



## Fluoride toothpaste

### Full Summary

#### **Description:**

Toothpastes, also called dentifrices, are pastes, gels or powders that help remove plaque and strengthen tooth enamel and dentine. Plaque is a film of bacteria that forms on teeth and gums which can cause damage to both teeth and gums. The major anti-caries effect of fluoride toothpaste results from small but protracted elevations in levels of fluoride in plaque and saliva. It is thought that fluoride has the potential to exert a caries reduction benefit largely through three mechanisms: (1) inhibition of demineralization; (2) promotion of remineralization and (3) interference with bacterial growth and metabolism.[1] Over-the-counter (OTC) fluoride toothpaste containing fluoride at up to 1,000 or 1,500 ppm F, depending on local regulations, can be sold directly to consumers.

#### **Use and Application:**

Fluoride toothpaste is generally used at home, but there are successful examples of community programs often based around schools to prevent dental caries. Many organizations the world over suggest the patient “brush teeth at least twice a day using fluoride-containing toothpaste.” Over the past five decades, professional dental organizations have come to endorse the use of fluoride-containing toothpaste as safe and effective for preventing tooth decay and improving oral hygiene. In order to mitigate a small risk of fluorosis that might occur due to excessive fluoride ingestion during the development period of the dentition, most toothpaste manufacturers now include the following language on toothpaste container: "Do not swallow. Use only a pea-sized amount for children under six. To prevent swallowing, children under six years of age should be supervised in the use of toothpaste." The U.S. Food and Drug Administration (FDA) also required a new label on all fluoride toothpastes stating, "If you accidentally swallow more than used for brushing, seek professional help or contact a poison control center immediately". [2]



### **Effectiveness:**

Fluoride in the toothpaste can remineralize tooth enamel and dentine and thus strengthen the outer tooth structure. [1] Triclosan, found in some toothpaste, can also help reduce gingivitis. [1] Several literature reviews confirm a clear and similar beneficial effect of fluorides toothpaste. [3-9] Studies suggest that the start of caries decline in Europe in the late 1960s/early 1970s in Norway was due to the extensive activities with fluoride-based preventive programs.[10] A recent comprehensive systematic review by Twetman et al. summarized literatures on “fluoride toothpaste” from 2002 to 2008 and concluded, “There was strong evidence that daily use of fluoride toothpaste has a significant caries-preventive effect in children compared with placebo (prevented fraction 24%). The effect was boosted by supervised tooth brushing, increased brushing frequency to twice daily, and use of a toothpaste concentration of 1,500 ppm fluoride.” [6] Another Cochrane review summarized randomized controlled trials and cluster-randomized controlled trials comparing fluoride toothpaste with placebo or fluoride toothpaste of a different concentration in children up to 16 years of age with a follow-up period of at least 1 year. For the 66 studies (74 trials) that contributed to the meta-analysis of Decayed Missing and Filled surfaces D(M)FS in the mixed or permanent dentition, the caries preventive effect of fluoride toothpaste increased significantly with higher fluoride concentrations. The prevented fraction of D(M)FS comparing to placebo were 23% (95% confidence interval ranged from 19% to 27%) for 1,000/1,055/1,100/1,250 parts per million (ppm) concentrations and 36% (95% confidence interval ranged from 27% to 44%) for toothpastes with a concentration of 2,400/2,500/2,800 ppm). There is therefore a strong dose response relationship between increasing fluoride concentration in toothpaste and its clinical effectiveness. High fluoride toothpaste (>1,500 ppm F) may be appropriate for at-risk groups. For concentrations of 440/500/550 ppm F, the benefit is less clear. [7] Although the existing literature suggests a consistent effectiveness of fluoride toothpaste for children and adolescents, the literature relating to adults and the senior populations is limited.[11]



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## **Safety:**

Different countries use different limits and suggest different concentrations of fluoride acceptable for oral health for general use by consumers. [5] Broadly, in different parts of the world the maximum permissible level of fluoride available in toothpaste for general sale is either 100 or 1,500 ppm F. Fluoride toothpaste is not intended to be swallowed, and toothpaste tubes should be kept out of the reach of young children. Even though it is very rare, young children are at some risk of ingesting toxic doses of fluoride from a standard toothpaste tube. Warning labels on the tube are intended to help reduce the risk of mild fluorosis, which is a cosmetic defect noticeable as very light spots on permanent teeth that develop while the teeth are still forming. Fluorosis only occurs when more than the recommended daily amount of fluoride is ingested. The children at greatest risk of fluorosis are those 6 years of age and younger when the front teeth are developing and the body weight is relatively low compared to the amount of toothpaste ingested. Currently the Food and Drug Administration of the United States requires the warning label "If you accidentally swallow more than used for brushing, seek professional help or contact a poison control center immediately" on all fluoride toothpastes. High-quality toothpastes that are endorsed by professional organizations should be used to ensure safety and efficacy. [12]

## **Cost Effectiveness:**

A systematic review of economic evaluations of caries prevention indicates that the cost effectiveness of fluoridated toothpaste is extremely good. [13] The utility of caries reduction from fluoride toothpaste has been well documented in clinical trial studies of high quality. The cost per prevented decayed missing or filled teeth (DMFT) was very low, and the marginal cost of adding fluoride to the toothpaste was negligible [13]. Manau et al. reported that the estimated cost of saving 1 DMFS was 1498 Spanish dollars (U.S. \$11.09) with supervised tooth brushing program to prevent dental caries in Catalonia, Spain. [14] A study in Germany suggests that the use of fluorides in caries prevention is highly cost-effective. [15] In different scenarios of constant,



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increasing or decreasing caries-controlling effects, and of limited (age 6-18 years) or lifelong application, the combination of fluoride in salt, fluoride toothpaste and fluoride gel were most cost-effective. They reduced the costs for caries treatment and prophylaxis to 482 euro or to a present value of 148 euro (5% discounting), when applied from age 6-18, and to 211-213 euro for lifelong use (present value, 5% discounting).[15]

## **Recommendations:**

Fluoride toothpaste purchased in stores by consumers has been shown to improve oral health. However, it must be locally available, of good quality, affordable and used advisedly. [16] Tooth brushing with fluoride toothpaste needs continuous promotion by dental professionals and reinforcement by community health leaders. [11, 17] For best results, individuals should follow instructions from dental professionals when using fluoride toothpastes.



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