Mothers are the primary source of oral bacterial transmission to infants. As teeth erupt, they are colonized with *Strep mutans*, primarily transmitted through the mother's shared saliva. Preventing *Strep mutan* colonization in an infant's mouth until age two provides a significant primary preventive strategy. Mother-child research studies allow for an intervention with the mother to determine *Strep mutan* transmission to the child.

Researchers in Finland compared daily xylitol chewing gum consumption by mothers to professionally applied fluoride and chlorhexidine varnish. There were 106 mothers who chewed xylitol-sweetened gum three to five times daily from the time their newborn was three months old until they were two years old. The varnishes were applied to those mothers every six months from the time those children were six months old until two years. The fluoride varnish group was 33 mother-child pairs and the chlorhexidine varnish group was 30.

Mothers were selected based on high *Strep mutan* levels. Thus these mothers were at high risk for transmitting *Strep mutan* to their babies.

At age two, 10 percent of the children of mothers who chewed xylitol gum were colonized with *Strep mutans*, based on plaque and saliva samples. In the chlorhexidine group it was 29 percent, and 49 percent in the fluoride group. The mother's use of xylitol-sweetened chewing gum significantly reduced the risk of bacterial colonization in their babies.

**Clinical Implications:** Advise new moms to chew 100 percent xylitol-sweetened gum three to five times daily from the time their babies are three months old until their second birthday to prevent transmission of *Strep mutans* from mother to child.

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Mother-child Study Phase Two

In the first part of this research, mothers with high *Strep mutan* levels who chewed xylitol-sweetened gum were less likely to have children with *Strep mutan* colonization by age two. Despite the mothers' high *Strep mutan* levels throughout the study, the xylitol seems to alter the colonization ability of the *Strep mutans*. The mothers receiving fluoride varnish or chlorhexidine varnish were more likely to have *Strep mutan* colonization in their children at age two.

All these children were followed for an additional three years after termination of the two-year intervention. Children in Finland are seen regularly for dental care. For this part of the study, there were 103 from the xylitol group, 28 from the chlorhexidine varnish group and 33 from the fluoride varnish group.

Children who were *Strep mutan* negative at age two were 3.6 times less likely to experience tooth decay than those who were *Strep mutan* positive when evaluated to age five. Analysis of the decayed, missing and filled teeth revealed that children whose mothers consumed xylitol chewing gum had 71 percent fewer lesions than the fluoride varnish group and 74 percent fewer lesions than the chlorhexidine varnish group.

These findings agree with other studies showing prevention of *Strep mutan* colonization up to age two provides significant protection against tooth decay in the following years. Xylitol alters the adhesion of *Strep mutans* to tooth surfaces.

**Clinical Implications:** Advising moms to use xylitol several times each day themselves during tooth eruption for their infants will provide long-term caries reduction benefits.

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Recent Mother-child Study from Japan

Many of the xylitol studies include European or North American subjects. Researchers in Japan wanted to see if xylitol consumption by Japanese mothers would have the same result in lowering Strep mutan levels in their babies.

Researchers at Okayama University recruited pregnant mothers from the Miyake Obstetrics and Gynecology Clinic in central Okayama, Japan. Mothers with high Strep mutan levels were invited to participate in the study. In this study design, mothers randomly assigned to the xylitol-sweetened chewing gum began using the gum when they were six months pregnant and continued until their babies were seven months old, generally prior to tooth eruption. The xylitol group consisted of 46 mothers and the control group 31 mothers who completed the study.

The dental exams and plaque and saliva samples were done at the Hello Dental Clinic that is part of the OBGYN clinic. Both groups of mothers received the same oral health information from the dental clinic. Xylitol chewing gum consumption averaged three pieces per day with the range being 1.2 pieces to 5.3 pieces daily. The gram dosage varied accordingly and averaged four grams per day. Plaque and salivary Strep mutan levels were measured until children reached the age of two.

Children whose mothers chewed xylitol gum were less likely to have Strep mutan colonization by age two compared to controls; 72 percent of the xylitol group had zero Strep mutan scores compared to 39 percent with a score of zero in the control group.

Clinical Implications: Even short term, xylitol consumption by mothers can prevent Strep mutan colonization in babies.


Swedish Mother-child Study

Evidence confirms the benefits of mothers consuming xylitol-sweetened chewing gum to prevent the transmission and colonization of Strep mutans in their infants. Researchers in Sweden compared three chewing gums used by new mothers. The gums were 1) xylitol, 2) chlorhexidine plus xylitol and 3) sodium fluoride.

