EPA plans to ban carcinogen daminozide

Lifetime exposure to an agricultural chemical used widely on apples, peanuts and other produce could cause cancer in a large number of humans, the Environmental Protection Agency (EPA) said last week. As a result, the agency will seek to ban daminozide.

The chemical's manufacturer disputes EPA's characterization of daminozide as a carcinogen, however. In a statement issued Aug. 28 by Uniroyal, Inc., sole producer of the chemical, the firm said it "does not believe daminozide poses any health hazard to humans or the environment." The company intends to fight the proposed ban by challenging the federal regulatory agency's interpretation of the animal toxicology data on which any such ban would be based.

As a plant-growth regulator, daminozide (known under the trade names Alar, Kylar and B-Nine) is used primarily to delay ripening and the premature dropping of fruit from plants. In the case of apples, where 75 percent of the chemical is now used, this allows fruit to attain better color and a firmer texture.

The advantage to growers is that an entire orchard can be harvested just once instead of periodically over six weeks as individual fruits ripen. For marketers, it offers more uniformly shaped and colored fruit, and can extend the usual six- to eight-month shelf life of apples to about a year.

Though several toxicology tests in the 1970s showed that the chemical—and its primary breakdown product, UDMH (1,1-dimethylhydrazine) — could cause several different cancers in rats and mice, these studies never triggered a challenge of the chemical's status. What prompted EPA to move now, says Paul Lapsley, head of the agency's special-review branch, was receipt of new data from Uniroyal earlier this year.

These included residue data showing that daminozide is present "at significant levels" in both fresh produce and processed foods, Lapsley says, and evidence demonstrating for the first time "that daminozide was converting to UDMH in the human body." According to a toxicology study conducted in 1973, UDMH is probably 1,000 times more carcinogenic than the parent compound, Lapsley says. Washing removes neither contaminant.

Based on the average residues found in foods to which the chemical is routinely applied, and on the proportion of the average American diet that these foods comprise, EPA estimates that a 70-year exposure might yield a 1 in 1,000 risk of contracting cancer—roughly the same order of magnitude, Lapsley says, as the risk his agency came up with for ethylene dibromide (EDB), banned last year (SN: 3/10/84, p. 151). The data, Lapsley says, suggest that only long-term exposures would represent a substantial hazard to health.

Moreover, he notes that his agency's estimates represent only ballpark figures. "For example," he says, "we assumed that all commodities [on which the chemical is sometimes used] were treated with daminozide — when in fact we know they aren't." For instance, though all apples in the food chain were assumed to be treated, only about 25 percent of them are, according to EPA (although among those sold as fresh, an estimated 38 percent are treated).

Uniroyal, however, sees EPA's concern as premature. "In its own press release EPA says there is no immediate cause for concern," notes Renée Potosky, manager of public relations, in New York City, for Uniroyal's chemical group. Therefore, she says, "we feel it would be an overreaction to pull the registration of the product until new tests can definitively determine the safety of daminozide."

Three tests serve as the toxicological basis for EPA's concern over daminozide. One, a 1977 study commissioned by the National Cancer Institute (NCI), found that daminozide triggered uterine cancers in female rats, liver tumors in male mice and lung tumors in male and female mice. The other studies were performed at the University of Nebraska's Eppley Institute for Research in Cancer and Allied Diseases in Omaha. In a 1973 experiment in which UDMH was supplied in drinking water, mice developed cancers of the lung, kidney, liver and blood vessels. A 1977 follow-up using daminozide in water showed the rare blood-vessel tumors in both sexes of mice, lung tumors in both sexes, and kidney and liver tumors in males.

Although Potosky says Uniroyal questions the statistical significance of the NCI findings, Lapsley says EPA does not. More important are their respective differences over the Eppley daminozide study. Potosky reports that an independent toxicologist hired by Uniroyal found it sufficiently flawed to "render it highly unreliable as an indicator of oncogenic [cancer] findings." Lapsley acknowledges that there were record-keeping deficiencies related to the Eppley studies. Still, he points out, two agency audits of the work concluded "that [the studies] clearly resulted in statistically significant oncogenic responses." He said the audits also concluded that these studies "would support our regulatory position."

