



## Ingredients for success

- › Stevia
- › Isomaltulose
- › Tagatose



### Toothfriendly chocolate at the tipping point?

Gummy bears & other Toothfriendly novelties

### Guidelines to pH-telemetry testing

Unveiling the EFSA-approved method



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Toothfriendly International is a non-profit association working for better oral health.



*Dr. Bär is the Director of Toothfriendly International and an expert in the field of Food Scientific and Regulatory Services*

## Dental claims under scrutiny

Many of our readers have been asking us whether the use of the Toothfriendly logo is still permitted after the EU has begun to redefine what constitutes legitimate nutrition and health claims.

The anxiety is understandable as the EU Commission has recently rejected a plethora of dental claims. For example, a claim that xylitol-sweetened candies may reduce the risk of tooth decay was declined based on “significant weaknesses” in the research presented to substantiate the claimed effect.

In contrast, the use of the Toothfriendly label is secured under the new EU Health Claim Regulation at least until the year 2022 as it is protected under a special trademark exemption of the regulation. Furthermore, the European Food Safety Authority (EFSA) has published a favourable scientific opinion backing the continued use of the “Toothfriendly” claim. The prerequisite for the claim use is naturally that the product has been found safe for teeth in a so-called plaque-pH telemetry test (> pages 10-11).

The good news is that there is an increasing range of ingredients that fulfil the Toothfriendly criteria. Two novelty sugars – isomaltulose and tagatose – are particularly worth mentioning as they provide new exciting possibilities for product formulators (> pages 6-9).

We wish you a creative start into the new year!

Dr. Albert Bär  
Toothfriendly International



### EU criticized for neglecting erosive potential

An expert group of dental professionals is criticizing the EU Commission for neglecting the measurement of erosive potential in foods which qualify for a dental claim. At present, any product which replaces fermentable carbohydrates with sugar substitutes qualifies for the tooth mineralization claim despite the fact that the product composition may contain high amounts of erosive ingredients such as citric or malic acid.

Erosion of teeth caused by direct contact with acids is observed frequently already in children ages 5–17.

The most common cause of dental erosion is the frequent consumption of acidic foods and drinks. In general, products with a pH below 5.0–5.7 are known to trigger dental erosion.

Dr. Albert Bär of Toothfriendly International said: “This is an embarrassing mistake for the EU Commission as it permits acidic soft drinks making dental claims based only on the fact that sucrose has been replaced by intense sweeteners. We sincerely hope that the Commission notices its mistake and amends the regulation as soon as possible.”

### FDI World Dental Congress in Istanbul

Toothfriendly International will be present at the annual FDI Congress with its range of accredited confectionery products. In 2013, the congress will take place in Istanbul from 28 to 31 August. The FDI event addresses the major themes of dental practitioners today,



presented by some of the world’s leading clinicians and experts in the field. The congress is expected to attract some 10.000 visitors worldwide, and serves as a platform of policy decisions regarding standards, services and products in good oral care practise.

### New pH-telemetry lab to be opened in Bangkok

To speed entry for toothfriendly products into the Asian market, a new laboratory will be set up in Bangkok, Thailand, to offer plaque-pH telemetry testing for the food industry. The lab which is located at the Dental Institute of the Chulalongkorn University is expected to be inaugurated by the end of 2013. The laboratory team has been trained last Summer

at the University of Zurich under the surveillance of Prof. Thomas Imfeld.

“We are very excited to start this new venture in Bangkok”, said Dr. Suchit Poolthong, the Dean of the Dental Faculty. “This new test laboratory will be instrumental in bringing new Toothfriendly confectionery products to the South East Asian market”.



