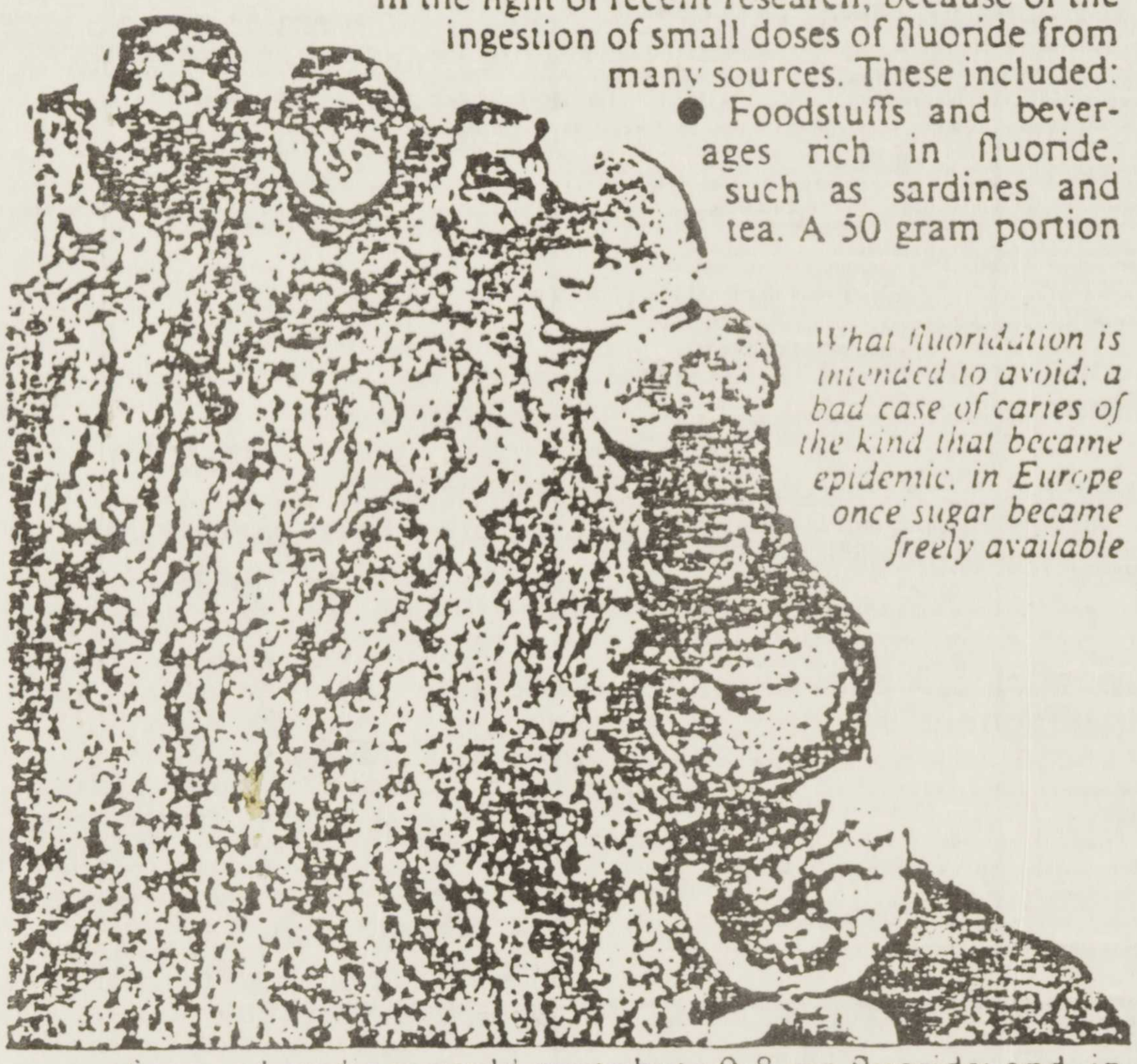
(*European Journal of Clinical Pharmacology*, vol 12, p 311). As this was a dosage of 0·166 mg fluoride per kilogram body weight, the equivalent amount needed to achieve similar peaks in a 10 kg infant and a 20 kg child would be 1·66 mg and 3·33 mg fluoride respectively. In fact, in a 10 kg infant a dose of only 0·8 mg fluoride could theoretically cause a peak of 0·2 ppm in the blood ionic fluoride; and a dose of just 0·4 mg fluoride, a peak of 0·1 ppm. Such levels can damage developing tooth cells and produce dental fluorosis.

An editorial in the *British Dental Journal* in 1981 (vol 150, p 261) warned that fluoride supplement dosage levels recommended 20 years ago are too high and need modifying in the light of recent research, because of the ingestion of small doses of fluoride from many sources. These included:

- Foodstuffs and beverages rich in fluoride, such as sardines and tea. A 50 gram portion of canned sardines could contribute 0·8 mg fluoride; and, in Britain particularly, many receive more than 1 mg fluoride daily from drinking tea.



