1. Introduction (Evidence for What? Whom?)
2. Dental Caries - Review
3. Fluoride Mechanism of Action – Review
4. Ways of Fluoride Use on Caries Control Based on Evidence
5. Systemic Effects of Fluoride Use Based on Evidence (emphasis to dental fluorosis!)
6. Conclusions

BACKGROUND: Evidence-based dentistry, or EBD, is not a new concept for the dental profession in the United States. The American Dental Association has long relied on credible scientific evidence in setting policy and communicating with dentists and the general public.

OVERVIEW: The authors discuss applications of systematic review findings to everyday clinical practice and explore the implications of EBD for dental education, clinical research and the provision of care to patients. CONCLUSIONS AND PRACTICE IMPLICATIONS:

In developing appropriate treatment plans, dentists should combine the patient's treatment needs and preferences with the best available scientific evidence, in conjunction with the dentist’s clinical expertise. To keep pace with other health professions in building a strong evidence-based foundation, dentistry will require significant investments in clinical research and education to evaluate the best currently available evidence in dentistry and to identify new information needed to help dentists provide optimal care to patients.

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Public Health

Caries Decline, Brazil, 1968-2002

Before

Post 90

Water Fluoridation

- The Brazilian Population Strategy

Fluoride Dentifrice

- The Brazilian Directed Population Strategy

SB 2010

DMFT10 = 2.07

Piracicaba, SP

Cury, Tenuta, Ribeiro, Pass Leme, Braz Dent J 15 (3) 2004 (Medline reachable)

Kits Odontológicos

Total: 32 milhões

de kits odontológicos para ação de promoção e prevenção em Saúde Bucal.

Pucca, G. COSAB, MS, Brasília
I am not affiliated to PT and also I do not sell toothpastes!

Beyond & Behind Papers & Prizes

Ingve Ericsson 2010 Lecture

Publishing with Quality and Responsibility

ORCA 2012 Lecture

EVIDENCE PYRAMID

High-Level Evidence

Systematic Experiments

In vivo

In situ

Cohort

Case-Control

Evidence

Low-Level Evidence

AnimalStudies / In-vitroResearch

Epidemiology / Opinion

Evidence-Based Dentistry and Evidence-Based Dentistry, 2010, Chap. 2.
1. Which community way of Fluoride application is effective on caries control?

2. Non-Fluoride toothpaste is effective to control caries?

3. Which is the minimal fluoride concentration that a toothpaste should contain?

4. Is a low F toothpaste (irrespective of its formulation) effective to control caries and to avoid fluorosis?

5. How many times a day the teeth should be brushed using a standard fluoride toothpaste (1000-1500 ppm F)?

6. Which ways of professional fluoride application are proved effective to control caries?

7. Is professional fluoride application relevant to control caries for patients using fluoride toothpaste?

8. Which is the cause-effect relationship between dose of fluoride intake and dental fluorosis from toothpaste?
1. Caries lesions develop where biofilms are allowed to mature and remain for prolonged periods of time.

2. Dental caries occurs:
   a) at occlusal surfaces (being particularly at risk during the long-lasting eruption into functional occlusion)
   b) in interproximal areas below contact point/facets
   c) along the marginal gingiva
   d) on enamel-cementum junction, when exposed

**Dietary sugars:**
   a) Change the biofilm composition and structure
   b) Provoke demineralization of mineral dental substrates
   c) ... and sucrose is the most cariogenic

**CARIES: A BIOFILM-SUGAR INDUCED DISEASE**

**The role of tooth brushing and the use of fluoride toothpaste**

The contribution of tooth brushing per se to oral health remains difficult to quantify. Evidence exists for an anticaries effect through efficient oral hygiene, and this is particularly clear in studies involving supervised brushing or professional tooth cleaning.

For prevention of caries at a population level, it has become apparent that regular exposure of the tooth surfaces to fluorides is key and that the major anti-caries benefit of tooth brushing is provided through application of fluoride toothpaste.

A systematic review of the effectiveness of health promotion aimed at improving oral health.
Kay E, Locker D.

