

THE WICHITA XYLITOL PROJECT—A VIABLE IN-SCHOOL ALTERNATIVE TO FLUORIDE FOR CARIES PREVENTION

SUMMARY: A five-year xylitol chewing gum and mint tablet demonstration project beginning in the fall of 2000 at a low-income area elementary school in Wichita, Kansas, gave impressive dental benefits to third- and first-grade children and enormous satisfaction to their parents. The results showed a notable reduction in tooth decay and a dramatic improvement in oral and overall health of the children.

Keywords: Caries prevention; Grade-school children; Nonfluoride dental care; Wichita, Kansas; Xylitol oral health.

Since around the year 2000, a number of credible controlled studies have questioned and cast doubt on the extent of the dental caries reducing ability and the cost-effectiveness of small, long-term daily doses of the five-carbon polyol sugar-substitute xylitol.¹ Nevertheless, many of these demurrals are contradicted by favorable results for such xylitol use^{2,3} and therefore need to be viewed in terms of the often poor showing of fluoride for the prevention of tooth decay, especially among certain groups of school-age children.⁴

As a hydrogenation product of the pentose sugar xylose, xylitol is produced commercially from the xylan lignans in hardwood and is present in various berries, mushrooms, and lettuce. Years ago, American Indians chewed on birch tree bark and wood for cleaning their teeth. During World War II, xylitol was manufactured from birch trees and used in Finland as a sweetener substitute for sucrose and found to have a remarkable ability to prevent tooth decay. Extensive follow-up research by Finnish and other scientists confirmed its anti-cariogenic properties and showed that it reduces plaque formation on the teeth, increases flow of saliva, and promotes remineralization of tooth enamel.^{5,6} By knocking out harmful bacteria, it also reduces gum disease and ear infections. Although seven times more expensive than sucrose, xylitol is about as sweet as sucrose with 33% fewer calories than sucrose, and it is safe for use in controlled amounts by diabetics⁵ (but not safe for dogs⁷). In 1963, the US Food and Drug Administration approved xylitol as a dietary supplement, and, although widely used in other countries, xylitol chewing gum did not appear in America until 1975, where, since then, it still has had only limited use.

ORIGIN OF THE PROJECT

In 1973, when I began teaching first grade in the small town of Fulton, Missouri with 0.8 mg natural F/L in the drinking water, I saw children with blackened, rotted teeth, who often complained about their teeth hurting. I was deeply bothered because I knew they were in pain, and there was nothing I could do to help. Because of this early classroom experience, I became devoted to teaching the importance of good oral hygiene and annual check-ups with a dentist. I had the students brush their teeth after lunch at school. I even offered small “rewards” if the children would bring in their dental visit slip before February, when a dentist would come to school to examine the students who had not been to a dentist. Despite all my teaching and efforts, only one or two dental slips were turned in every year. I did not see much improvement in the children’s oral hygiene or parental interest.

Later, in 1980 I moved to Wichita, Kansas (0.37 mg natural F/L), where I continued teaching first grade. In 1994 I began teaching third grade at Stanley

Elementary School located in a low-income area of Wichita. Again, I was deeply troubled by how many children were suffering from painful tooth decay. Then, in the autumn of the year 2000, after reading and studying about xylitol with the late June Allen, M Ed, along with her husband, Phil Allen, MD, June and I had the good fortune of being able to initiate an in-school caries-prevention program that became The Xylitol Project. Our goal was to improve the oral health of the children. Because earlier studies had shown that extended, long-term, daily oral use of xylitol in small amounts (5–10 g/day) significantly improves dental health,⁵ we decided a demonstration rather than a controlled research approach was appropriate. We just wanted to get xylitol into the mouths of the children. The Allens provided xylitol gum and tablet mints, and I provided the children.

I then dared do something no teacher had ever done before. Every school day I gave my students xylitol gum to chew during half of the day and xylitol mints to hold in their mouths as long as they could during the other half of the day—for the entire school year! I then proceeded to do the same for the next five years, during which time two open-minded teachers joined me in giving their students xylitol gum and mints provided by the Allens. Over a five-year period, hundreds of children in the school got to chew gum and were given xylitol mints in school. The children loved the flavored taste of the gum and mints, but the best part for them was that they were able to chew gum in school, one of the most forbidden places to chew gum!