A group of 173 mothers with high Strep mutan levels were randomly assigned to one of the three chewing gum groups. Mothers with low to moderate Strep mutan levels comprised the control group that did not chew gum. Gum chewing began when the babies were six months old and continued for one year until the children were 18 months of age. Mothers were instructed to chew their assigned gums for five minutes, three times daily.

Salivary and plaque levels of Strep mutan were measured for all the children. At the end of the study, 10 percent of the children of mothers chewing xylitol gum were positive for Strep mutans. In the chlorhexidine plus xylitol chewing gum group, 16 percent were positive for Strep mutans. In the fluoride chewing gum group, 28 percent of children were positive for Strep mutans. The control group, children of mothers with low levels of Strep mutans had 10 percent positive, similar to the xylitol group.

The xylitol reduced the risk of Strep mutan transmission and colonization in high-risk mothers to that of low-risk mothers. The chlorhexidine seemed to mildly reduce the effect of xylitol, but not of statistical significance.

Clinical Implications: Xylitol-sweetened chewing gum is the best choice for reducing Strep mutan transmission and colonization.

There are many bacteria that colonize the mouth, and two are associated with caries and are highly damaging: *S. mutans* and *S. sobrinus*. These bacteria will colonize the teeth and produce lactic acid that demineralizes enamel, leading to cavitation. Xylitol effectively prevents the transmission of *S. mutans* from mother to child.

Researchers at the University of Washington wanted to know if applying a xylitol syrup to infants’ teeth would prevent early childhood caries (ECC). The study was carried out on 94 nine- to 15-month-old children in the Marshall Islands where the caries rate is two to three times that of mainland USA. The average five year old has seven untreated carious lesions.

Three treatment programs were compared: eight grams of xylitol syrup twice daily, eight grams of xylitol syrup three times daily and the control group receiving 2.67 grams of xylitol in a single dose. This was not a true control group, but mandated by the internal review committee. To be sure each child received three syrup doses each day, one or more sorbitol syrup doses were added to make three for each group.

After 12 months, the control group had more children (52 percent), and more teeth (two per child) with tooth decay. The two xylitol syrup groups had much lower caries rates affecting 0.6 to one tooth per child. The researchers estimated that the xylitol syrup used during primary tooth eruption could prevent up to 70 percent of decayed teeth.

Xylitol Syrup Reduces Incidence of Early Childhood Caries

Clinical Implications: Xylitol syrup given during primary tooth eruption prevent caries.

Clinical Implications: Xylitol comes in many forms, tastes sweet and is easy to incorporate into the daily routine of new mothers to reduce the risk of sharing *Strep mutans* with their newborn babies.

**Influence of Maternal Xylitol Consumption**

Caries is an infectious, transmissible, diet-dependent, salivary mediated disease. When the balance between demineralization and remineralization tips toward demineralization, cavitation might result. It begins with transmission of the *Strep mutans* from a primary caregiver, usually the mother, to the child. Efforts to prevent transmission and colonization of *Strep mutans* in infants begin with the pregnant mother with diet changes, improved oral hygiene and daily xylitol consumption. Efforts to prevent the initial colonization of *Strep mutans* in an infant is considered primary-primary prevention.

The caries process has two disease stages prior to cavitation: infectious disease and life-style disease. The infectious disease stage occurs before the child’s teeth erupt, after eruption and continues through infection. The life-style disease stage refers to the dietary influences of frequent sugar consumption, oral hygiene and the quality of saliva that enhance acid production leading to decalcification.

Mothers asked to rinse daily with chlorhexidine, which attacks the bacteria, experienced a lower *Strep mutans* level and this delayed colonization in their infants for four months. The use of xylitol doesn’t attack the bacteria; it simply changes the environment to be less hospitable to acid-producing *Strep mutans*. Xylitol elevates the pH of the plaque and saliva and, as a five-carbon sugar rather than a six-carbon sugar, provides no usable nutrition for the bacteria. Xylitol provides not only immediate reductions in *Strep mutans*, it provides long-term caries reduction.

Clinical Implications: Xylitol comes in many forms, tastes sweet and is easy to incorporate into the daily routine of new mothers to reduce the risk of sharing *Strep mutans* with their newborn babies.
