European Association of Dental Public Health
Constanta, Romania

Salt Fluoridation in the Region of the Americas

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Sincere appreciation

• To the EADPH Organizing Committee and the Borrow Foundation and the WHO GOHP for designating this presentation on Salt Fluoridation in the Region of the Americas as The “Borrow Foundation Lecture” and, for the support to participate in this conference.
The University of Texas Health Science Center at San Antonio Dental School

World Health Organization Collaborating Center for Translation of Oral Health Sciences into Clinical and Public Health Practice
Why Fluoridate Salt?

- For over 80 years salt has proved a reliable, safe, inexpensive and stable carrier to correct iodine deficiency on a large scale. Iodized salt is available to over 1 billion people and has paved the way for the introduction of fluoridated salt” Hans Bürgi, 50th anniversary conference on salt fluoridation, October 2005
Why Fluoridate Salt?

• Salt is consumed by virtually all populations
• Amount consumed is constant (± 10 g/day)
• Overdose is virtually excluded (safe)
• Fluoride addition is inexpensive
• Addition of Fluoride not extremely complicated
• Accessible to small and large processors
• Demonstrated cariostatic efficacy
Why Fluoridate Salt in the Americas?

<table>
<thead>
<tr>
<th>Year</th>
<th>Cities with over 5,000 population</th>
<th>Total population</th>
<th>With water service</th>
<th>Without water service</th>
<th>Percent without piped water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949</td>
<td>39</td>
<td>983,000</td>
<td>404,000</td>
<td>579,000</td>
<td>58.9</td>
</tr>
<tr>
<td>1960</td>
<td>157</td>
<td>4,371,000</td>
<td>2,832,000</td>
<td>1,989,000</td>
<td>45.5</td>
</tr>
</tbody>
</table>

Pan American Health Organization
Summary of Four-year report on health Conditions in the Americas 1957-1960, July 1962
Mean DMFT in children 6 to 14 years in four communities — Colombia, 1964 to 1972

E.D Beltran Personal Communication
Decisive factors

- The high incidence and prevalence of dental caries in most countries
- Difficulty of using other mass preventive methods against dental caries
- Substantiated effectiveness
- Relatively low cost, ease of implementation, sustainability and evaluation.
- Ample coverage to reach urban and rural communities
Status of Implementation by countries in the Americas

- **Costa Rica**: Preliminary studies in 1986
- **Panama**: Initiated in 1989
- **Colombia**: Initiated in 1997
- **Ecuador**: Approved in 1989
- **Peru**: Initiated in 1992
- **Bolivia**: Initiated in 1995
- **Paraguay**: Preliminary studies in 1996
- **Honduras**: Access since 1987?
- **Nicaragua**: Preliminary studies 1997
- **Jamaica**: Initiated in 1986-1987
- **Venezuela**: Initiated in 1994
- **Belize**: Preliminary studies 1996
- **Uruguay**: Preliminary studies in 1992
SIMPOSIO
el uso del FLUOR en la PREVENCION

JULIO 5 de 1996
8 a 18 hs
SALON DE ACTOS DEL M.S.P.
ENTRADA LIBRE

AUSPICIAN:
OMS
OPS

ORGANIZAN:
M.S.P. Y COMISION HONORARIA NACIONAL DE SALUD BUCAL

ASOCIADO:
F.O.D.I.

FEDERACION ODONTOLÓGICA DEL INTERIOR

2010/05/26
Source of salt used and quality

- Most countries utilize sea salt
- Few countries utilize mining rock salt (Bolivia and Colombia although both countries also use sea salt)
- Most countries use refined salt
- At least one country (Uruguay) uses granular salt because of people’s preference (a similar situation occurred earlier in France).
CODEX STANDARD FOR FOOD GRADE SALT
(World-wide Standard)
CODEX STAN 150-1985

CODEX ALIMENTARIUS
El sistema de iodación y fluoración SERRA aditiva la sal de forma homogénea, contribuyendo a la prevención de desordenes y enfermedades sobrevenidas por falta de yodo y fluor en la dieta alimenticia de la población.

The SERRA iodation and fluoration system, by means of a steady salt addition, allows the prevention of disorders and diseases triggered by a lack of iodine and fluor in the food diet within the population.

