

Congress releases air-toxics survey

Businesses spewed some 1.2 million tons of toxic pollutants into U.S. air during 1987, according to a preliminary Environmental Protection Agency inventory released last week by the House subcommittee on health and the environment. "The magnitude of this problem far exceeds our worst fears," says subcommittee chairman Henry A. Waxman (D-Calif.). These data, the first national compilation gathered under a new annual industry-reporting requirement that went into effect last July, cover 320 chemicals, including 60 listed as carcinogens by the National Toxicology Program.

The tallied pollutants include only those emitted in the basic manufacturing industries by firms employing at least 10 people. All businesses in the new survey create or process at least 75,000 pounds of a toxic chemical or use 10,000 pounds of a commercially available toxic chemical, such as solvents.

According to the survey, Texas leads the nation in toxic emissions, with about 115,000 tons. On the basis of toxic tonnage, none of the next seven states on the list — Louisiana, Tennessee, Virginia, Ohio, Michigan, Indiana and Illinois — had even 60 percent of Texas' total.

The 10 most common toxic pollutants (by volume) accounted for roughly 65 percent of the national total. They were, in order: toluene, ammonia, acetone, methanol, carbon disulfide, 1,1,1-trichloroethane, methyl ethyl ketone, xylene, dichloromethane and chlorine. Dichloromethane is a potent carcinogen. Toluene, methyl ethyl ketone and xylene are neurotoxins. "We have not looked into the legality of the releases [reported here], although eventually we will," says EPA's David Sarokin. However, "it's not unreasonable to suppose that most of the releases are legitimately permitted."

Chemical firms lead the list of U.S. polluters, emitting more than four times as many tons of chemicals as the next most polluting industries — metal smelters, paper producers and transportation equipment manufacturers. "In the past, EPA has opposed legislation that would tighten emissions from chemical plants because it regarded these emissions as relatively small," Waxman says. But the new data indicate this industry's releases are 10 times as high as figures reported to his subcommittee in 1985 — ones that he recalls were "widely criticized as inflated by industry spokesmen" at the time.

EPA reports air quality is improving

The healthiness of U.S. air — as measured by levels of respirable particulates, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead — generally improved between 1978 and 1987, according to an EPA analysis of air quality trends, issued last week. Despite these improvements, the study finds almost 41 percent of U.S. residents still live in areas exceeding acceptable levels of at least one of these six pollutants — the only ones for which EPA has set health-based ambient-air standards.

Lead levels dropped 88 percent over the 10 years, 19 percent in the last year alone. EPA attributes these dramatic decreases to the phasing out of lead in gasoline. Carbon monoxide fell 32 percent over the decade, 6 percent in the last year. Tom Curran in EPA's Office of Air Quality Planning and Standards credits much of the improvement to the federal motor-vehicle control program — which required carbon-monoxide-emissions-control devices on new cars — and improved traffic flow patterns in large cities. By the end of the 10-year period, he notes, cars — which produce about two-thirds of the nation's carbon monoxide — emitted 38 percent less carbon monoxide while driving 24 percent more miles. Smog ozone remains the most intractable problem. While ambient levels fell 16 percent over the decade, more than one-third of all people in the United States live in areas where ozone regularly exceeds acceptable levels.

Ingrid Wickelgren reports from New Orleans at the meeting of the Federation of American Societies for Experimental Biology

Water-soluble vitamin A shows promise

In the first animal tests of water-soluble forms of vitamin A, scientists found the compounds remarkably effective in curing vitamin A deficiency in rats. The compounds are less toxic to body tissues than vitamin A's usual fat-soluble form, retinol, and one of the compounds even appears safe for pregnant rats, report Arun B. Barua, Desiree B. Gunning and James A. Olson of Iowa State University in Ames.

The researchers say their new compounds could potentially prove useful in controlling wrinkling and acne in humans while avoiding the complications of retinoic acid derivatives, used in the acne medications tretinoin (Retin-A) and isotretinoin (Accutane). Tretinoin, also used experimentally as an anti-wrinkle cream, burns the skin and kills cells, and isotretinoin, a medication commonly used against severe acne, can cause birth defects if used by pregnant women.

All fat-soluble derivatives of vitamin A are toxic in large doses; water-soluble compounds are less so and thus might be administered more liberally. In addition, the water-soluble derivatives could help prevent vitamin A deficiency, which can lead to blindness, in people with genetic abnormalities or diseases that render them unable to absorb fats and fat-soluble vitamins, Barua says.

To make the water-soluble forms, Barua attached either glucose or glucuronic acid to vitamin A or its metabolite, retinoic acid. The glucose derivatives, when fed or injected into vitamin A-depleted rats, were readily absorbed and allowed the rats to develop just as well as a second group given a form of retinol, whereas a control group of rats died, Olson says.

The glucuronide derivatives, when given to 24 normal pregnant rats, allowed all to produce 8 to 18 normal pups. All fetuses from pregnant rats given comparable doses of retinoic acid died. The reason the glucuronide did not produce adverse effects, Gunning suggests, is that the water-soluble compound probably does not cross the placenta.

Belief in boron: An element of strength

Students should no longer be taught that boron is essential only for plants, says Forrest H. Nielsen of the Department of Agriculture's Grand Forks (N.D.) Human Nutrition Research Center, who has pioneered human studies of boron deficiency. Nielsen's newest work shows the element is vital to calcium metabolism in both men and women, and so may help prevent osteoporosis.

Boron deficiency could help explain why Americans display among the highest rates of osteoporosis in the world, despite consuming large quantities of calcium-rich dairy products, Nielsen says. "Maybe the reason is that we don't eat a lot of plants," he suggests. Good sources of boron are legumes, leafy vegetables and fruits, especially apples, pears and grapes.

For 63 days, Nielsen fed a low-boron diet (less than 0.32 milligram per day) to five men, five postmenopausal women on bone-preserving estrogen therapy and four postmenopausal women not on estrogen. For the next 49 days, the group ate the same diet but supplemented it with 3 milligrams per day of boron in the form of sodium borate. Nielsen designed the diet to be low in magnesium because boron's effects are more marked with magnesium deficiency.

Boron deprivation decreased blood levels of active calcium and other hormones and chemicals that influence bone metabolism. Boron supplements improved these variables as well as improving copper status. Copper is important in maintaining a healthy cardiovascular system, Nielsen says.

Safe and adequate daily boron doses range from 1 to 3 milligrams, and are easily obtained in a balanced diet, Nielsen says. He warns that taking too much boron in the form of supplements can be dangerous.