

Prebiotic effects of NUTRIOSE®: a review

Muriel BERARD¹, Laetitia DEREMAUX¹, Catherine LEFRANC-MILLOT¹, Valérie MACIOCE¹
¹ Roquette Group

INTRODUCTION

- Increasing evidence suggests that gut microbiota is associated with gut health and general well-being. Some ingredients can modulate the colonic flora: it is the case of some soluble dietary fibres which are poorly hydrolysed or absorbed in the upper part of the gastrointestinal tract, and induce a selective fermentation in the colon in such a way that the composition of the intestinal microbiota is altered towards a healthier composition.
- NUTRIOSE® is a dextrin containing about 85% soluble fibres. Animal and humans studies have demonstrated that deep changes occur in the colonic environment during its digestion^(1,2,3). The dextrin induces a large production of Short Chain Fatty Acids (SCFAs), mainly propionate, resulting in a decrease in the colonic pH. Consequently, these fermentations benefit the colonocytes in the digestive epithelium and lead to an increased fecal concentration of alpha- and beta-glucosidases by encouraging an increase in beneficial glucidolytic flora and a decrease in potentially pathogenic flora.
- The aim of this review is to focus on the effects of NUTRIOSE® on the modulation of the gut microflora in humans.

MATERIAL & METHODS

Study design #1

- Placebo-controlled, double blind, randomized, parallel design
- Groups: 4 parallel groups – 12 volunteers/group
- Subjects: Males and females – Age 18 to 45 years

- Duration: **14-day** study
- Placebo group: **20g/day** glucose
- Treatment group: **10, 15 or 20g/day** NUTRIOSE®
- Fecal samples analysis: Counting colonies (plates method)

Study design #2

- Placebo-controlled, double blind, randomized, parallel design
- Groups: 2 parallel groups – 20 volunteers/group
- Subjects: Females – Age 25 to 59 years

- Duration: **14-day** study
- Placebo group: **8g/day** glucose
- Treatment group: **8g/day** NUTRIOSE®
- Fecal samples analysis: Biomolecular method (Real-time PCR)

Study design #3⁽⁴⁾

- Placebo-controlled, double blind, randomized, parallel design
- Groups: 3 parallel groups
- Subjects: Males – Age 20 to 45 years

- Duration: **35-day** study
- Placebo group: **22.5g/day** maltodextrin (GLUCIDEX®6), n=13
- Treatment group: **30 or 45g/day** NUTRIOSE®, n=14 or n=16 respectively
- Fecal samples analysis: Counting colonies (plates method)

RESULTS

- A significant increase in the saccharolytic flora *Bacteroides* (beneficial bacteria) in the feces of human volunteers

- after a 14-d consumption of **10g** NUTRIOSE® (study #1) – figure 1
- after a 14-d consumption of **8g** NUTRIOSE® (study #2) – figure 2

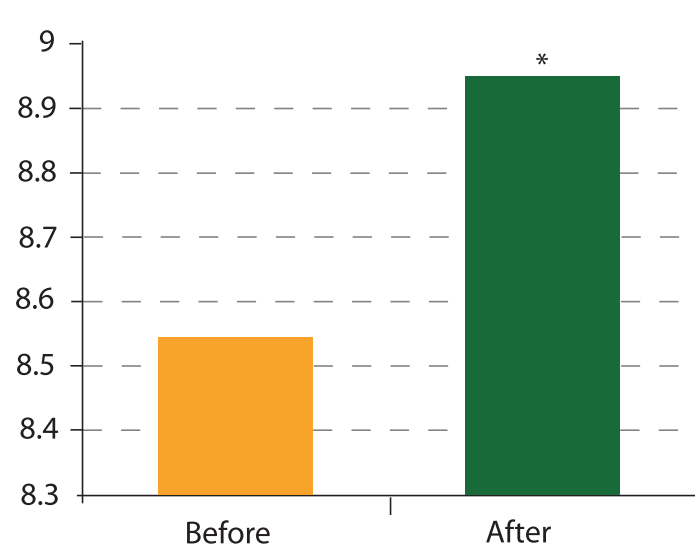


Figure 1: *Bacteroides* before and after a 14-day consumption of 10g/d NUTRIOSE® (STUDY#1)

