

New moves to limit EDB in food

Environmental Protection Agency (EPA) Administrator William Ruckelshaus announced emergency actions last week to expedite the removal of ethylene dibromide (EDB) from the U.S. diet. Effective immediately, this potent carcinogen may not be used to fumigate stored grain or grain-milling machinery. EPA has also established guidelines for allowable EDB levels in food: 900 parts per billion (ppb) in raw grains, 150 ppb in processed foods that require further cooking and 30 ppb in ready-to-eat grain-based foods. Based on 3,000 food samples analyzed thus far, 1 percent of grain-based processed foods (except those made from corn, where the figure is closer to 7 percent), may contain this pesticide at levels exceeding the guidelines.

These EDB limits for food are only voluntary at present because a 1956 federal law exempts grains from having to meet any EDB-content limit. Back in the 1950s, Ruckelshaus explains, the prevailing wisdom—now shown to be incorrect—held that EDB “volatilized shortly after use,” disappearing from grain. Although EPA has initiated procedures to revoke the 1956 exemption, the move may be appealed. If it is, it could take six months or more to make EDB limits in food become law. State governments may set their own EDB limits for food, however, and in fact have been encouraged to do so—preferably using the new EPA guidelines, Ruckelshaus told reporters on Feb. 3.

There have been no recommendations for destroying grain contaminated with EDB, Ruckelshaus says, because processes exist to promote the chemical's removal—through volatilization—from affected grains. Expected within a matter of weeks are related rules to cover EDB fumigation of citrus and tropical fruits. EDB levels as high as 1,000 ppb have been found in fruit imported from Italy and Mexico.

Illegal alcohol fuels

Since the Arab oil embargo, researchers have sought ways to extend fossil-fuel supplies by mixing alcohol—a renewable energy resource—with gasoline and other transportation fuels. Consumers have usually paid a premium of several cents a gallon to use these politically and environmentally motivated alternatives. So it may come as some surprise to learn the Environmental Protection Agency has just announced its intent to prosecute 17 gasoline distributors for at least 55 counts of selling unleaded gasoline mixed with alcohol.

EPA currently allows the mixing of 10 percent (by volume) ethanol or 0.3 percent methanol with unleaded gasoline. But agency investigators identified adulterated fuels containing as much as 15 percent ethanol or 12.5 percent methanol in 43 Detroit-area service stations. Related investigations are underway in Ohio and California. Profit motivates this illegal adulteration, according to EPA assistant administrator Joseph Cannon; these alcohols cost less than the fuel they replace.

EPA is concerned about this unauthorized alcohol blending for two reasons. First, “these fuels are likely to increase emissions and, if allowed to continue, could undermine the work that has been done to control pollution from automotive sources,” explains Cannon. Second, these fuels can damage vehicles—causing carburetor parts to fail and accelerator pumps to swell or crack—unless certain co-solvents have been added to protect the polyelastomers and synthetic rubbers used in many cars. EPA must approve the use of all substances added to unleaded gasoline. And before it grants any approval, EPA requires that test data prove that fuels containing the additive are no more damaging to cars or polluting to the environment than regulations permit.

Because there have already been complaints of automotive damage attributable to illegal alcohol/fuel mixing, EPA says that “in the settlement of these cases, [it] will seek a remedy for any consumer whose car may have been damaged.”

Inspiring a mathematical computer

A \$100,000 prize awaits anyone who can design a computer program capable of making a significant mathematical discovery. This recently announced prize will be awarded “for a mathematical work of distinction in which some of the pivotal ideas have been found automatically by a computer program in which they were not initially implicit,” according to a statement from a committee of mathematicians and computer scientists who are defining the rules for the competition.

Woodrow W. Bledsoe of the University of Texas in Austin, chairman of the rules-making committee, hopes that this prize will stimulate the use of computers in mathematical research. Generally, mathematicians have been reluctant to use computers in their work, he says. “We haven't seen much in terms of the computer proving theorems and making conjectures,” says Bledsoe. “Who knows where it will lead before we're through, as mathematicians really begin to use computers.”

One difficulty that the rules committee faces is to ensure that any candidate computer program that comes up with an original theorem and proof does so without “coaching” from its programmer. On its own, the computer program must discover a theorem that other mathematicians agree is a major new result.

The committee is also exploring the idea of an additional prize for a computer program that can take a tough mathematics examination and do better than its human competitors. Although this scheme would provide a criterion that is easier to judge than in the case of a mathematical discovery, difficulties still remain concerning the form in which the problems are presented to the computer. Bledsoe says, “We don't want any solving of the problems during the translation process.”

Currently, various research groups throughout the world are developing programs for “automated theorem-proving.” Bledsoe notes that in a few specific fields, these computer programs have proven fairly hard theorems, but their performance so far still lags far behind human capabilities. Douglas B. Lenat of Stanford University in Stanford, Calif., has taken a broader approach in his AM (for “automated mathematics”) program. This computer program can formulate new mathematical ideas, under certain well-defined conditions, from about 100 elementary concepts in a branch of mathematics called set theory, and then explore these ideas in depth.

Another promising computer program that appears to mimic some of the reasoning skills of the human mind is AURA, short for “automated reasoning assistant,” developed at the Argonne National Laboratory in Illinois. This general-purpose-reasoning program behaves a little like a scientist's “intelligent colleague” and can be used to design electronic circuits, detect flaws in other computer programs and solve previously unsolved problems in advanced mathematics. A program named BACON, developed by Herbert A. Simon and Patrick Langley of Carnegie-Mellon University (CMU) in Pittsburgh, can generate conjectures from patterns and relationships it discovers within data presented to it. This program has already rediscovered a variety of physical laws, including Kepler's laws of planetary motion and Snell's law for the refraction of light.

Nevertheless, CMU's Raj Reddy says, “Our belief is that no one is close to winning the prize now. It will probably be 10 or 20 years before anyone comes close.” By that time, accumulated interest may more than double the prize's value. The prize was donated by the Fredkin Foundation, an organization based in Cambridge, Mass., and established by Edward Fredkin, a professor at the Massachusetts Institute of Technology. The Fredkin Foundation has a similar \$100,000 prize for the first computer chess program to become the world chess champion. Recently, \$5,000 was awarded to Kenneth Thompson and Joseph Condon of AT&T Bell Laboratories for Belle, the first computer system to achieve a Master chess rating in tournament play (SN: 10/8/83, p. 236), one step on the way to the world championship.