*The dental prosthesis and electrodes used in the pH-telemetry testing of foods and food ingredients.*



### AXA survey: 4 in 5 young Germans recognize the Toothfriendly logo

A recent study conducted by AXA and the University of Witten/Herdecke demonstrates that 82 % of all 14-29-year-old consumers in Germany recognize the Toothfriendly logo. A majority of those who recognize the logo also know what it stands for: guaranteed toothfriendly quality. „These results highlight the positive and easily recognizable nature of the Toothfriendly logo“ says Prof. Stefan Zimmer, the President of the German Toothfriendly association. „The logo is not just an example of effective health communications but also one of the best known quality seals in Germany.“



*The joint booth of BENEIO, Palsgaard and Toothfriendly International at the Confitexpo2012 with Kati Weiss, Nelson González and Edilberto Sánchez.*

### Toothfriendly teams up with BENEIO & Palsgaard

Toothfriendly International teamed up with BENEIO and Palsgaard for promoting sugar-free ingredients at the annual Confitexpo in Guadalajara, Mexico. The leading trade fair for the Latin American confectionery industry attracted over 11'000 visitors. „We are pleased with the visitors' interest in isomalt and other sugar substitutes“, confirms Thomas Weber, BENEIO's Country Manager for Mexico.

He believes that Latin America and Mexico in particular has a big growth potential for sugar-free products. „While the sugar-free confectionery category is still small compared to Western Europe or Asia, the Mexican industry is able to successfully market specialty products, such as sugar-free breath fresheners, dental chewing gums and a variety of diet products“, Weber says.

### Dentistar pacifier at the IDS in Germany



The first Toothfriendly pacifier will be presented at the International Dental Show (IDS) in March 2013. Taking place every two years, the IDS in Cologne will be the world's leading trade show and sector meeting place for the dental industry. Round about 120,000 visitors are expected to gather information on new products and innovations from nearly 2000 exhibitors worldwide. Visit Toothfriendly International at the IDS between halls 10 and 11, Stand B4.



### Switzerland celebrates 30 years of Toothfriendly promotion

2012 marked the 30th anniversary of the Toothfriendly seal in Switzerland. The smiling tooth under a protective umbrella was created three decades ago by a group of dental professionals with the aim to make consumers aware of the healthier alternatives on confectionery aisles.

To mark the anniversary, the Swiss television channel SF1 dedicated a 30-minute TV programme to demonstrate the testing procedure behind the Toothfriendly label.

The certification of Toothfriendly sweets began in 1982 evoking a surge of sugar-free chewing gum and candies sold on the Swiss market. Today, the symbol is known by over 90% Swiss confectionery consumers.



*Toothfriendly goes TV - Puls, the leading health show in Switzerland dedicated a whole program to dental health and Toothfriendly sweets. The complete library of programmes and short films can be viewed here: [www.puls.sf.tv](http://www.puls.sf.tv)*

# Toothfriendly chocolate at the tipping point?

*While basking in the health halo of dark chocolate's potentially cardio-friendly and cancer-fighting antioxidants, most manufacturers often neglect one obvious health area – teeth. Antioxidants or not, nearly every chocolate on the market today is packed with cariogenic sugar.*



When the world's largest cocoa producer Barry Callebaut first introduced the concept of Toothfriendly chocolate five years ago, most confectionery manufacturers remained sceptical. Many thought that chocolate consumers – indulgent as they are – do not particularly care for dental credentials.

Admittedly, mainstream consumers may not give up on sugar just yet – and in some cases perhaps never – but the real potential of Toothfriendly chocolate lies in the super-premium niche of educated consumers: health-conscious mothers, dental professionals and other sugar-averse consumers. In a market survey conducted by Barry

Callebaut four years ago, one in five consumers said they were interested to try out Toothfriendly chocolate. When the survey was conducted among mothers only, 95% said they would buy Toothfriendly chocolate for their children – and 47% of them even accepted a significant price premium.

### Sugar as the devil

The unrelenting negativity of the media towards the health risks of refined sugar has had a great effect on consumers' perceptions, but particularly mothers are trying to avoid sugars wherever they can. Interestingly, in children's products sugar is often considered as the "devil" not because of the empty calories but because of the negative effect it has on teeth.

In addition to sugar, consumers have grown averse to anything considered "artificial". Natural ingredients and the idea of health benefits from products and ingredients that are intrinsically healthy remains the biggest consumer trend in most markets. The potential of "naturally derived" sweeteners such as stevia is huge, particularly in the kids' segment.

Tapping on this consumer trend, sucrose in chocolate can easily be replaced by isomaltulose, a disaccharide which is naturally occurring in honey and sugar cane - larger amounts are derived from sugar beet. Isomaltulose is a sugar and, just like sucrose, is composed of glucose and fructose. Isomaltulose, however, is resistant to decomposition by oral bacteria and therefore does not cause increased acidity in the dental plaque. Isomaltulose is digested like sucrose, though at a lower rate, and is, therefore, well tolerated even at high level of intake.

