

Fluoride toothpaste

May 1997

Regular toothbrushing by itself will not prevent tooth decay, but there is a definite benefit from regular brushing with a fluoride toothpaste¹. Dental scientists agree that fluoride toothpaste use has been the main cause of the decline in dental decay in Europe during the last two decades. This fact file explains the benefits of adding fluoride to toothpaste as well as giving other information about toothpaste formulation.

What is fluoride?

A fluoride is a compound of the element fluorine with some other element. The main fluorides used in toothpaste are sodium fluoride and sodium monofluorophosphate. Both substances have been the subject of extensive research, into both effectiveness against caries and safety.

How do fluorides help teeth?

Teeth decay when bacteria in the mouth produce acids from food remains, especially sugar. The acid attacks the tooth by dissolving minerals out of the dentine, a process called demineralisation. Fluoride assists in reversing this process, when minerals in the saliva remineralise the tooth.

Clinical trials have shown that fluoride toothpastes can reduce dental decay by 15-30%, and dental scientists believe that the lifetime reduction in decay levels could be considerably greater than the reduction shown in clinical trials lasting only three years. In the UK, where only about 10% of the population have the benefit of drinking fluoridated water, it is fluoride toothpaste which has curbed an epidemic of dental decay.

Is fluoride safe?

At the levels of use in toothpaste and provided the toothpaste is used in accordance with manufacturer and dentist guidance, fluorides are entirely safe. The only possible side-effect is a minor flecking of tooth enamel if significant amounts of fluoride toothpaste are swallowed by small children on a regular basis, over a period of several years, while the permanent teeth are forming. The front teeth, where any enamel flecking is most noticeable, are formed by age 6 or 7. This is why dentists and toothpaste manufacturers recommend that only a small pea-size amount of toothpaste is used up to age 7,

with toothbrushing supervised to minimise swallowing.

But what about intake of fluoride from several sources?

There is some evidence that enamel flecking is more common when there is an additional intake of fluoride from fluoride dietary supplements (tablets and drops). This is why fluoride toothpaste packs advise users of fluoride dietary supplements to consult their dentist. There is little evidence of higher incidence of flecking in areas with water fluoridation.

Is fluoride the only cause of enamel markings?

No. There are many possible causes of flecking on teeth, including injury, infections, drugs and nutritional disturbances. The cause of markings is not immediately deducible from appearance and requires expert examination.

How much fluoride should there be in a toothpaste?

Under European Community (EC) law, the maximum amount of fluoride which can be included in an over-the-counter (OTC) toothpaste is 1500 parts per million. Many OTC toothpastes contain fluoride at this level, but there are also lower dose formulations around 1000ppm or around 500ppm for children under seven.

Fluoride content will start to be shown on packs and tubes in a standardised format (ppmF, parts per million fluoride) over the coming year. This will help consumers choose the most appropriate toothpaste for themselves and their children. The table below shows how different fluoride formulations translate into ppm, from typical w/w% measures currently shown on packs.

ppmF	Sodium Fluoride	Sodium Mono-fluorophosphate
1500	0.32%	1.14%
1000	0.22%	0.76%
500	0.11%	0.38%

What other active ingredients are in toothpaste?

In addition to fluoride, other therapeutic agents may be included:

- *Antibacterial agents* which help to limit plaque formation. Triclosan is the most commonly used plaque-controlling agent;
- *Desensitising agents* which help to reduce tooth sensitivity. Desensitising toothpaste is often used by people whose gums have receded, exposing the roots - a condition which is increasingly common as people keep their teeth longer;
- *Anti tartar agents* which control the build-up of 'tartar' - mineralised plaque.

Sodium bicarbonate - baking soda - is used in some toothpastes. This is alkaline so it reduces plaque acidity and may help to prevent decay. At present there is no evidence from clinical trials of such an effect, though animal studies have been promising.

Enzymes have also been added to toothpaste with the intention of enhancing the antibacterial properties of saliva. So far, studies of enzyme toothpastes have been inconclusive.

