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Trace Pollutants: The Hidden Villains

After 30 years of study, a pioneer scientist is convinced that cadmium and lead are the biggest threats to the public

by Joan Arehart-Treichel

Not far from the lush Green Mountains of Vermont, a white-haired, ruddy-cheeked scientist works quietly on a challenge that has obsessed him for 30 years. The challenge is determining which elements, in trace amounts, have potential for hurting people. Henry A. Schroeder, professor of physiology emeritus of Dartmouth Medical School, is unequivocally the nation's authority on the subject.

Schroeder is headquartered in Brattleboro, Vt., where he and his staff operate a trace-element laboratory. During the past several decades Schroeder has exposed rats and mice to traces of various elements throughout their lifetime. The animals get trace elements with their food rather than by injection, so that their trace-element intake more closely approximates human intake. Although the animals ingest trace elements in somewhat larger quantities than those people absorb by eating or breathing, Schroeder still believes that his results shed light on the human situation.

Before deciding whether a trace element might hurt people, though, he considers not only the results of his animal tests but how prevalent a trace element is in the environment—both naturally and as a result of human pollution. A trace element that hurts experimental animals may or may not be widespread in air, food and water.

After studying over half of all the elements, Schroeder is convinced that the greater an element's natural abundance on earth, generally the less toxic it is in trace amounts. In fact, the more abundant elements are usually beneficial to animals and people at trace levels. Such elements include copper, cobalt, molybdenum, manganese, vanadium. So even if these elements are even more prevalent in the environment as a result of pollution, they are probably not hurting people and may even help them. Schroeder found that

life-long exposure to relatively large traces of chromium and vanadium did not hurt his animals; in contrast, these elements extended their lives and lowered the cholesterol in their blood.

Of all the elements Schroeder has tested, the light metal beryllium is the most toxic. When asked why, he replies, "It is the nature of the beast. I don't know." A worker who gets traces of beryllium in his lungs develops lung inflammation. Beryllium is known to have caused cancer in some persons. But Schroeder is not worried about beryllium hurting the general population because it is not a widespread pollutant. The only people who might be hurt by trace pollutants of beryllium are workers in the beryllium and coal industries and at Cape Kennedy, Fla., where beryllium escapes from rocket fuels.

Traces of antimony caused heart attacks in many of Schroeder's animals, but he does not think trace pollutants of this element threaten the general public. But typesetters, who are exposed to fumes of antimony, have an unusually high incidence of heart attacks.

Schroeder has preliminary evidence that traces of tungsten and barium, both heavy metals, reduce the life expectancy of his animals. Yet he does not believe that trace pollutants of tungsten, largely from steel industries, hurt the public. Nor does he consider barium a threat to the public, because barium is naturally present in the environment in large amounts and barium workers have not suffered any serious health problems.

Schroeder has obtained no ill effects in his animals by using several forms of mercury, including methyl mercury. He concludes that mercury may be dangerous to people in large amounts, but not in trace amounts, and the hoopla about mercury pollutants is



Schroeder: "Cadmium and lead are harming people right now."

largely "a myth." Other scientists, however, have obtained evidence to the contrary (see p. 34).

Nickel did not hurt Schroeder's animals. In fact, other investigators have evidence that nickel might help animals and people. But Schroeder worries about the effects of nickel carbonyl on the general population. This trace pollutant escapes from incompletely burned fuel oil. Nickel carbonyl has caused lung cancer in some workers.

The two trace elements Schroeder really worries about are lead and cadmium. These were his main concerns several years ago. They still are, particularly since other scientists have corroborated his evidence on them. Says Schroeder, "Lead and cadmium are hurting people right now, not because they are highly toxic, but because they are widespread trace pollutants."

Lead shortened the life-span of Schroeder's animals and gave them heart disease. Studies by other investigators have shown that people who live in cities have so much lead in their blood it inhibits important blood enzymes. Persons who live far from cities do not have this problem. Children are particularly susceptible to lead pollutants, not just because they nibble on lead paint off tenement house walls but because they are heavily exposed to lead from automobile exhaust. Dan Darrow, one of Schroeder's co-workers, went around dropping lollipops on streets, park benches, rooftops and in other places. He found that lollipops dropped on or close to the ground picked up more trace pollutants of lead than did lollipops dropped farther from the ground. A few months ago the Environmental Protection Agency reported that over a fourth of all American children have levels of lead in their bodies that border on toxicity.

Cadmium shortened the life of Schroeder's animals, gave them high

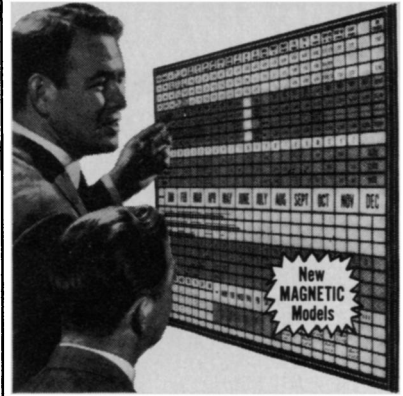
blood pressure and impaired some of their enzymes. There is evidence that trace pollutants of cadmium might cause, or at least enhance, high blood pressure in people. The Japanese have higher levels of cadmium in their environment than Americans do. They also have more cadmium in their blood. The leading cause of death in Japan is from cerebral hemorrhage, which is due to high blood pressure. Evidence culled from throughout the world suggests cadmium pollutants are widespread in air, water and food.

As Schroeder has brought the effects of trace elements on humans into ever-clearer perspective, and other researchers have further documented his findings, his greatest wish is that society does something about those trace pollutants that are hurting people. Yet only modest efforts have been made so far to reduce lead and cadmium.

Lead in gasoline is a prime source of lead pollution. Since 1971, the Environmental Protection Administration of New York City has required a progressive reduction of lead in gasoline. The requirement has worked to some degree. But several oil companies have brought suits that are stalling further reductions. The U.S. Environmental Protection Agency has ruled that after July 1974 at least one grade of lead-free gas must be available throughout the United States. Many automobiles, to meet the 1975 emission standards, will have to use lead-free gas.

A few cadmium industries have reduced their cadmium emissions under pressure of Government suits. Schroeder was a witness at several of the suits. In one, an industry that makes lipstick covers was dumping so much cadmium into the Hudson River the cadmium was ending up in fish, plants and muskrats. Unfortunately the EPA has not yet set any requirements for abating emissions of cadmium. □

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