OBJECTIVE: To examine the quality of oral health promotion research evidence and to assess the effectiveness of health promotion, aimed at improving oral health using a systematic and scientifically defensible methodology.

MAIN OUTCOME MEASURES: The review examined the evidence of effectiveness of oral health promotion on caries, oral hygiene, oral health related knowledge, attitudes and behaviours.

RESULTS: Very few definitive conclusions about the effectiveness of oral health promotion can be drawn from the currently available evidence. Caries and periodontal disease can be controlled by regular toothbrushing with a fluoride toothpaste, but a cost-effective method for reliably promoting such behaviour has not yet been established.

CONCLUSIONS: Oral health promotion which brings about the use of fluoride is effective for reducing caries.

This systematic review addresses the question: In the modern age of extensive fluoride exposure, do individuals with a high level of sugar intake experience greater caries severity relative to those with a lower level of intake? The MEDLINE and EMBASE databases were searched for English-language papers published between 1980 and 2000 using a search expression developed in conjunction with an experienced librarian. There were 899 papers located in the initial search, a review of titles and abstracts to identify clearly irrelevant papers reduced this number to 134. Two readers each read one half of these papers, and application of predetermined inclusion/exclusion criteria reduced this number of papers to sixty-nine. Criteria were established for scoring the quality of each of these papers on evidence tables. The maximum score for each paper was 100; the sixty-nine papers then scored between 12 and 79. Two independent raters were trained to score these papers to score 55 or higher on the evidence tables. Final judgment of results was limited to those thirty-six papers that scored 55 or higher on the evidence tables and that reported studies carried out in countries where there is moderate-to-extensive fluoride exposure.

Results showed that only two papers found a strong relationship between sugar consumption and caries development, sixteen found a moderate relationship, and eighteen found weak-to-no relationship. It was concluded that the relationship between sugar consumption and caries is much weaker in the modern age of fluoride exposure than it used to be.

Controlling the consumption of sugar remains a justifiable part of caries prevention, however, if not always the most important aspect.
Dietary effects on dental diseases. Sheiham A.

Dental caries is a highly prevalent chronic disease and its consequences cause a lot of pain and suffering. Sugars, particularly sucrose, are the most important dietary aetiological cause of caries. Both the frequency of consumption and total amount of sugars is important in the aetiology of caries. The evidence establishing sugars as an aetiological factor in dental caries is overwhelming. There is no evidence that sugars naturally incorporated in the cellular structure of foods (intrinsic sugars) or lactose in milk or milk products (milk sugars) have adverse effects on health. Foods rich in starch, without the addition of sugars, play a small role in coronal dental caries. The intake of extrinsic sugars beyond four times a day leads to an increase risk of dental caries. Fluoride, particularly in toothpastes, is a very important preventive agent against dental caries. Toothbrushing without fluorides has little effect on caries.

Dietary effects on dental diseases. Sheiham A.

Current Concept: posteruptive and local
- Right place
- Right time
- Right amount

Benefits everyone!

Reduce DEMINERALIZATION & enhance REMINERALIZATION

Also, there is a consensus that the main effect of fluoride (F) is to interfere physicochemically with caries development by reducing demineralization and enhancing remineralization of dental enamel [Dawes and ten Cate, 1990], without significantly promoting an antimicrobial effect on dental plaque [Drenten, 1992].

Effect of timing of F use before (to inhibit demineralization) or after (to enhance remineralization) daily 8 cariogenic challenges on mineral loss in enamel and dentine

Also, the data suggest that Fluoride is more effective in enamel than dentine!

Kusano, Tenuta, Del Bel Cury, Cury JA. Braz Oral Res 2011
WAYS of FLUORIDE DELIVERY

