Xylitol History and Use

Discovered in 1891 by German chemist Emil Fischer, xylitol has been used as a sweetening agent in human food since the 1960s. Xylitol is a white crystalline powder that is odorless, with a pleasant, sweet taste. It is gaining increasing acceptance as an alternative sweetener due to its role in reducing the development of dental caries (cavities).

Xylitol occurs naturally in many fruits and vegetables and is even produced by the human body during normal metabolism. Produced commercially from plants such as birch and other hard wood trees and fibrous vegetation, xylitol has the same sweetness and bulk as sucrose with one-third fewer calories and no unpleasant aftertaste. It quickly dissolves and produces a cooling sensation in the mouth.

Xylitol is currently approved for use in foods, pharmaceuticals and oral health products in more than 35 countries. Xylitol is used in foods such as chewing gum, gum drops and hard candy, and in pharmaceuticals and oral health products such as throat lozenges, cough syrups, children's chewable multivitamins, toothpastes and mouthwashes. In the United States, xylitol is approved as a direct food additive for use in foods for special dietary uses.

Reduces New Caries Formation

In clinical and field tests, the consumption of xylitol between meals was associated with significantly reduced new caries formation, even when participants were already practicing good oral hygiene. Results clearly establish that use of xylitol sweetened foods provides additional help in the battle against tooth decay. It also inhibits the growth of S. mutans, the primary bacterium associated with dental caries. The usefulness of polyols, including xylitol, as alternatives to sugars and as part of a comprehensive program including proper dental hygiene has been recognized by the **American Dental Association**. The FDA has approved the use of a "does not promote tooth decay" health claim in labeling for sugar-free foods that contain xylitol or other polyols.

In a two-year study conducted at the Ylivieska Health Center in Finland, children aged 11-12 who consumed 7 to 10g of xylitol daily in chewing gum showed a 30 to 60% reduction in new dental caries development compared to the control group not chewing gum.

The possible long-term caries-preventing effects of xylitol have been studied as a follow-up to the Ylivieska study. Re-examination of the subjects 2 or 3 years after discontinuation of the use of xylitol revealed a continued reduction in caries increment in the post-use years of about 55%. In teeth erupting during the first year of the use of xylitol chewing gum, the long-term caries preventative effect was over 70%. The results suggest that the value of xylitol may be highest during periods of high dental activity such as eruption of new teeth.

A 40-month (1989-93) cohort study on the relationship between the use of chewing gum and dental caries was performed with 4th grade students in Belize, Central America. Nine treatment groups were included: control group (no gum); four xylitol groups (range of xylitol consumption 4.3-9.0g/day); two xylitol/sorbitol groups (total polyol consumption 8.0/9.7g/day); one sorbitol group (9.0g/day); and one sucrose group (9.0g/day). Compared with the no-gum group, sucrose gum usage resulted in a marginal increase in caries rate (relative risk 1.20). Sorbitol gum reduced the caries rate (relative risk 0.74). The four xylitol gums were most effective in reducing caries rates (relative risks from 0.48-0.27). The most effective gum was a 100% xylitol pellet gum (relative risk 0.27). The xylitol/sorbitol gums were less effective than xylitol, but reduced the caries rates significantly compared to the no-

gum or sorbitol gum groups. The results suggest that systemic usage of polyol-based chewing gum reduces caries rates in young subjects, with xylitol gums being most effective.

A three-year clinical dentifrice caries study was conducted with 2,630 children initially aged 8-10 years in the San Jose, Costa Rica metropolitan area. The study evaluated the efficacy of a 0.243% sodium fluoride/silica/10% xylitol dentifrice when compared to a 0.243% sodium fluoride/silica dentifrice which contained no xylitol. After the three-year period, subjects using the xylitol-containing dentifrice had a statistically significant reduction in decayed and filled dental surfaces (12.3% reduction; $P<0.001$). The study supports earlier work which suggests that xylitol and fluoride act synergistically to increase the efficacy of oral hygiene products.

Reduces Plaque Growth

Recent studies at the Dental Schools of Michigan and Indiana Universities have tested the effect of xylitol/sorbitol blends in chewing gum and mints on plaque. They showed a significant decrease in plaque accumulation.

Stimulates Salivary Flow

The sweetness and pleasant cooling effect of xylitol-sweetened products (such as mints and chewing gum) create an increase in salivary flow. Saliva helps with cleaning and protecting teeth from decay.

Use in the Diets of People With Diabetes

Control of blood glucose, lipids and weight are the three major goals of diabetes management today. Xylitol is slowly absorbed. Therefore, when xylitol is used, the rise in blood glucose and insulin response associated with the ingestion of glucose is significantly reduced. The reduced caloric value (2.4 calories per gram versus 4.0 for sugar) of xylitol is consistent with the objective of weight control.

Safety

In 1986, the Federation of American Societies for Experimental Biology (FASEB) was commissioned by the U.S. Food and Drug Administration (FDA) to review all relevant data concerning xylitol and other polyols. The FASEB report's scientific conclusions indicate that the use of xylitol in humans is safe. The report also affirms xylitol's acceptability as an approved food additive for use in foods for special dietary uses.

In 1996, the Joint Expert Committee on Food Additives (JECFA), a prestigious scientific advisory body to the World Health Organization and the Food and Agricultural Organization of the United Nations, confirmed that adverse findings in animal studies conducted in the 1970s are "not relevant to the toxicological evaluation of these substances (e.g., xylitol) in humans." JECFA has allocated an Acceptable Daily Intake (ADI) of "not specified" for xylitol. ADI, expressed in terms of body weight, is the amount of a food additive that can be taken daily in the diet over a lifetime without risk. An ADI of "not specified" is the safest category in which JECFA can place a food additive. The Scientific Committee for Food of the European Union (EU) also determined xylitol "acceptable" for dietary uses.

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