

## Xylitol

*Xylitol* (pronounced ZIE-lih-tol) was originally used a hundred years ago as an intravenous support for diabetic patients who had to undergo surgery. Xylitol was used because of its safety, its freedom from the insulin pathway, and its ability to keep patients stable during surgical procedures. It was originally extracted from the woody fibers of birch trees, although today xylitol comes from such other sources as vegetables, fruits, corn husks, and a variety of other hardwoods. In its granular form xylitol looks and tastes like ordinary table sugar, but with a slightly fruity overtone. The difference, however, is that xylitol is not only tooth friendly but also has amazing benefits for teeth and general health.

Xylitol can be used as one of the most effective methods for removing harmful cavity-forming bacteria from the mouth. Eating a little less than two teaspoons (6.5 grams) of xylitol daily will gradually eliminate the harmful germs that normally feed on sugar or carbohydrates to produce mouth acidity, cause cavities and promote ear, nose and throat infections. It takes five weeks to eradicate the harmful bacteria from plaque on teeth and about six months to clean the tongue, saliva, throat, and other areas of the mouth of these bacteria.

## The Early History of Xylitol

The idea of using wood sugar to protect teeth is old, despite the fact that it is a new concept in the United States. Since ancient times, people have cleaned their teeth with instruments made from wood. In parts of Africa, intricately carved dental sticks are highly prized and stored in special wooden boxes. Native Americans were known to bite into birch wood and chew wooden sticks cut from birch trees as a cure for bad breath, and they gave their babies teething rattles carved from birch wood. They also seemed to be aware of the antifungal and antibacterial effects of birch wood, and they stored precious medicines and herbs inside wraps of birch-tree bark. Young Turkish children chew a raw gum from birch trees, and in rural areas

of Northern Europe and Russia today, children are encouraged as their teeth erupt to drink the juice from birch trees.

In a country where birch forests are plentiful, it is not surprising that during the 1940s, the Finnish Sugar Company became the first company to extract and distribute xylitol commercially. When there was a shortage of regular sugar during World War II, xylitol was used in the kitchens and on the tables of Europe. Now, sixty years later, more than half the candy produced in Scandinavia is made with xylitol, and the Scandinavians have regular dental health programs in elementary schools and kindergarten where children are provided with it. In Finland, xylitol chewing gum sales have increased from 1 percent in 1977 to 54 percent in 1998.<sup>1</sup> Switzerland has a variety of tooth-friendly candy made from xylitol, and travelers to Asia will find candy counters everywhere filled with gum and mints sweetened with xylitol.

Xylitol first arrived in the United States as an ingredient in chewing gum in the 1970s, but there was little interest in health food or natural cures at that time. The first xylitol gum tasted somewhat bland and was flavored with licorice, being rated a poor competitor to the tastier gum that the American marketplace normally enjoyed. Today xylitol can be purchased in granular form as well as in tooth-friendly zellies, breath mints and gum, tooth gels, mouth rinses, baby products, and nasal sprays. Products are in most health food stores, vitamin outlets, and even some of the more progressive grocery stores that feature organic and natural products.

## Recent Studies

During large, long-term dental studies from 1989 to 1994 undertaken in Belize, Central America, researchers noticed at the start of the program that some people's teeth showed signs of early cavities. These teeth were reevaluated at the end of the studies, and researchers documented that the decay had stabilized in the xylitol group in both the outer tooth enamel and inner dentin, and in some of the cases, the decay had completely healed.<sup>2</sup>

More recently, the Finnish Dr. Pentti Alanen completed a six-year study that examined the effectiveness of various xylitol products in preventing cavities. He showed that a daily dose of 5 grams of xylitol, either in mints or gum, had preventive effects among the 740 children, ages ten to twelve, who participated in the study. After two years, there was an approximately

50 percent reduction in decay in the xylitol groups compared with the control groups, with no other difference in dental care. The study also showed that if xylitol was used regularly for a sufficient period, a three-month break in the regimen did not reduce its effect.<sup>3</sup>