*: p<0,05

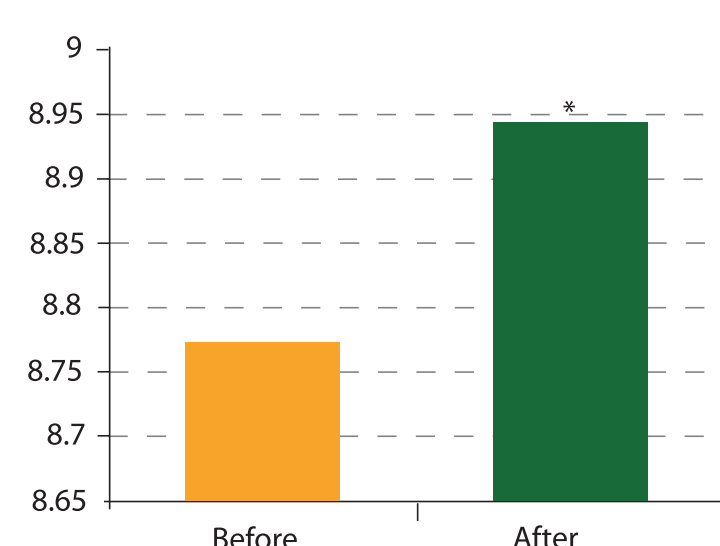


Figure 2: *Bacteroides* before and after a 14-day consumption of 8g/d NUTRIOSE® (STUDY#2)

- A significant increase in the mean *Lactobacilli* number (beneficial bacteria) in the feces of human volunteers

- after a 35-d consumption of **45g** NUTRIOSE® (study #3) – figure 3

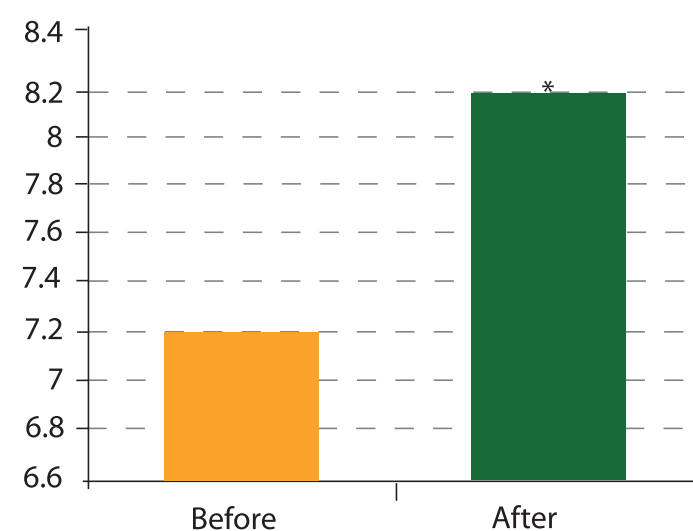


Figure 3: *Lactobacilli* before and after a 35-day consumption of 45g/d NUTRIOSE® (STUDY#3)

*: p<0,05

- A significant decrease in the genus *Clostridium perfringens* (potentially harmful bacteria) in the feces of human volunteers

- after a 14-d consumption of **15g** NUTRIOSE® (study #1) – figure 4
- after a 14-d consumption of **8g** NUTRIOSE® (study #2) – figure 5
- confirmed in study #3

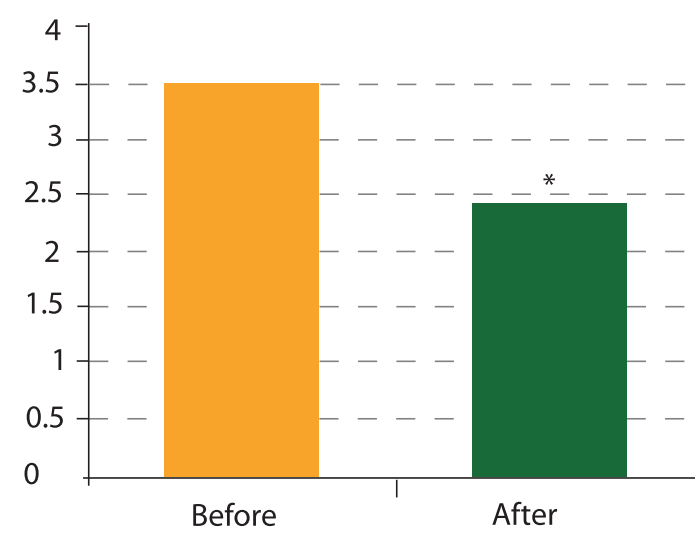


Figure 4: *Clostridium perfringens* before and after a 14-day consumption of 15g/d NUTRIOSE® (STUDY#1)

