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Two-month consumption of bread enriched with a fiber mix: impact on gut microbiota and cardiometabolic profile in at cardiometabolic-risk subjects.

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Abstract

Introduction

Increased adiposity, dyslipidemia and insulin resistance are associated with increased risk of developing cardiometabolic diseases (CM). Such deleterious phenotypes have been shown to be associated with a low gene-richness microbiota that can partly be restored by a short-term dietary intervention (energy-restricted high-protein diet, low glycemic index, enrichment with fibers) in parallel to an improvement of CM profile. In this study, we aimed at increasing fiber intake in quantity and diversity through a two-month consumption of bread enriched with a mix of selected fibers and evaluated the impact of this dietary intervention on gut microbiota gene richness and CM risk profile in subjects at risk of developing CM.

Materials and methods

In a randomized double blind cross-over design, thirty-nine subjects with CM risk profile (18–70 years old, BMI: 25–35 kg/m², waist circumference > 80 cm for women and > 96 cm for men, fiber intake < 20g/day, low fiber diversity) consumed daily for 8 weeks 150 g of standard bread vs. 150 g of bread enriched with a 7-selected fibers mix (5.55 g vs. 16.35 g of fiber respectively; 4-week washout). Gut microbiota and CM risk factors' analyzes were conducted before and after intervention. Stool samples were analyzed by shotgun metagenomics; microbial genes and metagenomics species (MSP) profiles were generated by mapping reads on a reference genes catalog (1529 MSP).

Results

The included dyslipidemic subjects with CM risk profile presented a lower microbiota gene richness compared to reference healthy cohorts. The two-month consumption of fiber-rich bread did not alter microbiota gene richness but modified microbiota composition with a significant decrease of *Bacteroides vulgatus* ($q = 1.7e-4$) and a significant increase of *Parabacteroides distasonis* ($q = 2.8e-6$), *Fusicatenibacter saccharivorans* ($q = 5e-5$) and *Clostridiales* ($q = 3.8e-2$). We observed in parallel a significant decrease in total cholesterol (- 0.26 mmol/L; - 5%; $p = 0.021$), LDL-cholesterol (- 0.2 mmol/L; - 6%, $p = 0.0061$) and an improvement of insulin sensibility estimated by HOMA index (3.23–2.54 mUI/L; - 21%; $p = 0.0079$). These effects were even significantly more pronounced for subjects presenting the higher waist circumference. Anthropometric parameters were not altered.

Discussion

The enrichment of the diet with a mix of selected fibers for 2 months altered microbiota composition by modifying the relative abundance of specific gut bacterial species, in parallel to a significant improvement of cholesterol and insulin sensitivity parameters. Increasing the quantity and diversity of dietary fiber intake could be used as an efficient tool to favorably impact CM profile.

Conflict of Interest

This study was funded by Bridor. I.Dussous and L.Roger work for Bridor as an employee and consultant respectively. The remaining authors declare no conflict of interest.