What fluoridation is intended to avoid: a bad case of caries of the kind that became epidemic, in Europe once sugar became freely available

- More than 90 per cent of toothpaste now sold contains high concentrations of fluoride. Today, toothbrushing is common even among pre-school children; and more than 75 per cent of children use toothpaste by the age of 18 months. Researchers have shown that children under 3 years are incapable of rinsing effectively due to poorly developed swallowing reflexes. Therefore, youngsters may swallow appreciable amounts of toothpaste. In fact, a pre-school child may swallow 0·3 grams to 0·4 grams of toothpaste at *each* brushing (*Journal of Dental Research*, vol 5 p 1317). Since most pastes contain fluoride at a concentration of 1000 parts per million, a daily intake in excess of 0·5 milligrams fluoride from this source alone is common.
- Many dental and child health authorities still advocate the use of fluoride tablets and drops for pregnant women and for children from birth. However, the use of such supplements could result in a daily intake of fluoride two to six times the recommended dose.
- In dental surgeries one of the now common methods of topical fluoride treatment is to use acidulated gels. The fluoride concentration of these gels varies between 0·5 per cent and 1·2 per cent (up to 6000 ppm fluoride). Each application delivers 3 to 5 ml of gel and the patient is exposed to as much as 60 milligrams of fluoride for four to five minutes. As the gels are both flavoured and acidulated, they stimulate the flow of saliva which leads to the swallowing of excess saliva and gel during treatment.
- Adverse reactions following gel applications were reported in the *British Dental Journal* in 1976 (vol 140 p 307). More recently, in 1980, Swedish researchers found, in a 25-year-old adult weighing 54 kg, that blood ionic fluoride levels of just over *1 ppm* were reached 30 minutes after gel treatment (*Journal of Dental Research*, vol 59 p 1067). This level is close to those reported to result in impaired kidney function.
- Czechoslovakian studies show that children aged 6 to 14 years who reside near an aluminium smelter ingest more than 2 milligrams fluoride a day from air, water, animal foodstuffs and plants although their drinking water was not fluoridated. Aluminium smelters are only one of a score of industries which now pollute the total environment with fluoride emissions and solid wastes.

An article in a recent issue of the *British Medical Journal*, pointed out that babies in fluoridated areas who drink dried milk formulae made up with water containing 1 ppm fluoride, are ingesting up to *100 times* the amount of fluoride they would obtain from mother's milk (vol 283, p 76). The researchers demonstrated that there is a physiological plasma/milk barrier against fluoride which protects the infant from more than extremely low concentrations of the halogen. They suggested: "Hence the recommendation made in several countries to give breast-fed infants fluoride supplements should be reconsidered."

Obviously, fluoride ingested from drinking water cannot be considered in isolation from other sources of fluoride intake. Nevertheless, the artificial fluoridation of a community water supply does have certain predictable consequences. First, fluoridation will raise the average steady state or plateau level of ionic fluoride in the blood throughout the total population. Secondly, by introducing large amounts of fluoride into the environment, all locally grown and manufactured foods and beverages may contain increased amounts of fluoride, and foods cooked in fluoridated water will increase the fluoride intake of consumers. Thirdly, because the overall intake has been increased and the average blood ionic fluoride level of the population raised, individuals who ingest submilligram doses of fluoride will run a greater risk of their blood ionic fluoride concentrations peaking to above the threshold level that can cause dental fluorosis or other ill-effects.

Spokesmen for the dental profession have stated that dental fluorosis, the "mild" mottling of the enamel caused by fluoride, is a sign of "good teeth". If unsightly, they say, the appearance can be remedied by the fitting of artificial crowns! But this dental fluorosis is an indication that the person, when a young child, suffered a toxic level of exposure to fluoride. Dental fluorosis, no matter how slight, is an irreversible pathological condition recognised by authorities around the world as the first readily detectable clinical symptom of previous chronic fluoride poisoning. To suggest we should ignore such a sign is as irrational as saying that the blue-black line which appears on the gums due to chronic lead poisoning is of no significance because it doesn't cause any pain or discomfort. Additionally, it is clearly wishful thinking to insist that tooth-forming cells are the only ones in the body sensitive to fluoride. In 1979, Professor Lennart Krook of Cornell University demonstrated that the primary target cells for fluoride poisoning include certain bone cells. (*Cornell Veterinarian, vol 8, supplement* 8). Undoubtedly, the "fluoridation controversy" has entered a new phase in which genuine doubts are replacing previously held certainties. For many years, a number of dentists seemed to believe that if a little fluoride is good for you, then more must be better. This attitude is not only wrong, it is irresponsible.

The issue has also been complicated by legislation making artificial fluoridation compulsory. Repeal of these laws would involve considerable loss of face for some politicians and their advisers. For 40 years the "debate" about fluoridation has been remarkably emotive. Now, at last, scientists appear to be taking a long, hard look at fluoridation and the uncontrolled, indiscriminate use of fluoride-containing dental products. □

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