### Super-premium niche

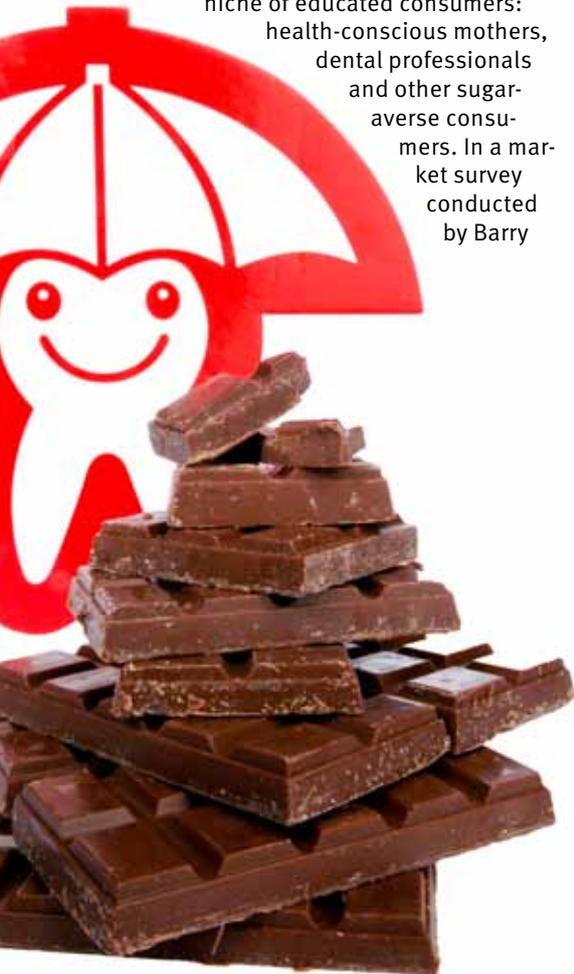
After five years of introduction, Toothfriendly chocolate has indeed found its biggest success in a low-volume super-premium segment. While larger chocolate manufacturers have so far steered clear of dental benefits maybe out of fear of cannibalizing the existing sugar-containing brands, the handful of Toothfriendly chocolate products that are successfully on the market today tend to be higher-priced and lifestyle-oriented ones.

### Formulating challenge

Fulfilling the "Toothfriendly" criteria means creating a product which contains neither fermentable carbohydrates nor unacceptable amounts of food acids.

Traditional chocolates contain about 30-55% of fermentable sugars (principally sucrose, with lactose in the case of milk chocolate) which have to be replaced. The novel Toothfriendly disaccharide isomaltulose (e.g. Palatinose™ of BENEÓ) has quickly rendered manufacturers' interest thanks to its non-laxative nature. Another commonly used sugar substitute in Toothfriendly chocolate is maltitol (e.g. SweetPearl of Roquette) which offers notable technological and sensory benefits.

Combining Toothfriendly chocolate with biscuits is out of question as starch is on the list of unsuitable (=cariogenic) ingredients. Most nuts and seeds are Toothfriendly, however, providing excellent flavour variation to chocolate-based products. Sugar-free marzipan and meringue, as well as coffee extract, herbs and many exotic spices such as pepper or chili can also be used.



### Isomaltulose debuts in baby teas

Germany's leading baby food manufacturer, HiPP, recently expanded its range of Toothfriendly instant teas. The novelties are sweetened with isomaltulose, a mildly sweet disaccharide derived from sugar beet. HiPP is the first producer to offer a sweetened granulated tea which has been scientifically proven non-cariogenic and non-erosive.

By replacing sucrose with isomaltulose, HiPP hopes to address parents' worry about the risks of baby bottle decay - a condition caused by the frequent and habitual access to sugary liquids. Each isomaltulose-sweetened tea bottle now carries the prominent message „Toothfriendly tested“ and the statement „this product was scientifically tested by the independent association Aktion Zahnfreundlich e.V.“



*The isomaltulose-based instant tea is currently available in five flavours: chamomille, fennel, rooibos, melissa and hibiscus.*



### Liquid-filled Läkerol

Since its introduction in Sweden in 1909, the Läkerol brand stands out by being the „healthier“ candy for adults, without compromising on taste. The new Läkerol Fruity Drop surprises with a crunchy coating and a refreshing filling. Currently all sugar-free Läkerol products sold in Asia carry the Toothfriendly seal.