1. COMMUNITY LEVEL
   - Water

2. SELF-USE
   - Dentifrice

3. PROFESSIONAL
   - Maintenance of low levels of FLUORIDE constantly in the mouth

4. COMBINATIONS

WAYS of FLUORIDE DELIVERY

1. COMMUNITY LEVEL
   - Water

2. SELF-USE
   - Dentifrice

3. PROFESSIONAL
   - Maintenance of low levels of FLUORIDE constantly in the mouth

4. COMBINATIONS

Systematic review of water fluoridation.
OBJECTIVE: To review the safety and efficacy of fluoridation of drinking water.
RESULTS: 214 studies were included. The quality of studies was low to moderate. Water fluoridation was associated with an increased proportion of children without caries and a reduction in the number of teeth affected by caries. The range (median) of mean differences in the proportion of children without caries was -5.0% to 64% (14.6%). The range (median) of mean change in decayed, missing, and filled primary/permanent teeth was 0.5 to 4.4 (2.25) teeth. A dose-dependent increase in dental fluorosis was found. At a fluoride level of 1 ppm an estimated 12.5% (95% confidence interval 7.0% to 21.5%) of exposed people would have fluorosis that they would find aesthetically concerning.
CONCLUSIONS: The evidence of a beneficial reduction in caries should be considered together with the increased prevalence of dental fluorosis. There was no clear evidence of other potential adverse effects.

Water fluoridation.
Parnell C, Whelton H, O’Mullane D.
AIM: This was to present a summary of the evidence from systematic reviews of the effectiveness and safety of water fluoridation.
RESULTS: Of the 59 publications identified, 3 systematic reviews and 3 guidelines were included in this review. While the reviews themselves were of good methodological quality, the studies included in the reviews were generally of moderate to low quality. The results of the three reviews showed that water fluoridation is effective at reducing caries in children and adults. With the exception of dental fluorosis, no association between adverse effects and water fluoridation has been established. Water fluoridation reduces caries for all social classes, and there is some evidence that it may reduce the oral health gap between social classes.
CONCLUSION: Water fluoridation, where technically feasible and culturally acceptable, remains a relevant and valid choice as a population measure for the prevention of dental caries.
Maintenance of Fluoride in the Oral Environment by drinking water

Fluoride concentration in the saliva of children living in areas containing 0.1 or 1.2 ppm F in the water

- Maintenance depends on daily ingestion!


Cury JA, Pantaroto RN, Tucciar A, Ribeiro JAR, Tenuta LMA. Salivary fluoride during mastication of foods cooked with fluoridated water. IADR 2013
Fluoride in whole dental biofilm of children (n=55 to 91) according to the conditions of water fluoridation, Piracicaba, SP, Brazil, 1986

<table>
<thead>
<tr>
<th>Condition of Water Fluoridation</th>
<th>ppm F*</th>
<th>Ca, µg/mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoridated (0.80 ppm)</td>
<td>3.2±1.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Interrupted (0.06 ppm)</td>
<td>0.2±0.09</td>
<td>0.8</td>
</tr>
<tr>
<td>ReFluoridated (0.70 ppm)</td>
<td>2.6±1.3</td>
<td></td>
</tr>
<tr>
<td>µg F/g wet weight</td>
<td></td>
<td>Non-F dentifrice use</td>
</tr>
</tbody>
</table>

*Nobre dos Santos & Cury, Caries Res 22(5), 1988

In Brazil, do not adjust the concentration of fluoride in water or interrupt its addition must be considered:
1. illegal;
2. scientifically unsustainable;
3. socially unjust.

(NARVAI, 2000)
Fluoride toothpastes for preventing dental caries in children and adolescents.
Marinho VC, Higgins JP, Sheiham A, Logan S.

MAIN RESULTS: Seventy-four studies were included. For the 70 that contributed data for meta-analysis (involving 42,300 children) the DMFDS pooled PF was 24% (95% confidence interval (CI), 21 to 28%; p<0.0001). This means that 1.6 children need to brush with a fluoride toothpaste (rather than a non-fluoride toothpaste) over three years to prevent one DMFDS in populations with caries increment of 2.6 DMFDS per year. In populations with caries increment of 1.1 DMFDS per year, 3.7 children will need to use a fluoride toothpaste for three years to avoid one DMFDS. There was clear heterogeneity, confirmed statistically (p<0.0001). The effect of fluoride toothpaste increased with higher baseline levels of DMFDS, higher fluoride concentration, higher frequency of use, and supervised brushing, but was not influenced by exposure to water fluoridation. There is little information concerning the deciduous dentition or adverse effects (fluorosis).

