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# NUTRIOSE®, a soluble fiber with outstanding tolerance and very low glycemic response

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## Context

Obesity and diabetes are of major health concerns worldwide <sup>(1)</sup>:

In 2014: 1.9 billion overweight } among adults  
9% diabetics

In 2030: potentially the 7<sup>th</sup> leading cause of death

Recommendations: to balance energy intakes and expenditures

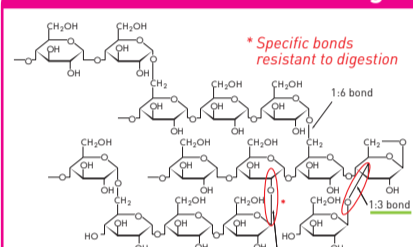
- Physical activity
- Dietary fiber intake to 25g/day
- Sugars and fat
- % Carbohydrates in total energy intake

In order to help reaching these objectives, food industry has developed solutions such as dietary fiber with scientifically proven benefits for consumers health and easy to use in different food matrices. Here is a review of the nutritional and technological benefits of NUTRIOSE® soluble fiber, a resistant dextrin manufactured by Roquette.

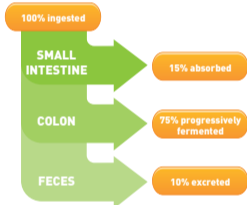


## Nutritional benefits of a resistant dextrin

### High fiber - Prebiotic

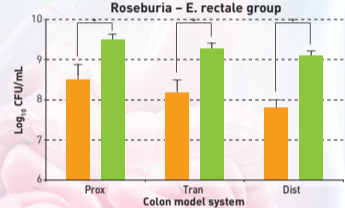


The metabolic fate of NUTRIOSE® soluble fiber <sup>(2)</sup>

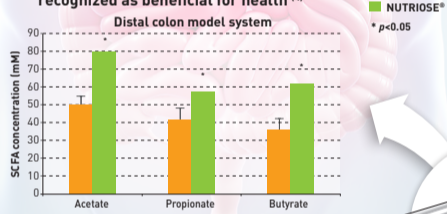


- Colonic pH
- Enzymatic activity <sup>(3)</sup>

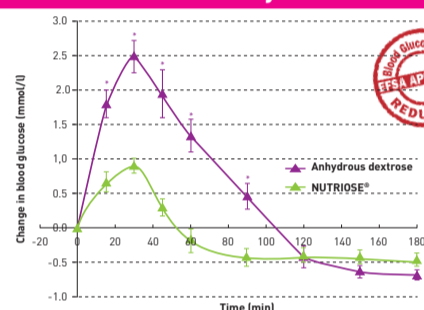
Positive impact on the gut microbial balance <sup>(4)</sup>



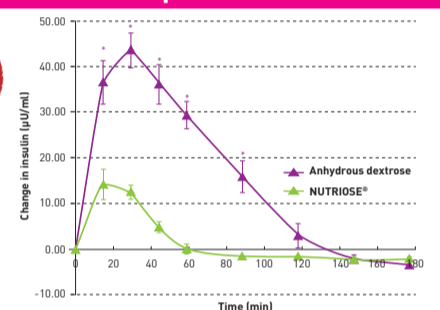
Production of short chain fatty acids recognized as beneficial for health <sup>(4)</sup>



### Low Glycemic and Insulinemic Responses



Glucose iAUC for NUTRIOSE® compared to 50g anhydrous dextrose. Values are the mean for 22 subjects with SEM represented by vertical bars. Asterisks show statistical significance ( $p < 0.05$ )

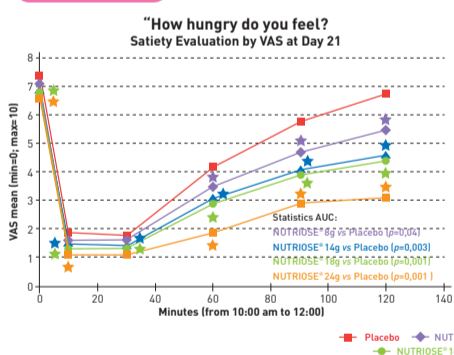


Insulin iAUC for NUTRIOSE® compared to 50g anhydrous dextrose. Values are the mean for 22 subjects with SEM represented by vertical bars. Asterisks show statistical significance ( $p < 0.05$ )

Additional clinical data have shown that NUTRIOSE® may improve insulin resistance in overweight men <sup>(5)</sup>

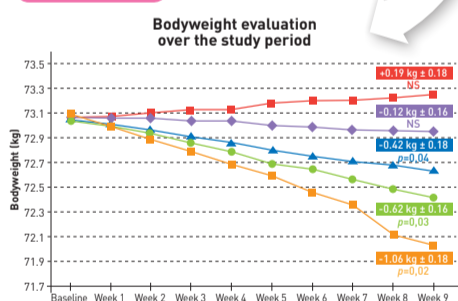
### Satiety and Weight Management

#### Satiety



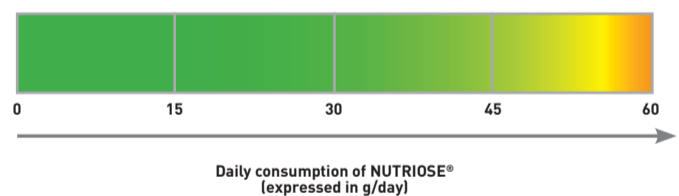
It has been shown also that NUTRIOSE® may improve satiety and body weight loss in a dose-dependent way in overweight men <sup>(6)</sup>

#### Bodyweight



### An Outstanding Digestive Tolerance

■ No symptom    ■ Digestive symptom



NUTRIOSE® is slowly fermented all along the colon. This digestive pattern may explain the very good digestive tolerance observed up to 45g/day and a still undetermined laxative threshold higher than 100g/day <sup>(7)</sup>

## A versatile and easy to use soluble fiber



NUTRIOSE® has a neutral taste, low hygroscopicity and is completely soluble and induces only low viscosity change when added in beverages. Unlike some resistant starches, which fiber content may decrease after heat treatment due to sensitivity of crystalline structure, NUTRIOSE® is very resisting and stable in a large range of pH and temperatures and has a very stable fiber content throughout its shelf-life.