To get the project started, I wrote to the Health Coordinator of the school district, explaining what xylitol is and asking for permission for what I wanted to do with it as a strictly voluntary program. I also explained that Dr Phil and June Allen were providing the xylitol gum and mints, so there was no cost to the district. The Health Coordinator quickly gave permission. The next step was to talk to my school Principal. When I told her I wanted to give my students xylitol gum and a mint every day to improve the health of their teeth and gums, all at no cost to the parents, she was interested, and actually she was quite excited because her dentist had recently recommended that she begin chewing xylitol gum. After I showed her the letter of permission from the district Health Coordinator, she agreed to let the project begin. Finally, I wrote a letter to the parents of my students explaining in detail what I was proposing and asking for their permission. I explained what xylitol is, the benefits of using it, and why I wanted to do the project. I pointed out that a local medical doctor and his wife were providing the xylitol gum and mints at absolutely no cost to them or to the school. The Allens and I were thrilled when we received permission from 100% of the parents, who were curious and intrigued about this extraordinary gift being given to their children. We could now begin The Xylitol Project!

I then gave my students the exciting news that I was going to give them gum and a mint every day for the entire school year. They couldn't believe their ears! What? Their teacher was going to give them candy every day? Wow! I explained what xylitol is and what it was expected to do for them. I took a survey and learned that about 25% (6 out of 25) of the children had regular earaches. (Because their Eustachian tubes are shorter, narrower, and more horizontal than in adults, children are more susceptible to middle-ear infections than are adults.) I also told the

students how important it was for them to brush and floss their teeth daily throughout the year and that chewing xylitol gum or letting a xylitol mint rest in the side of their mouths would greatly benefit their dental health.

On the first day of the project, June Allen arrived bringing xylitol gum and mints in a little red plastic toolbox with a padlock on it. She emphasized the importance of good dental care by brushing and flossing twice every day. (At a later date she brought floss for all the children.) She taught the children how to swish and swallow water two times after eating to help remove food particles from between the teeth. All my students were required to have a water bottle on their desks to drink during the day, so they were able to practice swishing and swallowing right away. June told the students what xylitol would do for them and then she played a song about xylitol on her autoharp she had written. It was a fun, unique introduction to a landmark project. Finally, June opened the little red toolbox and passed out a piece of gum to each student. Grinning from ear to ear, the children were eager to get their first piece of xylitol gum. This was the beginning of the five-year Xylitol Project (Figure 1).