REVIEWER’S CONCLUSIONS: Supported by more than half a century of research, the benefits of fluoride toothpastes are firmly established. Taken together, the trials are of relatively high quality, and provide clear evidence that fluoride toothpastes are efficacious in preventing caries.
Use of fluoride toothpaste and fluoride concentration in the fluid of a test biofilm

Mineral loss of enamel blocks, according to the source of F to the fluid after dentifrice use
Although the anticaries effect of fluoride (F) dentifrices is clearly established, the relative importance of F taken up by dental plaque not removed by brushing and of F products (CaF$_2$-like) formed on totally cleaned enamel for the subsequent inhibition of demineralization is not known. Both effects were evaluated using conventional (1,100 microg F/g) and low-F concentration (500 microg F/g) dentifrices in a randomized, crossover, double-blind in situ study. Enamel blocks not treated or pretreated with the dentifrices to form CaF$_2$-like deposits were mounted in palatal appliances in contact with a Streptococcus mutans test plaque. CaF$_2$-like deposition on enamel and F taken up by plaque due to the use of F dentifrices were able to significantly increase F concentration in the fluid phase of the test plaque, but only the latter significantly reduced the loss of hardness because of the 20-30 times higher F concentration. Also, significant differences between the low-F and conventional dentifrices were observed for F on enamel, in plaque and on the subsequent loss of hardness.

The results suggest that uptake of F by dental plaque not removed by brushing may be the main cause of the anticaries effect of F dentifrices.
A preview and meta-analysis of the effects of fluoride toothpastes on the prevention of dental caries in the primary dentition of preschool children.

Dos Santos AP, Nadanovsky P, de Oliveira BH.

OBJECTIVES: To assess the effects of fluoride (F) toothpastes on the prevention of dental caries in the primary dentition of preschool children.

RESULTS: Eight clinical trials fulfilled the inclusion criteria and most of them compared F toothpastes associated with oral health education against no intervention. When standard F toothpastes were compared to placebo or no intervention, significant caries reduction at surface (PF = 31%; 95% CI 18-43; 2644 participants in five studies), tooth (PF = 16%; 95% CI 8-25; 2555 participants in one study) and individual (RR = 0.86; 95% CI 0.81-0.93; 2806 participants in two studies) level were observed. Low F toothpastes were effective only at surface level (PF = 40%; 95% CI 5-75; 561 participants in two studies).

CONCLUSION: Standard F toothpastes are effective in reducing dental caries in the primary teeth of preschool children and thus their use should be recommended to this age group.
Toothbrushing (biofilm disruption) + FLUORide !!!

Frequency ???

Dental plaque disruption and Fluoride use

1988 September 1988 fluoride (MFP) was added to the dentifrice responsible for 50% of the Brazilian market

The importance of fluoride dentifrice to the current caries prevalence in Brazil.
Cury, Francisco, Simões, Del Bel Cury, Tabchoury
Caries Research, 2003;37:194-199

Effect of a calcium carbonate-based dentifrice on enamel REMineralization in situ
Cury, Francisco, Simões, Del Bel Cury, Gonçalves, Tabchoury
Caries Research, 2005;39: 255-7
An intervention programme to establish regular toothbrushing: understanding parents’ beliefs and motivating children.

AIMS/OBJECTIVES: To determine the benefit of twice daily toothbrushing on newly erupted first permanent molars. To investigate, through the Health Belief Model, how parents’ beliefs influence the likelihood of their children brushing twice a day. To identify aspects of a toothbrushing intervention programme that can be used in general dental practice.

METHODS: Supervised toothbrushing on school-days with a 1,000 ppm (MFP) chalk-based fluoride toothpaste for two years. A school and home-based incentive scheme including toothbrushing charts, 6-monthly dental examinations and parental questionnaires.

CONCLUSIONS: The benefit of 2 escovações por dia no desenvolvimento de novas lesões de cárie no primeiro molar permanente é cerca de 50% maior comparado com 1x/dia ou menos. Parents’ beliefs do influence the likelihood of their children brushing twice a day.

