply by applying the transient gene expression system in much the same way that an agricultural chemical might be applied."

Biosource has tested the system on laboratory-grown tobacco plants and plans to field-test its method in about a year. The private firm must get its system past regulatory hurdles posed by the Environmental Protection Agency and U.S. Department of Agriculture before marketing the product to tobacco farmers interested in transforming their fields. Erwin says he envisions tobacco farmers spraying the vector system on their crop, harvesting the leaves and then selling them to a drug-manufacturing firm that would extract the protein.