Other studies have demonstrated how well xylitol works in all age groups. In 2006, for example, Dr. Peter Milgrom of the University of Washington presented a study that shows exactly how much xylitol must be eaten each day to create a reduction in the harmful bacteria around teeth. He found that a dose of 6.5 grams each day for five weeks reduced the bacteria in plaque on teeth and that after six months the bacteria were gone from the saliva and skin of the mouth and tongue. He also showed that when the dosage is continued for two years, less plaque forms, and the effects can be long-lived.<sup>4</sup>

Lower doses may offer teeth immediate protection from mouth acidity, but research shows that consuming less than 6 grams daily may not give positive bacteria changes. Higher doses may have some general health benefits, but from a dental point of view, teeth benefit from 6.5 to 10 grams of xylitol each day, after which the effects plateau, or level off. Eating more than 10 grams a day will not reduce mouth bacteria any faster, nor reduce the time it takes to effect the change. More research may reveal other features of dosage, but for now people are encouraged to make a regular routine of eating a little xylitol after every meal and snack.

Higher doses of xylitol have been suggested for women who suffer osteoporosis. It appears that xylitol has a benefit on the absorption of calcium into the body and for this reason, it helps in the repair and mineralization of the skeleton. Doctors who believe in alkalizing the body for health often suggest around 20 grams of xylitol each day for alkalizing benefits that are believed to promote improved health. Some doctors even believe that there is a group of eight special sugars, from among the more than eight hundred known sugars, that are essential for health. Xylose—the precursor of xylitol—is one of these specific sugars, and doctors believe that these sugars provide the building blocks that enable cells in your body to communicate effectively and understand which cells are good and which ones are bad. These eight special sugars are sold in a supplement form.

Harmful bacteria are unable to use xylitol as an energy source, and as they become starved, their numbers on and around teeth gradually reduce. Bacteria absorb xylitol as they do regular sugar, but any attempt to process

it is unsuccessful. The bacteria continue trying, but they use up their resources in this futile effort. As the bacteria die out, new ones take their place that are less adhesive than the original ones and more easily removed from teeth by brushing and rinsing. After eating xylitol regularly for two years, most people notice that plaque no longer accumulates in any quantity around teeth. An important fact to know is that studies show harmful mouth bacteria (mutans streptococci) do not adapt to xylitol, even after years of exposure to it.<sup>5</sup>

## **The Many Benefits of Eating Xylitol**

As studies have shown, eating a little xylitol can rebuild and strengthen teeth over time and may completely prevent the need for a filling for an impending cavity. Xylitol stimulates a natural healing process in teeth, and eating some xylitol makes teeth feel smoother while helping to keep them cleaner. If you are among the millions of people who suffer from sensitive teeth, cavities, or plaque buildup, xylitol may help to alleviate some of these problems as well.

Research further shows that xylitol can reduce plaque formation and cavities; it makes sense, then, to think that it may simultaneously reduce other infections connected with the nose, mouth, throat, and possibly the lungs. Future studies will improve our understanding about changes in mouth chemistry and biology and possibly confirm if measures like eating a little xylitol each day could help people of all ages, particularly the disabled and debilitated, enjoy improved general health.<sup>6</sup> It certainly seems possible that studies of the future may hold harmful mouth bacteria responsible for some of the more complicated medical problems that debilitated and disabled people suffer.

### **XYLITOL AND EAR INFECTIONS**

If you think about the connection between tooth bacteria and ear infections for a few minutes, you will understand that the mouth or oral cavity is connected to the throat, the nose and nasal passages, the sinuses, and the tubes that go from the back of your throat and into your ears. Xylitol has the effect of reducing the number of sticky plaque bacteria on teeth, and it appears that it may reduce the number of sticky bacteria responsible for ear

infections in the tubes that travel from the throat into the ears. As harmful bacteria disappear, xylitol-tolerant non-sticky bacteria take their place. More research with xylitol appears each year, and eating a little xylitol daily may be an avenue to consider for any child suffering ear infections, sinus problems, or allergies.