MAIN RESULTS: Twenty-five studies were included, involving 7747 children. For the 23 that contributed data for meta-analysis, the D(M)FS pooled prevented fraction estimate was 28% (95% CI, 19% to 37%; p<0.0001). There was clear heterogeneity, confirmed statistically (p<0.0001). The effect of fluoride gel varied according to type of control group used, with D(M)FS PF on average being 19% (95% CI, 5% to 33%; p<0.009) higher in non-placebo controlled trials. A funnel plot of the 23 studies indicated a relationship between prevented fraction and study precision. Only two trials reported on adverse events.

REVIEWER’S CONCLUSIONS: There is clear evidence of a caries-inhibiting effect of fluoride gel. The best estimate of the magnitude of this effect, based on the 14 placebo-controlled trials, is a 21% reduction (95% CI, 14 to 28%) in D(M)FS. This corresponds to an NNT of 2 (95% CI, 1 to 3) to avoid 1 D(M)FS in a population with a caries increment of 2.2 D(M)FS/year, or an NNT of 24 (95% CI, 18 to 36) based on an increment of 0.2 D(M)FS/year. There is little information concerning deciduous dentition, on adverse effects or on acceptability of treatment. Future trials should include assessment of potential adverse effects.
Manutenção de Fluoreto no meio bucal pela aplicação profissional de F

Tenuta, Cerezi, Del Bel Cury, Tabchoury, Cury, J Dent Res 87:1032-6, 2008

Manutenção de Fluoreto no meio bucal via ATF profissional

Liberação de F dos reservatórios de fluoreto de cálcio

Tenuta, Cerezi, Del Bel Cury, Tabchoury, Cury, J Dent Res 87:1032-6, 2008

F formado no esmalte pela aplicação tópica de flúor fosfato acidulado e liberação de F para o fluido do biofilme

Tenuta, Cerezi, Del Bel Cury, Tabchoury, Cury, J Dent Res 87:1032-6, 2008

Perda mineral dos blocos de esmalte contendo diferentes concentrações de CaF₂

Tenuta, Cerezi, Del Bel Cury, Tabchoury, Cury, J Dent Res 87:1032-6, 2008
Effect of frequent exposure to sucrose in situ on enamel demineralization and biofilm composition after application of APF-gel and use of F toothpaste (combination effect?)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Mineral loss</th>
<th>% Dif.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1108.0</td>
<td>-</td>
</tr>
<tr>
<td>APF</td>
<td>697.5</td>
<td>40</td>
</tr>
<tr>
<td>F-Toothpaste</td>
<td>410.0</td>
<td>60</td>
</tr>
<tr>
<td>APF + FT</td>
<td>??</td>
<td>??</td>
</tr>
</tbody>
</table>

In conclusion, the results suggest that the combination of one topical application of APF followed by daily use of F dentifrice does not reduce enamel demineralization or change the biofilm composition when compared to their effects when used individually.

Paes Leme AF, Dalcico R, Talchaury CP, Del Bel Cury AA, Rosalen PL, Cury JA. J Dent Res 83 (1) 2004
Topical fluorides (mouthrinses, gels, or varnishes) used in addition to fluoride toothpaste achieve a modest reduction in caries compared to toothpaste used alone.
According to WHO, Brazil is currently among the countries with low caries prevalence (DMFT<sub>12</sub>).

<table>
<thead>
<tr>
<th>Risk/Benefit of fluoride use</th>
<th>Caries Fraction Prevented of Population</th>
<th>Fluorosis Risk Population Attributed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to water F up to 3 years</td>
<td>34.3%</td>
<td>65.7%</td>
</tr>
<tr>
<td>Use of fluoride toothpaste before age 3</td>
<td>28.3%</td>
<td>71.7%</td>
</tr>
<tr>
<td>Use of fluoride toothpaste with 1100 ppm F compared to 400-550 ppm F</td>
<td>-5.5%</td>
<td>26.8%</td>
</tr>
<tr>
<td>Use of medium or high fluoride toothpaste</td>
<td>5.3%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Habit of brushing or chewing toothpaste</td>
<td>10.4%</td>
<td>32.6%</td>
</tr>
</tbody>
</table>

Do & Spencer, IDR, 2007

**DENTAL FLUOROSIS PREVALENCE IN BRAZIL, 2010**

According to WHO, Brazil is currently among the countries with low caries prevalence (DMFT<sub>12</sub>).
Prevalência de Fluorose em Manaus

Cidade sem água fluoretada

67% dos pais relataram que seus filhos quando tinham menos de seis anos de idade, colocavam a pasta de dentes na escova de dentes.

