Embracing *xylitol*

Dental professionals must unite to promote xylitol to their patients in the fight against dental caries, says **Mark James.***

Xylitol in the dock

Dental caries can be defined as a carbohydrate-modified transmissible local infection with saliva as a critical regulator¹ and is a disease with a high prevalence in the European Union (EU).² In November 2008 the European Food Safety Authority (EFSA) formed a scientific panel to substantiate a claim made by a sugar-free confectionery company who presented evidence that xylitol chewing gum and pastilles can lead to a reduction in the risk of tooth decay in the general population pursuant to Article 14 of Regulation (EC) No 1924/2006. The EFSA is the organisation that collaborates closely with national authorities and is tasked with providing independent scientific advice and clear communication on existing and emerging risks in food products and safety.²

Background

Article 14 of Regulation (EC) No 1924/2006 establishes the rules which govern health claims made by individuals or companies. Health claims are prohibited unless they

comply with the general and specific requirements of this regulation. Article 14 is part of the regulation that lays down the provisions for the authorisation and subsequent inclusion of reduction of disease risk claims. The Panel on Dietetic products, Nutrition and Allergies evaluated the evidence provided comprising over 31 publications including human intervention and observational studies, systemic reviews and other publications. The evaluation considered the effects of chewing gum sweetened with 100% xylitol and pastilles sweetened with at least 56% xylitol as compared to non-treatment.²

Results of the evaluation

The panel concluded that despite some studies demonstrating evidence limitations, ie not being fully randomised for practical reasons, the higher number of studies, subjects and observation years presented, the consistency of the results and the magnitude of the effect that the cause and effect relationship established between the consumption of 100% xylitol

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chewing gum *led to the reduction of the risk of tooth decay in children*. The basis of this evidence is related to the consumption of 2-3 g of chewing gum sweetened with 100% xylitol at least three times a day for five minutes after meals. They also recommended that children under the age of three years avoid chewing gum due to choking hazards.

However, the panel could not sanction the claim regarding the sweetened pastilles as the cause and effect relationship could not be clearly established conclusively from the evidence provided.²

What is xylitol?

Xylitol is not an artificial sweetener but a sweet crystalline carbohydrate that occurs naturally in virtually all vegetables and fruits. It is produced commercially from birch bark, corn husks and stone fruit. The average adult consumes several hundred milligrams of xylitol from fruit and vegetables daily. Xylitol is significantly different to sorbitol, another well known polyol, in its chemical make up. Sugar alcohols like sorbitol have a six carbon structure whereas xylitol has five carbon atoms. This makes it unique and useful in treating a number of health related conditions including dental caries.³

The history of xylitol

Xylitol has been known to science for over a century after being discovered by Fischer and Stahel in Germany and Bertram in France prior to the outbreak of the Great War. During the Second World War sugar shortages compelled some countries to produce alternative sweeteners with the Finnish developing a limited xylitol production facility. After the war when shortages diminished xylitol production ceased until its resurrection in the 1960s and 1970s when scientists started to apply it to dental products. The first xylitol gum was launched in Finland and The United States in 1975.³

Important related research

The Turku Sugar Studies (1972-5) undertaken at the University of Turku Dental School in Finland involved 125 volunteer adults who substituted the sucrose in their diets with xylitol. Special non-sucrose based xylitol sweetened foods were manufactured for the two-year study period. The second test group consumed fructose sweetened food using the same protocol and the third group acted as a control with the sucrose containing diet. During the study period the xylitol group developed almost no new caries lesions, while more than seven developed with the sucrose group and four among the fructose group.^{3,4}

The Belize Trials in Central America (1989-1997) demonstrated the benefits of xylitol over the other more extensively used polyol, sorbitol, as a caries preventive agent. One of the trials compared groups of subjects who chewed xylitol sweetened, sorbitol sweetened and a mixed xylitol-sorbitol gum with a 'no gum' control group as well as a group who chewed sucrose sweetened gum during a period of 40 months (ethically, this was questioned by some because children were subjected to an unhealthy product during this trial). The results demonstrated the 100% xylitol sweetened gum was the most effective followed by the xylitol-sorbitol mixture. The trial determined the superiority of xylitol as compared to sorbitol. Children chewing xylitol gum developed 73% less tooth decay than those chewing the sorbitol.^{2,3,5}

