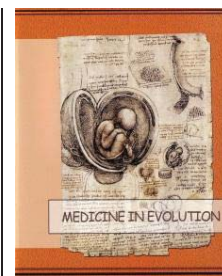


Fluoride prophylaxis through nutrition



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Abstract

The large-scale incidence of tooth decay, the onset of dental cavities from early age, the increase of the disease rate, the multiplication of cases with multiple and galloping tooth decay, the failure of therapeutic procedures to achieve a significant reduction of morbidity, all of the aforementioned make tooth decay prophylaxis an issue of public health concern. This involves the onset of complex primary and secondary prophylaxis programmes, both at collective and individual level. The lack of a sufficient intake of natural fluoride has led to the need to supplementing with fluoride from natural sources to an effective dose, by fluoridation of water, table salt, and fluoridation of various foods.

Keywords: prophylaxis, fluoride, water, salt

INTRODUCTION

Fluoride ion is a trace element present in nature and never found in a free state, its intake through food ranging between 0.2 and 0.5 mg. The amount absorbed is dependent on both the intake and the solubility of the compound in which it is present. In addition to the intake, the age factor is another variable i.e. the new-borns and infants retain 75% of the intake, while the toddlers and preschoolers children retain 50%, the storage of fluoride being usually done in the hard tissues [bone and teeth] and in the kidneys.

While the bone remains for the rest of its life dependent on the excess fluoride, the tooth enamel has from a more limited period of dependency to fluoride.

The distribution of fluoride in tooth enamel is uneven, the concentration at surface of tooth being ten times higher than at the amelodentinal junction.

In the end, teeth prone to cavities would not depend entirely on higher fluoride concentration in teeth, but on the concentration of fluoride in the most superficial layer of the surface enamel [according to Firu and Zarnea, cited by Elvira Cocarla]. [1,2]

Fixation of fluoride in the dental tissues is carried out by ion exchange, the fluoride being able to replace the -OH and -CO₃ groups in the apatite crystals, thus resulting in fluorapatite which is far less soluble in the acid environment.

Exogenously administered, fluoride can also contribute to the post-eruptive maturation of tooth enamel and its remineralization following acid attack. By decreasing the viscosity of saliva, it also contributes to reducing the dental plaque formation.

The antimicrobial effect is another local mechanism of the caries-preventive action of fluoride.

Aim and objectives

Specific prophylaxis means include fluoride prophylaxis, in addition to sealing dental cracks and dimples.

If the sealing of dental cracks and dimples is a procedure that can be done exclusively in specialized dental offices, fluoride prophylaxis can be done in two ways: by exogenous, and by endogenous administration.

MATERIAL AND METHODS

In this paper we aim to review and make a comparison between the main means of endogenous fluoride administration.

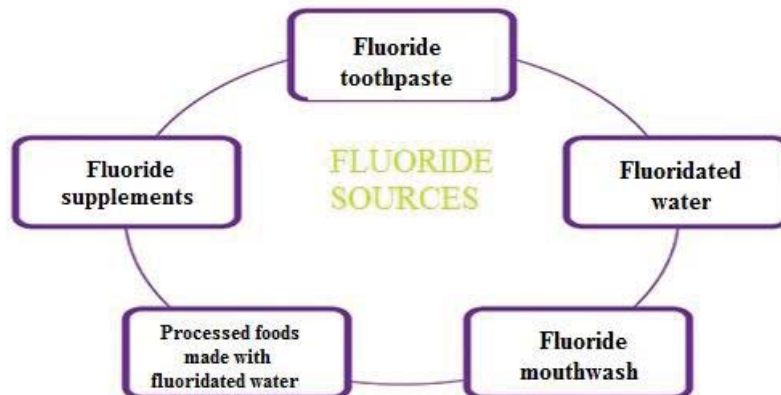


Figure 1. Fluoride sources

RESULTS AND DISCUSSIONS

The natural waters in Romania, especially in the western area of the country, have, with a few exceptions, low fluoride levels, and the social and economic condition of the majority of the population do not favour expensive dental treatments. Widespread awareness among the population of the benefits of fluoridated water consumption and raising awareness among the governmental institutions on the benefits of this caries-preventive method could be a real method for Romania to reduce the level of decay index in the long run.

Moreover, the people diet in this area of the country is low in fluoride i.e. 0.3-0.5 mg. Children are first to benefit from fluoride intake, during the formation of primary and permanent teeth, until around the age of 14.

The addition of fluoride can be done through water, fluoride tablets, milk, salt, and bread [3]:

In the following, we will present the pros and cons of each fluoridation method.

1. Water fluoridation:

The main advantages of water fluoridation are [1,2]:

- Its addressability to all members of the community, regardless of age or social and economic status;
- Continuous exposure, both during pre- and post-eruptive phase, at an exactly calculated concentration of fluoride;
- High effectiveness, since it is a collective prophylactic measure,
- Long-term administration possibilities.
- Lower costs,
- Accurate and easy dosing.



Figure 2. Fluoride water

The disadvantages of water fluoridation are [1,2]:

- First of all, it requires special installations operated by qualified personnel, as well as periodic controls thereof,
- Only people who have access to a centralized water source benefit from this method,
- There is a variation in terms of individual consumption, since the consumption of fluoride depends on water consumption,
- Unnecessary loss of fluoride in industrial installations.