Le système d’iodation et de fluoration du sel permet, au moyen d’un rajout d’additifs homogène au sel, la prévention de désordres et maladies survenues dûes à un manque d’iode et de fluor dans le régime alimentaire de la population.
GRUESA
FLUORADA
YODADA
Coarse salt iodated and fluoridated

- Paper grid size 1mm
Cooperación de la Industria Salinera

- Desde 1987, el compromiso y la responsabilidad social de la Empresa Salinera Nacional han sido fundamentales para el éxito del PFS Costa Rica.
PARTICIPACIÓN DE LAS EMPRESAS SALINERAS

COONAPROSAL
1. Planta ubicada en Colorado de Abangares, Guanacaste

Brinsa
2. Planta ubicada en Tacares de Grecia

3. Planta ubicada en Punta Morales Puntarenas
Tanks for I and F solutions and pumping mechanism
[Alkali limited – Jamaica]
SALT PROCESS

EVAPORATION OF UNDERGROUND BRINE, SAL DE ISTMO, MEXICO
Concentration of fluoride

- **Refined salt**
  - Refined fine grain salt in salt shaker (Colombia) 184 mg/Kg
  - Refined fine grain salt SEK (Uruguay) 220 mg/Kg
  - Refined fine grain salt Urusal (Uruguay) 188 mg/Kg

- **Coarse granular salt** Urusal 244 mg/Kg (Uruguay)
Fluoride concentration in salt samples from various countries

• Sample Colombian salt
  500 g pack Obtained in open market in Ecuador
  250.8 mg/kg

• Refisal: Colombia in salt shaker purchased in grocery store in Bogota
  260 mg/kg

• Ecuasal: Obtained in open market
  180 mg/kg
## Type of Salt Fluoridated, Caries Reduction and Regulation

<table>
<thead>
<tr>
<th>Country</th>
<th>Caries reduction %</th>
<th>Type of salt</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica</td>
<td>84%</td>
<td>All salt fluoridated</td>
<td>Decree/Standard* 1987</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>73%</td>
<td>Household use</td>
<td>Decree/standard 1989</td>
</tr>
<tr>
<td>Mexico</td>
<td>44%</td>
<td>Household use</td>
<td>Decree/standard 1981</td>
</tr>
<tr>
<td>Uruguay</td>
<td>40%</td>
<td>Household use</td>
<td>Decree/standard 1992</td>
</tr>
<tr>
<td>Colombia</td>
<td>50%</td>
<td>Household use</td>
<td>Decree/standard 1984</td>
</tr>
</tbody>
</table>

‡ JS87 2009 All salt iodated and fluoridated; all imported salt must comply; salt used for fabrication of seasoning and spices must comply with the standard.
‡ Alkali’s market share 97%; Colombia and US <3% salt imported.
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).

CR & JA initiated F in salt
SM & UR initiated F in salt

E.D Beltran Personal Communication
**Status in other countries**

- Belize (DMFT (0.65@12-1999) lowest in the Region at baseline
- Bolivia (First follow up survey scheduled early 2006 )
- Cuba (preliminary studies in late 90s, SF in 2000 – 100% coverage)
- Dominican Republic (preliminary studies 1997 no data available)
- Ecuador (initiated in 1997, partial salt fluoridation )
- Grenada (baseline survey 2.71@12-2000 – has not regulated FS)
- Honduras (preliminary studies 1997 [Hurricane destruction]
- Guatemala (preliminary studies)
- Nicaragua (preliminary studies 1997, initiated in 2009 ?)
- Panama reversed regulation to fluoride salt in 2001
- Paraguay (baseline survey 3.89 @12-1999 & 2.79 @12-2008)
- Peru (approved 1989 initiated; current status uncertain)
- Venezuela (2.12@12-1998). Currently experiencing importing difficulties of the F compound
RECOMMENDATIONS FOR THE SURVEILLANCE AND MONITORING OF FLUORIDE PREVENTION PROGRAMS

PAN AMERICAN HEALTH ORGANIZATION
REGIONAL ORAL HEALTH PROGRAM
March 2001
Epidemiological surveillance

- Used to determine the need of a public health action and evaluate effectiveness of programs.