In Finland during the 1950s, doctors were intrigued by the fact that the number of ear infections for preschool children decreased as the numbers of harmful bacteria around teeth was reduced. Since then a number of studies have shown that young children experienced around 42 percent fewer ear infections, known as *otitis media*, when they ate xylitol regularly.<sup>7</sup>

In 2000 the American Academy of Pediatrics reported that doctors wrote more than 800 prescriptions for every 1,000 children they treated for ear infections. This is of special concern since frequent use of antibiotics can develop drug-resistant bacteria strains. Children with recurrent ear infections are at higher risk for learning problems, not to mention the pain and suffering these children and their families experience. Clinical trials show that chewing xylitol gum, candies, or mints sweetened with 100 percent xylitol five times a day may reduce ear infection without antibiotics. Xylitol-based nasal sprays are also available and may be useful to treat sinusitis and allergies.<sup>8</sup>

## **XYLITOL AND CAVITY PREVENTION**

Adults who regularly eat around two teaspoons of xylitol (in any form) each day can remove 95 percent of cavity-forming germs from their mouths within six months. Anyone who continues to eat xylitol will notice less plaque forming on their teeth, and the need for dental cleanings will gradually be reduced or eliminated. New parents can use the xylitol mouth-cleaning system in the most exciting way of all—to help control the transmission of harmful bacteria to their babies and limit the chance of their children having a cavity by 70 to 90 percent.<sup>9</sup>

Xylitol not only reduces harmful mouth bacteria but also works to raise the pH in the mouth and to stimulate a healthy flow of saliva. In this way it helps protect your teeth. Since 1970 there have been hundreds of studies to show xylitol's ability to limit, decrease, and even repair cavities. While xylitol exerts its powerful effect on cavity-forming bacteria, it also shows the ability to stimulate the repair of soft spots on teeth, often seen as the

first stage of a cavity forming.<sup>10</sup> A recent study with special-needs children shows clearly how xylitol can strengthen and heal teeth.<sup>11</sup>

Although it may seem ironic, this sweet and delicious xylose derivative could be the ultimate magic bullet for tooth decay, working with nature to change the chemistry and biology of a dentally dangerous mouth to bring it back to health in less than a year.

Strong, healthy teeth need to be bathed regularly in mineral-rich saliva in order to naturally repair tooth defects and weaknesses. Xylitol stimulates mineral-rich saliva to flow into the mouth.<sup>12</sup> By eating a little xylitol regularly, natural tooth healing is encouraged; the more often you eat xylitol, the more healing occurs. Mineral-rich saliva in this way can reverse dental damage and help naturally rebuild and heal cavities without traditional dental treatments. For this reason, although the antibacterial properties of xylitol will occur no matter how it is consumed, I suggest ending every meal, snack, or drink with about one gram of xylitol: either coated on chewing gum, as a breath mint, or eaten directly off a spoon.

Xylitol gum and xylitol mints come in many flavors and textures, and taste as good, or better than, any other gum or breath mint. The difference is that by eating xylitol you change the entire biochemistry of your mouth and help to naturally clean your teeth from a biological point of view while also stimulating natural repair of any damaged or weak areas. Xylitol provides an easy and inexpensive way that can help anyone build strength into their teeth and protect them from wear, cavities, sensitivity, and gum disease.<sup>13</sup>

Xylitol is the perfect partner in any protective dental program. A simple daily routine eating 6 to 10 grams of xylitol can help build the strength of teeth and stop them chipping, wearing down, or breaking. People who eat xylitol notice results quickly, as their teeth become smoother and healthier. What a simple and delicious way to change your dental future!

## **REPAIRING EARLY CAVITIES: A TRUE STORY**

This real-life story is about some young patients of mine who almost wrecked their teeth during a summer-long camping trip. Before the start of their new school year, three teenage boys came to my dental office for their scheduled checkups. Tooth care had obviously been forgotten throughout the summer, and the teenagers admitted to consuming quantities of soda and other damaging drinks and foods throughout their trip. Summer heat and

dehydration from their active lifestyles had put the boys at increased risk for cavities. Two of them suffered from allergies, so they each breathed through their mouth, and this put their teeth at even more risk. As we have talked about in earlier chapters, acidity and dry mouth are the two primary factors that lead to weakened teeth and cavities.

I looked at their teeth, and it was apparent that all the molars had been damaged. The middle grooves of each permanent tooth—the first and second molars on both sides of the mouth in the upper and lower jaws—had started to decay. All these teeth had early cavities, a total of eight potential fillings for each boy.

