

Research Question

What effect does Xylitol have on reducing dental caries?

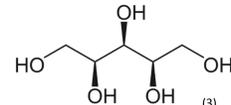
Abstract

Dental caries is a common illness in adults and is caused by the demineralization and decay of tooth structure. There are different factors that can contribute to dental caries, such as poor oral hygiene, an abundance of cariogenic bacteria, frequent consumption of sugary or acidic foods and drinks, and a maintenance of low pH in the oral cavity. While the best prevention of dental caries is brushing twice a day with a fluoride toothpaste and flossing daily, there are other options for patients that may be helpful, such as products containing a sugar alcohol called Xylitol. With this being said, the purpose of this research is to answer the following research question: What effect does xylitol have on reducing dental caries?

Xylitol is a sugar alcohol that has little to no calories, and has been found in many products such as chewing gum, toothpaste, mouth wash, and more recently peanut butter and ice cream. "Currently, more than 35 countries have approved the use of xylitol in foods, pharmaceuticals, and oral health products, principally in chewing gums, toothpastes, syrups, and confectioneries" (1). When xylitol is consumed through the mouth, it is unable to be broken down and metabolized for energy by the cariogenic bacteria that are naturally found in the oral cavity, and as a result there is no acid production from their by-products. Using information from four literature-reviewed articles, the hypothesis of this research question is that xylitol inhibits growth of *Streptococcus mutans*, prevents adhesion of bacteria on to tooth surfaces, and prevents demineralization by reducing acids that cause a drop in the pH of the oral cavity. When it comes to patient education on caries risk and prevention, suggesting xylitol containing products can be beneficial to many patients.

What is Xylitol, anyway?

Xylitol is a sugar alcohol with little to no calories and it is found naturally in fruit, vegetables, and berries and is artificially manufactured from xylan-rich plant materials such as birch and beech wood (2).



How does Xylitol work?

The effect that xylitol has on the bacteria in the oral cavity is that it "reduces the levels of *Streptococcus mutans* in plaque and saliva by disrupting their energy production processes, leading to futile energy cycle and cell death. It also reduces the adhesion of these microorganisms to the teeth surface and also reduces their acid production potential," (1). When xylitol is consumed, just like any other sugar or sweetener, it causes an increase in salivary flow which is great for patients who suffer from xerostomia.

How Does Chewing Xylitol Gum Help Prevent Tooth Decay?



Unlike sugar, bacteria cannot use xylitol as an energy source, and it also prevents bacterial growth and reproduction.



Chewing helps bring saliva to the mouth, which acts as a natural cleanser, & xylitol also increases salivary pH, combatting acidity.



Chewing gum can help dislodge food fragments which could otherwise act as energy sources for microorganisms.

Xylitol Containing Products

- Sugar-free gum (Popular brands with xylitol include Orbit, Mentos, Ice Breakers, Pür, Spry, Starbucks, Stride, Nicorette and Trident)
- Peanut Butter (Popular brands with xylitol include Go Nuts, Co, Krush Nutrition, Nuts 'N More, P28 Foods, Protein Plus PB)
- Certain medications (Popular brands with xylitol include Allegra, Gummy Vites and Nature's Plus)
- Throat lozenges
- Breath strips
- Toothpaste
- Mouthwash
- Hard candies
- Jell-O
- Some yogurts
- Some protein bars



What's the BEST way to benefit from Xylitol?

Chewing gums that contains xylitol after meals! "With daily consumption of xylitol chewing gum in particular, over time there is a decrease in levels of *Streptococcus mutans*, as well as the amount of plaque," (Isokangas, 1989). "The optimal amount of xylitol recommended to inhibit of *Streptococcus mutans* growth is a consumption of 5–6 g at a frequency of three or more times per day" (2).

The Sweet Benefits of Xylitol

- **Increases salivary flow to reduce xerostomia**
- **Is not metabolized like normal sugar, so it is helpful as a low calorie sugar alternative**
- **Since the caries causing bacteria can't digest xylitol, it can't stick to the teeth like other sugars do**
- **The pH where demineralization of enamel can occur is 5.0, and xylitol can help prevent demineralization from acids because it doesn't drop the salivary pH (6)**
- **The taste of xylitol compared to regular sugar is similar if not identical**
- **Suitable for diabetics as it doesn't cause high blood sugar**
- **Reduces plaque build-up and gingivitis**
- **Can be another form to help clean teeth after meals**

Conclusion

While there is a wide variety of products out there that contain xylitol that patients can choose from, understanding the mechanism of action that the different products have is most important when it comes to side effects that a patient may experience and possibly developing a tolerance with overuse. By using a chlorhexidine product along with fluoride toothpaste, and incorporating a xylitol chewing gum two to three times per day, it is possible to maintaining long-term caries prevention and suppression of *S. mutans* with currently available commercial products (7).

References

1. Nayak, P. A., Nayak, U. A., & Khandelwal, V. (2014). The effect of xylitol on dental caries and oral flora. *Clinical, Cosmetic and Investigational Dentistry*, 6, 89–94.
2. Roberts, Marilyn c. Reidy, Christine a, Caldwell, Susan e. Coldwell, Judge, Kathleen. (2002). How xylitol-containing products affect cariogenic bacteria. *The Journal of the American Dental Association*, 133(4), 435- 441
3. Xylitol Chemical Structure [Digital image]. (2015, April 4). Retrieved November 7, 2017, from <https://upload.wikimedia.org/wikipedia/commons/thumb/b/bb/Xylitol-2D-structure.svg/2000px-Xylitol-2D-structure.svg.png>
4. D., DDS. (2016, March 11). Xylitol Gum Products [Digital image]. Retrieved November 2, 2017, from http://durhamdds.com/wpcontent/uploads/2016/03/xylitolgum_durhamdds.jpg
5. F. (2016, November 22). Xylitol Graphic [Digital image]. Retrieved November 8, 2017, from <https://enamel32.wordpress.com/2016/11/22/best-toothpaste-for-kids/>
6. Hildebrandt, Gary h. Sparks, Brandon s. (2000). Maintaining mutans streptococci suppression: with Xylitol chewing gum. *The Journal of the American Dental Association*. 131(7), 909-916. ISSN 0002-8177.
7. Isokangas, P., Tiekso, J., Alanan, P., & MŠkinen, K. K. (1989). Long-term effect of Xylitol chewing gum on dental caries. *Community Dentistry & Oral Epidemiology*, 17(4), 200-203.doi:10.1111/1600-0528.ep12028117