- Data is used to:
  a) Evaluate impact
  b) Establish priorities
  c) Identify specific population groups that might be at high risk
  d) Observe course of illness and planning of programs
Epidemiological Surveillance

• Types of Surveillance systems
  – Active
    • Reaching out to various sources to solicit information
      – Biological indicators, laboratory tests or questionnaires
  – Passive
    • Routine reporting of special health events e.g.,
      – notifiable diseases to authorities by health care institutions and practitioners
Epidemiological Surveillance of Salt Fluoridation Programs

- System for routine reporting of conditions is not mandatory
- Commission may assist on reporting secondary problems of concern
  - reporting availability of fluoride supplements
  - reporting cases of enamel fluorosis
Strict epidemiological surveillance

- Fluoride exposure studies
  - Fluoride in drinking water
  - Fluoride in milk
  - Use of fluoride supplements
  - Use of toothpaste containing fluoride
  - Fluoride in diet
  - Fluoride in dental products
- Quality control of fluoridated salt
  - Internal
  - External
- Distribution network
  - Areas where FS should not be made available
- Periodic evaluation
  - Dentition status
    - Caries and enamel fluorosis
National Commission of salt fluoridation

• Government agencies
  – Ministry of Health - Oral Health programme and other agencies in charge of Health and Welfare programmes
  – Department of Trade (import & export div.)
  – Standardization agency
  – Ministry of Education

• NGOs
  – Health professions: Organized Dentistry, Academia, Medicine, Pharmacy, Nutrition, Social Sciences, Water Works, etc.
  – Salt industry
    • Processing plants and Distributors
  – Organizations interested in the welfare of children and elderly, i.e. UNICEF, Foundations, Rotary, AID, Lions, banks, etc.
  – Other interested parties, Iodization programme
  – Media: TV, Radio, Newspaper
Sub programa de vig. en zona con flúor natural en el agua

Divulgación masiva
VALLAS DE CARRETERA

Noroeste de la Provincia de Cartago CR
Localities in Uruguay where FS should not be consumed
INGREDIENTS:
SALT, POTASSIUM IODIDE, YELLOW PRUSSIATE OF SODA
SAL REFINADA, YODADA Y FLUORIZADA PARA CONSUMO HUMANO. NO SE PEGA
DISTRIBUTED BY: LAFE FOODS
MOONACHIE, N.J. 07074
MIAMI, F.L. 33127

LaFe
IS A TRADEMARK OF G&T FOODS INC. "EL SABOR DE MI TIERRA"™
VISIT US AT: WWW.LAFE.COM
FOR INFORMATION CALL 1-866-BUY-LAFE

NET WT. 10 LBS
CPOD EN NIÑOS ESCOLARES COSTA RICA, 1957-2006

12 años


- Cremas dentales fluoruradas
- Agua fluorurada
- Suspenden agua fluorurada
- Enjuagues fluoruro
- Introducción sal fluorurada

1960: 8,9
1975: 9,23
1980: 6,35
1987: 9,13
1992: 8,4
1996: 4,9
1999: 4,4
2006: 2,4
2008: ?
INDICE CPOD DE LA CARIES DENTAL EN ESCOLARES DE 12 AÑOS, COSTA RICA
1984-2006

Prevalence of enamel fluorosis using Dean’s criteria in three age groups
ENCUESTA NACIONAL DE SALUD ORAL, COSTA RICA 1999

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Canino a Canino</th>
<th>Premolar a Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-8 años</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>12 años</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>15 años</td>
<td>18</td>
<td>35</td>
</tr>
</tbody>
</table>

36% 49%
Doña Ana and El Paso Counties - 2001-2002
Enamel Fluorosis - Distribution of Scores by Severity by County

<table>
<thead>
<tr>
<th>County</th>
<th>No. Children</th>
<th>Normal</th>
<th>Questionable</th>
<th>Very Mild</th>
<th>Mild</th>
<th>Moderate</th>
<th>Not Recorded (Unerupted)</th>
<th>CFI*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Dona Ana</td>
<td>80</td>
<td>5</td>
<td>23</td>
<td>13</td>
<td>9</td>
<td>3</td>
<td>27</td>
<td>0.64</td>
</tr>
<tr>
<td>El Paso</td>
<td>151</td>
<td>28</td>
<td>18</td>
<td>15</td>
<td>6</td>
<td></td>
<td>84</td>
<td>0.24</td>
</tr>
<tr>
<td>Total</td>
<td>231</td>
<td>33</td>
<td>41</td>
<td>28</td>
<td>15</td>
<td>3</td>
<td>111</td>
<td></td>
</tr>
</tbody>
</table>