I talked with their mother about the options available. Of course, I could easily put fillings in twenty-four teeth. Alternatively, this family could go home and start a program to rebuild these teeth naturally and replace minerals in the damaged enamel. The most important part of this choice would be taking the situation seriously, since the cavities could progress if the teens did not follow directions.

I explained to this family how remineralization could give the boys the chance to avoid fillings and hopefully have perfect teeth for life. The three were instructed simply to **rinse at least twice a day with a dilute fluoride mouthwash and to snack regularly on xylitol-containing gum or mints.** Although the outcome was successful, today I would likely suggest the additional use of fluoride varnish to help stimulate remineralization in conjunction with the other products.

On the other hand I have a less cheerful story of a young college student who was told by her dentist she **required fifteen fillings.** The new lesions had been noticed on X-ray examination during her summer vacation. The filling appointment was scheduled for her winter break. The young college student attended one of my seminars and discovered how xylitol and fluoride can repair weak enamel. This student worked hard for **two months** to try to repair her tooth damage. Although both her dentist and hygienist noticed great improvement in her teeth and oral health, the fifteen cavities were promptly filled. Although insurance coverage may have been involved in the decision, it seems sad that new X-rays were not taken to see if remineralization was occurring. Any sign of remineralization could have given this patient an opportunity to continue natural healing and a chance to avoid fillings completely.

## Acceptance among Dental Professionals

In universities and research institutions in the United States and elsewhere in the world, many scientists and researchers are familiar with the healing and protective powers of xylitol and the studies showing its effectiveness. For years these people have tried unsuccessfully to disseminate information about the benefits of xylitol to their peers in private practice.

The U.S. military has understood the benefits that xylitol offers; around 2001, it instigated a program called “Look for Xylitol First” to put xylitol chewing gum into packed meals issued to the troops.<sup>14</sup> Soldiers are also advised to check the ingredients in any chewing gum they buy to make sure that xylitol is the number-one ingredient in the gum—and preferably the only sweetener used. The military became concerned about an increase in cavities that occurred when the troops began fighting in desert conditions, where their mouths became dry and unprotected and oral care was difficult or impossible. In 2008, the Association of Dental Hygienists in Arizona adopted xylitol as a preventive method of care; this also happened in Hawaii the following year.

Michigan, Ohio, and Arizona have been developing programs to introduce mothers and pre-kindergarten children to xylitol, and in Utah some schools have been teaching the use of xylitol for preventive dental care. The main surprise is that so few people in the United States are familiar with xylitol and its dental benefits. In every program and study, participants appear to enjoy the taste of 100 percent xylitol, and it has been shown to be extremely well tolerated by children and adults.

Unfortunately, throughout much of the country people are confused about the difference between xylitol and other sugar alcohols, such as sorbitol and mannitol. Many dentists in general practice classify them together under one umbrella, incorrectly believing that they are all the same. This problem has been aggravated recently by the ADA’s endorsement of a mainly sorbitol-containing chewing gum. Because of the confusion, do not blame your dentist if he or she has overlooked xylitol as a proven method for protecting teeth. Hygienists have recently begun to discuss xylitol in many of their journals and meetings, but other U.S. dental organizations have issued little, if any, encouragement for the use of xylitol.

Besides being a dentist, my husband and I own a restaurant in upstate New York. My passion for dental health led me to install a xylitol-



dispensing machine in the kitchen of this restaurant many years ago. I was concerned about the oral health of our many employees because bakery and restaurant staff are noted for having poor oral health. In the environment of a bakery or restaurant there is frequent snacking on sugar, drinking soda on demand, and using breath mints, all of which create a high risk for cavities and dental problems. Even though I knew about the effectiveness of xylitol, I was stunned and amazed to observe firsthand the dramatic improvements we all noticed over the years. The employees who visited dentists regularly were able to bring back reports of how shocked their health professionals were by the improvements in their oral health.

Since then, I have been looking more closely for endorsement of xylitol by the ADA or other organizations. Even though I've found a lot of information on the Internet—including research since the 1970s enumerating the benefits of xylitol—when I typed the word “xylitol” into the search box on the ADA's Research Foundation website in 2002, to my surprise and amusement, a window popped up asking if I meant “Tylenol”! Xylitol was not even in their database. No wonder so many dentists remain unaware of this product and its health benefits.

