

KiOslim® technology

An ally for weight management

Strategy for weight management

The World Health Organization (WHO) reported last year that more than 1.9 billion adults aged 18 and over were overweight, and 600 million of these were obese¹. WHO also noted that these numbers are continuing to rise, with worldwide obesity more than doubling since 1980.

Among the main causes associated to overweight and obesity is an energy (calories) imbalance between energy intake and energy expenditure that is mainly due to unhealthy diet, i.e., foods with high fat, salt and sugar content coupled with a lack of physical activity. According to the WHO, total fat should not exceed 30% of total energy intake, while intake of free sugars should be limited to less than 10% of total energy intake and salt intake to less than 5 g per day². However, it is not recommended to completely suppress the absorption of nutrients like lipids, as they bring a satiation effect and a more pleasant food consistency. It is also recognized that extreme fat diets are very difficult to follow, and not successful on the long-term. So the current recommendations are to consume balanced diet by limiting total caloric intake.

Reduction of caloric intake may be achieved through several strategies including, lowering fat and carbohydrate intakes from diet, and/or controlling hunger by increasing the satiety feeling and preventing craving. In 2001, WANDERS published a review on the effects of dietary fibers on subjective appetite, energy intake and body weight through a systematic review of randomized controlled trials³. He proposed the grouping of fibers according to their chemical structure and physicochemical properties including viscosity, solubility, and fermentability. The authors concluded that more viscous fibers presumably affect subjective appetite and acute energy intake.

A satiating effect induces a reduction of appetite, allowing the consumers to either wait until the next meal avoiding cravings, or consume a smaller amount of food during the meal. Consequently, consumers reduce their calorie intake to lose weight and/or to control their weight.

In addition to reduce appetite only, it might also be advantageous to limit the absorption of fats and sugars, which are the main sources of calories.

Their excessive consumption, and therefore absorption, results in:

- increased BMI (Body Mass Index),
- promote overweight and/or obesity,
- promote associated cardio-metabolic disorders (visceral adiposity, atherosclerosis, diabetes, metabolic syndrome...).

How KiOslim® is an innovation

Today there is no product that can induce a feeling of satiety, while limiting the absorption of



fats and sugars. Recent *in vitro* test on KiOslim® technology suggest that this can be achieved thanks to a specific combination of glucomannan and chitosan.

Konjac glucomannan is among the more viscous fibers due to its high solubility and swelling capacity. Konjac glucomannan forms a gel-like mass in the stomach that could delay gastric emptying and induced satiety leading to a decrease in subsequent energy intake⁴. It is used in a wide range of appetite reducing products.

Chitosan is a dietary fiber able to bind negatively charged molecules like fats reducing their absorption and allowing their excretion^{5,6,7}.

Effect of KiOslim® on appetite

In 2014, a user test was conducted on 44 subjects (39 women and 5 men with BMI between 20.0 and 29.9 kg/m²) with the aim to investigate the KiOslim®'s effect on parameters related to appetite.

KiOslim® was compared to a commercially available glucomannan-based product. Depending on product recommendation for use, breakfast

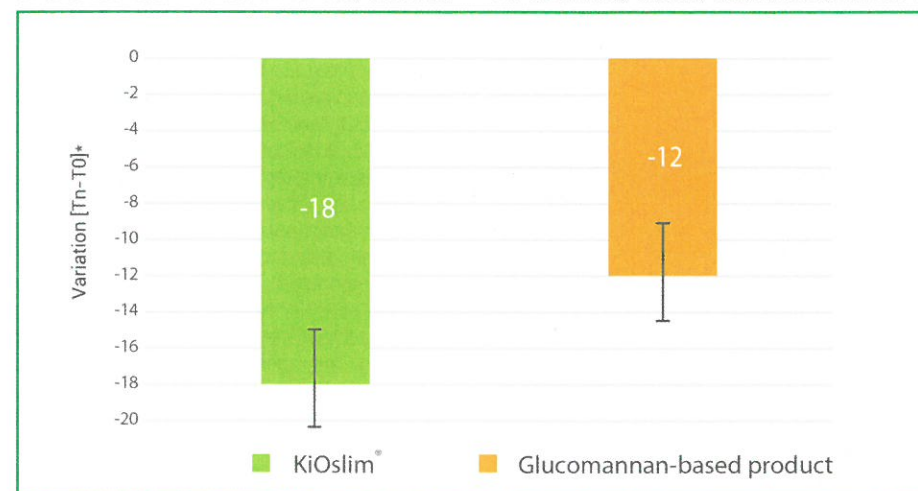


Figure 1 –Variation of global appetite score between T0 and T15 for KiOslim® compared to a reference product

was given 15 minutes (T15) or 30 minutes (T30) after product intake (T0). From T0 to T240 (4hrs), the subjects regularly filled in a Visual Analog Scales questionnaire to assess the perception of satiety.

