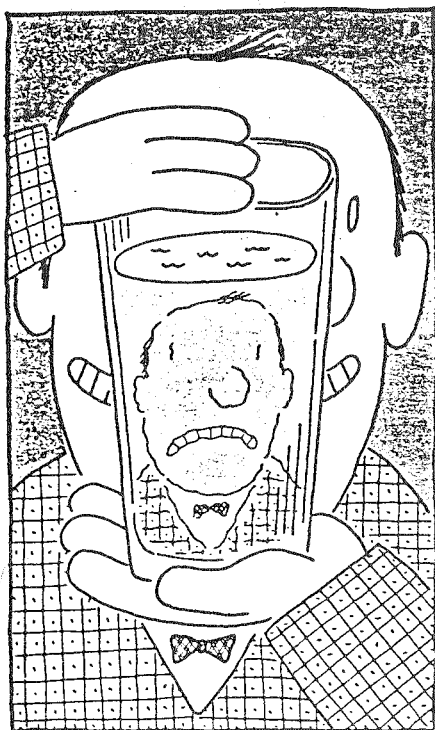


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HEALTH

AN ENDLESS DEBATE

Worrying about fluoride is not so crazy after all. Many Americans may be exposed to more of it than is healthful

FLUORINE IS A pale yellow, highly reactive, very poisonous gas that is used in the manufacture of rocket fuel and in the processing of uranium in the nuclear-power industry. It is also the active constituent in the compounds sodium fluoride and hydrofluosilicic acid, one or the other of which is systematical-

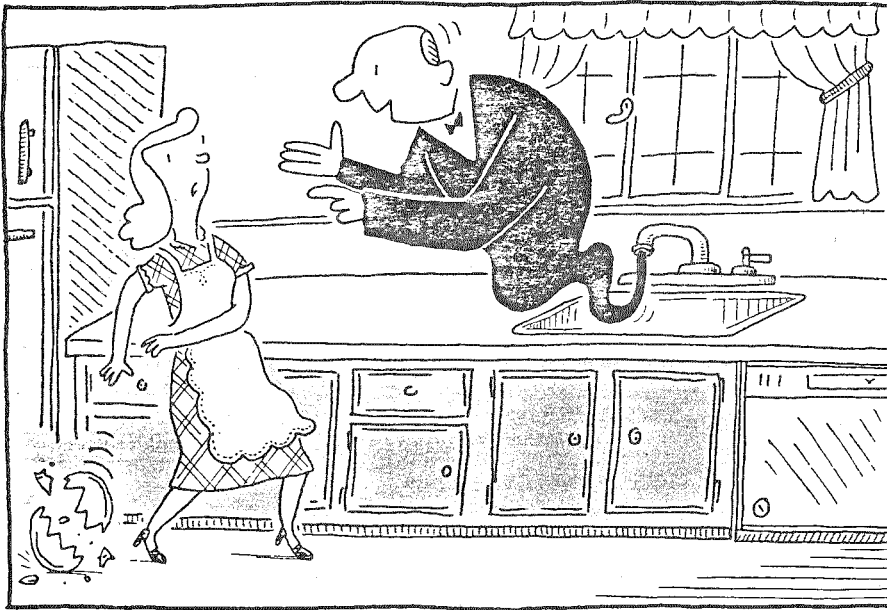
ly added to the water supply of 57 percent of the American population. (Fluoride occurs naturally in the water supplies of four percent of the population.) Every major medical organization in the country endorses this practice. Dozens of citizens' groups and some environmentalist groups oppose it.