Uniroyal has commissioned its own, "definitive" daminozide study. Meanwhile, an advisory panel will review EPA's proposal later this month. With its approval, EPA could formally propose its daminozide ban by Oct. 31. —*J. Raloff*

Writing on magnetic walls

Magnetic bubbles are a technological suggestion that has "come and gone and come again," to use the words of one observer. Magnetic bubbles are regions of a magnetic substance in which the atoms are all magnetized in the same direction. About 15 years ago there was a certain enthusiasm about using magnetic bubbles as the basis for computer memories: Information could be recorded by manipulating the directions of the bubbles' magnetization. But before it really took off, bubble technology was surpassed by other techniques. Now bubbles—or rather the walls between them — are back as a suggested technology for memories that are denser than any now used and quicker to search for some wanted piece of information.

In a talk at last week's International Conference on Magnetism '85, held in San Francisco, Floyd B. Humphrey of Carnegie-Mellon University in Pittsburgh proposes using characteristics of the walls between bubbles as memory units. Between two bubbles that are magnetized in opposite directions there has to be a wall, a narrow stretch, in which the direction of magnetization gradually turns over. These are called Bloch walls or Néel walls, depending on the plane in which the rotation of magnetic direction takes place. For example, in a very thin film of iron garnet or gadolinium iron garnet doped with some rare earth element, two adjacent bubbles will have their magnetizations in opposite directions in the plane of the film. If there is a Bloch wall between them, the direction of magnetization in the wall rises up out of the plane of the film, becomes vertical, then gradually descends until it is back in the plane of the film but 180° from the direction it originally pointed.

Bloch walls can be left-handed or right-handed depending on how the magnetic direction twists. Manipulating the walls with external magnetic fields can produce complicated twists. Among them are tiny regions in which the magnetism points vertically. These are known as vertical Bloch lines, or VBLs. Taken singly, VBLs are unstable, but if they are made in pairs of the same handedness — which means that the magnetic direction in the wall twists through 360° between them — such pairs are stable. "These pairs have been proposed as the most dense computer memory yet," Humphrey says.

To make such a memory the magnetic bubbles are stretched from the more or less circular configuration they ordinarily have into very elongated strips. The writing device uses electromagnetics to snip off the end of a strip, making a tiny bubble with a pair of VBLs in its wall. Because the information is coded in the VBLs, not in the bubbles themselves, the bubbles can be very tiny and the VBL pairs very close together. An array of such snippers, each snipping sequentially, piece after piece from long magnetic bubble strips, writes the memory. The device has been experimentally tried, and it works, Humphrey says. For example, with a pair width of 0.2 microns and a strip 1 centimeter long one could write 50,000 bits per strip. According to the experimenters, the limit of information density seems to be about 10 billion bits per square centimeter.

The little bubbles that are made can be arranged, bubble in, bubble out, in logical patterns, to perform the logical operations of a computer, such as OR and AND.

In addition, this kind of memory is easily addressable and quick to read out. Time to search the memory for information is a serious limitation on all kinds of computers. For instance, Humphrey says, when you stick your card into a sidewalk teller machine, it will say, "Please wait, your request is being processed." It's not that hundreds of other people are trying to use the system at the same time—at midnight you may be the only one using it—but that it needs the time to search its memory for your file. A VBL memory should yield in about two-thousandths of a second the information it now takes 10 seconds to find. *—D.E. Thomsen*

False start at TMI

It was a busy week of ups and downs for those engaged in the debate over whether the Harrisburg, Pa.-based General Public Utilities (GPU) Nuclear Corp. should be allowed to restart the undamaged nuclear reactor (Unit 1) at Three Mile Island (Pa.). The unit has been closed since 1979, when its twin unit was the site of the worst commercial nuclear accident in history.

On Aug. 27, a federal appeals panel in Philadelphia issued a 2-1 decision rejecting claims that the Nuclear Regulatory Commission (NRC) had approved the restart without sufficiently investigating GPU for allegedly falsifying safety records in the months prior to the 1979 accident. This decision was thought by NRC and GPU to effectively permit reopening of the plant, according to GPU spokesperson Gordon Tomb. But apparently just a few minutes before GPU flipped the switch on Aug. 29, the court issued an order saying the Aug. 27 decision hadn't reversed a June 7 order blocking the restart. That order will be in effect pending appeals on the Aug. 27 ruling, according to a spokesperson in the Third District Court.