Dr. Catherine Hayes, an associate professor in the Department of Oral Health Policy and Epidemiology at the Harvard School of Dental Medicine, holds a doctorate in epidemiology and is also a diplomat in public health dentistry. At the turn of the twenty-first century, she participated in a large program that included many well-known scientists, researchers, and dentists from a number of countries and fields of study. Dr. Hayes's group reviewed fourteen studies on the dental effects of eating xylitol and sorbitol that had been published between 1966 and 2000.<sup>15</sup> The latter did not have any long-term effects in reducing tooth decay in children, but evidence overwhelmingly and consistently confirmed that xylitol could be used to control cavities and that it provided strong protection for teeth by removing harmful mouth bacteria.

In her presentation in 2001 to the National Institute of Dental and Craniofacial Research conference in Bethesda, Maryland, Dr. Hayes even went so far as to say that it would be unethical to deprive people of the benefits of xylitol. She concluded her report by saying that “xylitol can significantly decrease the incidence of dental caries.”

## **Ways to Eat Xylitol**

Xylitol tastes so good that making it a part of your daily dietary routine is easy. You can eat it as candy, chew it as gum, or use it as a breath mint or spray. Granular xylitol can be made into a solution to wipe or brush onto the teeth of babies, the elderly, or bedridden patients. Some people, especially special-needs patients, may find it easiest to consume xylitol in baked goods, such as puddings and custards, or sprinkled onto foods or into drinks. You need approximately two teaspoons of xylitol each day.

In our restaurant we provide breath mints for patrons to eat after meals as well as individual packets of xylitol at each table for use as a beverage sweetener. Our pastry kitchen experiments with xylitol in its granular form to sweeten cheesecakes, banana and zucchini breads, and other pastries, for instance, to make healthier desserts, especially for guests on a diabetic regimen.

Xylitol was first used as a diabetic sugar more than a hundred years ago. It is gently absorbed by the body and has a low glycemic index. The only setback to baking with xylitol is that it cannot be caramelized, and because it has antifungal properties, it inactivates yeast.

Karen Edwards is a nutritionist and xylitol advocate who has compiled recipes into a book called *Sweeten Your Life the Xylitol Way*. Karen has been working with xylitol for years and has developed a line of chocolate dessert sauces that are available on the Internet as products of Karen's Kitchen.

The structure of xylitol is different from other so-called *sugar alcohols*. In contrast to sorbitol, maltitol, and mannitol, xylitol is in fact well tolerated, and about 15 grams of xylitol is produced naturally in our bodies every day. People who suddenly eat large quantities or replace all the sugar in their diet with xylitol may notice a mild laxative effect at first, because xylitol behaves as a fiber in the diet. But this reaction should not be compared to the bloating and gas after eating even tiny amounts of sorbitol. To avoid any changes from consuming large doses of xylitol, slowly increase the amount you add into your diet.<sup>16</sup> Those who wish to consume large quantities of xylitol regularly can comfortably eat around a hundred grams—about a quarter of a pound—a day, if desired!<sup>17</sup>

The only warning for xylitol is that it should not be given to pets and particularly not to dogs. There are many human foods that are not suggested for dogs—grapes, chocolate, and raisins, to name a few. Xylitol is another of these foods; it's better kept away from them.

## **XYLITOL AFTER MEALS**

Many foods take away acidity, but xylitol is one of the most convenient, and it is especially healing for teeth because of its other attributes. Xylitol stimulates a rapid flow of mineral-rich saliva into the mouth, which quickly raises the pH and bathes teeth in healing minerals. Xylitol makes the mouth instantly alkaline, raising the pH to between pH 7.5 and 8.0, which is healthy and safe for teeth. At that alkaline pH, minerals go into teeth and repair weakened areas. Within six months, eating a little xylitol after meals can help anyone with sensitive or weak enamel start to have teeth feel comfortable again. Remember the young Turkish woman who ate lemons and in doing so damaged her teeth? She was able to eat ice cream and drink cold summer beverages without pain or sensitivity within four months of making these simple changes.