*Modified Dean’s Community Index of Fluorosis: 0.6 or more begins to constitute a public health problem*
Differences in reporting fluorosis results

- Percentage of Not Zero score = Fluorosis
- Percentage of objectionable Fluorosis

<table>
<thead>
<tr>
<th>County</th>
<th>No. Children</th>
<th>Normal</th>
<th>Questionable</th>
<th>Very Mild</th>
<th>Mild</th>
<th>Moderate</th>
<th>Not recorded</th>
<th>Not Zero</th>
<th>Objectionable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doña Ana</td>
<td>80</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>13</td>
<td>9</td>
<td>27</td>
<td>28</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>N%</td>
<td>6%</td>
<td>3%</td>
<td>16%</td>
<td>11%</td>
<td>4%</td>
<td>34%</td>
<td>35%</td>
<td>4%</td>
</tr>
<tr>
<td>El Paso</td>
<td>151</td>
<td>28</td>
<td>19</td>
<td>18</td>
<td>12</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>N%</td>
<td>18%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>6%</td>
<td>56%</td>
<td>26%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Community Index of Fluorosis must be calculated and complement the enamel fluorosis report
FLUORURIA EN ESCOLARES COSTA RICA, 1984-2005
<table>
<thead>
<tr>
<th>Jamaica 21 years</th>
<th>Excretion, μgF/24h</th>
<th>Nocturnal excretion, μgF/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>after Salt Fluoridation</td>
<td><strong>Lower</strong></td>
<td><strong>Upper</strong></td>
</tr>
<tr>
<td>Standards, age 3–5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low F intake</td>
<td>170</td>
<td>290</td>
</tr>
<tr>
<td>Optimal F usage</td>
<td>360</td>
<td>480</td>
</tr>
<tr>
<td>Present study, age 2–6 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td>220 to 332</td>
</tr>
<tr>
<td>Rural</td>
<td></td>
<td>279 to 385</td>
</tr>
<tr>
<td>Standards, age 6–7 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low F intake</td>
<td>190</td>
<td>310</td>
</tr>
<tr>
<td>Optimal F usage</td>
<td>480</td>
<td>600</td>
</tr>
</tbody>
</table>

Fluoride concentration (ppm)

<table>
<thead>
<tr>
<th>Standards, all ages</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low F intake</td>
<td>0.2</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Optimal F usage</td>
<td>0.9</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Urban</td>
<td>1.02 to 1.55</td>
<td></td>
<td>1.07 to 1.54</td>
</tr>
<tr>
<td>Rural</td>
<td>0.94 to 1.30</td>
<td></td>
<td>1.07 to 1.46</td>
</tr>
</tbody>
</table>

Confidence limits of present results (separately for urban and rural children) compared to WHO Provisional Standards (Lower and Upper) for urinary fluoride excretion and concentration under Low or Optimal fluoride usage (Schweiz Monatsschr Zahnmed Vol. 120 1/2010)
Salt Fluoridation in the Americas

• Successful
  – Effective, Safe and Economic
  – Countries with adequate planning
  – Proper technology
  – Epidemiological surveillance
    • Internal and external quality control
Salt Fluoridation in the Americas

- Uncertain results
  - Countries with inadequate planning
    - Insufficient coordination among key organizations
    - Absence of studies on caries severity and Fluoride exposure
  - Operational difficulties
    - Inadequate technology
    - Difficulties in acquisition of Fluoride
    - Deficient or non-existent community education efforts
- Absence or inadequate epidemiological surveillance
  - Population covered including distribution networks
  - Follow up surveys on caries and fluoride exposure
Is the total caries reduction due to salt fluoridation?

- Children had been exposed to various levels of fluoride in water and most below optimal concentration to have a cariostatic effect.
- Fluoridated milk has only been available in two countries Chile and more recently in Peru in areas without salt fluoridation.
- Toothpaste containing fluoride (1000-1500 mg/l) had been available in the countries for several years prior to salt fluoridation.
- Use of fluoride supplements and fluoride rinses had been very limited.
- The analysis of types of diet, use of fluoride toothpaste and dietary fluoride supplements, and access to dental health promotion and preventive and curative services do not contribute, to a large degree, to the reductions reported.
- Most of the reduction in dental caries children could be attributed to the introduction of fluoridated salt for human ingestion.
Sunset in Boerne, Texas