*: p<0,05

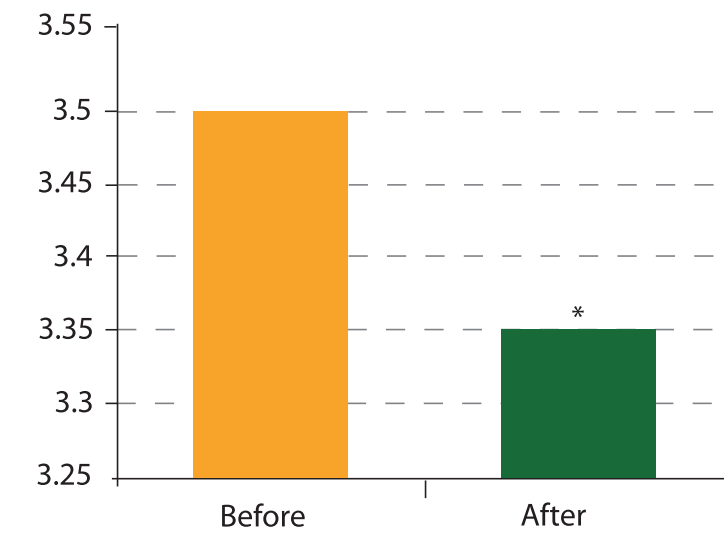


Figure 5: *Clostridium perfringens* before and after a 14-day consumption of 8g/d NUTRIOSE® (STUDY#2)

CONCLUSION

- NUTRIOSE® has positive effects because it stimulates the proliferation of *Bacteroides* (a colonic bacteria able to adapt to non-digestible carbohydrates) and the proliferation of *Lactobacilli* (classified as desirable colonic bacteria). NUTRIOSE® also decreases *Clostridium perfringens*, a potentially harmful gram-negative bacteria.
- These changes in the gut microflora following NUTRIOSE® consumption are associated with the production of SCFAs, a decrease in the colonic pH and an increase in the fecal enzyme concentration^(1,2,3). Moreover preclinical studies have shown the potential beneficial role of NUTRIOSE® in the regulation of the visceral pain, in the regulation of the colonic inflammation and in the regulation of immunity⁽⁵⁾.
- All these colonic effects are key criterias to allow making the link between NUTRIOSE® properties and a recent definition of a prebiotic proposed by FAO in 2007⁽⁶⁾: “a non-viable food component that confers a health benefit on the host associated with modulation of the microbiota”.

Bibliography
 1. Lefranc-Millot C, Wils D, Roturier JM, Le Bihan C and Saniez-Degrave MH. NUTRIOSE® Soluble Fiber. In : *Fiber Ingredients: Food Applications and Health Benefits*, 2009, Susan S Cho (Ed), Taylor & Francis Group LLC, CRC Press, Boca Raton, USA.
 2. Lefranc-Millot C. NUTRIOSE® 06: a useful soluble dietary fibre for added nutritional value. *Nutrition Bulletin*, 2008, 33: 234-239.
 3. Lefranc-Millot C, Wils D, Neut C, Saniez-Degrave MH. Effects of a soluble fibre with excellent tolerance, NUTRIOSE® 06, on the gut ecosystem: a review. *Dietary Fibre* 2006, Helsinki, Finland, 12-14 June.
 4. Pasman W, Wils D, Saniez MH, Kardinaal A. Long-term gastrointestinal tolerance of NUTRIOSE® FB in healthy men. *European Journal of Clinical Nutrition*, 2006.; 60(8), pp. 1024-34 Epub 2006 Feb 15.
 5. Lefranc-Millot C, Deremaux L, Rousseaux C, Wils D, Saniez-Degrave MH, Desreumaux P. Impact of a new resistant dextrin on intestinal well-being and immunity maintenance. *Ann Nutr Metab*, 51(Suppl. 1), p. 154 (2007).
 6. FAO (Food and Agriculture Organisation) (2007, September 15-16) FAO Technical Meeting on Prebiotics. FAO: Rome. http://www.fao.org/ag/agn/agns/files/Prebiotics_Tech_Meeting_Report.pdf (Last accessed on August 25, 2009).