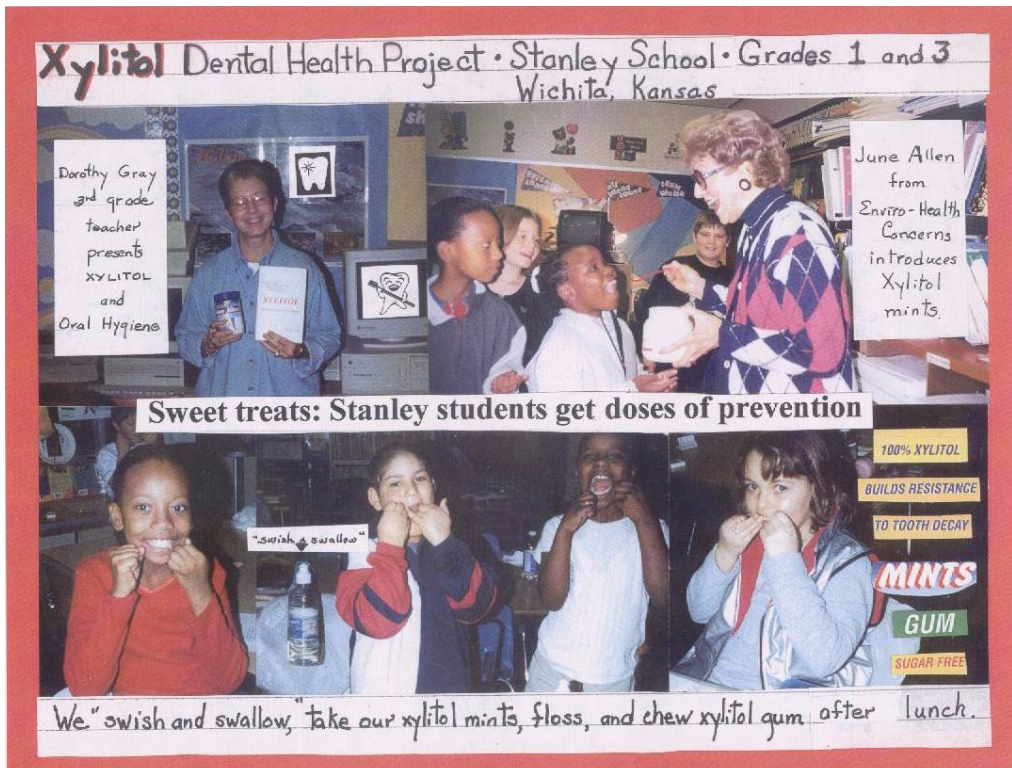


Figure 1. The Xylitol Project in full swing circa 2002 with Stanley Elementary School third graders and co-designers of the project, Dorothy Gray and June Allen.

MAKING THE PROJECT WORK

After that first day, a protocol was set up so that at the beginning of each school day, a different student was assigned to distribute the gum and mints with a small measuring spoon so hands never touched the xylitol. Students lined up, each in turn receiving the xylitol in their cupped hands, making eye contact as they said, “Thank you.” When physical education or music was scheduled, a xylitol mint instead of gum was distributed. The whole process took only about three minutes.

In order for xylitol to be most effective, it needs to stay in the mouth as long as possible. As little as five minutes will work, but the longer the better. That said, getting the children to chew gum for three hours was never a problem because they loved chewing the gum! The rules for the gum were simple:

- (1) Chew the gum as long as possible.
- (2) No “smacking” while chewing.
- (3) When ready to spit out the gum, wrap it in a little piece of paper provided in a little basket by the trashcan and then throw it away.

I made it very clear to the children that the gum was to be either in their mouths or in the trashcan. Not once during the entire five-year project did I ever find an errant piece of gum stuck where it did not belong (Figure 2).

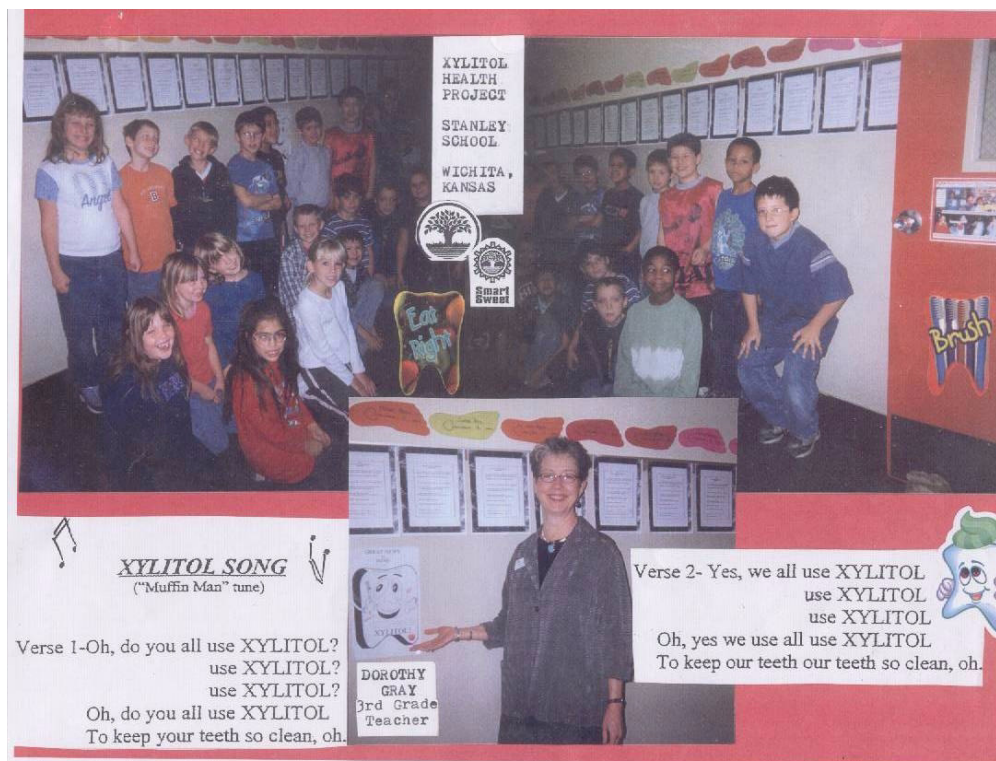


Figure 2. Stanley School third-graders proudly displaying their stories about xylitol, circa 2003. Below is the Xylitol Song and third-grade teacher Dorothy Gray.

