The Role of Xylitol in Oral Health

School and Correctional Center-Based Public Health - A Xylitol Gum Initiative

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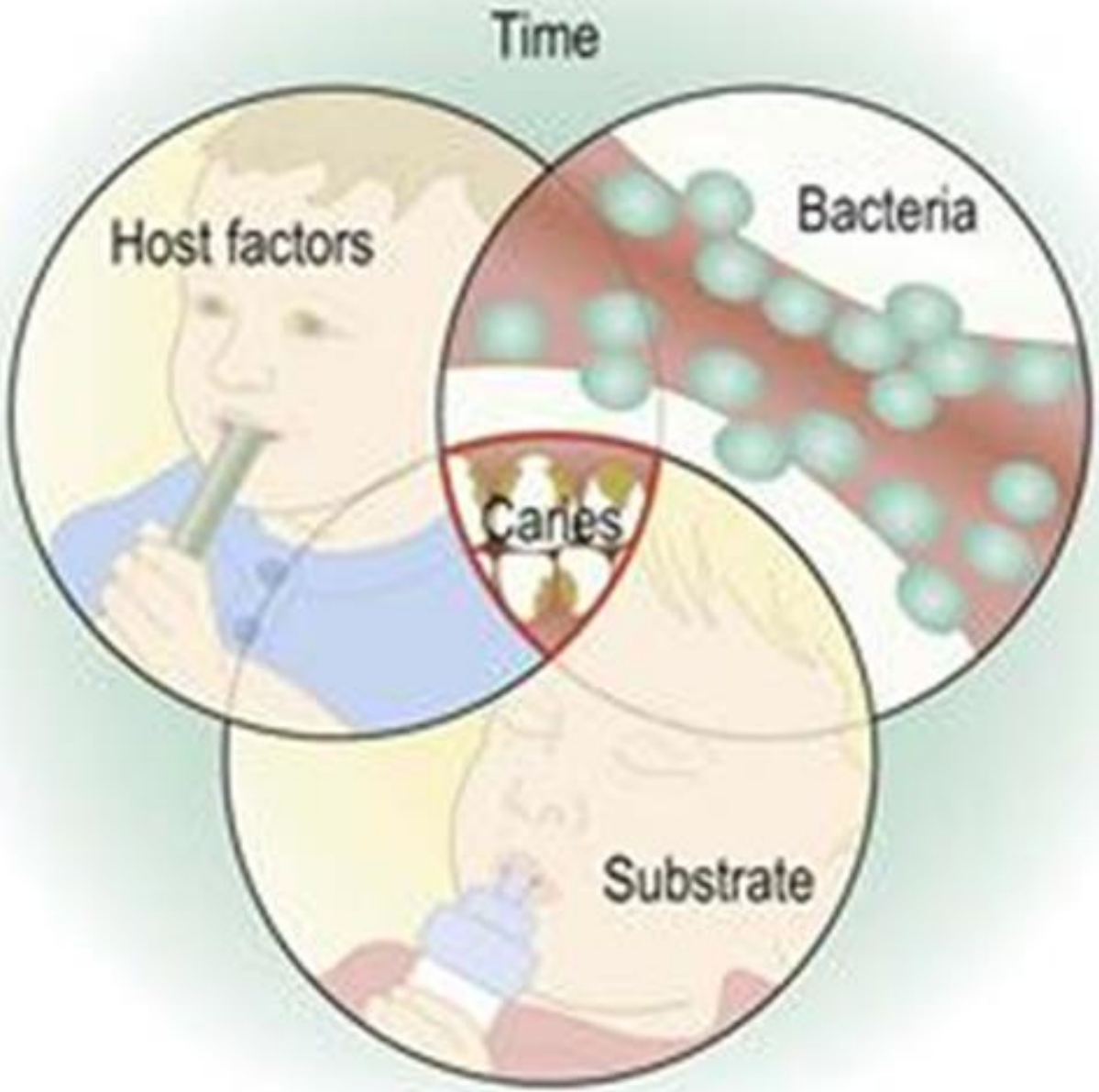
What does it take to make a cavity?

Teeth

Sugar

Bacteria



AJPH

A PUBLICATION OF THE AMERICAN PUBLIC HEALTH ASSOCIATION

Home Articles

Home » American Journal of Public Health (AJPH) » **November 2004**

WHAT CAN ORAL PUBLIC HEALTH LEARN FROM FINLAND?