In some areas, drinking water is deficient in fluoride, and fluoridation of water should be at the core of prophylaxis programs. When deciding on prophylactic measures within a certain water, the data on concentration of fluoride in drinking water should be already available.

We present some examples below:

- In several European countries: following a study conducted by Rock et al., cited by Elvira Cocarla, in two cities in England one benefiting from fluoridated water, and the other city – the control one – without benefiting from fluoride in water, the DMF [decay-missing-filled] indices were compared. The finding was that the morbidity was 2.5 times higher in the city with non-fluoridated water. Also, the index of extractions was 4 times higher in the same city. The same studies show that in areas where the level of fluoride is low, the following results were obtained: 50% of first permanent molars are decayed one year after the eruption and, by the age of 12, only 10% are still intact. In areas with fluoridated water, the results are satisfactory, the morbidity in permanent primary molars being low and the index extraction has been reduced by up to 75%. [1,2]
- In the USA, 50% of the population benefits from this method. One method used in this country was to fluoridate water supplied in schools. According to a study conducted by Horowitz et al., and cited by Elvira Cocarla, there was a 40% reduction in the incidence of dental decay, and a maximum protection after 12 years of implementing this method, as well as a progressive benefit. The disadvantage of this method is the late onset of fluoride administration, when the first permanent molars and permanent incisors can no longer benefit from it. The recommended doses of fluoride are increased due to consumption during school days only. [1,2]
- In Romania, in TarguMures, this method was applied and consisted in increasing the concentration up to **1 mg. Fluoride/ litter** by the addition of sodium silicofluoride or sodium fluoride. Following the related studies, according to Benedek and Csongor, cited by Cocarla E. [1,2], by comparative data collected from children living in ClujNapoca and TarguMures, on decay morbidity, they showed a decrease in intensity indices, although fluoridation was not continuous due to technical considerations.

For a good efficiency of this method it is recommended to use the method since child birth. Should the method be applied after teeth eruption, the outcomes can be observed 2-3 years after application.

2. Fluoride tablets

Fluoride tablets [supplements] are effective during the formation and mineralization of dental hard tissues. They contain sodium fluoride and are administered to children until the age of 14. To be effective, it should be started with the administration to pregnant women and continued to be administered to breast-feeding mothers.

The right daily dose and age for administration of fluoride tablets are presented in the table below:

Table 1. Daily dose of fluoride tablets

AGE	DAILY DOSE
0- 2 years old	1x1 tablet of 0.25 mg
2-4 years old	2x1 tablet of 0.25 mg
4-6 years old	3x1 tablet of 0.25 mg
over 6 years old	4x1 tablet of 0.25 mg or 1x1 tablet of 1 mg
During pregnancy	1 x tablet of 1 mg

Advantages of this method:

- It allows facile application,
- It ensures an exact dosage, depending on age.

Disadvantages of this method:

- It is difficult to perform a regular administration,
- The individual consent of potential beneficiaries is required,
- It requires a strict supervision to prevent overdoses,
- It is an expensive method.



Figure 3. Enamel dystrophies

3. Salt fluoridation

It is successfully practiced in several countries i.e. Switzerland, France, Hungary, Costa Rica, Mexico, Spain, and recently in Romania.

This method is applied where drinking water sources are poor in fluoride, mountainous areas or when water fluoridation specific sanitary policies are lacking.

Disadvantages of table salt method:

- Impossibility of individual dosing,
- It cannot be applied to the new-borns, infant and toddlers whose diet must be low in salt,
- There are large variations in terms of salt use habits,
- Its clinical efficacy is lower in comparison with other methods.

This salt is commercially available in packs of 1 kg, each containing 200 mg of sodium fluoride and 10 mg of iodine. In our country, iodized salt has been used to treat endemic goiter, and over the past years fluoridated salt has been launched on the market. It was found that an average consumption of 6g of salt would provide the necessary fluoride amount to the human body. [1,2].

4. Milk fluoridation

Milk is the basic component of a baby's diet.

Milk fluoridation method is practiced in several countries i.e. Hungary, Bulgaria, Russia, China, England, Scotland.

Advantages of this method:

- It is a method recommended for children.

Disadvantages of this method:

- Implementation of a milk distribution system in schools and kindergartens, as well as the monitoring of milk consumption,
- Possibility of inactivation of fluoride ions by casein.

It is recommended to consume a glass of milk with 0.5 mg fluoride for about 1 year, the addition of fluoride being 2 mg / liter of milk. [1,2]

5. Fluoridation of bread

Before baking, the bread is soaked with a fluoride solution. No special packaging is required [1,2]

Disadvantages of this method:
Consumption rates vary from one individual to another.

CONCLUSIONS

Both the lack of fluoride in the human diet in the western part of the country, and the sources of drinking water poor in fluoride impose the need to supplement the fluoride intake. The addition of fluoride can be made through water, milk, bread, and salt.

When prophylactic measures are to be taken for that purpose, the data on concentration of fluoride in water and food must be available, this indicator presenting variable levels from one country area to another.

Caries preventive doses of fluoride is 1 mg Fluoride per day and represents the amount that has the maximum caries-preventive effect, with a minimum risk to onset fluorosis. It is generally considered that an intake of 0.1 mg F/ Kg prevents any side effects.

Although in the developed countries tooth decay indices have registered significant reductions as a result of the widespread use of fluorinated products, in our country these indices still have extremely high values.

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