PALATINOSE™ –

The functional carbohydrate providing better energy
PALATINOSE™ is a pure, white, crystalline carbohydrate derived from the natural source of sucrose. It can be found in e.g. honey and sugar cane extract. PALATINOSE™ is the only functional carbohydrate which is fully digestible yet slowly released. In other words, PALATINOSE™ provides glucose in a more balanced way thus providing prolonged energy. In addition to being low glycemic, low insulinemic and toothfriendly, PALATINOSE™ burns more calories from fat under physical activity in comparison to other carbohydrates.

**Origin and molecular structure**

The generic name of this sucrose-isomer is isomaltulose (chemical name: 6-0-α-D-glucopyranosyl-D-fructose). PALATINOSE™ is made from sucrose by enzymatic rearrangement of the alpha 1,2 linkage between glucose and fructose to an alpha 1,6 linkage, still combining the glucose and the fructose molecule.
PALATINOSE™ is produced in a biotechnological process and applied as a functional carbohydrate because of its distinct nutritional and physiological properties. Large-scale manufacturing of PALATINOSE™ from beet sugar became possible only after the discovery of a natural enzyme activity with the unique ability to modify the molecular structure of conventional sucrose.

The microorganism that produces this enzyme is a biological genius: in nature, Protaminobacter rubrum secures its food supply by creating its very own carbohydrate which cannot be used as an energy source by most competing microorganisms. How is this possible? Usage of sucrose as energy source requires the splitting of the bond which connects the two molecular parts of sucrose: glucose and fructose. Protaminobacter rubrum is able to rearrange said bond between the glucose and the fructose part of sucrose resulting in a new carbohydrate with a higher stability of the linkage and a three-dimensional structure which is “less attractive” for other microorganisms. The resulting carbohydrate is PALATINOSE™.
As result of the stronger bond between the two molecules, PALATINOSE™, distinctly differs in its nutritional and physiological properties from those of e.g. sucrose. PALATINOSE™ is very low glycemic. The slow but complete hydrolysis and absorption of PALATINOSE™ is reflected in its characteristic blood glucose response. PALATINOSE™ is very low glycemic with a glycemic index (GI) of 32° and guarantees a balanced energy supply without peaks and troughs in the blood glucose response curve, thus helping to avoid ‘hunger pangs’ and ‘sugar rushes’.

PALATINOSE™ provides longer lasting energy. PALATINOSE™ provides a sustained energy release. It is hydrolysed and absorbed four to five times more slowly than sucrose due to the stronger binding of its glucose and fructose component. In this way it supplies glucose as fuel for body and brain at a time when the digestion and absorption of sucrose or pure glucose has long been finished. For muscles and brain this means a constant stream of energy over a longer period of time compared to quickly absorbed carbohydrates. Furthermore, specific energy release profiles can be achieved by combining PALATINOSE™ with other carbohydrates.


Physiology

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Energy release of PALATINOSE™ in comparison to sucrose

- Balanced energy
- Avoiding extreme insulin reaction
- Prolonged energy
- The extra availability
PALATINOSE™ promotes fat oxidation
PALATINOSE™ promotes fat burning by increasing the use of body fat and fatty acids as energy sources. When consumed as part of an exercise regimen, a sports drink with this unique functional carbohydrate helps to improve the metabolism of fat. PALATINOSE™ causes a very distinct absorption that leads to the release of glucose energy at exactly the level where it triggers an increased rate of fat metabolism – with the potential to spare glycogen. This leaves important glycogen reserves in liver and muscle for when they are really needed. **PALATINOSE™ helps to burn fat in the flame of carbohydrates, thus promoting endurance.**

PALATINOSE™ is kind to teeth
As another consequence of the more stable glucose-fructose linkage compared to sucrose, PALATINOSE™ is hardly fermented by oral microbes and can even inhibit the formation of insoluble glucans. pH-telemetry tests confirmed the non-cariogenicity of PALATINOSE™ – thus it is an ideal alternative to sucrose, glucose, maltodextrin and other highly digestible and highly fermentable carbohydrates. PALATINOSE™ has been approved by the US FDA as being non-cariogenic.

PALATINOSE™ – A long-term solution for blood glucose control
A human intervention study over 12 weeks suggests that the regular intake of a liquid formula with PALATINOSE™ by persons with impaired glucose tolerance would have beneficial effects on metabolic syndrom related parameters. In this long-term study with persons with impaired glucose tolerance, the intake of a PALATINOSE™-based formula as part of breakfast was associated with long-term improvements in 2h plasma glucose after OGTT and serum free fatty acid levels; moreover, in viscerally obese persons the visceral fat accumulation was decreased.