Rachel WidomeMHS

Published Online: October 10, 2011

- **Multiple clinical and field trials have demonstrated that the addition of xylitol to the diet dramatically reduces the incidence of dental caries**,4–7 and this reduction seems to continue long after use of xylitol is terminated. 7 One study in Finland demonstrated that a school-based xylitol program was equal in caries prevention to a pit and fissure sealant program.8 Xylitol-based chewing gum is a mainstay for prevention in Finland, where in 1998 **45% of boys and 63% of girls** in a nationally representative survey of 11-, 13-, and 15-year-olds used xylitol gum daily.9

References from AJPH Article

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7. Isogangas P, Makinen KK, Tiekso J, Alanen P. Long-term effect of xylitol chewing gum in the prevention of dental caries: a follow-up 5 years after termination of a prevention program. *Caries Res.* 1993;27: 495–498. Crossref, Medline, Google Scholar
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Xylitol and chewing gum

The study “Ancient DNA from mastics solidifies connection between material culture and genetics of mesolithic hunter–gatherers in Scandinavia” is published in Communications Biology.

Ancient Wads of 'Chewing Gum' Hold the Oldest Human DNA in Scandinavia

By Mindy Weisberger May 17, 2019 History

- More than 10,000 years ago, humans who settled in what is now Sweden chewed gobs of sticky pitch, a tar-like material extracted from birch bark. This ancient "gum," recovered from a Mesolithic settlement, still contains traces of DNA — the oldest human DNA from Scandinavia. Birch bark contains xylitol.

Xylitol and chewing gum

JADA
THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

The effect of chewing xylitol gum on the plaque and saliva levels of Streptococcus mutans

Walter J. Loesche, DMD, PhD, Natalie S. Grossman, MA

- A study designed to determine whether the chewing of xylitol gum has an effect on salivary and plaque levels of S mutans and lactobacilli is discussed, and the proportions are compared with those gums with fructose or sorbitol/mannitol.
- **A new chewing gum may now be able to help in the fight against the bacteria that cause caries. 1984. What happened?**

Xylitol and chewing gum- 6 yrs

Caries Research

Original Paper

Influence of Maternal Xylitol Consumption on Mother–Child Transmission of Mutans Streptococci: 6–Year Follow–Up

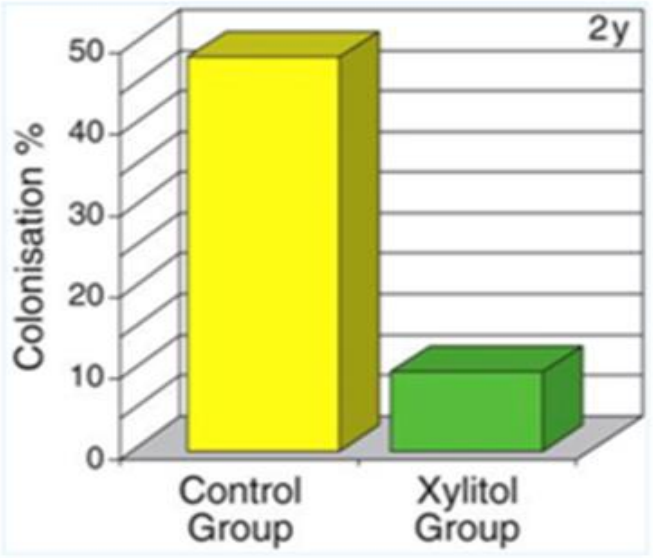
Söderling E.[a] · Isokangas P.[b] · Pienihäkkinen K.[a] · Tenovuo J.[a,c] · Alanen P.[a]

- **At the 3–year examination, the children's risk of having MS colonization was 2.3–fold in the F group (95% CI 1.3–4.2) compared to the xylitol group.** This difference was statistically significant. Even at 6 years of age, the salivary MS levels were significantly lower in the xylitol group than in the other groups (ANOVA, $p<0.001$). In conclusion, the earlier demonstrated, **xylitol–associated reduction in the probability of mother–child transmission of MS was still found in the children's MS counts at the age of 3 and 6 years.**

Caries Res 35:173-7, 2001.

Don’t let disease spread!

