# Supplementation with a soluble dietary fiber, NUTRIOSE®, improves insulin resistance and determinants of metabolic syndrome in overweight men

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## Introduction

How dietary fiber can influence determinants of metabolic syndrome is controversial. NUTRIOSE® (Roquette, France), a soluble resistant dextrin with prebiotic properties, has been clinically proven (34g/day) to beneficially affect **bodyweight(BW)**, **body mass index (BMI)**, **body fat (BF)**, **hunger feeling (HF)** and **caloric intake (CI)**[1] [2]. In this context, a secondary objective of the same trial was to investigate whether dietary supplementation with this fiber was associated with a positive impact on parameters such as insulin resistance and determinants of metabolic syndrome (MS) in overweight men, following a double-blind, randomized, placebo-controlled design.

## Materials and Methods

### Objective

- To determine the effects of NUTRIOSE® supplementation on insulin resistance and the determinants of metabolic syndrome in overweight men.

### Parameters

- Biomarkers of lipid metabolism: **cholesterol** (total, HDL, LDL, VLDL)**, triglycerides**
- Biomarkers of glucose metabolism: **Adiponectin, glucose, insulin, glycosylated hemoglobin** (HbA1c), **glycated albumin** after an overnight fast of 12h, at Week 0, 4, 8, 12

### Product description

- Placebo: 250 ml Orange juice with 17g of **maltodextrin** ➜2 daily intakes = 34g/day
- Treatment: 250 ml Orange juice with 17g of **NUTRIOSE®** ➜2 daily intakes = 34g/day

### Study design

- Randomized, placebo-controlled, double blind, parallel, multi-center
- Groups: 2 groups of n=60 volunteers
- Subjects: Overweight Chinese male adults aged 20-35 yrs, BMI=24-28 kg/m²

## Results

### Statistics

**p-value for each group**

Intra-group comparisons:
p-values in blue and red

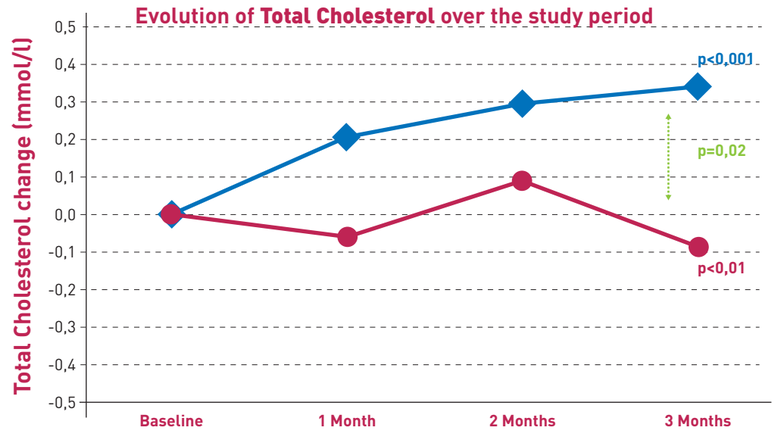
Inter-groups comparisons:
p-values in green

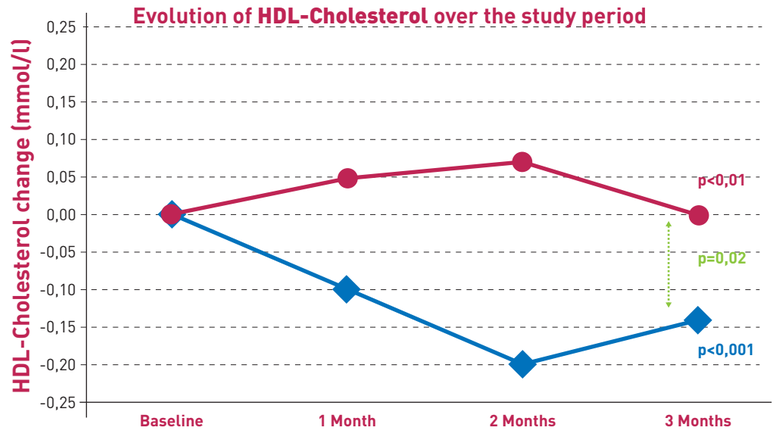
NUTRIOSE® Placebo

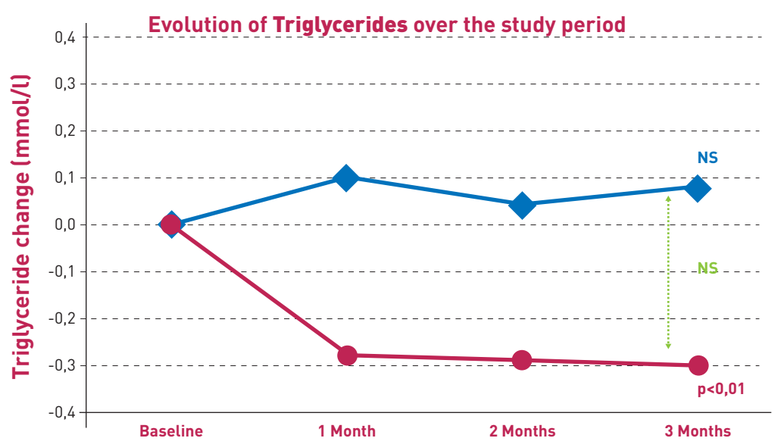
*Table 1: Percentage of volunteers who experienced a 5% improvement from pre to post-study*

