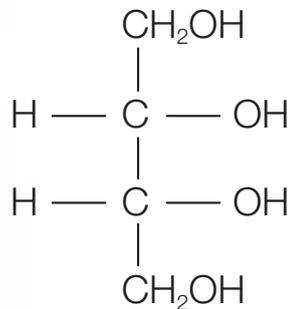


Erythritol

A novel low-calorie bulk sweetener

Erythritol is a novel bulk sweetener with a caloric value close to zero. Chemically, it is a four-carbon sugar alcohol (polyol). Erythritol, a white crystalline powder, is made through fermentation. Based on this production process and its raw materials (carbohydrate substrates) erythritol is the first and only polyol that can claim to be natural. It occurs naturally in a wide variety of foods, including many fruits and mushrooms, as well as in fermented foods such as cheese, wine, beer, and soy sauce. Its flavour profile is very similar to sucrose with approximately 70% of the sweetening power of sucrose (measured in water).



Erythritol's metabolic profile is unique. Due to its low molecular weight, more than 90% is absorbed in the small intestine. This fraction is not metabolised and is excreted unchanged via the urine. The remaining fraction of less than 10% reaches the large intestine and is partially metabolised. Only about 5% of the intrinsic caloric value of erythritol is provided to the body. This metabolic profile leads to the extremely low effective caloric value of erythritol.

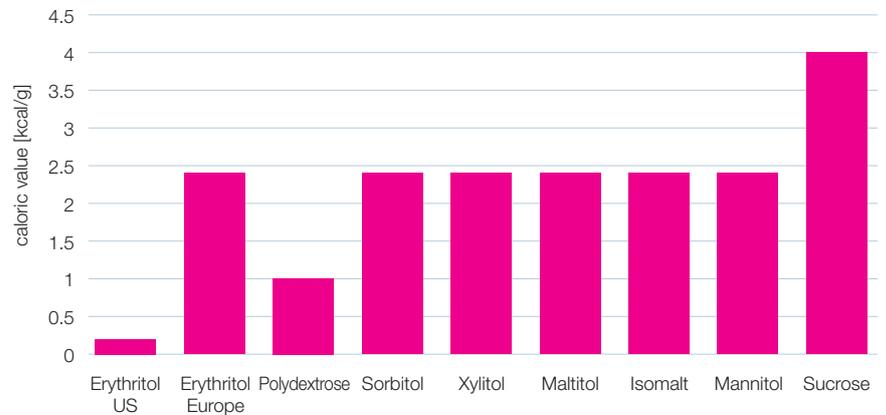
Erythritol is non-cariogenic and has the highest digestive tolerance of the polyols. This is especially important because it is non-laxative compared to the other polyols. Erythritol will play an increasingly important role in the fight against obesity. It is both suitable for diabetics and fits the trend for natural products and healthy life style.

Nutritional and Physiological Properties

Erythritol

- has a clean sweet taste with no aftertaste and is approximately 70% as sweet as sucrose (measured in water).
- has virtually no calories, only about 0.2 kcal/g. This is 5% of the caloric value of sucrose. The current legislation in the EC, however, requires erythritol to be labelled the same as the other polyols with a calorie content of 2.4 kcal/g. In Japan erythritol is labelled with 0.0 kcal/g.
- has a zero glycaemic index, it does not raise plasma glucose or insulin levels. It is suitable for diabetics.
- has a high digestive tolerance, in particular, it is non-laxative. Adults ingesting up to 1g erythritol per day and per kg body weight do not show any gastrointestinal effects.
- is non-cariogenic. Oral bacteria produce acids by breaking down sugars and starches, which may lead to tooth enamel loss and cavity formation. Erythritol is resistant to metabolism by oral bacteria and is tooth-friendly.
- exhibits interesting qualitative synergies with intense sweeteners (e.g. sucralose, aspartame acesulfame-K) or Stevia. It improves mouthfeel, provides body, and masks off-tastes.
- exhibits quantitative synergies with other (intense) sweeteners. Sweetener blends with erythritol often provide a sweetness higher than the sum of the sweetnesses of the single components.

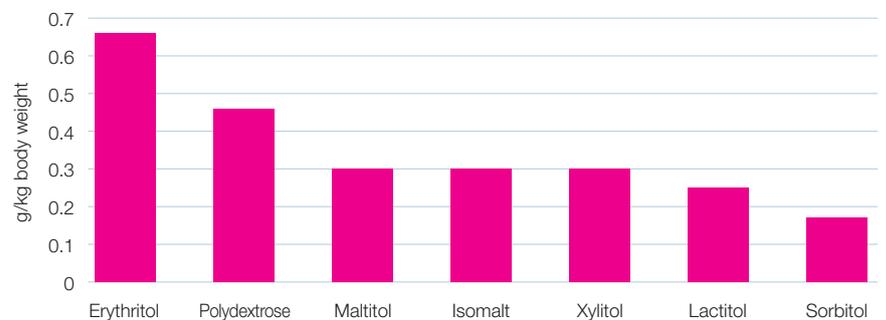
Caloric values of polyols and sucrose



Sources: 90/496/EEC, US FDA

Laxation thresholds of erythritol and other polyols

(g/kg body weight, consumed in foods)



Sources: Oku et al, Bio Clinica



Physical and Chemical Properties



Erythritol

- shows a cooling effect on dissolution due to its high negative heat of solution.
- is heat stable up to 180°C.
- exhibits no Maillard browning reactions.
- causes a freezing point depression in frozen foods.
- is storage stable and does not affect shelf life of finished products.
- is stable in a pH range between 2 and 10.
- is water soluble up to 36 w% at 25°C.
- has a very low hygroscopicity.
- leads to low-viscous solutions.



	Erythritol	Sorbitol	Xylitol	Maltitol	Isomalt	Polydextrose	Mannitol	Sucrose
Molecular weight	122	182	152	344	344	< 22000	182	342
Melting point [°C]	121	97	94	150	145 - 150	130	165	190
Water solubility at 25°C [g/100 g]	61	235	200	175	39	80	22	185
Heat of solution [cal/g]	-43	-26.5	-36.5	-19	-9.4	9	-28.5	-4.3
Relative sweetness [% vs Sucrose]	60 - 70	60	100	90	40	0	50	100
Degree of hygroscopicity	very low	medium	high	low	very low	high	very low	low

Application Areas

Erythritol can be applied in a wide variety of sugar-free, reduced-sugar and low-calorie foods, such as:

- beverages (not approved in the EC)
- chocolates
- ice cream
- yoghurt
- bakery
- confectionary
- sugar substitutes/table-top sweeteners
- chewing gum



Safety and Regulatory Status

Erythritol is safe under conditions of its intended use. This is substantiated by human and animal safety studies.

Erythritol is fully approved in the European Union since February 2008. It may be used for sweetening as well as for some other purposes as laid down in the approving Directive 2006/52/EC. The quantum satis principle applies for the majority of applications.

In the USA, erythritol was affirmed GRAS (generally recognized as safe) already in 1997. The affirmation states intended use as flavour enhancer, sweetener, humectant etc. and lists several maximum use levels.

In Japan erythritol is approved since 1990. It is treated as food and not as an additive and thus has no restrictions of use.

Erythritol is also approved in a growing number of countries like Canada, Australia/New Zealand, The Philippines and others.

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