The American Medical Association, the American Dental Association, the World Health Organization, the United States Public Health Service, and every Surgeon General since the mid-1950s have agreed that water fluoridation at levels of about one part per million is a cheap, effective, and perfectly safe way to reduce cavities by as much as 60 percent. They have stated this point of view in countless speeches, on television, in newspaper and magazine articles, and in dozens of booklets. Yet 39 percent of the American population is without fluoridated water, and in local referenda fluoridation is voted down more often than it is approved. Los Angeles, San Diego, San Antonio, Honolulu, and dozens of smaller cities and communities have rejected it. This fact has frustrated and sometimes infuriated pro-fluoridationists in the dental and medical establishments, who associate anti-fluoridation activity with quackery, radical conservatism, and fraud.

Debates on the fluoridation issue are passionate and polemical. For this reason disinterested scientific opinion on fluorides in the water supply, which is itself hard to come by, is not always the basis for public policy.

As an example, consider the history of the Environmental Protection Agency's proposal last year to nearly double the maximum allowable and recommended levels of fluoride in drinking water, a proposal that was put into effect by the administrator of the EPA, Lee Thomas, in April. In proposing this increase the EPA seems to have paid more attention to fiscal than to scientific concerns.

SOUTH CAROLINA is one of a number of states that have high levels of fluoride occurring naturally in some of their drinking-water systems. In 1975 the EPA included fluoride in a list of primary contaminants—substances whose regulation is enforceable by federal law. The EPA set a maximum allowable fluoride standard for drinking water of 1.4 to 2.4 parts per million (or milligrams per liter), and a recommended level of 0.7 to 1.2 ppm. (The ranges were designed to take account of differences in climate. The



EPA assumed that in warm weather people drink more water, and thus it set the levels of fluoride low for states with warm climates.) The EPA set the allowable level for South Carolina, a relatively warm state, at 1.6 ppm—much too low as far as state officials were concerned, given that some water sources within the state contain more than 6 ppm of fluoride. In 1981 the state petitioned the EPA in the hope of having fluoride removed from the list of primary contaminants. The regulation of fluoride should be left to the discretion of the states, South Carolina argued.

At the request of the EPA, the United States Surgeon General, C. Everett Koop, appointed a committee of fourteen experts to review the health effects of fluoride. The committee met in the spring of 1983 and then drafted a report concluding that although adults could safely be exposed to twice as much fluoride as the existing EPA standard allowed, children should not be, because not enough was known about the effects of high levels on growing bones and because of what it described as the "adverse health effect" of severe dental fluorosis. The committee pointed out that evidence exists to link fluoride intake in excess of 5 ppm to osteosclerosis (thickening of the bone) in adults. The committee also pointed out that consuming too much fluoride can cause dental fluorosis, which the EPA itself had already recognized as an adverse health effect. Fluorosis begins as white flecks on the teeth and can develop into brown discoloration and pitting. In extreme cases the teeth can become brittle

and start to crumble. A child under the age of nine can develop a mild case of fluorosis by consuming as little as one milligram of fluoride a day, and the risk that the disorder will be more severe increases with the amount consumed. The committee recommended that the EPA keep fluoride on its list of primary contaminants, to minimize the incidence of fluorosis and, possibly, osteosclerosis and other disorders of the bone.

In the version of the report that the committee presented to the Surgeon General in September of 1983, the finding that fluoride in water should not exceed 2.4 ppm for children and 4.8 ppm for adults had not been changed. However, other conclusions had been, including the characterization of fluorosis as an adverse health effect. The new report described fluorosis as "uncosmetic." This seemingly minor alteration had significant ramifications. Fluorosis is the only undisputed negative effect of chronic exposure to low levels of fluoride. By saying that fluorosis is uncosmetic rather than an adverse health effect, the committee seemed to imply that the EPA did not have to protect against fluorosis. This, some members say, was not their intention. One, Dr. Michael Kleerekoper, the head of the Bone and Mineral Division of the Henry Ford Hospital, in Detroit, says, "There is absolutely no doubt that excess fluoride changes the properties of bone. And I don't think we could really say that fluorosis is not a health effect. We don't really know enough about the psychological ramifications of going through life with brown teeth."