PALATINOSE™ – A good way of energy supply
As PALATINOSE™ is slowly but fully digested and absorbed in the small intestine it provides the same calories as most other sugars (4 kcal/g). After absorption, glucose and fructose from PALATINOSE™ are metabolised following the same classical routes as glucose and fructose from sucrose. As PALATINOSE™ cleavage and absorption is slow but complete, gastrointestinal tolerance of PALATINOSE™ is comparable to that of sucrose even at high intake levels. **PALATINOSE™ – modern energy supply management.**
Taste and appearance of PALATINOSE™ are similar to sucrose providing a natural sweet perception without any aftertaste. Its sweetening power, in comparison to a 10% sucrose solution, is about 50% — increasing in sweetening power as the concentration is increased. PALATINOSE™ displays a mild sweetness providing volume and texture for a food or beverage. Depending on the application, a combination of PALATINOSE™ with other carbohydrates or high intensive sweeteners can result in improved sweetness, taste and texture of the final product. In combination with other functional ingredients like omega-3-fatty acids, soy and others, a masking effect on taste and odour of those ingredients can be observed.
Solubility and viscosity
The solubility of PALATINOSE™ is 29 % (20°C; aqueous solution) and the melting temperature is lower (120°C–128°C) compared with sucrose (160°C–185°C).

In an aqueous solution the viscosity of sucrose and PALATINOSE™ is similar.
Stability

PALATINOSE™ offers high stability and true-blue osmolarity. The strong molecular bond of PALATINOSE™ directly influences its stability in acidic environments. This directly translates into a stable osmolarity of a drink from the point of production all the way to consumption. Unlike all other acid-sensitive sugars or commonly used carbohydrates (e.g. maltodextrin) that can break apart and significantly change the osmotic pressure of a sports drink over time, an isotonic or hypotonic sports drink with PALATINOSE™ will maintain its vital osmolarity until the very instant of actually being consumed.

PALATINOSE™ is not hygroscopic and the powder has an excellent flowability. It therefore is an ideal ingredient e.g. for instant beverages. Moreover, as PALATINOSE™ is not fermented by environmental microbes and lactobacilli it can be used as an fermentable carbohydrate e.g. in dairy applications.

As a reducing sugar – it tends to undergo a maillard reaction resulting in coloration only at around 140°C. The reducing power of PALATINOSE™ is ~ 50 % of glucose.

The shelf-life of PALATINOSE™ is comparable to that of sucrose. PALATINOSE™ should be stored under dry conditions and moderate temperatures. Overall, the physicochemical properties of PALATINOSE™ permit the substitution of sucrose or fructose in most foods and beverages.
Looking at technological properties and considering the nutritional benefits, PALATINOSE™ allows and optimises the development of wellness and functional drinks, be it in instant formulas or as ready-to-drink beverages. But also sports drinks that aim at extending and completing their energy supply from “fast and instantaneously available” to “slow release” carbohydrates can benefit from this new ingredient. For the convenient and on-the-go-breakfast new energy and cereal bars or dairy drinks can be developed, as well as instant tea and coffee specialties seeking a wellness positioning.

**The physiological and technological benefits of PALATINOSE™**

**Physiology**
- Low blood glucose response
- Very low glycemic
- Prolonged energy release
- Supports fat oxidation
- Good digestibility = sucrose
- Kind to teeth
- Low insulin reaction
- Energy = 4.0 kcal/g

**Technology**
- Not hygroscopic
- Very pH stable in solution
- Mild sweetness
- Taste profile like sucrose
- Good solubility
- Reactivity > sucrose
- Stable osmolarity
- Anti-oxidative potential
- Not fermentable by most common microorganisms
Regulatory Status

PALATINOSE™ is a food or food ingredient (like sugar, starch or maltodextrin). In more than 40 countries, the food status of PALATINOSE™ has been confirmed by the authorities. It has been approved for use as novel food / novel food ingredient in Europe and Australia for example. In the U.S., PALATINOSE™ has FDA notified GRAS status (the GRAS notification #184 has been accepted by FDA with a letter of no objection in March 2006). In Japan it has been marketed already since 1985. Furthermore, BENEOPalatinit is heavily involved in the regulatory framework and the EU claim regulation.

BENEOPalatinit – Close to you worldwide

BENEOPalatinit GmbH is a subsidiary of the Südzucker AG, the world largest sugar producer. Founded in 1979 BENEOPalatinit has developed and is No 1 in the market with the unique sugar replacer ISOMALT and the functional carbohydrate PALATINOSE™. BENEOPalatinit produces PALATINOSE™ routinely on industrial scale. State-of-the-art production facilities are located at Offstein in south-west Germany.

With its subsidiaries in North America (New Jersey/US) and in Asia (Singapore) as well as a global network of sales agencies in more than 40 countries, BENEOPalatinit supplies its ingredients to food and pharmaceutical markets all around the globe.

BENEOPalatinit's service package

- Development of product concepts
- Technical consulting
- Nutritional Science
- Regulatory support for dealing with food legislation or obtaining product approval
- Research on international markets and consumer trends
- Marketing communication