Importance of fluoridated salt in the strategy of caries prevention

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WHO's World Health Assembly (2007)

Member states adopted a resolution on oral health, which urged the establishment of national plans for the use of Fluoride based on appropriate programmes for automatic administration through drinking water, salt or milk and the provision of affordable toothpaste.

Salt fluoridation: History

iodized salt in

fluororidated salt



cretinism and goiter prevention caries prevention

Dr. Hans Wespi, first to begin production of a salt containing iodine and fluoride in 1946

Industrial production of fluoridated salt started in Switzerland in 1955 @90 mg/kg

iodized salt in **goiter and mental retardation prevention** fluoridated salt in **caries prevention**

Fluoridation benefits from iodine experience Communication and quality control are complimentary KIO₃ and KF are compatible in the mixture Using a mixer for fluoridation process provides a mixture of greater homogeneity for the KIO₃

Salt Fluoridation in Switzerland

1969 the Canton of Vaud

250 mg F for the Canton of Glarus

1974 Swiss Rhine saltworks Glarus

1974-1977 urinary excretion studies (TM. Marthaler)

1980 the General Health Office recommended Cantons concentration of **250 ppm**

Market share about 80%

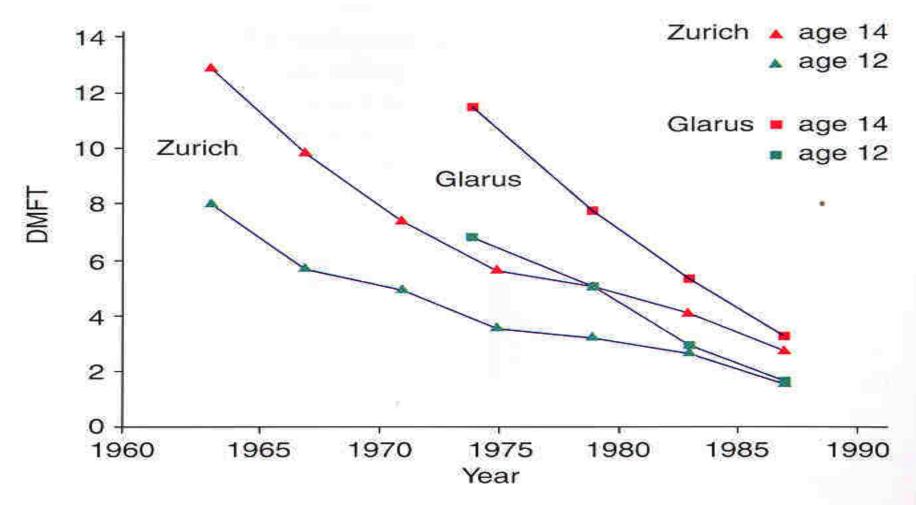


Figure 18.29 Mean DMF teeth per child aged 12 or 14 years in the canton of Zurich, 1963–1987, and in the canton of Glarus, 1974–1987. Glarus uses fluoridated salt in households and bakeries. (Source Marthaler *et al.*, 1988; Steiner *et al.*, 1986, 1989.)

Salt Fluoridation in other countries

1966-1984 Hungary (K. Toth)

mid 1990s Czech and Slovak Republics

1985 France [1993 market share 60% to 27%]

1991 Germany Market Share 63% in 2005

Romania 2010

Belarus comprehensive program with toothpaste F- and health education

Cariostatic Effectiveness of Fluoridated Salt

Germany: Caries dropping sharply DMFT₁₂ fell from **2.44 in 1994 to 1.24 in 2000**. Number of individual and group preventive measures and the application of sealants increased substantially. Moreover, market share of fluoridated salt rose rapidly.

Schulte G. A. Schweiz Monatsschr Zahmed 115: 659-662 (2005)

Spain Recent data not available but initial studies indicated caries reduction 12 year-olds = 57.9% (Marthaler T.M.)

Cariostatic Effectiveness of Fluoridated Salt

France: National mean DMFT₁₂ decreased from **4.2 to 2.07 from 1987-1993**

Montpellier DMFT₁₂ **1.42 in 1999 and 1.29 in 2002**

Heidelberg DMFT₁₂ **1.56 in 1999 and 1.15 in 2002**

Tramini P., Schweiz Monatsschr 115:656-658 (2005)

STATUS OF IMPLEMENTATION BY COUNTRIES IN THE AMERICAS



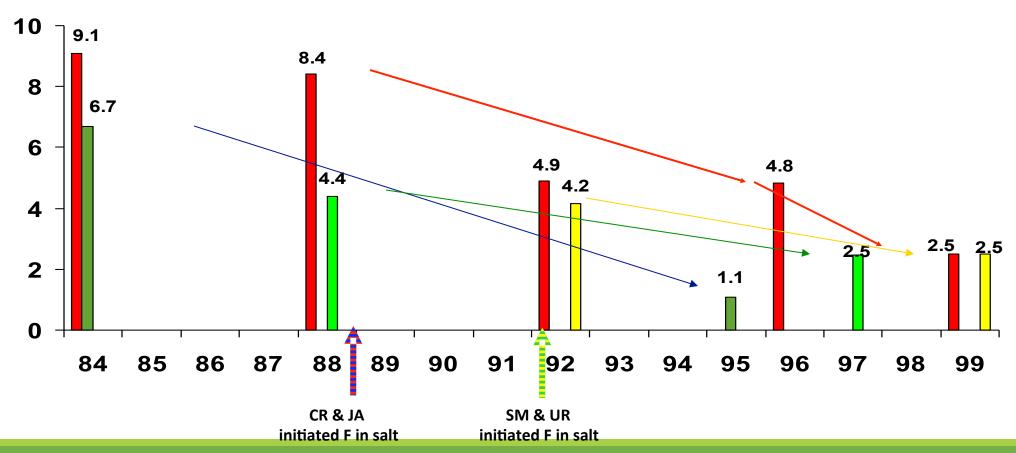
Tanks for Iodide and Fluoride solutions with pumping mechanism [Jamaica]