### Chocolate-filled Halter candies

Fruit candies with a core of premium Swiss chocolate - without sugar - is Halter's answer to chocolate indulgence without remorse. Sweetened with a combination of maltitol and isomalt, the candies are targeted to the modern, health-conscious consumer looking for healthier - and Toothfriendly - alternatives to chocolate.

### Velamints with stevia

The German Ragolds is reviving its hit brand from the 70s with a new health twist. Toothfriendly Velamints are sweetened with stevia and claim to include a special „germ-killing“ ingredient that fights bad breath for up to 6 hours. Velamints are offered in three sugar-free flavors: spearmint, chocolate and peppermint and packed in a pocket-size tin box.



### Toothfriendly gummy bears

Zahnfreundchen, the German specialist for Toothfriendly confectionery, recently expanded its range with sugar-free gummy bears. The colourful jellies which are made with maltitol syrup contain only a moderate amount of food acids. Currently Zahnfreundchen is the only producer to offer Toothfriendly-tested gummy bears in Germany.



## Toothfriendly caramels with tagatose

*In a world where companies struggle to find „naturally healthy“ alternatives to refined sugar, tagatose is a model example of a naturally occurring sweetener with fascinating health benefits. Furthermore, it makes excellent caramels.*



When Arla Food Ingredients launched the first commercial samples of D-tagatose in 1996, a lot of confectionery manufacturers got excited about the potential of this new sugar – a naturally occurring low calorie monosaccharide which was arguably toothfriendly. And tagatose indeed made waves, but not in a way many people imagined.

It quickly turned out that tagatose was a challenging ingredient to produce profitably. After a decade of investments in process optimisation, Arla gave up its tagatose production and sold the complete stock to Nutrilab, a subsidiary of the Belgian Damhert group. The enzyma-

tic process that Nutrilab began developing in 2001 and had finalised by 2006, is said to cost a fraction of Arla's.

Since 2007, Nutrilab has been working from the bottom up to create market for Tagatesse, the table-top and kitchen sweetener brand based on D-tagatose which has taken its home market Belgium by the storm. Today Tagatesse is also sold in over 5000 supermarkets in Holland, Portugal and Scandinavia.

This, obviously, isn't enough for the ambitious tagatose team. „We are expanding our Tagatesse sweetener range in 2013“, confirms Clio Hendrickx of Damhert. „Next to the

powder for cooking and baking and the tablets and sticks for hot drinks, we will launch a pure tagatose syrup for various sweetening purposes and pure tagatose sugar cubes. We will focus on this range and boost sales by extra marketing campaigns and availability throughout Europe by finding distributors in each country.“

While its biggest success has so far been in a niche segment and not in the mass market, tagatose is expected to make a comeback also on the B-to-B market by the end of 2013 once Nutrilab's new enzymatic production plant in Italy enables full scale industrial production. The current small scale production just covers the tagatose needed by Dam-

# D-tagatose

hert and its direct suppliers. By 2014 at the latest, however, tagatose may become available for wider use by the food industry.

## Caramel production

In caramel, toffee and fudge production, D-tagatose can substitute sugar without significantly changing the process parameters. The key properties are:

- High Maillard reactivity
- Low viscosity
- Soft consistency
- Low glass transition temperature

As D-tagatose caramelises at a low temperature, the characteristic caramel flavour is easily obtained. The ability of D-tagatose to crystallise makes it also suitable for making fudge. Toffees produced with D-tagatose have a smooth and soft consistency. Browning and caramel flavor occur due to the low temperature of caramelising. This makes D-tagatose suitable also for producing caramel notes in chocolates.

Product developers also need to know a few other key properties of D-tagatose:

- It has relatively high melting point at 134°C
- It is non hygroscopic at RH 75% /30°C
- It is stable at pH from 3-7.