Xylitol, a non-sugar sweetener, reduces levels of cariogenic (decay causing) bacteria in the mouth and enhances remineralisation. Xylitol is not used in UK brands, but can be found in some Scandinavian toothpastes. Xylitol is also used in some sugar-free chewing gums.

'*Natural*' toothpastes may contain a variety of ingredients - anything from oil of ginger to seaweed extract. However, the abrasive agents used are not always powerful enough, the toothpaste may not contain fluoride, and there will probably not be any clinical trial evidence of dental decay reduction from their use.

And what about the inactive ingredients?

As well as water, other toothpaste ingredients are:

- Detergents to make the toothpaste foam, help to distribute it around the mouth and loosen plaque and other debris from the tooth surface;
- Binding agents to stop the separation of solid and liquid ingredients in the tube;
- *Humectants* to retain moisture and prevent the toothpaste from hardening (these can also sweeten the toothpaste);
- *Flavouring, sweetening and colouring agents* like peppermint, spearmint, cinnamon, wintergreen and menthol, as well as non-sugar sweeteners;
- *Preservatives* to prevent bacterial growth on the organic binders and humectants;

- *Abrasives* for cleaning and polishing. Dental enamel is exceptionally strong but smokers' toothpastes can be too abrasive. If you smoke, make sure you see a dentist regularly as well as cleaning your teeth because smokers are at increased risk of gum disease, early tooth loss and also soft tissue conditions including oral cancer.

Do whitening toothpastes work?

All toothpastes clean. If you are interested in the effectiveness of a particular whitening toothpaste, ask the manufacturer for evidence of the toothpaste's effectiveness in changing the colour of the teeth. A responsible manufacturer will have tested the product for effectiveness. If you buy a whitening toothpaste, make sure it contains fluoride.

What toothpaste does the BDA recommend for young children?

For children below seven, and particularly those living in a fluoridated area or receiving fluoride dietary supplements, the BDA recommends low dose fluoride formulations (around 500ppmF, but not less). At 7 and above, normal fluoride dose toothpastes (1000 or 1500ppmF) are better for children because of their greater effectiveness against decay².

Avoid 'fluoride free' toothpaste, or baby toothpaste with so little fluoride in that it is completely ineffective.

How do I find out if my children should be using fluoride dietary supplements?

Fluoride dietary supplements are only for use on advice from a dentist, for use by children - and sometimes adults, too - who are at special risk from dental caries. The risk might be diet-related or it might be linked to general health problems and the difficulty of treating dental decay if it is not prevented³.

So, what toothpaste should I use?

There isn't a 'best' toothpaste but the BDA Accreditation Scheme identifies products which have demonstrated 'safety, quality and efficacy' to an independent panel of BDA experts. Generally, these are brands from major manufacturers who are committed to improving oral care products and continue to undertake research and develop new products. Clinical trials are very expensive and the BDA wants to support the companies which carry out trials and research by allowing them to use the BDA's logo on packs:

The current BDA Accredited toothpastes are:

Low fluoride toothpastes

Macleans Milk Teeth
Macleans Milk Teeth Gel

Normal dose toothpastes

Macleans Freshmint/Coolmint
Colgate Triple Cool Stripe
Colgate Ultra Cavity Protection

Formulations for sensitive teeth with fluoride

Macleans Sensitive

Whitening toothpaste

Macleans Whitening

Gum health/anti-caries/anti-tartar formulations

Crest Complete
Colgate Total

Brands without the BDA logo may still be effective and of good quality but the BDA does not have any way of knowing this unless data has been submitted for independent scrutiny by the BDA's independent experts.

References:

1. The scientific basis of dental health education: a policy document, 4th edition, Health Education Authority, 1996
2. Fluoride dietary supplements and fluoride toothpastes for children. A policy document of the British Society of Paediatric Dentistry, International Journal of Paediatric Dentistry 1996; 6: 139-142
3. Fluoride supplement dosage, British Dental Journal 1997; vol 182(1): 6-7