

Fluoride Adulteration in Dental Products

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ABSTRACT

Fluorine, the 13th most abundant element of the earth's crust, represents about 0.3g / kg of earth's crust. It occurs mainly in the form of chemical compounds such as sodium fluoride or hydrogen fluoride, which are present in minerals fluorospar, fluorapatite, topaz and cryolite. Fluoride is frequently encountered in minerals and in geochemical deposits and is generally released into subsoil water sources by slow natural degradation of fluorine contained in rocks. Fluoride being a natural element has several effects on health. Fluoride is beneficial to health if the concentration (CF) of the fluoride ion (F⁻) in drinking water is less than 1.5 mg/L (WHO 1994). A higher concentration causes serious health hazards. The disease caused manifests itself in three forms, namely, dental, skeletal, and non-skeletal fluorosis. On a large scale, it is used in dental product due to its anti-sensitizing property and abrasive action. Application of fluoride must be controlled and restricted to reduce the side effect induced by it.

Keywords: Abrasive action, fluoride, human health, kidney disease, reproductive functioning

INTRODUCTION

Dental caries (i.e., tooth decay) is an infectious, multi-factorial disease afflicting most persons in industrialized countries and some developing countries. ^[1]In recent decades, there has been a worldwide decline in the prevalence and severity of dental caries, even in countries with unstable market economy. ^[2] One of the most widely accepted measures for control of dental caries is brushing with fluoridated toothpaste. If used at optimal levels, fluoride has highly beneficial effects in preventing and controlling dental caries. However, if fluoride is ingested above the optimal level, this halogen may lead to the emergence of developmental structural changes known as dental fluorosis, skeletal fluorosis, characterized by patches of enamel. If children under the age of six ingest high levels of fluorides during the period of tooth formation, they can develop dental fluorosis. This condition causes white areas or brown stains to appear on the teeth, which affects the appearance of the teeth but not their function. Children need fluoride protection while their teeth are developing and adults need it since the risk of

root cavities increases as they get older. Moreover, many governments and health organizations, including Health Canada, the Canadian Public Health Association, the Canadian Medical Association, the Canadian Dental Association, and the World Health Organization endorse the fluoridation of even our drinking water to prevent tooth decay. Clearly, the appropriate use of fluorides in dentistry is very beneficial. Rocks, soil, water, air, plants, animals and food products all contain fluoride in widely varied concentrations. Tea leaves are usually very rich in fluoride and the tea plant (*Camellia sinensis*) takes up fluoride from the soil and accumulates it in its leaves; it is considered a major source of fluoride. ^[3]

FLUORIDE IN DRINKING WATER

Fluoride can occur in drinking water naturally as a result of the geological composition of soils and bedrock. Some areas of the country have high levels of naturally occurring fluoride. Fluoride can also be added to public drinking water supplies as a public health measure for reducing cavities. Frequent consumption of fluoridated drinking water and

beverages and food processed in fluoridated areas maintains the concentration of fluoride in the mouth. In the United States, water and processed beverages (e.g., soft drinks and fruit juices) can provide approximately 75% of a person's fluoride intake.^[4] But excess of fluoride content even in drinking water can create a lot of health problems, therefore many communities choose to adjust the fluoride concentration in the water supply to a level beneficial to reduce tooth decay and promote good oral health. This practice is known as community water fluoridation.^[5]

FLUORIDE IN TOOTHPASTE

Most toothpaste now contains fluoride, and most people get their fluoride this way. Fluoride toothpaste is very effective in preventing tooth decay. Brushing with fluoride toothpaste also increases the fluoride concentration in saliva 100- to 1,000-fold; this concentration returns to baseline levels within 1--2 hours.^[6] The amount of fluoride in toothpaste is usually enough to lower the level of decay as fluoride makes your tooth enamel stronger and less likely to suffer acid damage. In areas where the water supply is fluoridated, fluoride toothpaste gives extra protection. All children up to three years old should use a toothpaste with a fluoride level of at least 1000ppm (parts per million). After three years old they should use a toothpaste that contains 1350ppm to 1500ppm (<http://www.dentalhealth.org/tell-me-about/topic/sundry/fluoride>).