In order to utilise the synergistic effect of other bulk sweeteners, D-tagatose can be combined with several low digestible carbohydrates. Having a toothfriendly end product in mind, resistant dextrin (Nutriose or Polydextrose) would complement D-tagatose to an ideal match. Also other non-cariogenic bulk sweeteners such as isomaltulose are good choices.

## Dental claims

With regard to food labelling, products containing D-tagatose raise an interesting question. Since D-tagatose is classified as sugar, retail products sweetened with D-tagatose do not qualify for a 'sugar free' claim. They may, however, be labelled as 'Toothfriendly'. As a consequence, the delimitation between 'sugar containing' and 'sugar free' no longer coincides with the presence or absence of certain nutritional/ physiological benefits.

This could serve to bring about the gradual obsolescence of the 'sugar free' claim and may motivate confectionery manufacturers to give preference to label statements that directly indicate the claimed physiological benefits. As D-tagatose does not promote dental caries, the FDA has approved the use of a dental health claim for products containing D-tagatose as long as the retail product complies with all the requirements of a non-cariogenic and non-erosive product.

In June 2011, the European Food Safety Authority (EFSA) approved the following claim: "the consumption of D-tagatose instead of other sugars contributes to the maintenance of tooth mineralisation."

Products sweetened with D-tagatose may also qualify to use the internationally recognised 'Toothfriendly' label which guarantees that the product is non-cariogenic and non-erosive, based on scientific procedures. This trademark is granted and controlled by Toothfriendly International, a registered non-profit association with seat in Basel, Switzerland.

## Regulatory aspects

World Health Organization's Joint Expert Committee on Food Additives (JECFA) evaluated the safety of D-tagatose in June 2004 and stated that there is no need for a limited acceptable daily intake. D-tagatose obtained GRAS status in US in 2001, thereby permitting its use as a sweetener in foods and beverages. The EU novel food approval on D-tagatose was published on 14 December 2005. D-tagatose is also accepted for use in Hong Kong, Australia and New Zealand. Damhert's new enzymatic D-tagatose production was approved by the High Health Council on 30 June 2010 and published in the EU official journal on 4 August 2010.

While being generally recognised as safe for human consumption, products which contain more than 15g tagatose per serving and beverages with a tagatose content of more than one per cent must carry an information statement "may cause laxative side effects" as is known and in use already for polyolcontaining products. Since D-tagatose is absorbed only slowly and incompletely, the consumption of excessive amounts (< 25g) may produce the same intestinal side effects that are known to occur after the consumption of excessive amounts of polyols.

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*A summary of this article was previously published in the February 2012 issue of Confectionery Production.*

### References:

*Christian M. Vastenavond et al. (2011) Alternative Sweeteners, Chapter 13: Tagatose. Fourth Edition. CRC Press.*

*Ulla Petersen Skytte (2002) Sweet, natural and healthy, International Food Ingredients No. 1/02*





## Measuring the cariogenic and erosive potential of foods: Guidelines to pH-telemetry testing

*Before a food product can be labeled as „safe for teeth“ or “Toothfriendly”, it must pass a so-called plaque-pH-telemetry test. The validity of this method is generally recognized by the dental profession and is cited by reference in the US Code of Federal Regulations as well as in the recent scientific opinions of the European Food Safety Authority.*

The idea to reduce the caries risk by providing the consumer with a selection of confectionery and snack products which are not harmful for teeth requires both a definition of and a reliable method for assessing the cariogenic and erosive potential of foods. From both *in vivo* and *in vitro* tests it appears that foods can be considered non-cariogenic as long as the pH value of the dental plaque does not fall below the critical point of 5.7.

In 1985 an international scientific consensus has been reached stating that there is really only one reliable method for assessing the cariogenic potential of foods and food ingre-

dients: the plaque-pH-telemetry test. Today, this test is carried out by three designated University Dental Institutes (Zurich, Witten/Herdecke and Beijing).

Detailed descriptions of the plaque-pH-telemetry test have been published in the scientific literature. In this context, it may suffice to say that this test measures the formation of acid by plaque bacteria from ingested food *in vivo*. Volunteers carrying a partial prosthesis with an indwelling pH electrode consume the test food in the ordinary way.

The oral bacteria that have accumulated on the teeth and electrode

during 3 to 4 days prior to the test come in contact with the ingested food. If the food contains fermentable components, such as sugars or starch, acid will be formed by the bacteria. In contrast, sugar alcohols (polyols), certain dietary fibres, intense sweeteners and very few sugars (isomaltulose, tagatose) will not result in significant acid formation.

