Erythritol

Jo Goossens and Michel Gonze
Cerestar

Modern life has transformed our eating habits and medical science has extended life expectancy. These two major changes have exposed the fact that we are increasingly vulnerable to the so-called "civilized world" diseases such as caries, diabetes, cancer and rheumatoid diseases. It was recognized only recently that changes in diet may have played a part. However, it has been known for a long time that our calorie intake is excessive. The fact that these calories are often being delivered by fatty substances rather than carbohydrates only makes things worse.

Healthy eating is a priority for many consumers. Of all new food products launched in a year, almost 20 percent incorporate some kind of health benefit — ranging from simple calorie reduction to foods enriched with ingredients that claim to prevent disease. So far, probably the most successful new market has been the sugarfree product sector.

Replacing sugar results in a product that is both reduced in calories and toothfriendly. Although a wide range of sugar replacers is now available, many have shortcomings. These include the following:

- limited calorie reduction
- side effects, such as digestive intolerance, which limit the level of use
- low solubility
- unsatisfactory taste profile
- lack of storage stability
- insufficient texture and bulking properties

ERYTHRITOL

Erythritol occurs naturally in a wide variety of fruits and vegetables. Its taste and functional properties are similar to sucrose, though its calorie content is close to zero, and when used in combination with intense sweeteners it can enhance the sweetness of both ingredients. Unlike many other polyol sweeteners, erythritol does not cause digestive intolerance, even when consumed in large quantities.

It can be used in a wide variety of processed food, baked products, confectionery and beverages. In Japan it has been widely adopted by the soft drinks industry.

Chemical and Physical Properties

Erythritol is a linear carbohydrate molecule of four carbon atoms, each carrying one hydroxyl group.

Chemically, erythritol therefore belongs to the class of monosaccharide polyols, which also includes sorbitol, mannitol, xylitol and glycerol. Erythritol is a symmetrical molecule and therefore it exists only in one form, the mesoform. It forms anhydrous crystals with a moderately sweet taste without off-taste or odors. The powder has a transparent white brilliant appearance and dissolves in water to give a colorless nonviscous solution. Crystals melt at 122°C to form a colorless and brilliant nonviscous melt.

Erythritol's chemical properties are similar to those of other polyols in that it has no reducing end-groups and thus has excellent heat and acid stability. It differs in having a low solubility, and its heat of solution is very low. However, compared to the group of polyols presently used as sugar replacers, erythritol has the lowest molecular weight — which of course gives it different properties, such as higher osmotic pressure and lower water activity in solution (Figure 1).

The most important and special nutritional properties that differentiate erythritol from other polyols are due to its small molecular size.