



Tooth Whiteners & Oral Hygiene Products

containing hydrogen peroxide

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Context - To date, millions of tooth whitening kits have been sold across the world to consumers seeking to brighten their smiles. Tooth whitening products can be applied as paint-on gels, strips, or mouth guards, either at the dentist's office or at home. The whitening ingredient in these products is hydrogen peroxide. In general, the more hydrogen peroxide, the greater the whitening power.

Toothpastes and mouth rinses may also contain low concentrations of hydrogen peroxide as a disinfectant to prevent plaque and inflammation of the gums.

Are toothpastes, mouth-rinses and tooth whitening products containing hydrogen peroxide safe? Should they be freely available to consumers?

An assessment by the European Commission Scientific Committee on Consumer Products (SCCP)

Hydrogen Peroxide

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Oral hygiene products & tooth whiteners

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The answers to these questions are a faithful summary of the scientific opinion produced in 2007 by the Scientific Committee on Consumer Products (SCCP):

"Opinion on Hydrogen peroxide, in its free form or when released, in oral hygiene products and tooth whitening products"

The full publication is available at: <https://copublications.greenfacts.org/en/tooth-whiteners/>
and at: <http://ec.europa.eu/health/opinions/en/tooth-whiteners/>

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- Level 3 consists of the Source document, the internationally recognised scientific opinion which is faithfully summarised in Level 2 and further in Level 1.

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1. What is hydrogen peroxide and what is it used for?

Hydrogen peroxide is a highly reactive chemical containing hydrogen and oxygen. It is used mainly in the production of other chemicals and to bleach paper and textiles. Moreover, contact lenses can be disinfected with highly diluted hydrogen peroxide.

Carbamide peroxide is a chemical that is made of hydrogen peroxide and urea.

Both hydrogen peroxide and carbamide peroxide are used in cosmetics, mainly as bleaches in dental products such as tooth whiteners and some hair products. Low concentrations may also be used in toothpastes and mouth rinses as a disinfectant to prevent plaque and inflammation of the gums.

In the European Union, cosmetics are regulated by the Cosmetics Directive



2. What health effects of hydrogen peroxide have been observed?

2.1 Swallowing a large dose of hydrogen peroxide can be lethal to humans.

2.2 Highly diluted hydrogen peroxide solutions are non-irritant or mildly irritant. However, animal tests have shown that, when exceeding certain concentrations, hydrogen peroxide can cause irritation of eyes, skin, and the inside of mouth, stomach, and intestine. The use of eye drops and contact lens solutions containing some hydrogen peroxide can irritate the eyes. Hydrogen peroxide is not considered to cause allergic reactions of the skin.



2.3 To test whether repeated exposure to hydrogen peroxide can harm health, mice and rats were given hydrogen peroxide solutions by various means. Above certain exposure levels, effects on body weight, blood and some organs were seen. Risks to humans can be assessed by comparing human exposures to the highest exposure at which no harmful effects were observed in any animal studies.

2.4 Hydrogen peroxide can act as a weak cancer promoter, meaning it can slightly stimulate the growth or multiplication of cancer cells. There is not enough data to evaluate potential effects of hydrogen peroxide on reproduction and development.

2.5 People with certain genetic disorders are more vulnerable to hydrogen peroxide because their bodies cannot break it down effectively.

3. How is hydrogen peroxide used to whiten teeth?

Tooth whiteners and oral hygiene products – such as certain toothpastes and mouth rinses – use hydrogen peroxide or carbamide peroxide for its whitening and/or disinfecting properties. Peroxide whitens teeth by passing into the tooth and reacting with the molecules that cause stains or discoloration. In general, the more peroxide, the greater the whitening power.



Tooth whiteners can be applied to teeth using custom made mouthguards
Source: GreenFacts

Depending on their peroxide content, such products are either freely sold over the counter for home use, dispensed by dentists for home use, or exclusively applied by dentists in their offices. In the European Union, oral hygiene products may only be sold freely to consumers if they contain no more than 0.1% hydrogen peroxide whereas in the USA, whitening products are sold at higher concentrations. In-office bleaching generally uses products with higher levels of whitening agents.

Tooth whitening products can be applied at home in three different ways: using strips that are stuck onto teeth, custom made mouthguards that maintain the whitening product on the teeth, or gels that are painted directly on the teeth.

The length of treatment depends on the level of discoloration and the whitening product used. It ranges from short interventions in the dental office to applications at home lasting minutes/hours per day and repeated over a number of days.

4. How much hydrogen peroxide is an individual exposed to when using dental products?

4.1 Toothpastes and mouth rinses may also contain low concentrations of hydrogen peroxide as a disinfectant to prevent plaque and inflammation of the gums. Studies have shown that hydrogen peroxide from toothpastes or mouth rinses is rapidly broken down in the mouth by the saliva, but some of it is swallowed. Toothpastes and mouth rinses that contain small amounts of hydrogen peroxide and are used once or twice per day do not seem to harm the inside of the mouth, when used up to 6 months for toothpastes or 24 months for mouth rinses. However, rinses that contain larger amounts of hydrogen peroxide or that are used more frequently can cause mouth irritation.

