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### Review Article

## Dental Fluorosis - A cosmetic condition not a disease...!

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### Abstract

It seems prudent at present to assume that the ameloblasts are not the only cells in the body whose function may be disturbed by the physiological concentrations of fluoride which result from drinking water containing 1 ppm. The safety of the use of fluorides ultimately rests on the assumption that the developing enamel organ is most sensitive to the toxic effects of fluoride. Fluoride causes dental fluorosis by damaging the enamel forming cell called ameloblasts. The damage of these cells results in a mineralization disorder of teeth. Dental professionals consider dental fluorosis to be solely a cosmetic effect and not a teeth effect. The present article presents a review on Dental fluorosis with emphasis on the dual-ended sword behavior of Fluoride in Oral Health.

**Keywords:** Ameloblasts, Fluoride, Fluorosis, Dental fluorosis, Oral Health.

### Introduction

Dental fluorosis is an irreversible condition caused by excessive ingestion of fluoride during the tooth forming years. It is the first visible sign that a child has been overexposed to fluoride. Over the past 50 years, the prevalence of dental fluorosis has increased quite dramatically in the United States and other fluoridated countries. According to the Centers for Disease Control, dental fluorosis now impacts 32% of American children (in the 1940s, dental fluorosis rates in fluoridated areas averaged 10%). According to

recent estimates from the U.S. and British Governments, 2 to 12% of children living in fluoridated communities have dental fluorosis of “esthetic concern” (Griffin 2002 York Review 2000). Dental fluorosis, of esthetic concern, is an expensive condition to treat. If left untreated, it can cause embarrassment for school aged children, resulting in psychological stress and damaged self-esteem.<sup>1,2</sup>

The prevalence of fluorosis at a water fluoride level of 1.0 ppm was estimated to be 48% and for fluorosis of aesthetic concern it was predicted to be 12.5%.

Current studies support the view that dental fluorosis has increased in both fluoridated and non-fluoridated communities.

**CLASSIFICATION:<sup>3</sup> The Dean Index & The thylstrup-Fejerskov Index**

<b>CRITERIA FOR DEAN’S FLUOROSIS INDEX</b>	
<b>SCORE</b>	<b>CRITERIA</b>
<b>Normal</b>	The enamel represents the usual translucent semivitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color.
<b>Questionable</b>	The enamel discloses slight aberrations from the translucency of normal enamel, ranging from a few white flecks to occasional white spots. This classification is utilized in that instance where a definite diagnosis of the mildest form of fluorosis is not warranted and a classification of “normal” is not justified.
<b>Very Mild</b>	Small opaque, paper white areas scattered irregularly over the tooth but not involving as much as 25% of the tooth surface. frequently included in this classification are teeth showing no more than about 1-2 mm of white opacity at the tip of the summit of the cusps of the bicuspid or second molars
<b>Mild</b>	The white opaque areas in the enamel of the teeth are more extensive but do not involve as much as 50% of the tooth
<b>Moderate</b>	All enamel surfaces of the teeth are affected and the surfaces subject to attrition show wear. Brown stain is frequently as disfiguring feature.
<b>Severe</b>	Includes teeth formerly classified as “moderately severe as severe” all enamel surfaces are affected and hypoplasia is so marked that the general form of the tooth may be affected. The major diagnostic sign of this classification is discrete or confluent pitting. Brown stains are widespread and teeth often present a corroded-like appearance.

**MILD DENTAL FLUOROSIS<sup>4</sup>**

<b>CLASSIFICATION CRITERIA FOR MILD DENTAL FLUOROSIS – DEAN’S FLUOROSIS INDEX</b>	
<b>SCORE</b>	<b>CRITERIA</b>
<b>Normal</b>	The enamel represents the usual translucent semivitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color.
<b>Very Mild</b>	Small opaque, paper white areas scattered irregularly over the tooth but not involving as much as 25% of the tooth surface. Frequently included in this classification are teeth showing no more than about 1-2 mm of white opacity at the tip of the summit of the cusps of the bicuspid or second molars.
<b>Mild</b>	The white opaque areas in the enamel of the teeth are more extensive but do not involve as much as 50% of the tooth.



**IMPACT ON TOOTH QUALITY:** The mineralization of teeth under formation may be affected so that dental fluorosis may occur. Dental fluorosis

reflects an increasing porosity of the surface and subsurface enamel, causing opaque enamel.



The clinical features represent a continuum of changes ranging from fine white opaque lines running across the tooth on all parts of the enamel to entirely chalky white teeth. In the latter cases,

the enamel may be so porous (or hypomineralized) that the outer enamel breaks apart posteruptively and the exposed porous subsurface enamel becomes discolored.



**PSYCHOLOGICAL EFFECTS:** Mildly fluorosed enamel is fully functional, but may be cosmetically objectionable. Mild fluorosis was assessed less favorable than normal/control midline diastema was less favorable than mild fluorosis, and mild fluorosis was less favorable than isolated opacity.

“Although Many dental professionals often state that very mild fluorosis is not a cosmetic problem, these results suggest that it is perceived otherwise.

Even parents of children suffering from very mild fluorosis showed an increase in dissatisfaction with their child’s appearance.



**MODERATE TO SEVERE DENTAL FLUOROSIS:** After eruption into mouth, the porous enamel of moderate to severe fluorosis readily takes up

stain, creating permanent brown and black discolorations of the teeth.