CHANGE IN THE MEAN NUMBER OF PERMANENT TEETH DECAYED, MISSING, OR FILLED IN 12 YEAR OLD CHILDREN IN COSTA RICA (CR), JAMAICA (JA), STATE OF MEXICO (SM) AND URUGUAY (UR)





RESULTS ON CARIES REDUCTION AND TYPE OF SALT FLUORIDATED

Jamaica 84% (all salt fluoridated)

Costa Rica 73% (household use)

Mexico 44% (household use)

Uruguay 40% (household use)

Colombia 50% (household use)

Fluoridated Salt

Salt is consumed by virtually all populations

Amount consumed is constant (~10 g/day)

Overdose is virtually excluded (safe)

Fluoride addition is inexpensive

Possible same technique for addition of fluoride as iodized salt

Demonstrated cariostatic efficacy, 44% caries reduction in Mexico (*Irigoyen ME et al. Caries Res 2000; 34:303-7*)

Salt Fluoridation in the Americas

Successful

Effective, Safe and Economic

Countries with adequate planning

Proper technology

Epidemiological surveillance

Internal and external quality control

Cost less than US\$ 0.06/person/year

Salt Fluoridation Essentials

Assessment of fluoride exposure

Baseline studies on caries and enamel fluorosis

Assessment of salt processing plants, capacity, technology, salt quality, quality control, distribution networks

Cost: Benefit estimates

Attributes to Salt Fluoridation

Inexpensive

Effective

Eminently safe

Equitable – entire population benefits

Requires no cooperative effort or direct action

Benefits continue for a life time if consumption continues

Reduces cost for dental treatment

Does not depend on professional services

Proper Use of Fluorides the Most Feasible Way to Reduce Dental Caries

Method

Estimated cost person/year

Water

US\$ 0.52

Salt

\$<0.06

Milk

\$ 3.49

Community Fluoride Approach in Asia

Water fluoridation

 China SAR Hong Kong, Malaysia, Singapore, Korea, Vietnam, Brunei

Milk fluoridation

Thailand

Salt fluoridation

Lao PDR, Vietnam, Taiwan

Paddle mixer for iodized and fluoridated salt



batch production with a paddle mixer good results for a combined mixture of KIO₃ and KF, perfectly homogeneous

Quality control: factory Laboratory



90% of the samples have a good concentration of iodine and fluorine.

Monitoring Urinary Fluoride in 4-yr children

	Baseline morning ug/hr	Baseline afternoon	After 6-mo morning	After 6-mo afternoon
Salt F in Lao	4.7 (3.32)	9.5 (4.65)	4.8 (2.49)	9.6 (5.33)
WHO standard	7-12 (low)	8-13 (low peak)	15-20 (optimum)	18-27 (optimum peak)
Milk F in Thai	9.0 (4.87)	9.0 (4.62)	10.7 (6.49)	26.5 (12.02)

Fluoridated salt

The recommendation of fluoridated salt must be considered along the amount of salt consumption due to concern to minimize salt intake for hypertension prevention (5g/day – WHO)

Fluoride in the oral environment

Posteruptive application of fluoride plays the dominant role in caries prevention.

Low level of fluoride in the acidic solution around the enamel crystallites may completely inhibit lesion development.

Fluoride impedes caries progression rather than interferes with caries induction.

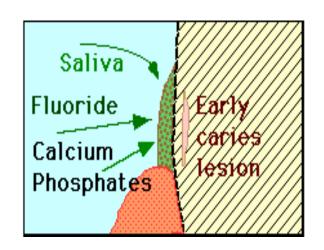
Fluoride should be presented in the oral cavity throughout life, particularly during tooth eruption.

Dynamic Process of Dental Caries Plaque/Enamel Interface

(Zero 2011)

$$8H^+ + Ca_{10}(PO_4)_6OH_2$$

Supersaturated conditions in oral fluids

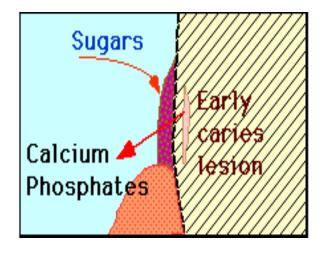






Undersaturated conditions in oral fluids

$$6(HPO_4)^{--} + 10Ca^{++} + 2H_2O$$



Improved oral health and enhanced quality of life



Oral disease (dental caries) need to be treated or prevented as to control pain and discomfort and enhance the quality of life

Globally only 20% of the world's population benefit from appropriate exposure to Fluoride

FD1-2007

Thank you prathipphan@gmail.com