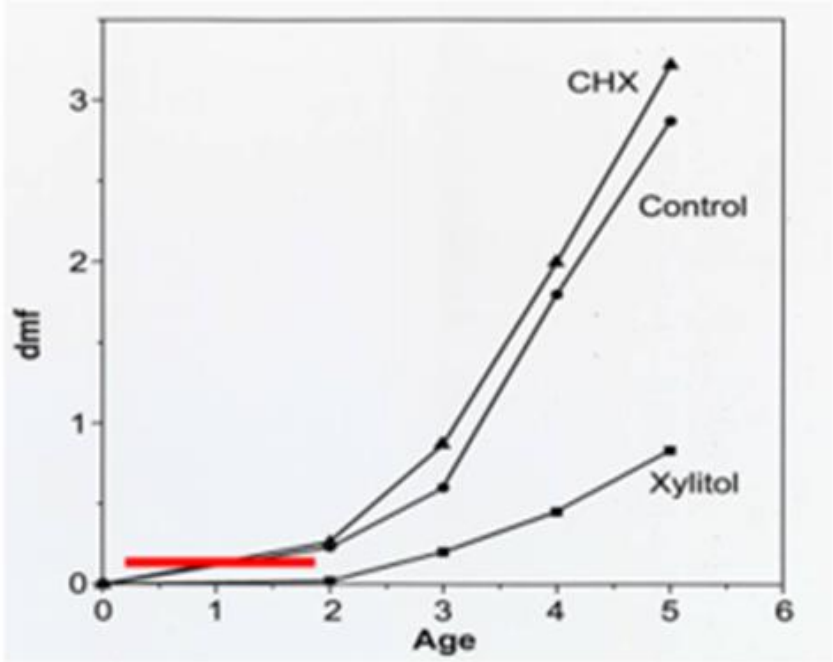
Finland:Effects of xylitol on mother-child transmission of mutans streptococl



Why isn’t this done all the time?

dmf- children 0-5 years

dmf-figures in the study groups 0-5 years
(Isokangas et al, J Dent Res 2000)



Preventive effect 71-74%

Red line = timing of use of xylitol by the **mothers**

6.2.2019

2

– Why not by Public Health?

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Med November 13, 2024 CellPress OPEN ACCESS

Article

A cluster randomized trial of xylitol chewing gum for prevention of preterm birth: The PPaX trial

Gregory C. Valentine,[1,3,4,14,15,*] Kathleen M. Antony,[1,3,5,14] Haleh Sangi-Haghpeykar,[1] Alexis C. Wood,[2] Rose Chirwa,[3] Saukani Petro,[3] Mary Dumba,[3] Deborah Nanthuru,[3] Cynthia Shope,[1] Jesse Mlotha-Namarika,[6] Jeffrey Wilkinson,[1,7] Joshua Aagaard,[8] Ellen J. Aagaard,[9] Maxim D. Seferovic,[1] Judy Levison,[1,3] Peter Kazembe,[13] and Kjersti M. Aagaard[1,2,3,7,8,10,11,12,*]

Compared to an active control group receiving education and Malawi Ministry of Health standard prenatal care, early pregnancy initiation and **ongoing use of xylitol-containing chewing gum twice daily reduced the occurrence of preterm and low-birthweight deliveries.** In order to prevent one such occurrence, fewer than 26 gravidae needed xylitol chewing gum use, making it **efficacious and affordable** in a low-resource setting.

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Article

A cluster randomized trial of xylitol chewing gum for prevention of preterm birth: The PPaX trial

During pregnancy, **periodontal disease is associated with a 2- to 3-fold increased risk for a preterm birth (PTB) or low-birthweight (LBW) delivery.**

The **inherently disruptive nature of dental scaling and root planing treatment during pregnancy could lead to greater dissemination of bacteria** and fail to render a net difference in systemic inflammation, thus failing to show an overall improvement in perinatal outcomes. And it **may be too late** in the progression of perinatal pathophysiology to significantly alter perinatal outcomes.

Clinical Oral Investigations (2022) 26:119–129
https://doi.org/10.1007/s00784-021-04225-8

REVIEW

Effects of xylitol chewing gum and candies on the accumulation of dental plaque: a systematic review

Eva Söderling[1] · Kaisu Pienihäkkinen[1]

- Habitual xylitol gum chewing appears to show plaque-reducing effects that differ from those of sorbitol gum.
- Clinical relevance: Habitual xylitol gum chewing is likely to decrease plaque. **In 13 of the 14 chewing gum studies, xylitol gum decreased plaque accumulation.**

Research Article

Sealants and xylitol chewing gum are equal in caries prevention

Pentti Alanen, Marja-Leena Holsti & Kaisu Pienihäkkinen

Pages 279-284 | Published online: 02 Jul 2009

- Sealants and xylitol have been demonstrated to prevent dental decay, but their effect has never been compared in the same study. **Regular use of xylitol chewing gum during 2 or 3 school years was compared with application of occlusal sealants in a randomized study.** The reliability of the clinical observations was controlled by examining the presence of dental decay in the same teeth from bitewing radiographs in a blind study.

After 5 years, no statistically significant differences between the sealant and xylitol groups were found.