By the spring of 1985 the Office of Management and Budget had become concerned that the cost of filtering excess fluoride from naturally fluoridated water supplies might be passed from the states to the federal government. Thus it sent a memo advising the EPA to remove fluoride from the list of primary contaminants. Three weeks later the EPA announced its proposal. Although the agency would not abandon its authority to regulate fluoride, as the OMB had requested, it would seek to raise the maximum amount of fluoride allowable in water to 4 ppm—near the limit of the amount that the committee had said is safe for adults and well above the limit safe for children. This is the standard that took effect in April.

The new ceiling is still too low for South Carolina, and the state has sued. South Carolina's director of the Division of Water Supply, Max Batavia, says that taking fluoride out of water supplies to meet the EPA standard will raise water bills by 75 to 100 percent. According to Batavia, water bills in the state now average \$10 a month.

THE SAME YEAR the EPA proposed to change the fluoride standard to 4 ppm, it cited in a report a study showing that of a group of children drinking water with fluoride levels of 4 ppm, about 40 percent developed moderate to severe dental fluorosis, with symptoms ranging from stains to pitting and finally to a condition resembling rust. Also that year the EPA acknowledged, in a notice published in the Federal Register, that consumption of more than 20 milligrams of fluoride a day for twenty years or more can lead to a much more severe disorder—crippling skeletal fluorosis, which involves stiffening of the spine and other arthritis-like symptoms.

The number of cases of skeletal fluorosis that have been diagnosed in this country is small (the estimates range from two to twenty), but the disease is fairly common in India and has been reported in North Africa, in the Persian Gulf region, and in southern Italy, where extraordinarily high concentrations of fluoride occur naturally in the environment. Lack of calcium, vitamin D, or protein in the diet exacerbates the risk of skeletal fluorosis. Anti-fluoridationists say that the disorder is more widespread in this country than medical authorities will admit, and that it is probably being misdiagnosed as arthritis by unwitting physicians. The point is at

least worth considering. The EPA estimates that about one percent of the population drinks more than five liters of water a day. Furthermore, about 184,000 people in this country drink from water supplies with fluoride levels at or above 4 milligrams per liter. It should follow, then, that the exposure of about one percent of this group reaches the EPA's threshold for skeletal fluorosis, of 20 milligrams of fluoride a day. Those whose exposure persists for twenty years or more thus risk developing the disorder, and the number affected is conceivably a good deal larger than twenty.

"The EPA administration is making outrageous statements, and completely contradicting itself," says Robert Carton, the president of the Washington, D.C., local of the National Federation of Federal Employees and a scientist in the toxic-substances division of the EPA. "In 1976 the EPA said that mottled teeth were an adverse health effect. Now it's saying they aren't. It was a distinction of convenience, a change made on purely political grounds." Last year Carton wrote to Lee Thomas, the EPA administrator, asking that the agency reassess the scientific evidence before putting any changes in the standard into effect. Thomas refused.

The EPA ultimately did not remove fluoride from the primary-contaminant list, but critics of the change in the fluoride standard say that some dental and medical organizations pressured the agency to do so, because fluoride's presence on the list interfered with their efforts to promote the substance as a desirable additive. As evidence of this motive the critics cite a resolution by the Association of State and Territorial Health Officials, which stated: "The continued labeling of fluoride as a contaminant and health hazard will undoubtedly undermine the efforts of the dental profession to promote fluoridation of community water supplies." This was among the reasons the association gave for requesting "that fluoride be changed from the Primary to the Secondary Drinking Water Regulations." Secondary regulations are not enforceable by the EPA.