This test revealed that KiOslim® allows an increased reduction of global appetite score (-18 AU, Arbitrary Units) than the reference (-12 AU) between T0 and T15, corresponding to a reduction of 34% in appetite score, only 15 minutes after ingestion of the product.

This result can be explained by the viscosity generated by KiOslim® in gastrointestinal conditions (data not shown).

Effect of KiOslim® on fat binding (in vitro test)

The capacity of KiOslim® to limit lipids absorption (directly linked to its fat-binding capacity) was investigated. KiOnutrime-CsC® Chitosan entering into KiOslim® technology is a fiber extracted from the mycelium of *Aspergillus niger*. This copolymer of N-acetyl-D-Glucosamine and D-glucosamine is positively charged at gastric pH (due to the protonation of the amine functions) which allows electrostatic interactions with negatively charged molecules like fatty acids and explain its excellent fat binding properties. At the intestinal pH, the chitosan-fat complex is precipitated which allows fat excretion without absorption. Thanks to this mechanism of action, KiOnutrime-CsC® showed to reduce mean body weight with 3 kg in overweight and obese subjects after 90 days⁸.

Glucomannan is not known for fat binding properties. Therefore, the fat binding capacity of the KiOslim® technology was tested according to a method based on Rockway's method⁹. The aim is to reproduce *in vitro*, the route of lipids through the gastrointestinal tract. Under the test conditions, results showed that KiOslim® pass the test for fat-binding capacity despite the presence of

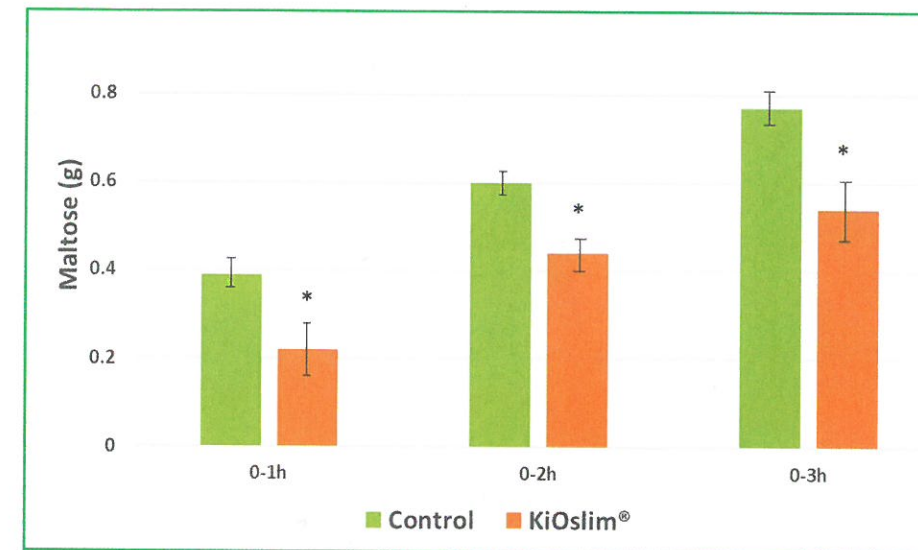


Figure 2 – Absolute amount of maltose (g/incubation) released from CHO in the absorbed fraction during different time intervals using with KiOslim® or control (n=8). * = significant difference compared to the control (p<0.05).

glucomannan in the formulation.

Effect of KiOslim® on sugar binding (in vitro test)

As a complementary approach for human studies, the *in vitro* SHIME methodology developed by PRODIGEST (BE) was used to evaluate the potential effect of KiOslim® on the absorption of dietary complex carbohydrates (CHO) in a model that simulates the human upper gastrointestinal tract. This *in vitro* approach allows the in-depth study of the activity of selected products in the gut under representative environment conditions. Results of this study showed that KiOslim® significantly reduces the amount of absorbed maltose during the incubation into the small intestine compared to the control. In particular,

during the first hour of incubation, the formulation induces a drastic reduction (46%) of the amount of maltose (p=0.002).

In an additional *in vitro* test, the ability of KiOslim® formulation to entrap glucose was measured and compared to a control. The *in vitro* test is based on the publication from PALANUJEV 2009¹⁰ who studied the properties for entrapping glucose of glucomannan and different mucilaginous polysaccharides from selected medicinal plants, using the dialysis tubing technique as an *in vitro* model. This test revealed that KiOslim® presents a very good capacity to entrap glucose. Under the test conditions, the percentage of decrease in glucose diffusion into the external solution in presence of KiOslim® was 40.5% (n=6). This value is significantly different compared

Contract manufacturer invests in a second plant

The contract manufacturer SternMaid is due to start construction work on a second production plant for powdered foods and food supplements in September. In the initial phase a production and warehouse complex with a floor area of 5,000 m² will be built opposite Plant 1. With a total area of 40,000 m² the site has further reserves for subsequent construction phases. In future, all the retail products in the company's range will be manufactured in Plant 2. According to the current schedule, the construction work will take just under one year.

