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