**CLASSIFICATION:<sup>4</sup> Moderate to severe dental fluorosis**

CLASSIFICATION CRITERIA FOR MODERATE/SEVERE DENTAL FLUOROSIS - DEAN’S FLUOROSIS INDEX	
SCORE	CRITERIA
<b>Moderate</b>	All enamel surfaces of the teeth are affected and the surfaces subject to attrition show wear Brown stain is frequently a disfiguring feature
<b>Severe</b>	Includes teeth formerly classified as “moderately severe and severe” All enamel surfaces are affected at hypoplasia is so marked that the general form of the tooth may be affected the major diagnostic sign of this classification is discrete or confluent pitting. brown stains are widespread and teeth often present a corroded like appearance

**IMPACT ON TOOTH QUALITY:** In its “moderate and severe forms, fluoride causes a marked increase in the porosity of the enamel. In addition to extensive staining, teeth with moderate to severe fluorosis are more prone to attrition and wear-leading to pitting chipping, and decay. As a

result of the staining and crumbling of enamel, children with moderate to severe dental fluorosis can suffer a great deal of social embarrassment and psychological stress with a corresponding loss in self-esteem.



“Severe enamel fluorosis is characterized by dark yellow to brown staining and discrete and confluent pitting, which constitutes enamel loss. The damage to teeth caused by severe enamel fluorosis is a toxic effect that is consistent with

prevailing risk assessment definitions of adverse health effects”



In more severely fluorosed teeth, the enamel is pitted and discolored and is prone to fracture and wear. Several studies have found significant increases in the number of decayed, missing, or filled tooth surfaces in children with severe dental fluorosis.

the affected individual. Mottling of teeth can have significant psychological impact on patients.

**PSYCHOLOGICAL EFFECTS:** The more severe forms can cause great psychological distress to

**BIOLOGY OF DENTAL FLUOROSIS:** Excessive ingestion of fluoride during the early childhood years may result in a disorder of the teeth known as dental fluorosis. teeth with fluorosis have an increase in porosity in the subsurface enamel (“Hypomineralization”)



The increased porosity of enamel found in fluorosis is a result of a fluoride-induced impairment in the clearance of proteins amelogenins from the developing teeth.

Dental fluorosis is characterized by greater surface and subsurface porosity than in normal enamel, that results from excess fluoride (F) Reaching the developing tooth during developmental stages excess F available to the enamel during maturation disrupts mineralization and results in excessive retention of enamel proteins. Any use of fluorides, whether systemic or topical, in caries prevention and treatment is children results in ingestion and absorption of fluoride into the blood circulation. The mineralization of teeth under formation may be affected so that dental fluorosis may occur.<sup>5</sup>

Fluorosis is a Hypomineralization of enamel caused by the retention of amelogenins proteins by fluoride. the affected enamel does not mature and has surface and subsurface porosities. Fluorosed enamel is characterized by retention of amelogenins in the early-maturation stage of enamel and by the formation of subsurface Hypomineralization”.

The clinical features represent a continuum of changes ranging from fine white opaque lines running across the tooth on all parts of the enamel to entirely chalky white teeth. In the latter cases, the enamel may be so porous or hypomineralized that the outer enamel breaks apart posteruptively and the exposed porous subsurface enamel become discolored. Enamel maturation has been characterized by the progressive deposition of mineral and withdrawal of organic matrix and water it is evident that high chronic levels of fluoride interferes with this process.

**IMPACT ON DENTIN:** The fact that human dentin also exhibits Hypomineralization in human fluorosis teeth indicates that fluoride exerts its effects on very basic processes involved in biomineralization in general irrespective of whether crystal formation and growth occurs in mesenchymally or ectodermally derived mineralized tissues. However relatively little work has been done to identify the mechanisms by which low serum levels of fluoride which result in dental fluorosis effect the development of mineralizing tissues.<sup>6</sup>

Exposure of the dentin-pulp complex to higher concentrations of fluoride in the mineralization process in the transition from predentin to dentin, which may well have a mechanistic basis in the fluoride induced extra cellular matrix changes arising in this region of the tissue. In view of the continued apposition of dentin throughout life, these observations indicated that exposure to high levels of fluoride may exert effects at the cellular level well beyond tooth development during

- Generally speaking, bleaching and microabrasion are use for superficial staining, whereas the conservative restorations are used for more unaesthetic situations.
- Also as a preventative measure, dentists recommend that children should not receive topical fluoride treatment until the age of three or at the earliest time that a determination can be made about a child's total fluoride exposure.

primary, physiological secondary and tertiary dentin genesis.

The sevenfold reduction in phosphate content of DPP isolated from fluorosis dentine evident in the present study will undoubtedly have an influence on the anionic nature of these macromolecules. Such as major change in the biochemical structure of DPP together with those previously reported for other macromolecules. such as proteoglycans, are likely to be important in considering the Hypomineralization associated with fluorosis.<sup>7</sup>

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#### **TREATMENT:**<sup>8</sup>

- Dental fluorosis can be cosmetically threaded by a dentist
- The cost and success can vary significantly depending on the treatment
- Tooth bleaching microabrasion and conservative composite restorations or porcelain veneers are commonly used treatment modalities.

#### **Conclusion**

The public is generally not aware of dental fluorosis. This is changing there have been attempts and litigation in several countries. Cosmetic issues related to teeth matter, witness the increasing proportion of dentists' time devoted to aesthetic care and the many articles in clinical journals about techniques to improve the appearance of moderate and severe fluorosis. It is only and matter of time until a case is brought that

gets public attention. The risk is that noticeable fluorosis will be perceived by the public as a toxic consequence of fluoride ingestion – which arguably it is.

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