The present factory offers no more room for expansion, especially since a new blending line with automatic weighing of raw materials was commissioned at the end of June and greatly enlarges SternMaid's capacity. It was this continuous increase in capacity utilization that led the company to invest in building a second production plant. The total volume of investments in 2016/2017 will be 15 million EUR.

The base area of the new buildings will be made up of about 2,500 m² for warehousing, 2,000 m² for production and 500 m² for technical equip-

ment; the production hall is designed as a two-storey building and already offers space for further expansion. As far as possible the two plants will work independently of each other. Plant 1 will in future focus on all products intended for further industrial processing, whereas Plant 2 will manufacture all retail products. For this reason, the small-pack filling lines currently in use will move into the new plant in 2017. The floor space thus released will be converted into blending and filling areas for industrial products. Separation of the two types of production will ease the logistic situation on the site, which is made difficult by the increasing volume of goods handled.

As Torsten Wywiol, the CEO of SternMaid, comments: "Blending is our mission. In 1999 we started with lines 1 and 2, and now line 8 has recently been commissioned. SternMaid is all set for growth, so that we shall continue to meet the demand for powder mixtures in full. Construction of the second plant will enable us to serve our retail customers and meet their requests even better in future."

to the control (p<0.05).

Conclusion

KiOslim® is a very powerful technology as adjunct to weight management and a clear innovation for addressing obesity and overweight. Mechanistic studies tend to demonstrate that KiOslim® acts not only by increasing satiety (reducing appetite) and lowering fat intake for diet but also reducing availability of carbohydrate for absorption through sugar entrapment¹¹.

References:

- 1 <http://www.who.int/mediacentre/factsheets/fs311/en/>
- 2 <http://www.who.int/mediacentre/factsheets/fs394/en/>
- 3 Wanders AJ et al. Effects of dietary fibre on subjective appetite, energy intake and body weight: a systematic review of randomized controlled trials. *Obes Rev.* 2011 Sep;12(9): 724-739.
- 4 EFSA Journal 2010; 8(10): 1798
- 5 Ylitalo R, Lehtinen S, Wuolijoki E, Ylitalo P, Lehtimäki T. Cholesterol-lowering properties and safety of chitosan. *Arzneimittelforschung* 2002, 52 (1): 1-7.
- 6 Shields KM, Smock N, McQueen CE, Bryant PJ. Chitosan for weight loss and cholesterol management. *Am. J. Health Syst. Pharm.* 2003, 60(13):1310-1313.
- 7 Thongngam M, McClements DJ. Characterization of interactions between chitosan and an anionic surfactant. *J. Agric. Food Chem.* 2004, 52(4): 987-991.
- 8 Trivedi VR et al. Single-blind, placebo controlled randomized clinical study of chitosan for body weight reduction. *Nutrition Journal* 2016, 15:3.
- 9 Rockway SW. Absorbent Fat-Binding Report: An *in vitro* binding study. *Pharma Nutrients® Scientific Affairs.* 2001, 1-8.
- 10 Palanuvej C et al. *In vitro* glucose entrapment and alpha-glucosidase inhibition of mucilaginous substances from selected medicinal plants. *Sci Pharma.* (2009) 77: 837-849
- 11 This claim has not been reviewed by a notified body.

Kitozyme

Parc Industriel des Hauts Sarts Zone 2
Rue de Hilmort 680
4040 Mierstal
Belgium
Tel: +32 4 259 85 00
Email: info@kitozyme.com
www.kitozyme.com

Asiros has acquired a Danish fruit concentrate plant

Asiros A/S has acquired the plant Trensums A/S in Sorø from the Swedish Nordic Food Group AB. For a number of years the plant has supplied juices and concentrates for the Danish and international market.

The production and service of contracts will continue unchanged, and the staff will retain their jobs.

Asiros Nordic A/S will focus on customers with a wish for quality products within fruit and berry concentrates, flavoured products, elderflower concentrate and organic productions.

Carsten Aalund has acceded as Site Director of Asiros Nordic A/S, responsible for production and sales. He has substantial technical and commercial experience within the business and has been plant manager at the former Vallø Saft and Agrana as well as process manager at Harboe Brewery and long-time director at Ardo. With his great technical and commercial insight he has the right background to take over the day-to-day management of the plant.