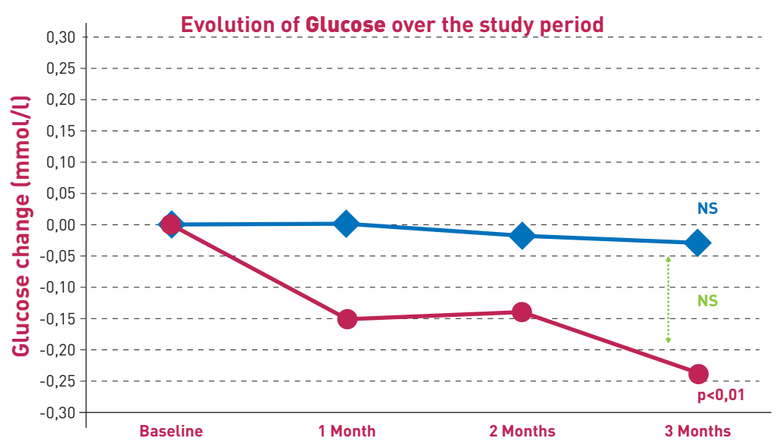
| Parameters | NUTRIOSE® | Placebo |
|---|---|---|
| Adiponectin | 57%* | 35% |
| Glucose | 25% | 17% |
| Insulin | 57% | 42% |
| Total-cholesterol | 22% | 8% |
| HDL-cholesterol | 43%*** | 8% |
| LDL-cholesterol | 35%* | 15% |
| VLDL-cholesterol | 52%* | 28% |
| Triglyceride | 45%** | 17% |
| Glycosylated Hemoglobin | 27% | 25% |
| Glycated Albumin | 32%* | 13% |

** p<0.05; ** p<0.01; *** p<0.001*




- **Lipid metabolism:** In the NUTRIOSE® group, there are decreases in the plasmatic concentrations of **total-cholesterol (p<0.01)**, and an increase in **HDL-cholesterol (p<0.01)**, these changes are significantly different from those observed in the placebo group. The **VLDL-cholesterol** (data not shown) and the **triglycerides** concentrations decrease also in the NUTRIOSE® group **(p<0.01)** but theses changes are not different from those observed in the placebo group.
- **Glucose metabolism:** Subjects supplemented with NUTRIOSE® display significant reductions in plasmatic concentrations of **glucose (p<0.001)** and **insulin** (data not shown) although these changes are not significantly different from those observed with the placebo. HOMA-estimated insulin resistance exhibited a 18% decrease in the NUTRIOSE® group, greater than in the Placebo group (p = 0.04) (data not shown)[3] Intermediate and long-term glucose control, measured by **glycated albumin** and **glycosylated hemoglobin**, improve over time in the NUTRIOSE® group (data not shown). **Adiponectin**, a cytokine which regulates glucose metabolism and stimulates fatty acid oxidation, increases in the NUTRIOSE® group **(p<0.01)** (data not shown).
- **Biomarkers of the MS:** The *table 1* details, for each biomarker, the percentage of volunteers who experienced a 5% **improvement** between the beginning and the end of the study in each group. It shows that NUTRIOSE® largely improves the biological parameters involved in the MS.
- **Prevalence of the MS:** The prevalence of the MS after the 12-week supplementation period decreased in NUTRIOSE® subjects (from 27 to 12%) and increased in Placebo subjects (from 17 to 27%) (data not shown). In general, Test subjects who presented MS at the beginning of the study had greater improvements in glucose metabolism markers than healthy subjects. No adverse events or gastrointestinal complaints, such as gas, bloating, or diarrhea, were reported in either group during the trial.

## Conclusion

Twice daily supplementation with **NUTRIOSE®** over a 12-week period had been demonstrated[1] to significantly **decrease BW, BMI, BF, WC and HF**, in association with **a decreased CI**. Moreover, NUTRIOSE® has improved the lipid and glucose metabolisms of slightly overweight Chinese volunteers. The **metabolic syndrome** status of the volunteers is largely improved with NUTRIOSE®. Supplementation is well tolerated, **lowers insulin resistance**, and **improves some determinants of metabolic syndrome** in overweight men. This makes of NUTRIOSE® a promising tool for diet fortification with fibers, particularly in the context of weight management and chronic metabolic disorders associated with overweight[3].

[1] LEFRANC-MILLOT C, GUERIN-DEREMAUX L, WILS D, POCHAT M, LI S Effects of a soluble dietary fiber supplementation with NUTRIOSE® on risk factors of the metabolic syndrome in Chinese male adults. *Obesity Reviews*, 2010, 11(Suppl. 1): p. 438
[2] GUERIN-DEREMAUX L, LI S, POCHAT M, WILS D, MUBASHER M, REIFER C and MILLER LE Effects of NUTRIOSE dietary fiber supplementation on body weight, body composition, energy intake, and hunger in overweight men. *International Journal of Food Sciences and Nutrition*, 2011 (in press)
[3] LI S, GUERIN-DEREMAUX L, POCHAT M, WILS D, REIFER C, MILLER LE NUTRIOSE® Dietary fiber supplementation improves insulin resistance and determinants of metabolic syndrome in overweight men: a double-blind, randomized, placebocontrolled study. *Applied Physiology, Nutrition and Metabolism*, 2010, 35: 773–782