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Can dietary fiber influence Parkinson's patients' gut microbiota and short chain fatty acid production – an ex-vivo study, preliminary results

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Abstract

Introduction

Recent studies demonstrated that the gut microbiome of Parkinson's Disease (PD) patients differs from that of age-matched healthy controls. Notably less butyrate-producing bacteria and low mucosal and fecal short chain fatty acid (SCFA) concentrations were found in PD patients. SCFA play a role in the interplay of health and disease: SCFA butyrate improves colon motility, protects the colonic epithelium and reduces inflammation. Administration of butyrate in animal models of PD improved motor impairment and dopamine deficiency and reduced early mortality. We hypothesize that certain orally supplemented dietary fibers can stimulate butyrate production in the colon of Parkinson's patients, and consequently can improve the motor impairment and their quality of life. This hypothesis still requires a step-wise approach. Our objective is to investigate the effect of different types of dietary fiber on the gut microbiota and SCFA production in PD patients and healthy elderly.

Material and methods

PD patients and healthy controls (HC) were selected based on age (55–70 years old) and BMI (18.5–25 kg/m²). For PD patients the Hoehn and Yahr score (I–III) was added to this selection. The effect of inulin varying in degree of polymerization (DP) (average DP ~10 vs. average DP ~23) on the SCFA production was evaluated by *ex vivo* fermentation experiments with fecal samples of PD patients and HC. Inulin (1% w/v) was incubated in small-scale batch fermentations for 24 h at 37°C in anaerobic conditions. SCFA production was analyzed by solid phase micro-extraction capillary gas chromatography-mass spectrometry detection (SPME-cGS-MS). The clostridia clusters IV and XIVa were quantified through 16s qPCR.

Results and discussion

Short chain (Sc) and long chain (Lc) inulin fermentation resulted in a mean total SCFA increase of respectively 490.3 ± 128.2 μmol/ml and 384.3 ± 85.9 μmol/ml in HC (n = 7) and 453.9 ± 99.2 μmol/ml and 402.9 μmol/ml ± 84.1 μmol/ml in PD patients (n = 3). Sc inulin fermentation increased butyrate production with 200.0 μg/ml ± 46.2 μmol/ml in HC and 119.8 ± 94.4 μg/ml in PD patients (p = 0.09). Lc inulin fermentation increased butyrate production with 174.9 μmol/ml ± 82.2 μmol/ml and 113.3 μmol/ml ± 21.2 μmol/ml in HC and PD patients, respectively (p = 0.25). Large variation between samples was observed in PD patients.

Conclusion

Although sample size is relatively small and data is still collected, we can conclude that both Sc and Lc inulin increase total SCFA and butyrate production in HC and PD patients. This *ex vivo* study shows that stimulation of the butyrate production is still possible in PD patients and could be beneficial.

Conflict of Interest

There is no conflict of interest.