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Proper use of fluoride products in fluoridated communities

In January, 1945, Grand Rapids, MI, USA, became the first city in the world to adjust the concentration of fluoride in its municipal water supply.¹ The decision to add 1 mg fluoride per litre of water (or 1 ppm) was based on an extensive series of epidemiological surveys in communities with different concentrations of fluoride in their drinking water. These surveys had shown that in communities with fluoride at 1 ppm the prevalence of dental caries was 50–65% lower than that in communities with only trace levels of fluoride. Only 10–12% of children showed evidence of the mildest forms of dental fluorosis.²

Dental fluorosis is a hypomineralisation of enamel of teeth caused by the chronic ingestion of excessive amounts of fluoride during the period when teeth are forming within the jaw.³ Milder forms of dental fluorosis are characterised by whitish spots, striations, or diffuse opacities of teeth. Fluorosis does not affect the health of teeth or of an individual, but, in its more severe forms, may cause cosmetic concerns. Permanent teeth other than third molars are susceptible to the development of fluorosis in children aged up to 6 years. Excessive fluoride ingestion early in life tends to produce fluorosis in early forming and erupting permanent teeth, the incisors and first molars, whereas excessive ingestion in the later preschool years affects later forming and erupting permanent teeth, the canines, premolars, and second molars.

In the 1950s and 1960s, several countries started to fluoridate their water. Hong Kong and Singapore fluoridated all their water supplies, and countries that provide fluoridated water to more than half their residents include Australia, Ireland, New Zealand, and the USA. Other countries with large water-fluoridation programmes include Brazil, Canada, Chile, and Malaysia.

At the time fluoridation programmes began, fluoride that occurred naturally in drinking water and that which occurred naturally in some foods, primarily tea, seafood, and some grains, were essentially the only sources of ingested fluoride. Since then, several fluoride-containing products have been developed as alternatives to fluoridated water (dietary fluoride supplements) or as agents to provide fluoride topically to erupted teeth (fluoride toothpastes and mouth rinses and solutions, gels, and varnishes for professional application).

About 20 years ago, investigators began to notice increased prevalences of dental fluorosis in school-aged children who were participants in epidemiological surveys or in clinical field trials in countries with established market economies. Most of the fluorosis observed was still mild, but there have been some increases as well in the intensity of fluorosis. Increases in the prevalence of fluorosis have been noted in non-fluoridated as well as fluoridated communities.^{4,5}

Large epidemiological surveys have shown that the factors associated with the increases in fluorosis are early use of fluoride toothpaste, the use of dietary fluoride

supplements, particularly when misused in areas with fluoridated drinking water, and long-term use of infant formula, especially powder concentrates reconstituted with fluoridated drinking water.^{4,6} D G Pendrys and R V Katz have lately reported strong associations between dental fluorosis in children aged 10–14 years in a fluoridated community and use of fluoride supplement and early use of toothpaste.⁵ They also found a strong association between fluorosis on later forming tooth-enamel surfaces and use of infant formula in the form of powdered concentrate.

In most established economies, fluoride toothpaste makes up 95% of the commercial dentifrices market. Most fluoride toothpastes contain 1000–1500 ppm fluoride. The amount of toothpaste ingested is inversely proportional to age; toddlers who brush their teeth with toothpaste before the age of 2 years and who use fairly large amounts of it may ingest sizeable quantities of fluoride, nearly all of which is absorbed.⁷ Fluoride ingestion from toothpaste is a particular problem for young children in fluoridated communities, since they already receive sufficient fluoride. Young children should use only a dab or pea-sized quantity of toothpaste on a child-sized toothbrush, be instructed to spit out thoroughly after brushing, and have their teeth brushed for them or be supervised closely. If available, preschool-aged children should use paediatric fluoride toothpastes, in which fluoride concentrations generally range from 250 to 500 ppm.⁸ Dietary fluoride supplements should not be prescribed for children who drink fluoridated water. Dentists, paediatricians, other medical practitioners, and parents must be educated about this issue. It would help if everyone knew the fluoridation status of their community water supply.

Manufacturers of ready-to-feed infant formula in some countries voluntarily control the fluoride concentration in their products. Infant formula in the form of powdered concentrate is most commonly prepared with tap water, and, in fluoridated communities, larger and larger amounts of fluoride are ingested as children grow and require more formula. Children in a fluoridated community who consume formula for more than a year have a higher risk of fluorosis than those who do not.⁶ In fluoridated communities, parents who wish to give their children formula beyond the age of 1 year should use ready-to-feed varieties or dilute powdered concentrate with bottled water of low fluoride concentration.

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