This simple product, which has been ignored and discounted in this country for more than thirty years, may be the key to protecting your teeth by yourself. Xylitol will not only help you fight dental disease and the formation of cavities but also may reduce your need for cleanings, sealants, and other treatments at the dentist. For those who do not want to consume xylitol, studies show it is also effective as a mouth rinse or as an ingredient in toothpaste. A Costa Rican study among 2,630 schoolchildren, for example, showed benefits when xylitol was brushed onto teeth twice a day for three years.<sup>18</sup> The problem with toothpaste, however, is the level of abrasiveness, and there may be concerns about other ingredients in the pastes. Those who follow my recommended regimen (outlined in detail in the next chapter) will notice it does not include xylitol-containing toothpaste at this time.

## **Success Story with Xylitol**

Recently I explained to a retired dentist friend of mine and his wife about the way I teach people how to avoid cavities and gum disease with home remedies. The dentist's wife asked if I would tell her the secret, because her teeth were falling apart. Here was a wonderful dentist, an expert in his field, who could not protect his own wife from the disease that was destroying her teeth. I explained how xylitol and simple mouth rinses work in harmony to

strengthen teeth. I was impressed by the interest they showed in a new method for improving dental health.

Some weeks later, they told me about the positive effects they had noticed. Those same results have been repeated over and over, and people are amazed at the immediate benefits they feel and see. They cannot believe that something so easy and simple could be so different and effective. People often call me after their dental visits, excited to tell me how much praise they have received and the new level of excellence they have reached with their oral health.

If you are searching for results like these, perhaps it is time to try using xylitol as part of your dental health regimen. Such a simple change may turn the tide, especially people who have difficulty with flossing or who have difficulty taking adequate care of their teeth.

**PART SIX**

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## A System for Healthy Teeth

*Better put a strong fence round the top of the cliff than an ambulance down in the valley.*

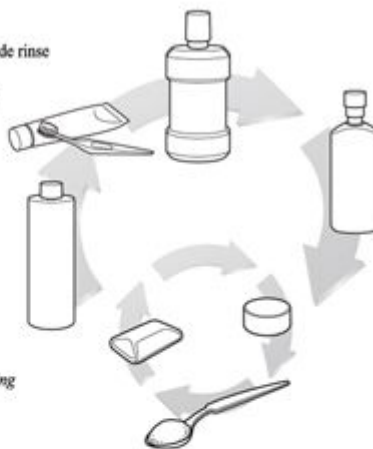
—Joseph Malins, “A Fence or an Ambulance” (1895)

### Dr. Ellie’s Complete Mouth Care System “A recipe” for adult oral care

For product details and where to purchase these items visit: [www.CleanWhiteTeeth.com](http://www.CleanWhiteTeeth.com)

You will need:

- A bottle pH balanced, chlorine dioxide rinse
- A new or clean toothbrush
- A tube of Crest® Regular toothpaste
- A bottle antiseptic rinse
- A bottle 0.05% sodium fluoride anticavity rinse
- A small cup for brush storage and toothbrush disinfection
- One or more sources for 100 percent xylitol (no sorbitol!)
  - Mix and match: mints, gum, wipes, spray, granules etc.
- Optional, pH testing paper.



Use the following routine before sleeping  
(after last food and beverage).  
Repeat about twelve hours later  
(preferably after breakfast).

1. Enhance tooth cleaning by using the chlorine dioxide rinse, before brushing
2. Brush your gum margin and teeth with a small amount of toothpaste
3. Disinfect all tooth surfaces with the antiseptic rinse, used as “liquid floss”
4. Strengthen, beautify, heal and protect your teeth with the fluoride anticavity rinse
5. Don’t re-infect your mouth – disinfect your toothbrush daily and store safely.

Use these specific products, exactly in this order, following directions! Like baking a cake, ingredient substitution or changes in method will affect the outcome.

#### Between these rinsing routines (day or night):

To promote ultimate oral health, expose your teeth to a minimum of 6.5 -10 grams of xylitol each day. This can be in any form: mints, gum, granular etc. Chose a form or forms that work with your lifestyle. For maximum benefit, plan at least 3-5 xylitol exposures each day. Enjoy xylitol after meals, snacks and beverages and whenever your mouth is dry.

For more about prevention and new advances in dentistry, visit: [www.cleanwhiteteeth.com](http://www.cleanwhiteteeth.com)  
and [AskDrEllie.blogspot.com](http://AskDrEllie.blogspot.com)