Fonte: Pesquisa de campo realizada em Manaus-AM, no período de Maios a Novembro de 2003.

Moura & Rebelo, 2004


A possible adverse effect associated with the use of topical fluoride is the development of dental fluorosis due to the ingestion of excessive fluoride by young children with developing teeth.

AUTHORS' CONCLUSIONS:
1. There is weak unreliable evidence that starting the use of fluoride toothpaste in children under 12 months of age may be associated with an increased risk of fluorosis.
2. The evidence for its use between the age of 12 and 24 months is equivocal.
3. If the risk of fluorosis is of concern, the fluoride level of toothpaste for young children (under 6 years of age) is recommended to be lower than 1000 parts per million (ppm).
CUIDAR DEMASIADO PERJUDICA

Fluorose Severe no 46!!!

Rev ABO Nacional 5 (1), 1997


Suspeita de fluorose por leite de soja!

European Academy of Pediatric Dentistry

Fluoride toothpastes

Haja Dose?

Desfecho de Dose é...?

<table>
<thead>
<tr>
<th>Age group</th>
<th>Fluoride concentration</th>
<th>Daily use</th>
<th>Amount to be used daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months to 2 years</td>
<td>500 ppm</td>
<td>twice</td>
<td>pea-size</td>
</tr>
<tr>
<td>2+ years</td>
<td>1000 (±) ppm</td>
<td>twice</td>
<td>pea-size</td>
</tr>
<tr>
<td>6 years and over</td>
<td>1450 ppm</td>
<td>twice</td>
<td>1.2 cm</td>
</tr>
</tbody>
</table>

Potential harm: One problem with young children's use of toothpaste is that they often swallow considerable amounts with a subsequent risk for dental fluorosis [Macalence and Burt, 1996]. Fluoride toothpastes may be responsible for up to 60% of the daily fluoride intake [Mazali et al., 2007] and the first 3 years of life seem to be the most critical. Therefore, parents should be strongly advised to use only a pea-size of toothpaste for daily young children and assist them in supervised twice brushing (at least 2 years of age). A children's toothpastes with a lower concentration of fluoride may be indicated, although the evidence for a caries preventive effect of formulas with less than 500 ppm F is insufficient [Twetman et al., 2000; Steiner et al., 2004].
Não baseada em evidência!

There was no association between dental fluorosis in permanent teeth and fluoride intake from diet, dentifrice and combined (p > 0.05).

Vinte e nove crianças (59%; 90% delas TF = 1) apresentaram fluorose dental em pelo menos 2 dentes e 20 crianças (41%) não mostraram nenhum grau de fluorose nos dentes;

Dose Total de 0,09 mg F/kg/dia!
30% Maior que o Limite!!

DOSE de INGESTÃO e EFEITO SISTÊMICO

*ESTUDOS mg F/ Kg LOCAL

<table>
<thead>
<tr>
<th></th>
<th>Dieta</th>
<th>Dentífrico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lima &amp; Cury, 1998*</td>
<td>0,040</td>
<td>0,052 Piracicaba, SP</td>
</tr>
<tr>
<td>Paiva &amp; Cury, 1998**</td>
<td>0,027</td>
<td>0,061 Ibiá, MG</td>
</tr>
</tbody>
</table>

*Paiva, Lima e Cury, Community Dent Oral Epidemiol, 31(3) 2003

APOS 6 ANOS???

1. Vinte e nove crianças (59%; 90% delas TF = 1) apresentaram fluorose dental em pelo menos 2 dentes e 20 crianças (41%) não mostraram nenhum grau de fluorose nos dentes;
2. There was no association between dental fluorosis in permanent teeth and fluoride intake from diet, dentifrice and combined (p > 0.05).