4.2 How much hydrogen peroxide is released into the saliva during tooth whitening treatments depends mostly on the amount of hydrogen peroxide in the product being used and the product type and only partly on the amount of saliva produced.

During a tooth whitening treatment procedure, the concentration of hydrogen peroxide on the gums and in the saliva falls rapidly because hydrogen peroxide is broken down quickly.

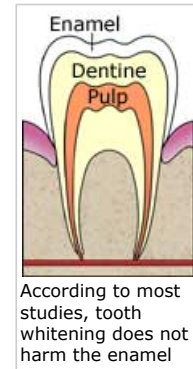
It is estimated that up to 25% of the hydrogen peroxide applied by tooth whitening products is swallowed.

5. Can tooth whitening products containing hydrogen peroxide harm teeth?

5.1 The two most common side effects of using tooth whitening products containing hydrogen peroxide are mouth irritation and increased tooth sensitivity to temperature changes. Both effects are temporary. No information is available on long-term effects of the use of tooth whitening products or on the effects of repeated use of such products.

5.2 Hydrogen peroxide passes easily through the tooth enamel.

According to most existing studies, bleaching does not harm the enamel. However, a few investigations have reported that bleaching can harm the surface of the teeth, making the enamel more porous and leading to dents, scratches, and loss of minerals.



5.3 After crossing the enamel, hydrogen peroxide passes into dentin and pulp. In some cases, whiteners cause minor inflammations of the pulp, which might be the reason for the increased tooth sensitivity that sometimes occurs. However, generally, tooth whitening does not seem to harm dental pulp of healthy teeth, possibly because the levels of hydrogen peroxide are too low to cause damage.

5.4 Tooth whitening does not usually change the colour of fillings and other restorative materials. It does not affect porcelain, other ceramics, or dental gold. However, it can slightly affect restorations made with composite materials, cements and dental amalgams.

6. How safe are products containing hydrogen peroxide?

6.1 Solutions containing more than 5% hydrogen peroxide are labelled "harmful" and "irritating to eyes". At higher concentrations other mentions are added, highlighting the risk of serious damage to eyes, irritation of the respiratory system and skin, and burns.

6.2 Oral hygiene products and tooth whiteners containing hydrogen peroxide are not very likely to affect the body as a whole, because the substance is rapidly broken down. But above certain levels effects have been seen in animals. In addition, there are concerns about direct effects like irritation in the mouth and in the gastrointestinal system after swallowing.

In the European Union, oral hygiene products may only be sold freely to consumers if they contain no more than 0.1% hydrogen peroxide.

Risks to humans can be estimated based on animal studies. For general effects on the body, the margin of safety is considered sufficient if human exposures are at least 100 times lower than the level at which no effects have been observed in any animal study. This is the case for toothpastes and mouth rinses containing 0.1% of hydrogen peroxide and tooth whitening products containing 6% of hydrogen peroxide, but not for tooth whitening products containing more hydrogen peroxide.

7. What should be considered before a tooth whitening treatment?

Above 0.1% hydrogen peroxide, tooth bleaching is not just a simple cosmetic procedure. Dentists should diagnose the cause of the staining, check whether patients have any other oral health problems, and counsel patients about the best way of dealing with this esthetical problem.



As already mentioned above, common undesirable side effects of tooth whitening treatment, such as increased tooth sensitivity and mouth irritation, usually disappear within a few days. The surface of fillings and other restorations can be affected.

Hydrogen peroxide can act as a weak cancer promoter, meaning it can slightly stimulate the growth or multiplication of cancer cells. Tobacco use, alcohol abuse, and specific genetic predispositions increase the risk of oral cancer. Hydrogen peroxide may therefore further increase this risk, especially when the treatment is repeated. This may be of concern as smokers are likely candidates for tooth whitening. The risk of harmful effects may be greater for people who have pre-existing oral diseases.

8. Conclusion – Are oral hygiene products and tooth whiteners containing hydrogen peroxide safe and should they be freely available to consumers?

To conclude, the SCCP (Scientific Committee on Consumer Products) of the European Commission expressed the following opinions:

- The use of **toothpastes, mouth rinses** and tooth whiteners containing **up to 0.1%** hydrogen peroxide does not pose a risk to the health of the consumer. Toothpastes and mouth rinses should not contain more than 0.1% hydrogen peroxide.
- The use **tooth whitening products containing 0.1 to 6 % hydrogen peroxide** entails potential risks for the consumer. These risks increase with increasing concentration of hydrogen peroxide and frequency of application. Potential risks of the use of tooth whiteners containing **between 0.1 and 6 %** hydrogen peroxide can be limited if tooth whitening is done properly with the approval and under the supervision of a dentist. The specific situation of each individual should be taken into account prior to treatment. Additional research is needed on the use of tooth whitening products over longer time periods.
- Use of tooth whitening products containing **more than 6% is not considered safe** for use by consumers.

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