

# Guideline on Xylitol Use in Caries Prevention

## Originating Committee

Council on Clinical Affairs

## Adopted

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### Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes the benefits of caries preventive strategies involving sugar substitutes, particularly xylitol, on the oral health of infants, children, adolescents, and persons with special health care needs. This guideline is intended to assist oral health care professionals make informed decisions about the use of xylitol-based products in caries prevention.

### Methods

This guideline is based upon a review of current dental and medical literature related to the use of xylitol in caries prevention. An electronic search was conducted using PubMed® with the following parameters: Terms: “xylitol AND dental caries”, “caries prevention”, “plaque reduction”, “maternal *Streptococcus mutans* transmission”, and “*Streptococcus mutans* long term suppression with xylitol”; Fields: all; Limits: within the last 10 years, humans, English, birth through 18. Two hundred forty articles matched these criteria. Fifty-one papers were chosen for review from this list and from the references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

### Background

Xylitol is a naturally occurring 5-carbon sugar polyol currently approved for use in foods, pharmaceuticals, and oral health products in more than 35 countries. It is found naturally in various trees, fruits, and vegetables and is an intermediate product of the glucose metabolic pathway in man and animals.<sup>1</sup> Xylitol was approved by the Food and Drug Administration as a dietary food additive in 1963 and has been used widely in the general market since the mid 1970s. European countries such as Finland have national programs promoting the use of xylitol chewing gum among children in an effort to reduce dental caries. The AAPD supports the use of xylitol in caries prevention.<sup>2</sup>

Xylitol has properties that reduce levels of mutans streptococci (MS) in the plaque and saliva. Xylitol disrupts the energy production processes of MS leading to a futile energy consumption cycle and cell death.<sup>3</sup> Further, consumers of clinically effective levels of xylitol show MS strains with reduced adhesion to the teeth and other reduced virulence properties such as less acid production.<sup>4-8</sup>

There are numerous clinical studies evaluating the effectiveness of xylitol.<sup>9-37</sup> Several studies of children who have consumed xylitol for 3 weeks or more have reported both short- and long-term reduction in salivary and plaque MS levels.<sup>9-15</sup> A few studies, however, have not shown a long-term reduction in salivary and plaque MS levels.<sup>39-42</sup> The mechanical action of chewing a gum containing xylitol along with subsequent increased volume of saliva may assist with caries reduction.<sup>38</sup> Evaluation for this guideline was done with the consideration that several of the published studies used “no chewing” groups instead of placebo controls.

Numerous clinical studies have demonstrated a decrease in caries rates, increment, and/or onset among children who were exposed to daily xylitol use for 12 to 40 months.<sup>16-25</sup> Long-term benefits on caries rates, increment, and/or onset also have been observed up to 5 years after the cessation of xylitol intervention.<sup>26,27</sup> Xylitol works most effectively on teeth that are erupting.<sup>27</sup> There is also evidence that maternal consumption of xylitol may reduce the acquisition of MS and dental caries by their children.<sup>28-33</sup>

### Recommendations

Clinicians may consider recommending xylitol use to moderate or high caries-risk patients. Those recommending xylitol should be familiar with the product labeling and recommend age-appropriate products. They should routinely reassess (not less than once every 6 months) a patient for changes in caries-risk status and adjust recommendations accordingly.

### Dosage

There is accumulating evidence that total daily doses of 3 to 8 grams of xylitol are required for a clinical effect with the currently available delivery methods of syrup, chewing gum, and lozenges.<sup>40,42</sup> Dosing frequency should be a minimum of 2 times a day<sup>42</sup>, not to exceed 8 grams per day. Although tables of clinically effective xylitol containing products have recently been published, the products are continually changing.<sup>34,40,42</sup>

### Modality

Chewing gum has been the predominant modality for xylitol delivery in clinical studies.<sup>35</sup> Studies<sup>24,36</sup> that have utilized xylitol-containing mints and hard candies have shown them to be as effective as xylitol-containing chewing gum. The American Academy of Pediatrics (AAP) does not recommend

use of chewing gum, mints, or hard candy by children less than 4 years of age due to the risk of choking. A randomized trial of xylitol syrup (8 g/day) reduced early childhood caries by 50-70 percent in children 15 to 25 months of age.<sup>25</sup> Another study showed that gum or lozenges consumed by children at 5 grams total dose per day at about age 10 resulted in 35-60 percent reductions of tooth decay, with no differences between the delivery methods.<sup>24</sup> Xylitol-containing gummy bears,<sup>14</sup> other confections,<sup>37</sup> and even milk<sup>43</sup> have been studied as delivery vehicles, but they are neither well established scientifically nor available commercially at present. A pacifier with a pouch containing slow release xylitol in tablet form, not yet available in the US, has shown high salivary xylitol concentrations and may be a potential delivery vehicle for infants.<sup>44</sup> Currently, xylitol-containing chewing gum, mints, energy bars and foods, nasal sprays, and oral hygiene products (eg, mouth rinse, gels, wipes, floss) are commercially available through retail or online venues. However, they may not contain the necessary therapeutic level, xylitol as the only sweetener, or adequate labeling.<sup>45</sup>

Studies<sup>46-48</sup> using toothpaste formulations with 10 percent xylitol (dose of 0.1 g/brushing) have shown reduction in MS levels and caries in children. The toothpastes that were studied are not for sale in the US. Furthermore, the xylitol-containing toothpastes that currently are sold in the US have never been tested and their formulas differ from those tested.

Current evidence supports the following recommendations for children at moderate or high caries risk:

| Age          | Xylitol Product  | Dosage                              |
|--------------|--|-------------------------------------|
| <4 years old | Xylitol syrup*   | 3 – 8 grams/day<br>in divided doses |
| ≥4 years old | Age-appropriate products such as chewing gum*, mints, lozenges, snack foods such as gummy bears. | 3 – 8 grams/day<br>in divided doses |

\* AAP does not recommend chewing gum use in children less than 4 years of age due to the risk of choking.<sup>49</sup>

### Side effects

Parents need to control the amount of xylitol and other polyols that their child consumes. Xylitol is safe for children when consumed in therapeutic doses for dental caries prevention. Common side effects that may occur with the use of xylitol are gas and osmotic diarrhea. These symptoms usually occur at higher dosages<sup>50-51</sup> and will subside once xylitol consumption is stopped.<sup>51</sup> To minimize gas and diarrhea, xylitol should be introduced slowly, over a week or more, to acclimate the body to the polyol, especially in young children.

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