*Martins et al, Caries Res 42(2) 2008

Doentes Sistêmico do USO de FLÚOR

- Toxicidade Aguda
  - Náusea
  - Vómito
  - Parada cardíaca
  - Morte
- Toxicidade Crônica
  - Fluorese Dental

DOSE = 0,07 mg F/Kg
Limite Superior
Não baseada em evidência!

DOE = 5,0 mg F/Kg
DPT

Considerations on optimal fluoride intake using dental fluorosis and dental caries outcomes–a longitudinal study.
The “optimal” intake of fluoride has been widely accepted for decades as between 0,05 and 0,07 mg fluoride per kilogram of body weight (mg F/kg bw) but is based on limited scientific evidence. Study children through periodic questionnaires at the ages of 6 weeks; 6, 8, 12, 16, 20, 24, 28, and 36 months; and then at 6-month intervals thereafter. Estimates of total fluoride intake at each time point were made by summing amounts from water, dentifrice, and supplements, as well as other foods and beverages made with, or containing, water. Caries data were obtained from examinations of children at ages 5 and 9 years, whereas fluorosis data were obtained from examinations of children only at age 9 years. The estimated mean daily fluoride intake for those children with no caries history and no fluorosis at age 9 years was at, or below, 0,05 mg F/kg bw for nearly all time points through the first 48 months of life, and this level declined thereafter. Children with caries had generally slightly less intakes, whereas those with fluorosis generally had slightly higher intakes. Given the overlap among caries/fluorosis groups in mean fluoride intake and extreme variability in individual fluoride intakes, firmly recommending an “optimal” fluoride intake is problematic.
**INTRODUCTION**

Fluoride Bioavailability & Fluorosis Risks

Ekstrand & Oliveby, 1999 (modified)

---

**INTRODUCTION**

F bioavailability in dentifrices

- Bioavailability: “the extent to which a drug reaches its site of action or reaches a biological fluid from which the drug has access to its site of action”

“...a widespread belief existed that all products were equipotent! ...recent bioavailability studies have shown that...”

Ekstrand et al., 1990

---

**RISCO DE FLUOROSE DENTAL PELO USO DE DENTIFRÍCIO FLUORETADO**

1- É ESPERADA UMA PREVALÊNCIA DE FLUOROSE DENTAL DE ATÉ 28%;

2- A MENOR PREVALÊNCIA SERIA EXPLICADA:

- Frequência de Escovação Superestimada
- Nem todo flúor ingerido pode ter sido absorvido

DOSE de INGESTÃO vs DOSE SISTÉMICA ???

---

**Dose de Ingestão**

**Dose de Absorção**

**BIODISPONIBILIDADE FLUORETO**

Ekstrand & Oliveby, 1999, modificada por Cury & Tanuta, 2008

---

**INTRODUCTION**

“...a widespread belief existed that all products were equipotent! ...recent bioavailability studies have shown that...”

Ekstrand et al., 1990

---

**DOSE de INGESTÃO vs DOSE SISTÉMICA ???**
Blood fluoride after toothpastes ingestion

Estimated dose of fluorosis risk from toothpastes should be based on total soluble fluoride.

**Table 1:**

<table>
<thead>
<tr>
<th>Toothpaste</th>
<th>Dose (mg F/day/kg bw)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Based on TF declared</td>
</tr>
<tr>
<td>Family**&lt;sup&gt;1&lt;/sup&gt; Sorriso (n=52)</td>
<td>0.070 ± 0.002</td>
</tr>
<tr>
<td>Children***&lt;sup&gt;2&lt;/sup&gt; TANDY (n=102)</td>
<td>0.039 ± 0.002</td>
</tr>
<tr>
<td>All (n=194)</td>
<td>0.053 ± 0.002</td>
</tr>
</tbody>
</table>

<sup>1</sup> Family: Family Sorriso

<sup>2</sup> Children: Children TANDY

<sup>3</sup> All: All participants

*a, b: Significantly different from the control group at the 0.05 level (Student’s t-test)
Effects of low and standard fluoride toothpastes on caries and fluorosis: systematic review and meta-analysis

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Although the anti-caries effects of standard fluoride (F) toothpastes are well-established, their use by preschoolers (2-5 year-olds) has given rise to concerns regarding the development of dental fluorosis. Thus, a widespread support of low F toothpastes has been observed. The aim of this study was to assess the effects of low (<600 ppm) and standard (1000-1500 ppm) F toothpastes on the prevention of caries in the primary dentition and aesthetically objectionable (moderate to severe) fluorosis in the permanent dentition. A systematic review of clinical trials and meta-analyses were carried out. Two examiners independently screened 1932 records and read 159 potentially eligible full-text articles.