Furthermore, clinical data that support NUTRIOSE® benefits for health were recognized twice by the EFSA panel <sup>(8,9)</sup>.



## Conclusion

NUTRIOSE® is a well-tolerated and technologically easy to use ingredient.

As a soluble fiber offering numerous added benefits, it is a good candidate for sugar or energy reduction, improvement of fiber content of food.

It may therefore help the consumers to reach the dietary recommendations contributing to obesity and diabetes prevention.

References: 1: WHO, 2014, factsheets 311 & 312. Updated January 2015. 2: van Den Heuvel et al., 2005, *European Journal of Nutrition* 3: Lefranc-Millot et al., 2012, *Journal of International Medical Research* 4: Hobden et al., 2013, *PlosOne* 5: Li et al., 2010, *Applied Physiology, Nutrition and Metabolism* 6: Guerin-Deremaux et al., 2013, *Global Epidemic Obesity* 7: Pasman et al., 2006, *European Journal of Clinical Nutrition* 8: EFSA Journal, 2013 9: EFSA Journal, 2014  
Scientific data and other information contained or referred to in this article may be proprietary to Roquette Frères who accordingly reserves the right – notwithstanding the publication of this article – to claim the exclusive right of reference to such data and other information pursuant to Article 21 of Regulation (EC) 1924/2006 on nutrition and health claims

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**NUTRIOSE® , a soluble fiber with outstanding tolerance and very low glycemic response.**

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Obesity, diabetes and lifestyle diseases are major public health concerns worldwide. In 2014, more than 1.9 billion adults were overweight. Of these over 600 million were obese. 42 million children under the age of 5 were overweight or obese in 2013. In 2014 the global prevalence of diabetes was estimated to be 9% among adults and WHO projects that diabetes will be the 7th leading cause of death in 2030.

Physical activity, nutritional interventions and policies can impact positively these figures in most countries, among which dietary habits recommendations play a key role. In combination with reduced intake of simple sugars and fat, 45 to 60% of the total energy intake should come from carbohydrates. Furthermore a daily dietary fiber intake of 25 g/day would be also recommended, in line with WHO/FAO's recommendations. In this context, some fibers, such as the resistant dextrin NUTRIOSE®, may offer added advantages through their specific properties.

**NUTRIOSE® is a fermentable resistant dextrin with high fiber content and prebiotic effect.** It is produced from wheat or maize starch using a highly controlled process of dextrinization that creates specific glycosidic bonds, resistant to digestion in the small intestine. It provides a total fiber content of nearly 85 % for NUTRIOSE® 06, one product of the range. NUTRIOSE® is later slowly fermented in the colon, inducing some ecological (pH, short chain fatty acids production, enzymes) and microbial (increase in lactobacilli or *Bacteroides* and decrease in *Clostridium perfringens*) changes in the human's gut. This prebiotic effect was further confirmed in an *in vitro* model, specifically highlighting a significant butyrogenic effect of NUTRIOSE® and a beneficial alteration of the human gut microbiota, with significant specific modulations in butyrate producers and short chain fatty acids, known to promote protective, trophic and metabolic host benefits.

**NUTRIOSE® is a low digestible carbohydrate, inducing low glycemic and insulinemic responses and improving insulin resistance and some biomarkers of the metabolic syndrome.** Different recent trials confirmed that blood glucose and insulin responses to NUTRIOSE® were always very low; the in use value is of 25 for the glycemic response and 13 for the insulin response. Moreover, a 12-week supplementation with NUTRIOSE® has demonstrated its ability to lower insulin resistance, improve determinants of metabolic syndrome and induce improvements in body composition and weight, energy intake and hunger in overweight men.

**NUTRIOSE® has an impact on satiety and weight management.** Daily inclusion of NUTRIOSE® in the diet has been demonstrated through 2 studies to be effective in the modulation of satiety from 8 to 14g/d, and in weight management from 14g/d with a dose-effect on satiety, caloric and food intakes, and a direct impact on management of bodyweight, body fat and BMI.

**NUTRIOSE® is outstandingly tolerated in the digestive tract.** Inducing no gastrointestinal complaints at doses fully compatible with all the above described effect, NUTRIOSE® is outstandingly tolerated, bringing beneficial effects with a preserved digestive comfort (digestive tolerance threshold of about 45 g/day, undetermined mean laxative threshold > 100 g/d).

**NUTRIOSE® is a soluble fiber very stable to food processes.** It has a neutral taste, is completely soluble and induces low viscosity change. It can be easily incorporated in liquid products and is very stable towards heat and pH treatments, with very stable fiber content throughout its shelf-life.

NUTRIOSE® is a well-tolerated and technologically easy to use ingredient. As a soluble fiber offering numerous added benefits, it is a good candidate for sugar and energy substitution or reduction; moreover it can be used for fiber content improvement of food, possibly helping consumers to reach the dietary recommendations worldwide and contributing to obesity and diabetes prevention.

BMI: Body Mass Index

WHO: World Health Organization

FAO: Food and Agriculture Organization of the United Nations

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