Xylitol Research Background and Sources

To fully understand the dental effects of xylitol, it is important to refer to the structural differences between various dietary polyols (3). Sorbitol is another sugar alcohol, a hexitol type of polyol, owing to its 6-carbon structure. Because of this, sorbitol can support the growth of cariogenic mutans streptococci and other oral bacteria which are not normally able to utilize xylitol for growth. Because of evolutionary expediency, cariogenic organisms prefer 6-carbon ("hexose-based") structures, such as D-glucose, as an energy source. Therefore, it is important to acknowledge the inevitable biochemical differences between xylitol (a pentitol and pentose-derived) and sorbitol (a hexitol and hexose-derived), and to understand the nomenclature-related definitions described above.

The chemistry on how xylitol can be anti-cariogenic is complex but it hinges on the production of xylitol phosphate which inhibits further fermentation through the glycolytic pathway.

There are dozens of studies on xylitol phosphate for example:


The Turku sugar studies indicated that xylitol may possess a caries-therapeutic effect. More recent data show that xylitol exhibits a bacteriostatic activity on a wide range of bacteria based on uptake and expulsion of xylitol. Intracellular xylitol 5-P appears to be a key substance associated with inhibition of bacterial metabolism by xylitol. This has been shown in studies with pure strains of bacteria, mainly Streptococcus mutans. The aim of the present study was to examine if production of xylitol 5-P occurs in freshly collected dental plaque which is exposed to labeled xylitol. Plaque extracts were analyzed by thin-layer chromatography combined with autoradiography and high performance liquid chromatography. Strong indications were obtained that xylitol 5-P is readily produced by dental plaque. No other significant xylitol metabolites were identified. The bacteriostatic properties of xylitol in plaque are a mechanism which may well account for the caries-therapeutic effect of xylitol.

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and hundreds of studies on xylitol's anti-cariogenic effect.

What’s really cool is that
1. The Finn’s (and then the Swedes), who love to eat the sugar substitute because it occurs naturally in birch bark (they seem to want to beat it into their systems by whipping themselves on the back in over-heated saunas) and who
have made it a huge international industry out of marking xylitol, have the lowest mutans counts.

2. mothers who consume a lot of xylitol do not transmit xylitol to their kids (mutans colonizes as soon as the first teeth erupt) and the caries rate goes down in the offspring

3. xylitol is now being used in pacifiers to treat otitis media (inner ear infection).


-A method for the determination of acid production from 20-25 mg (wet weight) of Streptococcus mutans and 12-33 mg (wet weight) of human dental plaque is described. After endogenous acid production had been followed, either sorbitol or xylitol or a mixture of sorbitol and xylitol (2:1) was added. After about ten minutes glucose, sucrose or Palatinose were added for a vitality test. Addition of xylitol to the bacterial suspension caused inhibition of acid production from sorbitol by Streptococcus mutans grown on sorbitol or a mixture of sorbitol and glucose. It was also observed that it had a similar effect on acid production from sorbitol in suspensions of dental plaque with few exceptions. On the other hand, Streptococcus mutans cells grown on glucose, sucrose and xylitol media, produced no or insignificant amounts of acid from sorbitol. Streptococcus mutans cells grown on media containing glucose, sucrose, sorbitol and a mixture of sorbitol and glucose generally formed a large amount of acid from glucose and sucrose after the addition of sorbitol and xylitol. However, Streptococcus mutans cells grown on a medium containing xylitol and the mixture of sorbitol and xylitol formed less acid from glucose. The acid production activity from sorbitol in suspensions of dental plaque after the xylitol addition was somewhat lower than the acid production from sorbitol alone (p less than 0.02).

Xylitol inhibition of acid production and growth of mutans Streptococci in the presence of various dietary sugars under strictly anaerobic conditions.