Scientists, public-health officials, and others were relieved by the EPA's decision to leave fluoride on the list of primary contaminants. They had feared that removing fluoride from the list would set a dangerous precedent. William Lappenbusch, who was the chief of the health-effects branch of the federal Office of Drinking Water from 1978 to

1984, supports water fluoridation—but only if fluoride levels are carefully controlled. "The window of acceptability is very small with fluoride, and you've got to focus in very closely on one part per million or risk health effects," he says. "If people are willing to spend fifteen hundred dollars just to get their kids' teeth a little straighter, then my guess is that they'd be willing to spend a fraction of that to make sure their kids' teeth don't become stained and brittle. But I think it's very difficult for the dental establishment to consider fluoride a health problem when it has promoted it for so many years as protective against dental caries. It's very hard for them to realize that fluoride is both good and bad."

The Natural Resources Defense Council, an environmentalist organization based in New York City, has sued the EPA on the grounds that the new standard does not protect the public health. The NRDC's attorney, Jacqueline M. Warren, points out that the Public Health Service, the National Academy of Sciences, and previous EPA administrations have all recommended against allowing more than 2.4 ppm of fluoride in water. The new regulation requires a supplier of water with a concentration of fluoride higher than this to warn customers that children under the age of nine should not drink it. Water supplies containing more than 2 ppm of fluoride are scattered across the country and are the chief source of drinking water for about 830,000 Americans. "This is the first time in the history of the EPA that permanent regulations are in place to tell people not to drink the water," Warren says. "The EPA has an independent charge from Congress to protect the water supply against any contaminant that can affect the public health, and this decision is in clear violation of that mandate. By calling fluorosis a cosmetic effect, they are simply attempting to define the problem out of existence."

FLUOROSIS HAS traditionally been the biggest obstacle to the effort to promote fluoride in water, an objective that the Public Health Service and the American Dental Association have actively pursued since 1950. In fact, it was fluorosis, not tooth decay, that brought fluoride to the attention of the medical community. In the early 1900s Frederick S. McKay, a dentist in Colorado Springs, noticed a connection between mottled teeth (called "Colorado stain" in his part of the country) and the water supply. In

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1931 two independent research teams identified the culprit as fluoride. The dental community's initial reaction to this finding, logically enough, was to assume that fluoride is bad for teeth. The Public Health Service immediately assigned a dentist from its staff, H. Trendley Dean, to look into the problem.

Dean conducted a series of epidemiological studies over a period of years. In a report submitted in the late thirties he concluded that fluoride concentrations of 0.6 ppm or higher cause mild but detectable fluorosis in some people and that the extent and severity of the problem rise sharply until, at concentrations of 2 ppm or more, fluorosis becomes "an acute and urgent public health problem." But Dean also found, as had McKay, that the level of decay in mottled teeth was well below average, and in 1942 he reported that although a fluoride concentration of one ppm causes mild fluorosis in about 10 percent of the population, it reduces the incidence of dental decay by about 60 percent. Dean added that fluoride levels of more than one ppm increase the incidence of fluorosis without decreasing the incidence of decay. A year later the Public Health Service established one ppm as the maximum amount of fluoride allowable in drinking water.

Whereas in the 1930s public-health officials had sought ways to remove natural fluoride from water systems, the 1940s saw the beginning of a campaign to fluoridate water systems considered fluoride-deficient. At first the Public Health Service was a bit nervous about this idea, and it decided to test the effects of artificial fluoridation in a pilot study before proceeding with a national fluoridation program. The plan was to add fluoride to the water supply of Grand Rapids, Michigan, and to monitor the health of the children's teeth for at least ten years. But in neighboring Wisconsin two impatient dentists, Francis Bull (who was also the state dental officer) and John Frisch, upset the plan by demanding that fluoride be made available to all immediately. Bull and Frisch toured the country, touting the benefits of fluoride and denouncing and even threatening those who disagreed. The Public Health Service resisted the pressure for several years. But when preliminary data showing a lower incidence of decay in four- and five-year-old children leaked from the Grand Rapids study, the fluoride crusaders had all the evidence they needed to push the issue over the

top. In 1950 the Public Health Service announced that "communities desiring to fluoridate their communal water supplies should be strongly encouraged to do so." Within a year the American Dental Association and the American Medical Association added their endorsements.