The Mother-Child Studies (2000-2001) undertaken in Finland demonstrated that the mothers' or caregivers' use of xylitol prevented dental caries in their children. The 195 mothers were all determined to have high *Streptococcus mutans* levels at the start of the study and were treated with either chlorhexidine varnish, fluoride varnish or 100% xylitol gum chewed two or three times a day for 18 to 21 months. The children of mothers treated with xylitol had the lowest levels of *S. mutans* during the intervention period and follow up compared to the children whose mothers received fluoride and chlorhexidine varnish treatments. Additionally, the children received no preventive treatment and were examined annually for caries until

the age of five. The caries rate for children aged five was 70% lower in the xylitol group than the other two.⁶ A second significant finding was that children whose mothers consumed xylitol had fewer caries incidents over a three year period compared to those who used non-xylitol measures. This led to the conclusion that the mothers' and caregivers' long term use of xylitol during tooth eruption successfully delays and reduces the transmission of harmful bacteria by reducing the bacteria in their mouths.^{7,8}

Xylitol in the surgery

Benefits

The evidence for xylitol health benefits is very compelling and difficult to dismiss. It cannot be metabolised by disease causing bacteria; it reduces the accumulation of plaque on non-shedding (tooth) surfaces, it enhances remineralisation when chewed in gum by not decreasing the pH and it inhibits the growth of *S. mutans* in the mouth with suggestions of a permanent reduction in *S. mutans* levels. Chewing gum also stimulates the flow of saliva, enhancing the beneficial buffering effect in plaque. It also has two thirds the calorific value of sucrose, has a sweetness ratio similar to ordinary commercial sugar and a low glycaemic index (GI).³ The body absorbs various carbohydrates differently thus raising blood sugars at varying rates. GI is a scientific index that ranks the effects of various carbohydrates on blood sugar levels from a value of 100 and determines the rate at which 50 g of sugar raises these levels in two hours; the higher the number the faster the blood sugars are raised. Xylitol has a value of 7, sucrose is 68.9.

Promotion of xylitol

Xylitol is still relatively difficult to source commercially in a 100% form. However, new chewing gum ranges are gradually becoming more accessible from the internet and smaller dental and health product companies. Granulated xylitol is also available in some supermarkets, online and from the dental trade industry. With time and increased demand it is anticipated that more choice and better availability will result in enhanced interest from the dental profession and public, cheaper products and better awareness of its benefits thus leading to greater improvements in dental and general health.

Xylitol taste challenge

As part of a smile campaign at a dental practice, I recently demonstrated the dental and health benefits of xylitol to the public with a 'taste challenge'. Twenty-four muffins were made at home using the same recipe and were

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either xylitol or sucrose based, being cooked under the same conditions. The participants who attended the practice open day or were approached on the high street or in local shops were asked to determine the difference between the two sets of muffins in terms of taste, texture and look. The participants were also challenged about their knowledge of xylitol, its dental and general health benefits. Bespoke handouts were produced and much debate followed. The results demonstrated that nearly all participants could not tell the difference and knew nothing of xylitol and its benefits before being challenged. The participants also felt that both sets of muffins looked similar and more actually considered the texture of the xylitol muffin to be preferable to the sucrose muffin.

Xylitol is currently being used by myself and by other dental professionals in caries, fresh breath, dry mouth and remineralisation management protocols.

Conclusion

Oral health has been described as being 'central to our general well being' and with the rapid changes in the field of oral health there is a 'great deal to learn'.¹⁰ Tickle and Milsom in 2008 declared a 'need to take prevention serious' and not see it as just 'something to which we pay lip service'.¹¹ Indeed, In 2005 Cockcroft stated that 'Oral health should be considered part of general health, addressed through evidence based interventions focusing on the underlying factors that put people at risk of disease'.¹²

'Will the dental profession embrace this safe and EFSA endorsed natural product?'

Debate

Xylitol has now demonstrated its health benefits internationally. Will we now promote its dental and general health benefits within our clinical environments, local and national dental health promotion strategies to the benefit of our patients and population? As xylitol becomes more accessible within the market place, will the dental profession embrace this

Above: Freshly baked muffins with their hidden ingredients. Right: Mark James' wife with the xylitol taste challenge at a local wine shop

safe and EFSA endorsed natural product that has demonstrated its efficacy beyond doubt as being able to help reduce the risk of caries, one of the greatest chronic diseases in the country and in other health related arenas?

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