The concentration of the acid formed is measured by the pH-electrode under the plaque, i.e. at exactly the site where caries is formed. If the measured acidity in the plaque (biofilm) does not exceed the critical limit of pH 5.7 during and for 30

# pH-telemetry

minutes after consumption of the test food, the product is considered to be non-cariogenic.

The erosive potential of test foods is measured with a plaque-free electrode. A product is regarded as not presenting a significant erosive potential if the acid exposure of the plaque-free electrode does not exceed 40 mmol H<sup>+</sup> x min.

Without these tests it is often impossible to determine whether a product is safe for teeth. Sugar-free products may contain caries- or erosion-causing ingredients such as starch, oligosaccharides or citric acids and only the pH-telemetry test will reveal if critical amounts are exceeded.

## Labelling

Products which successfully pass the pH-telemetry test are considered “safe for teeth” and qualify for distinction with the Toothfriendly quality seal.

This eye-catching pictogram was developed by the four Swiss Dental University Institutes in 1982 to allow an easy and science-based recognition of Toothfriendly products. In parallel, the meaning of the logo was explained to consumers in a general way by a non-profit association called “Toothfriendly International”.

Confectionery manufacturers may use the Toothfriendly logo on the labels and in the advertising of their products only under a license agreement concluded with Toothfriendly International. According to this agreement, the logo may be exhibited only on confectionery which has passed the pH telemetry test, i.e. does not promote tooth decay or

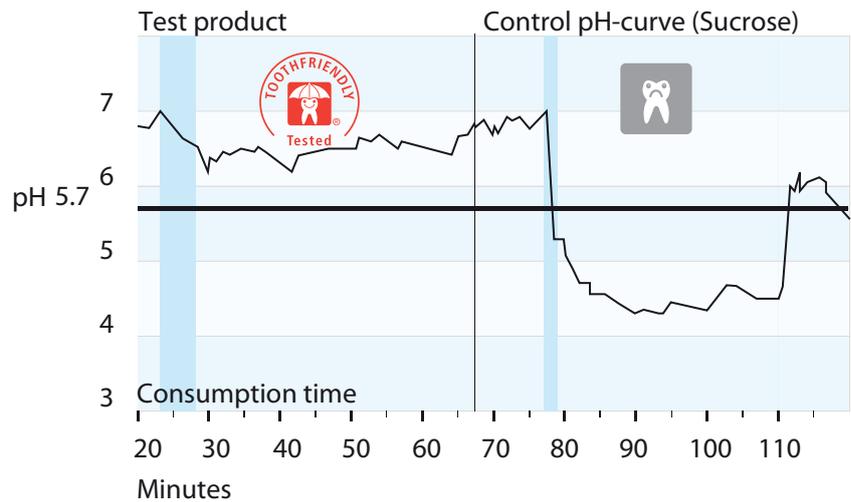


Figure 1. Volunteer is chewing a sugar-free chewing gum (circa 8 minutes). Before, during, and for 30 minutes after, the pH of the plaque is measured. As the product does not depress the plaque pH below the critical level of 5.7, it is considered non-cariogenic. After paraffin chewing a positive control with sucrose solution demonstrates that the plaque pH drops below 4.5 after sugar consumption.

dental erosion. The agreement also obliges the company to notify Toothfriendly International of any change of composition in their products.

confectionery categories, including lozenges, lollipops, mints, toffee and chocolate, as well as medical candies.

## Accredited test stations worldwide

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Since the first Toothfriendly chewing gum was launched in Switzerland thirty years ago, the logo has been expanded to encompass other major

Today, the registered trademark is awarded to over 40 companies worldwide covering a geographic area of some 60 countries.

## Regulatory aspects

In Europe, the European Food Safety Authority has recently examined all health claims used on food products in the EU market and accepted the scientific evidence of the “tooth-friendly” and „tooth mineralization“ claims based on the measurements of the plaque-pH. Similarly, the term “toothfriendly” and the pH-telemetry test method have been cited by reference in the US Code of Federal Regulations.



Telemetry prosthesis in the mouth of a volunteer



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