Organized opposition to fluoridation was immediate. The first fluoridation referendum, held in Stevens Point, Wisconsin, in 1950, was rejected by a wide margin, as was one held in Seattle, Washington, in 1951.

Fluoridation decisions are not always made by referendum. In many parts of the country local health officials or city councils have the power to decide the question on their own. But of the 2,000-some referenda on fluoridating water that have been held in the United States since 1950, about 60 percent have been voted down.

PRO-FLUORIDATIONISTS describe anti-fluoridationists as the lunatic fringe: members of radical societies, rabid anti-Communists, and so forth. This is certainly true of some. Members of the John Birch Society and the Ku Klux Klan, for example, have traditionally been enthusiastic supporters of the anti-fluoridation movement. But today, it seems, an anti-fluoridationist is far more likely to be an ordinary citizen worried about public health or the environment than a political extremist.

Numerous sociological studies have been sponsored by proponents of fluoridation to determine why the addition of a decay preventive to the water supply should meet with so much grass-roots opposition. By and large these have concluded that anti-scientific attitudes, fear of technology, and anti-government sentiment are responsible.

There is more to the issue than that. Beyond the political fray of competing interest groups are scientific questions in need of resolution. Although hundreds of studies have demonstrated the effectiveness of fluoride in warding off tooth decay, relatively few data exist on the long-term effects of chronic exposure to fluoride on human biological systems other than teeth. Many scientists say that not enough is known to describe with certainty the effects of fluoride on bone or on unborn children, people with impaired kidneys, or other particularly vulnerable people. Moreover, there is a growing belief among scientists that enough fluoride is reaching the public

through fluoridated toothpastes and mouth rinses and in food and beverages processed with fluoridated water to limit the need for further fluoridation of water supplies.

Members of the scientific community are reluctant to express reservations like these publicly for fear that they might be misinterpreted. It seems that whenever a report discussing possible negative effects of fluoride is published, proponents of fluoridation rush to discredit the author, to play down the finding, or to explain why the finding does not apply to human beings, though it might apply to animals in a laboratory. By the same token, anti-fluoridationists wait eagerly for anyone in the scientific mainstream to add credence to their cause. Their support may be just as unwelcome to scientists as the hostility of the pro-fluoridationists.

For example, in 1982 the journal *Science* published a paper by Dennis Leverett, the chairman of the Department of Community Dentistry at the Eastman Dental Center, in Rochester, New York, arguing that the levels of fluoridation in water should be reassessed in view of the influx into the food chain of fluoride from sources other than tap water. Leverett concluded (as have many dental researchers) that even communities without fluoridation were enjoying a reduced level of tooth decay and that the incidence of very mild fluorosis was on the rise. Much to Leverett's dismay, the anti-fluoridationists immediately reproduced and distributed the paper. The pro-fluoridationists, meanwhile, criticized him for voicing his concerns in public.

It is not surprising that mainstream scientists are loath to involve themselves even indirectly in the anti-fluoridationist cause. Anti-fluoridationists frequently distort, misinterpret, or exaggerate scientific reports. Several of the "experts" whose opinions are often cited are professional anti-fluoridationists on the fringes of established science or medicine. Many of the documents purporting to prove the hazards of fluoridation are filled with anecdotes, and some read like the memoirs of a recently converted evangelist. Nothing other than fluoride which might affect health is considered, medical history is scant, and hard data are nowhere to be found. The claims of anti-fluoridationists that low levels of fluoride cause cancer, AIDS, and birth defects, hasten aging, and produce gastrointestinal and cardiovascular prob-

lems have never been substantiated by controlled scientific studies.

But the pro-fluoridationists, many of whom are respected members of the medical establishment, are also prone to overstate their case. When asked in an interview about the consequences—other than fluorosis—of ingesting fluoride, Dr. John Brown, the chairman of the Department of Community Dentistry at the University of Texas Health Science Center at San Antonio, insisted that none exist in this country. He conceded that excess fluoride can cause staining, but contended that this is not a serious problem. "It's obvious to people who live in some areas that some children will grow up with brown teeth," he said. "But these can be bleached, coated with plastic, or crowned."