"We were expecting a final go-ahead for 4:00 p.m. on Thursday [Aug. 29] when we got word of a court order preventing the operation of the plant," says Tomb. Unit 1, he adds, has been "on hot, standby condition using non-nuclear heat since June 8 at the cost of $40,000 a day for fuel oil and electricity." He declined to estimate how much that was costing consumers. □

Syncom 3: Dropping the first shoe

Demonstration of the space shuttle's capability as a satellite service truck has been a gradual affair, even if the reason has been in part that many satellites are out of reach of the shuttle's low-altitude orbits. Yet the work carried out on the Syncom 3 communications satellite during the just-completed mission of the shuttlecraft Discovery (though the payoff will not be known until late next month) is a major step in that direction.


Wide World

Van Hoften (right), Fisher and Syncom 3.

Even back when the shuttle was just a gleam in its designers' eyes, NASA scientists hoped that one of its roles would be to facilitate the repair, in orbit, of multimillion-dollar satellites that sometimes succumb to ills as trivial as blown fuses. In 1972, with the shuttle's first space flight still many years away, NASA began working on plans for a family of modular satellites with interchangeable parts, conceived specifically to take advantage of such fix-it potential.

Things drag on, however, and when the first shuttlecraft finally saw space in 1981, only one of the modular satellites, called the Solar Maximum Mission or Solar Max, had even been launched. But almost as though the fix-it-in-space lobby had been writing the script, Solar Max was already suffering from blown fuses, and in a dramatic mission in April of 1984, a crew of shuttle astronauts fixed it (SN: 4/21/84, p. 245). And again as if looking to the future, the team replaced not only an easily swapped module designed for the purpose, but also a key component that had been built with no such convenience in mind.

Syncom 3 is like that, but if it had been successfully rocketed up to its lofty duty station from the altitude at which the shuttle deployed it barely four months ago, any repairs at all would have been out of reach. Syncom 3's problem was that it never got there. Its built-in rocket motor never fired, and an apparently successful attempt to move an unthrown lever by means of the shuttle's remote-control arm still proved to no avail (SN: 4/27/85, p. 261). But thinking about the effect on future satellite costs of collecting on the $85 million device's insurance, its builder, Hughes Communications in Los Angeles, commissioned NASA for about $8 million to make one more try.

As Discovery's crew approached Syncom 3 last week, they thus faced a device armed with a fully fueled rocket that had failed to fire for reasons that could only be guessed at. Astronaut James van Hoften (whose one previous space mission had been spacewalking through the repair of Solar Max) rode out on the shuttle's arm, seized the satellite by hand and handed it over to colleague William Fisher. Fisher's first task was to "safe" the device, disconnecting and rerouting certain components so that the rocket would not fire unexpectedly even if it were somehow to have fixed itself (SN: 6/15/85, p. 377).

The only problem turned out to be with the arm, which astronaut John M. Lounge had to operate in a more time-consuming, "manual" fashion due to a malfunctioning computer in the arm's "elbow." The delay resulted in officials deciding to spread the spacewalk over into a second day. Indeed, the first day's jaunt set an "extra-vehicular activity" (EVA) record of 7 hours 8 minutes.

The next day's EVA (4 hours 20 minutes) consisted primarily of installing a device to allow the rocket to be fired on command from the ground. With the device in place, van Hoften gave Syncom 3 a series of shoves—again by hand—until mission control radioed him that the satellite was spinning at a stable two revolutions per minute. Elated NASA and Hughes officials reported that it seemed to be operating correctly, as it responded to ground commands that increased its spin to its planned 22 rpm.

But there is still another shoe to be dropped. Will the rocket fire? Hughes does not plan to try until about Oct. 29, by which time Syncom 3 should have reached its proper position and, the company hopes, its propellant will have thawed out from four untended months in the cold of space. Preliminary indications were that no fuel lines had ruptured and that the thawing was proceeding, though the long chill could turn out to have had other consequences. (Cold-ruptured fuel lines were also a concern when another spacecraft, ICE, had to spend half an hour out of sunlight in the moon's shadow on the way to its upcoming rendezvous with Comet Giacobini-Zinner, but ICE survived [SN: 1/7/84, p. 6].)

Before servicing Syncom 3, Discovery's crew had already deployed three other communications satellites, including Australia's first, AUSSAT-1, and a fourth Syncom. Later, the mission ended with a smooth, predawn landing in the California desert. *— J. Eberhart*