Initially, as might be expected, instead of sucking or chewing the mints, the students struggled to keep the mints in their mouths tucked between their cheek and gums. I challenged them to see how long they could keep the mints in their mouths. Periodically, while they had the mints, I would say “Xylitol check!” Everyone would face me, stick out their tongues, and show me the mints that were on their tongues and not chewed up or somewhere else. The kids always got a kick out of sticking out their tongues at me. I was astounded at how long some of them were able to make the mints last. The all-time record was two hours and 40 minutes. My personal best was only 23 minutes.

UNIFORMLY POSITIVE RESULTS

I am pleased to report that the results of the Xylitol Project, although anecdotal, were 100% positive. The students repeatedly told me they were brushing and flossing their teeth more often, and their parents confirmed this was true. More parents were taking their children to the dentist than I had ever seen before, some for the very first time, and they were getting great check-ups. No longer were parents afraid to take their child to the dentist for fear of what the dentist might find and end up with a big bill they could not afford. They could not have been more thrilled with the good dental check-ups their children were getting. When I informed my own dentist, Joseph Baba, DDS, about the benefits of xylitol I was seeing with my students, he was so impressed that, after doing his own research, he began recommending and selling xylitol gum, mints, and toothpaste at his office.

Equally pleasing was the fact that students who had a history of many earaches reported not having a single earache during the entire five years of the project. Their parents were elated because they did not have to miss work to stay home with a sick child or take the child to the doctor. The xylitol project actually reduced costs for medical care and medicines for many of the families. Besides preventing earaches, xylitol also eliminated stomachaches because of its ability to destroy streptococci bacteria not only in the mouth but also in the intestines. Young children often have upset stomachs from poor diets, irritating food, and stress. For me it was a wonderful experience not to hear daily complaints of stomach problems, which I had heard for decades.

As I have already mentioned, the children really enjoyed the taste of the gum and mints. Dr. and Mrs. Allen occasionally tried different flavors, and the children liked them all (Figure 3).



Figure 3. Dr Phil and June Allen with her autoharp and a group of Stanley Elementary School students in the final year of the Xylitol Project 2005.

Some of the parents were so delighted about xylitol that they bought xylitol gum, mints and even toothpaste for their whole family

During the five years of The Xylitol Project I received only positive, appreciative comments from the children and parents. Because I taught the importance of good dental hygiene throughout the school year, the children learned to take very good care of their teeth, as did other members of their family as well. Parents were so pleased with the results of the project that they told their friends, relatives, and co-workers about it. Xylitol was no longer a well-kept secret during the years of the project. It was one of my proudest achievements as a teacher of young children. Regrettably, because xylitol was not an official part of public health policy in Wichita, the project ended in the spring of 2005 when I retired, or it would have continued for many more years.

I am forever grateful to June Allen and her husband Dr Phil Allen for introducing me to xylitol and joining with me in an extraordinary shared vision to improve the health of hundreds of children at Stanley Elementary School in Wichita, Kansas. It was our passionate desire that the project would serve as viable model for other schools where tooth decay is still a serious problem. Replicating the Wichita Xylitol Project would appear, from our experience, to be a safe and ultimately a highly cost-effective way to prevent childhood tooth decay and promote better health.

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^aWhile teaching elementary school in Wichita, Kansas, Dorothy Gray wrote and directed the documentary "The Brain Friendly Classroom" (©2000, 2003, 2005). In 2004 she published research on the effects of music on reading in "A Musical Interlude: Using Music and Relaxation to Improve Reading Performance" involving the first use in the nation of a vibroacoustic music chair in the classroom. In 2005 she retired from teaching elementary school and taught remedial Reading at the Butler County Community College Campus in Andover just east of Wichita until 2010. Beginning in 2004, Dorothy became a licensed Educational Kinesiologist-Brain Gym[®] Instructor, giving lectures on Brain Gym, holding workshops on it, and teaching weekly classes on it at a medical facilities' fitness center. She taught Brain Gym at Stanley Elementary School and Butler Community College. Since 1987 she has been a Qualified Therapeutic Touch Teacher and Practitioner and teaches workshops on Therapeutic Touch. In 2004 Dorothy became a Certified Emotional Freedom Technique Teacher. She maintains a private practice in Educational Kinesiology-Brain Gym, Therapeutic Touch, Rhythmic Movement Training, NeuroKinesiology, and Emotional Freedom Technique.