Results: Five clinical trials fulfilled the inclusion criteria. Low F toothpastes significantly increased the risk of caries in primary teeth (RR = 1.13 [1.07-1.20]; 4634 participants in three studies) and did NOT significantly decrease the risk of aesthetically objectionable fluorosis in the upper anterior permanent teeth (RR = 0.32 [0.03-2.97]; 1968 participants in two studies).

Conclusion: There is no evidence to support the use of low F toothpastes by preschoolers regarding caries and fluorosis prevention.
How much toothpaste should a child under the age of 6 years use?

Use of fluoride, particularly in young children is a balance between maximising caries efficacy and minimising the risk of fluorosis. This review considers the importance of amount, concentration and dose of fluoride applied from toothpaste and the implications for risk and benefit. During the developmental period of the tooth, fluorosis is dependent on fluoride levels in the extra cellular fluid. Fluoride levels in the extra cellular fluid are determined by the plasma concentrations which in turn are a function of both the daily intake of fluoride and that released during bone remodelling. The amount of fluoride released during bone remodelling is determined by the lifetime cumulative dose of fluoride ingested. Therefore fluoride can modulate fluorosis both due to the amount ingested at any one point in time and also that ingested during the lifetime of the individual. In contrast to dilution of fluoride in the plasma, dilution of toothpaste in the mouth is relatively small. For a given dose of fluorides, higher fluoride levels can be achieved in the oral environment using toothpastes with higher fluoride concentrations rather than using larger amounts of low fluoride formulations.

Concluí-se que para crianças jovens o melhor equilíbrio entre risco e eficácia pode ser obtido pelo uso de uma pequena quantidade de dentífrico de maior concentração de flúor, sob supervisão dos pais ou cuidadores.

Ellwood & Cury. Eur Arch Ped Dent 2009
CONCLUSIONS

1- The effect of water fluoridation on caries control in children is based on evidence.

2- The anticaries effect of F-toothpaste in children is based on evidence but it depends on:
   a) The F concentration in the formulation, that should be 1000 ppm or above.
   b) The frequency of use, that should be at least 2x/day.

3- The anticaries effect of professional application of F-gel and varnish (Duraphat) in children is based on evidence.

4- Professional fluoride (gels, or varnishes) used in addition to fluoride toothpaste achieve a modest reduction in caries compared to toothpaste used alone.

5- There is no evidence to support the use of low F toothpastes (irrespective of the formulation) by preschoolers regarding caries and fluorosis prevention.

6- Dental fluorosis in children living in countries having water optimally fluoridated and exposure to fluoride toothpaste is mild or very mild, with little impact on OHRQoL.

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E continua o problema do rico e do pobre: no primeiro vídeo, a odontopediarista recomendou o creme dental sem F até os 3 anos (a partir dos 25:06 min). Mas no segundo vídeo, a reportagem perguntou: mas o creme dental sem F é muito caro? Ah sim, nesse caso é só usar um grão de arroz! E o pior, a dentista diz que nesse caso não há risco de fluorose! Ou seja, está PARA QUE O CRIANÇA NÃO SEM O Creme Dental sem F??? Ah, para filho de rico que é criado sem limites, para que por limite na quantidade de creme dental???

Com esse vies de rico e pobre, o creme dental sem F vai se tornando “politicamente incorreto”, ou seja, é o creme dental dos ricos. Pela inocência descrita acima, vamos torcer para que o pobre deixe de querer imitar o rico, como a Branca relatou no simpósio.

Acho que nosso próximo alvo, além dos médicos, deve ser as Faculdades de Odontologia (especialmente as disciplinas de Odontopediatria) – pq esses dentistas estão aprendendo isso em algum lugar?