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The aim of this study was to investigate the inhibitory effect of xylitol on the growth of and acid production by mutans streptococci in the presence of various dietary sugars, and the relationship between the inhibition and the accumulation of xylitol 5-phosphate (X5P) under strictly anaerobic conditions like those in the deep layers of dental plaque. Xylitol retarded the growth of mutans streptococci in the presence of glucose (G), galactose (Gal), maltose (M), lactose (L) or sucrose (S) as an energy source, though the inhibition of growth on fructose (Fr) was small. Xylitol inhibited acid production by washed cells of Streptococci mutans from G, Gal, M, L or S (12-83% inhibition). S. mutans accumulated X5P intracellularly through activity of the phosphoenolpyruvate-xylitol phosphotransferase system (PEP-xylitol PTS) when they fermented these sugars in the presence of xylitol. However, in the presence of Fr, no inhibition of acid production was observed. In addition, the amounts of X5P during the fermentation of Fr were smaller than those of other sugars in spite of the presence of PEP-xylitol PTS activity. These results suggest that along with the intracellular accumulation of X5P, xylitol decreases the growth and acid production of mutans streptococci in the presence of various dietary sugars except Fr. Copyright 2003 S. Karger AG, Basel


Sealants and xylitol chewing gum are equal in caries prevention.

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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. The results were in line with the results from separate studies with sealants or xylitol. There were no great differences between the costs of the measures. The selection between the compared preventive measures has to be made on the basis of practical aspects such as caries occurrence, availability of personnel and other resources, opportunity costs, cooperation with schools, and other local conditions.


Evaluation of the dental plaque pH recovery effect of a xylitol lozenge on patients with fixed orthodontic appliances.


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The purpose of this study was to evaluate the influence of a xylitol lozenge on the dental plaque pH profile of fixed orthodontic patients. Twelve volunteers participated in this study. Before the measurement of plaque pH, subjects were asked to refrain from brushing their teeth for 48 hours and from eating and drinking for two hours. The subjects' baseline dental plaque pH was recorded using the touch technique. It was followed by a one-minute rinse with 15 ml of a 10% solution of sucrose, and subsequent plaque pH measurements were carried out during the next one hour. Xylitol lozenges were taken five times a day during a 14-day period. The variables of resting-plaque pH, minimum-plaque pH (MP pH), time required to reach MP pH (TMP), last-plaque (LP) pH at the end of one hour, cH area (CH), and pH at each test time were calculated for each pH test of the subjects. The paired sample t-test was used for statistical comparison. The mean MP pH values increased from 4.81 to 5.09 in the experimental measurement (P < .05). The mean TMP was not affected by the use of xylitol (P > .05). Although the LP pH showed an increase during the experimental period, the difference between control and experimental periods was not statistically significant (P > .05). The CH of the experimental period was significantly less than that of the control period (P < .05). As a result, the use of a xylitol lozenge after a
Meals, Ready-to-eat, also called MREs, will soon contain gum that helps reduce tooth decay. The new gum, made with the alternative sweetener xylitol, works by blocking the bacteria that cause cavities. The gum currently provided in MREs contains sugar and can cause tooth decay.

This change in the MREs, approved by the 2004 Joint Services Operational Rations Forum, is partially due to a recent study showing a significant increase in tooth decay for deployed soldiers. The 3rd Infantry Division, which deployed to Iraq for six months, returned home with more than two-and-a-half times the number of cavities they had before deployment, according to a study conducted in January 2004.

"The amount of tooth decay that occurred in just six months was overwhelming," said Army Maj. Georgia dela Cruz, public health dental staff officer at the U.S. Army Center for Health Promotion and Preventive Medicine and lead for the 2004 study.

Army Col. Christine Inouye, Reserve Component force health protection integrator, and dela Cruz were the driving force behind the change in the gum supplied in MREs.

"We are convinced that this initiative will be one major solution to the dental readiness problem for the warfighters," said Inouye.

"Ultimately, the warfighters are at high risk for dental disease," Inouye said. "More importantly, the xylitol gum will potentially impact 2.68 million active component and Ready Reserve soldiers, marines, sailors and airmen while they are deployed in a field environment."

"Deployed [service members] are at greater risk for cavities because of starchy foods, sugary drinks and infrequent tooth brushing," said dela Cruz. MREs contain carbohydrate-rich foods that are essential for energy in a field environment.