Long-term effect of xylitol chewing gum in the prevention of dental caries: a follow-up 5 years after termination of a prevention program

P Isogangas [1], K K Mäkinen, J Tiekso, P Alanen

Affiliations + expand

PMID: 8281565 DOI: 10.1159/000261587

- About 65% of the original 258 children who participated in 1982-1984 in a caries prevention program involving the use of xylitol chewing gum were retrieved in 1989 for a follow-up study. Ninety-five subjects from the original xylitol (X) group and 70 subjects from the original control (no-gum, C) group were available**. In 1984, when the children completed the program at the age of 13-14 years, the caries scores were significantly lower in children who had used xylitol gums daily, compared with the C group.**

Long-term effect of xylitol chewing gum in the prevention of dental caries: a follow-up 5 years after termination of a prevention program

P Isogangas [1], K K Mäkinen, J Tiekso, P Alanen

Affiliations + expand

PMID: 8281565 DOI: 10.1159/000261587

In 1989, 5 years after the discontinuation of the gum program, the difference between the X and C groups had continued to increase in favor of the X group. These effects were explained by assuming that the **X gum program had facilitated the establishment of a low-virulent bacterial flora on the surfaces of the teeth**, and especially on those teeth that erupted during the trial proper. This type of results are possibly helpful when **evaluating cost-benefit ratios of caries prevention**.

Conclusion and review of the Michigan Xylitol Programme (1986-1995) for the prevention of dental caries.

Published: International dental journal, 1996, Vol. 46, Issue 1, p22-34
By: Mäkinen, K K; Mäkinen, P L; Pape, H R, Jr; Peldyak, J; Hujoel, P; Isotupa, K P; +4 more
ISSN: 0020-6539
Item identifier: 8744914 (PMID)

- The accumulated clinical, sialochemical and microbiologic evidence suggests **that xylitol, a natural carbohydrate sweetener of the pentitol type, is more effective in preventing dental caries** than sorbitol, and cariologically safer than sorbitol, a natural carbohydrate of the hexitol type. Sorbitol was found to be significantly less cariogenic than sucrose. The Programme's results shed additional light on the cariologic and oral biologic effects of natural, dietary polyols, and **suggest that the usage of xylitol chewing gum (and in some cases xylitol dragées) can be considered a valuable additional tool in caries prevention and in stabilisation of caries in all age groups.**

Clinical Trial > Int Dent J. 1995 Feb;45(1 Suppl 1):93-107.

Stabilisation of rampant caries: polyol gums and arrest of dentine caries in two long-term cohort studies in young subjects

K K Mäkinen [1], P L Mäkinen, H R Pape Jr, P Allen, C A Bennett, P J Isokangas, K P Isotupa

Affiliations + expand

PMID: 7607749

- One study focused on the permanent dentition of 1,277 initially **10-year old** subjects, while the other study was carried out on 510 initially **6-year old** subjects and focused on the primary dentition. In both trials, several chewing gum formulas containing dietary polyols (xylitol and sorbitol, or their combinations) were used for up to 40 months (10-year olds) or up to 24 months (6-year olds). These results and previous studies suggest that **high-xylitol chewing gum usage can retard or arrest even rampant dentine caries** in conditions where effective restoration and prevention programmes have not been instituted, and can also provide additional protection against further caries development during full implementation of restorative procedures by **holding the lesion in a non-progressive condition.**

J Dent Res 74(12): 1904-1913, December, 1995

Xylitol Chewing Gums and Caries Rates: A 40-month Cohort Study

K.K. Mäkinen*, C.A. Bennett[1], P.P. Hujoel[2], P.J. Isokangas[3], K.P. Isotupa[4], H.R. Pape, Jr., and P.L. Mäkinen

Department of Biologic and Materials Sciences, School of Dentistry, University of Michigan, Ann Arbor, Michigan 48109-1078; [1]Belize City Hospital, Belize City, Belize; [2]Department of Dental Public Health Sciences, University of Washington, Seattle; [3]Ylivieska Health Center, Ylivieska, Finland; and [4]Institute of Dentistry, University of Turku, Turku, Finland; *to whom correspondence should be addressed

- A 40-month double-blind cohort study on the relationship between the use of chewing gum and dental caries was performed in 1989-1993 in Belize, Central America. The four xylitol gums were most effective in reducing caries rates, **the most effective agent being a 100% xylitol pellet gum (relative risk, 0.27; 95% confidence interval, 0.20 to 0.36; p = 0.0001). This gum was superior to any other gum (p < 0.01).**

Polyol chewing gums and caries rates in primary dentition: a 24-month cohort study

