

Does dietary fiber enhance re-establishment of the gut microbiome composition following colonoscopy?

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Background: Colorectal cancer (CRC) is the fourth most diagnosed cancer and second most common cause of cancer-related deaths among men and women in the United States. Recent experimental evidence has suggested a potential role for the gut microbiome in CRC pathogenesis. Prebiotic supplements have been observed to affect gut microbial diversity in animal and human studies, suggesting a chemopreventive effect on colorectal neoplasia. The present study aims to investigate whether soluble dietary fiber, xylooligosaccharides (XOS), enhances the re-establishment of the gut microbiome composition following exposure to prescription laxatives.

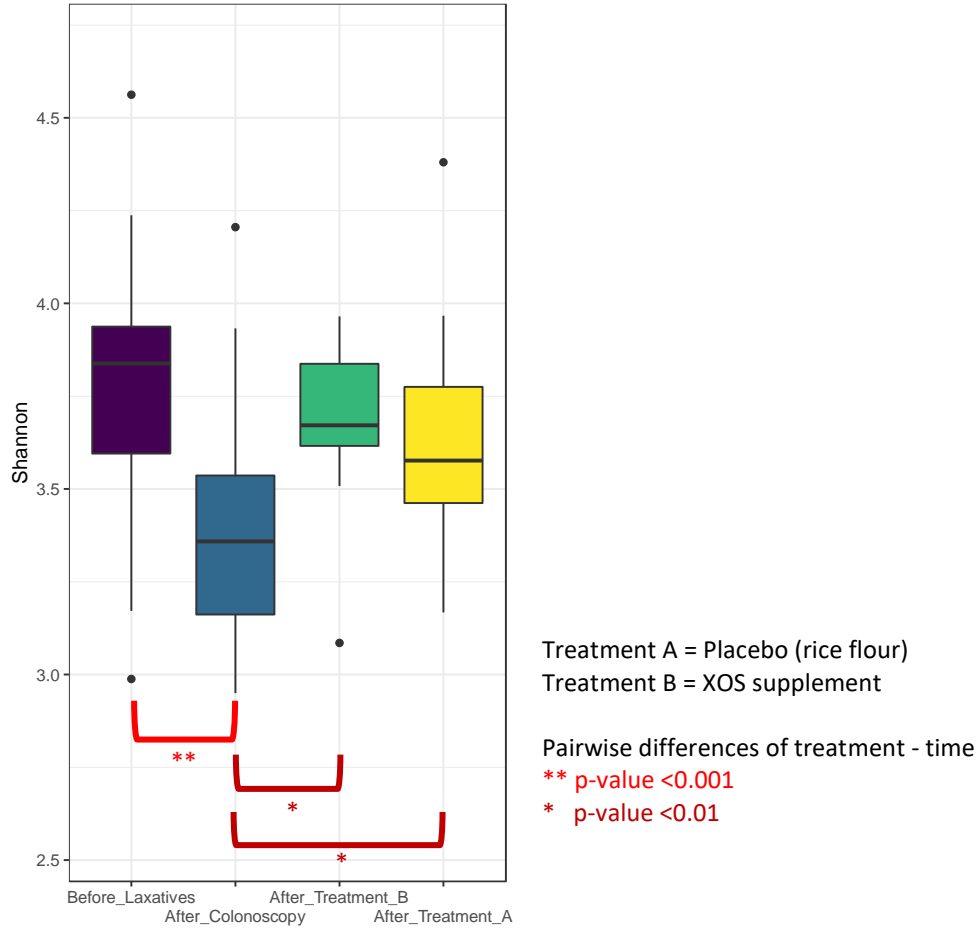
Methods: The current study is a randomized, double-blind, placebo-controlled study carried out at the University of California Los Angeles. Individuals were randomized to consume either 5g of prebiotic XOS or 5g of placebo (rice flour) per day for 30 days consecutively following a colonoscopy. We collected a baseline stool sample prior to the colonoscopy preparation. The second stool sample was collected 1-5 days after colonoscopy and a third stool sample occurred after 30 days of supplement consumption. DNA extracted from stool samples was analyzed using 16S rRNA gene sequencing. Gut microbiome composition was examined between timepoints using alpha (Shannon index) and beta diversity (Bray-Curtis distances) and using differential abundance analyses (MaAsLin2). Questionnaires were used to collect information on age, race, weight, height, and current medications, supplement use and diet.

Results: A total of 17 eligible participants (9 in the XOS group, 8 in the placebo group) undergoing a routine colonoscopy were enrolled in our study. The mean age of participants was 56.6 years (standard deviation (SD) 8.6 years), 65% were female, the average BMI was 27.2 kg/m² (SD 3.8 kg/m²) and the majority were never or former smokers (94%). There were significant alpha diversity (Shannon index) and bacterial composition differences (beta diversity and differential abundance analyses) over time, but no differences between the XOS and placebo groups (Figure 1). Visual taxonomic plots of the gut microbiome at both the phylum and genus level suggest that there are more inter-personal bacterial differences and less intra-personal bacterial differences in both arms (Figure 2). Overall, participants' gut microbiome changed after colonoscopy but returned to pre-colonoscopy levels at 30 days, regardless of the supplement group.

Conclusion: We found little evidence to suggest that prebiotic XOS supplement advances the re-establishment of the gut microbiome. In both XOS and placebo groups, the gut microbiome was resilient to external factors with the participants' microbiome returning to their original state 30-days post-colonoscopy.

Figure 1. Alpha and beta diversity

a) Alpha diversity (Shannon index) of stools before laxatives, after colonoscopy, and after 30 days supplement intake



b) Repeated measures principal coordinates analysis (Bray-Curtis distances with PERMANOVA) examining change in gut microbiome beta diversity over time and across groups at the amplicon sequence variant (ASVs) levels

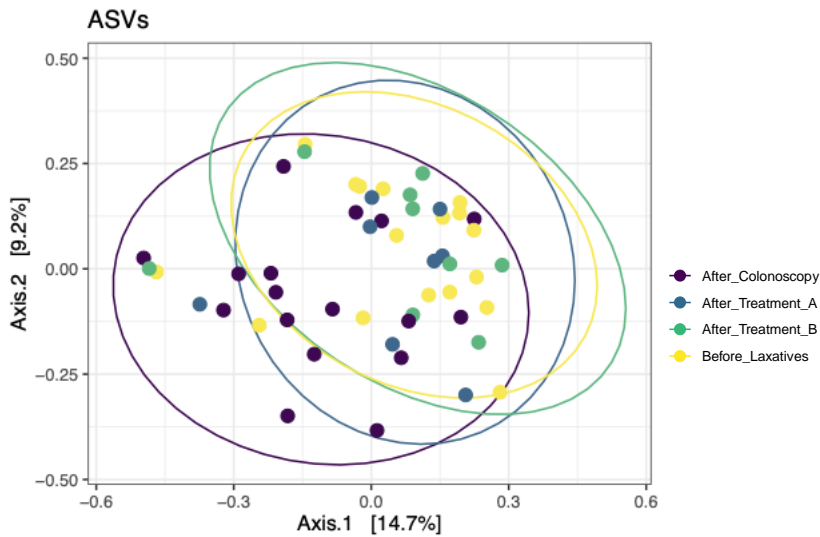


Figure 2. Visual taxonomic plots of bacteria at the phylum level

