Systemic Fluorides

Full Summary

Description:

Fluoride is a naturally occurring compound that continues to play a vital role in the prevention of dental caries. The decrease in prevalence and severity of dental caries over the second half of the 20th century in many industrialized countries is attributed to use of fluorides. The 2003 World Health Organization (WHO) report on oral health reported that “there is clear evidence that long-term exposure to an optimal level of fluoride results in diminishing levels of caries in both child and adult populations”[1]. Griffin et al. conducted a meta-analysis evaluating the role of systemic fluorides in adults, reporting fluorides provide a protective effect against caries among adults across all ages[2].

Research on use of fluoride in preventing dental caries has been conducted since the early part of the 20th century and fluoride is now used widely across the globe [2, 3]. The WHO Global Oral Health Programme is currently undertaking further demonstration projects in Africa, Asia and Europe in order to assess the effects of affordable fluoridated toothpaste, milk fluoridation and salt fluoridation[3].

Systemic fluorides are those that are ingested into the body and become incorporated into forming tooth structures[4]. Systemic fluorides when ingested during tooth development are deposited to some extent throughout the tooth surface. However, the actual mechanism of action of systemic fluorides is from the topical protection as the fluoride present in saliva, which continually bathes the teeth, provides a constant source that is also incorporated into plaque and facilitates remineralizetion[5]. Today the primary source of systemic fluoride in the U.S. is water fluoridation. Other sources include dietary supplements (tablets, drops or lozenges) and fluoride present in food and beverages. Salt and milk fluoridation are more common in other countries around the world, including Europe, Canada, China, South America, and Mexico.

The preventive action of fluoride occurs through the following three mechanisms[6]:

1. It decreases the solubility of enamel in acid by converting hydroxyapatite into less soluble fluorhydroxyapatite/fluorapatite.
2. It incorporates in plaque and reduces the ability of acid production by the plaque organisms.
3. It promotes the remineralization of enamel in areas that have been demineralized by acids.

Of the above mechanisms, remineralization action of fluoride is most important and requires calcium and phosphate, which come from saliva in addition to fluoride delivered over longer periods of time[7].

Recommendations for fluoride use including systemic fluorides:
The CDC has provided recommendations for using fluorides in preventing and controlling dental caries in the U.S. [8, 9].

In public health and clinical practice it is recommended that:

- Fluoridation should continue and extend into the fluoridation of community drinking water.
- Counsel parents and caregivers regarding use of fluoride toothpaste by young children, especially those < 2 years of age.
- Target mouth-rinsing to persons at high risk.
- Judiciously prescribe fluoride supplements.
- Apply high-concentration fluoride products to persons at high risk for dental caries.

For purpose of self-care, it is recommended that patients:

- Be aware of the fluoride concentration in the primary source of drinking water
- Use small amounts of fluoride frequently.
- Supervise use of fluoride toothpaste among children < 6 years of age.
- Consider additional measures for persons at high risk for dental caries.
- If the primary drinking water contains > 2 ppm fluoride, then use an alternative source of water for children ≤ 8 years of age.

References:

1. Petersen, P.E., *The World Oral Health Report 2003: continuous improvement of oral health in the 21st century--the approach of the WHO Global Oral Health Programme.* Community Dent Oral Epidemiol, 2003. 31 Suppl 1: p. 3-23.
2. Griffin, S.O., et al., *Effectiveness of fluoride in preventing caries in adults.* J Dent Res, 2007. 86(5): p. 410-5.
3. Jones, S., et al., *The effective use of fluorides in public health.* Bulletin of the World Health Organization, 2005. 83: p. 670-676.
4. Newbrun, E., *Fluorides and dental caries.* 3rd Ed. Springfield, Illinois: Charles C. Thomas, publisher, 1986.
5. Lambrou, D., et al., *The effect of fluoride in saliva on remineralization of dental enamel in humans.* Caries Research, 1981. 15(341-345).
6. Dhar, V. and M. Bhatnagar, *Physiology and toxicity of fluoride.* Indian Journal of Dental Research, 2009. 20: p. 350-5.
7. Featherstone, J., *Remineralization, the natural caries repair process. The need for new approaches.* Advances in Dental Research, 2009. 21: p. 4-7.
8. *Recommendations for using fluoride to prevent and control dental caries in the United States. Centers for Disease Control and Prevention.* MMWR Recomm Rep., 2001. 50(RR-14): p. 1-42.
9. Levy, S.M., *An update on fluorides and fluorosis.* J Can Dent Assoc, 2003. 69(5): p. 286-91.