WHY IT IS DNEROUS TO SWALLOW FLUORIDE

Fluoride can accumulate in the body, and it has been shown that continuous exposure to it causes damaging effects on the body tissue. Wide range in individual response to fluoride is not yet fully understood, the following are the factors that are believed to play a role;

- Impaired kidney function
- Dietary deficiency
- Genetics
- Acidosis
- Repetitive physical stress
- Age
- Pregnancy/ lactation

ASSOCIATED HEALTHY BENEFITS AND RISK OF FLUORIDES

Beneficial effects of adequate fluoride: Fluoride is a micronutrient. Adequate intake of fluoride has a beneficial effect on oral health in both children and adults. Fluoride is the only chemical added to water for the purpose of medical treatment. The U.S. Food and Drug Administration (FDA) classify fluoride as a drug(http://www.fluoridealert.org/uploads/fluoride_drug.pdf) when used to prevent or mitigate disease (FDA 2000). It was discovered that fluorides work by making the outer layer of teeth, called the enamel, stronger. When the outer layer is strong, teeth are then protected against these acids. Children need fluoride protection while their teeth are developing and adults need it since the risk of root cavities increases as they get older. Fluoride has been used for nearly 30 years as an experimental therapy to treat osteoporosis, but has only recently been evaluated in controlled clinical trials.

Assessment of health risk of fluoride: Ingested fluoride reacts with gastric acid to produce hydrofluoric acid in the stomach. Thus, acute exposure to high concentrations of fluoride results in immediate effects: abdominal pain, excessive saliva, nausea and vomiting. Seizures and muscle spasms may also occur. Death due to respiratory paralysis is a possibility (by WHO). Several clinical and experimental studies have reported that the F induces changes in cerebral morphology and biochemistry that affect the neurological development of individuals as well as cognitive processes, such as learning and memory.^[7,8] High doses of fluoride have repeatedly been found to interfere with the reproductive system of animals . Commonly observed effects in fluoride-exposed animals include: oxidative stress, damaged sperm, reduced sperm count, and reduced fertility (<http://www.ffo-olf.org/ReproductiveAndFluoride.html>). Fluoride is toxic to thyroid cells; it inhibits function and causes cell death.^[8] Research suggests that exposure to fluoride causes cardiovascular inflammation and atherosclerosis. Other research has examined its effect on blood pressure but had mixed results. Regardless, despite

that cardiovascular disease can have many causes, the evidence, and history show its incidence increases with exposure to fluoride.^[9,10] Fluoride has been shown to cause calcification of cartilage, the essential tissue for joint health.

The main effect of long-term ingestion or inhalation of high concentrations of fluoride is fluorosis:

- Enamel fluorosis: It results from intake of high levels of fluoride during the period of tooth development. In the more severe form, reduced mineralization of the enamel results in stained and pitted teeth.

- Skeletal fluorosis: skeletal fluorosis is associated with osteosclerosis, calcification of tendons and ligaments, and bone deformities. There is an elevated risk of skeletal effects at fluoride intakes above 6 mg/day.

While the global prevalence of dental and skeletal fluorosis is not entirely clear, it is estimated that excessive fluoride concentrations in drinking-water have caused tens of millions of cases of dental and skeletal fluorosis worldwide over a range of years.^[11]

CONCLUSION

In this review, we emphasize to find an alternative in place of fluoride to reduce the hazard cause by fluoride's presence. As we know that fluoride have both beneficial as well as harmful effects, systemic should be approached to minimize the risk. One of the major side effects of fluoride is whitening of hair i.e. premature discoloring of hair Awareness should be spread among the consumers to restrict the use of fluoride products. Companies must pay their attention to control and regulate the fluoride products and their presence in the premises. Government must formulate such governing bodies that design the standards for presence of harmful chemical substances in human life. And further more government must organize audit to have look on that norms regarding the level of fluoride in various marketed products.

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