Unfortunately, oral bacteria use the starches and sugars in these foods to produce acids that cause tooth decay. Xylitol blocks these bacteria, interfering with their ability to "stick" to the teeth to produce damaging acids. Xylitol also increases saliva flow, which helps neutralize any acids and provides calcium to repair any weakened areas of the teeth.

Col. Robert Lutka, commander, Fort Benning Dental Activity, and Navy Capt. N. Blaine Cook, specialty leader for operative dentistry to U.S. Navy Surgeon General and the chair of operative dentistry, Naval Post-graduate Dental School, are long-time advocates of xylitol.

"Xylitol has been used by diabetics for years as an alternative sweetener," said Lutka. "It’s a safe and effective way to keep [service members] healthy while
deployed." Due to the number of MREs already in stock, xylitol gum will not reach service members' MREs immediately but will be included within 18 to 24 months.

"Don't wait to start using xylitol gum," said dela Cruz. "The gum can be purchased on the local economy and at commissaries, although the choice of flavors may be limited at smaller commissaries. Read the ingredients on the label and make sure that xylitol is the first ingredient. Chewing the gum at least five minutes is extremely important for maximum effectiveness."

Sources

Epic products at www.epicdental.com carries a xylitol line of TP, gum and mints in a variety of flavors.

A quick perusal of “commercially available” gums this weekend showed that Trident – original Trident – meets this criteria (none of the others I looked at did). My hygienist wants me to order a xylitol-containing gum we have seen advertised called “Bite Me.” I would probably enjoy telling a few of my patients that this is the product I would recommend for them…

Spry www.sprydental.com

To get your own AT WHOLESALE PRICING simply call 1-877-599-5827 ask for either Blaine Yeates or Amber Hall, identify yourself as a dental practitioner make a minimum order of a quantity to qualify and YOU CAN RECEIVE WHOLESALE PRICING.

I don't know anything about Bite Me. Spry has gum, mints, mouthwash, gel and toothpaste (although I like Squigle better than the Spry). Spry also has nasel spray to help reduce sinus infections.
Not all xylitol gum have sorbitol. I sell XYLAMINT GUM that is 100% sweetened with xylitol (no sorbitol) if you would like more info e-mail me. KEN SCHWARTZ DDS FAX 518-374-1982 phone 518-374-1935 e-mail kschwart@nycap.rr.com

The only candies that I know of are of the mint variety. Smints, Starbuck mints, Spry. Most of the supporting studies done with xylitol found that gum works best, so there are a lot more gums available than candies. I'll check the stores today, the Internet didn't give many options for hard candies, like butterscotch.

Another benefit of xylitol that is mentioned often is the mouth cooling effect of the xylitol itself. So, it's a little hard to mix with just any flavor, like butterscotch. Koolerz gum, is called Koolerz because of this property. The xylitol in there is a consequence of the cooling property, not because it's helpful for fighting caries. Stating this on the package, or noting it somehow would bring the candy maker terribly close making a medical claim.

Also www.xlear.com
Here is an address to information. http://www13.netrition.com/now_xylitol_page.html

We obtained some tubs of Xylitol granules (to replace granulated sugar for coffee etc) from Homestead market: http://www.homesteadmarket.com/

It tastes like sugar but "colder" has a low glycaemic index (so it's fine for diabetics) and is bactericidal, and cariostatic. Not bad for a natural fruit sugar!

Xyli-chew is available on line or at some health food stores. 70% by weight. (chocolate and licorice as well as other flavors)
Look at [www.xylitolworks.com](http://www.xylitolworks.com) They have a full range of xylitol products including chewing gum. I buy xylitol nasal saline spray to prevent sinusitis. My wife used to get about 6 infections per year and now it is 2 or less.

See: presentation "How to heal tooth decay and avoid fillings" at [http://www.dental.ufl.edu/Faculty/DBenn/OralHealth/](http://www.dental.ufl.edu/Faculty/DBenn/OralHealth/)