San Antonio defeated a fluoride referendum by a slim margin this year, and Brown, who campaigned mightily to get the referendum passed, blames the result on the opposition's scare tactics.

IT SOMETIMES SEEMS that, in its eagerness to promote fluoridation, the dental community has lost sight of its original goal—the promotion of dental health. Consuming more than one milligram of fluoride a day can result in permanent discoloration of the teeth, but many dentists do not warn their patients of this consequence. It is known that children under the age of six who drink fluoridated water and brush their own teeth with fluoridated toothpaste are at risk. This is because a child tends to ingest as much as a third of the toothpaste on the brush, which contains fluoride at levels of 1,000 ppm. The typical user puts about one gram of toothpaste on the brush, and thus is exposed to one milligram of fluoride per brushing.

From 1955 to 1958 the boxes for fluoride toothpaste bore labels advising that children under the age of six were not to use the product, but today no such labeling is required. Dentists understand the fluorosis risk but are sometimes unwilling to warn their patients for fear that such warnings will compromise their profession's efforts to fluoridate. They worry that people told of the hazards of consuming excessive amounts of fluoride will conclude that any amount of fluoride is bad.

Pro-fluoridationists tend to gloss over the fact that most Western European countries do not fluoridate their water supplies; only two percent of the population of Western Europe consumes wa-

ter treated with fluoride. The reasons these countries give vary but generally come down to two. One is that the safety of drinking fluoridated water over a lifetime has not been established. The other is that the long-term effects of fluoride on the environment—notably, the buildup of possibly harmful concentrations in plants and animals—are unclear.

The more extreme anti-fluoridationists say that European countries consider fluoride a poison. This is not the case. Switzerland, for example, adds fluoride to table salt. Denmark and Norway make wide use of the substance in school-based or other subsidized dental-hygiene and public-health programs. These countries distribute fluoride in pill and vitamin-supplement form or apply it directly to the teeth of those who can benefit from it most—school-age children. Dental officers in the United States argue that such programs simply don't work because children forget or refuse to take the supplements, and because topical treatments are not as effective as adding fluoride to water. However, the experience of several Western European countries contradicts these assumptions. The Danish Dental Association, for example, has reported that the use of topical fluorides in connection with Denmark's compulsory dental-health programs for children "has caused such a progress in dental health that only a few areas will benefit particularly from water fluoridation today."

Opinion on the issue of fluoridation is so thoroughly polarized that, as one social scientist has put it, "only people with iron wills and blinders are willing to get involved." Debates almost always end in deadlock. Proponents argue that fluoridation is a safe, effective way to protect Americans from costly and painful tooth decay. Opponents counter that fluoride has never been proved safe and that tests showing its effectiveness are inconclusive and biased. Proponents say that fluoridation is the only way to protect the teeth of people too poor to seek dental care. Opponents say that fluoridation interferes with their right to choose their own and their children's medications. No new epidemiologic or laboratory study seems to change the position of either side. This is because the fluoride debate was ushered out of the scientific and into the political arena more than thirty years ago, and it shows no signs of retracing its steps.

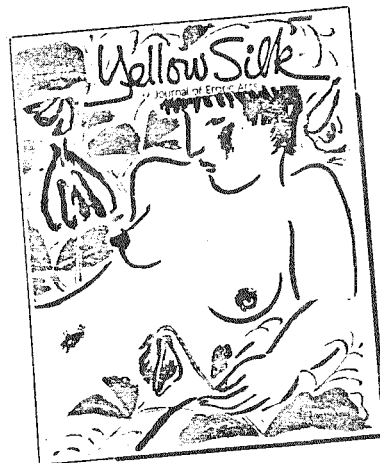
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