K K Mäkinen [1], P P Hujoel, C A Bennett, K P Isotupa, P L Mäkinen, P Allen

Affiliations + expand

PMID: 8946097 DOI: 10.1159/000262352

- The effect of 2-year chewing-gum use on the caries rates of primary teeth was studied in a **combined school and home program in a sample of 510 initially 6-year-old subjects with high caries experience, low availability of fluoride, and difficult access to dental care.** The gum, formed into either sticks or pellets, comprised either xylitol, sorbitol, or mixtures thereof. The gum was chewed for 5 min under supervision five times a day during the school year, **The caries onset risk for a primary surface in the xylitol pellet and the sorbitol pellet groups was 35 and 44% of that in the no-gum group** (relative risk, 0.35; 95% confidence interval, 0.21-0.59; relative risk, 0.44; 95% confidence interval, 0.30-0.63, respectively). **The largest caries risk reduction was observed in the group receiving xylitol pellet gum.**

International Journal of Dentistry
Volume 2012, Issue 1
Jan 2012

Review Article

Nonnutritive, Low Caloric Substitutes for Food Sugars: Clinical Implications for Addressing the Incidence of Dental Caries and Overweight/Obesity

Michael W. Roberts and J. Timothy Wright

Department of Pediatric Dentistry, School of Dentistry, University of North Carolina, 228 Brauer Hall, CB No. 7450, Chapel Hill, NC 27599-7450, USA

- **Caries and obesity are two common conditions affecting children in the United States and other developed countries. Caries in the teeth of susceptible children have often been associated with frequent ingestion of fermentable sugars** such as sucrose, fructose, glucose, and maltose. Given the health impact of sugars and other carbohydrates, dental professionals should be aware of the nonnutritive non-/low caloric sweeteners available on the market and both their benefits and potential risks. **Dental health professionals should also be proactive in helping identify patients at risk for obesity and provide counseling and referral when appropriate.**

- PubMed Disclaimer

Cavities and Strokes

- **The incidence of CMB was significantly higher in the group with cnm-positive S. mutans,** especially in deep areas, (incidence rate ratios [95% CI], **5.1** [1.9–13.6] for CMB in any brain region; **15.0** [5.4–42.0] for deep CMB), which persisted after adjusting for age, sex, hypertension, and renal impairment (4.7 [1.8–11.9] for CMB in any brain region; **13.9** [4.3–44.5] for deep CMB). This study demonstrates that cnm-positive S. mutans is associated with an increased incidence of CMB.

Stroke
Volume 51, Issue 12, December 2020; Pages 3632-3639
https://doi.org/10.1161/STROKEAHA.120.029607

American Heart Association.

CLINICAL AND POPULATION SCIENCES

Oral Carriage of *Streptococcus mutans* Harboring the *cnm* Gene Relates to an Increased Incidence of Cerebral Microbleeds

See related article, p 3489

Satoshi Hosoki, MD, Satoshi Saito, MD, PhD, Shuichi Tonomura, MD, Hiroyuki Ishiyama, MD, Takeshi Yoshimoto, MD, Shuhei Ikeda, MD, Hajime Ikenouchi, MD, Yumi Yamamoto, PhD, Yorito Hattori, MD, PhD, Kaori Miwa, MD, PhD, Robert P. Friedland, MD, Roxana O. Carare, MD, PhD, Jin Nakahara, MD, PhD, Norihiro Suzuki, MD, PhD, Masatoshi Koga, MD, PhD, Kazunori Toyoda, MD, PhD, Ryota Nomura, DDS, PhD, Kazuhiko Nakano, DDS, PhD, Misa Takegami, RN, MPH, PhD, and Masafumi Ihara, MD, PhD

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Meta-analysis on the Effectiveness of Xylitol in Caries Prevention

Jehan ALHumaid and Mohamed Bamashmous[1]

Products included xylitol-containing lozenges, candies, and chewing gum, foods based on xylitol, and xylitol-containing toothpaste and mouth rinse. **Results showed that xylitol-containing products significantly prevented caries compared with the other (control) non-xylitol products.** Pooled estimates using the combined fixed and random effects of standardized mean difference were −0.099 [95% confidence interval (CI): −0.149, −0.049] and −0.089 (95% CI: −2.04, 0.026), respectively.

Former NFL player Mike Williams died of dental-related sepsis, medical examiner says

By Paradise Afshar, CNN

2 minute read · Published 10:12 AM EST, Sat December 23, 2023

- His cause of death has been listed as “bacterial sepsis with **cerebral abscesses and necrotizing labor pneumonia due to multiple caries and retained tooth roots**,” the preliminary medical examiner’s report said. A comprehensive autopsy report will be released later, according to the medical examiner’s office.

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Thank You

Any Questions?