

Global Prebiotic Association Young Researcher Awards - Entry #335

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Please indicate which category you're applying for:

GPA Young Researcher Award for Fundamental Research (100 points possible)

GPA Young Researcher Award for Applied Research (115 points possible)

Please provide a link to your published paper (if open access) or abstract:

[https://ajcn.nutrition.org/article/S0002-9165\(23\)66114-3/fulltext#secsectitle0055](https://ajcn.nutrition.org/article/S0002-9165(23)66114-3/fulltext#secsectitle0055)

Please provide a summary of your research(limit 250 words)

Anxiety and depression are two of the mental health disorders documented worldwide costing health services in excess of 1 trillion USD per year. Recently, there is a growing interest in relationship existing between the gut and the brain – a term coined the gut brain axis. Modulation of the gut microbiota is considered a key aspect in modulation health outcomes. One way of modulating the gut microbiota is through the use of prebiotics and candidates namely oligofructose and 2'fucosylatcose. To date, the ability to prebiotics to improve mood states is unclear due to the limited number of previous studies documenting mixed results. Yet, one area frequently overlooked in these studies is changes in microbial composition. Therefore, in this study we investigated the effects of oligofructose and 2'fucosylactose alone and in combination on microbial composition and mood state. We conducted a 5-week 4-arm parallel double-blind randomised placebo-controlled trial involving 96 adults with mild-to-moderate levels of anxiety and depression. Faecal and urine samples were collected at baseline and at end of the intervention phase and analysed for changes in microbial composition and metabolites via fluorescence in situ hybridisation flow cytometry, 16S rRNA sequencing and 1H proton NMR. Changes in mood states were analysed using Beck Depression Inventory, State Trait Anxiety Inventory Y1 and Y2 and Positive and

Negative Affect Schedule – Short Form. Changes in sleep quality were assessed using the Pittsburgh Sleep Quality Index. Lastly, we also collected saliva samples to analyse changes in cortisol awakening response.

Please provide a summary of methods (limit 250 words)

The study was a 5-week, 4-arm parallel, double-blind, randomized, placebo-controlled trial involving with mild-to-moderate levels of anxiety and depression. The trial was segregated into a 1-week run-in phase designed to capture day-to-day changes in bowel habits prior to supplementation and a 4-week intervention phase. Healthy adults were screened for eligibility using PHQ9, GAD7 and medical questionnaires. Eligible volunteers were randomly assigned into one-of-four arms with each arm being assigned a different intervention - oligofructose; sole 2'fucosyllactose, oligofructose/2'fucosyllactose combination with the last arm being assigned a placebo in form of maltodextrin. Volunteers were asked to consume their assigned supplement one per day just in water for the entire 28-day intervention duration. Volunteers provided stool, urine and saliva samples at the start and end of the to identify changes in microbial composition (fluorescence in situ hybridization and quantitative microbiome profiling), urinary metabolites and cortisol awakening response. To assess changes in mood states volunteers were asked to complete Beck Depression Inventory, State Trait Anxiety Inventory Y1 and Y2, Positive and Negative Schedule – Short form and Pittsburgh Sleep quality index questionnaires at both the beginning and end of the intervention phase. Additionally, volunteers completed daily gastrointestinal diaries to assess changes in bowel habits (stool frequency and consistency) and gastrointestinal sensations (flatulence, intestinal bloating, abdominal pressure, and pain and feeling of fullness). Along with keeping 3-day food diaries to determine any changes in dietary composition.

Please provide a summary of your results (limit 250 words)

Regarding changes in bacterial taxa there were increases in several bacterial taxa in Bifidobacterium, Bacteroides, Roseburia, and Faecalibacterium prausnitzii in both the oligofructose and oligofructose/2'fucosyllactose combination interventions (all $P < 0.05$). In contrast, changes in bacterial taxa specifically bifidobacteria were highly heterogenous in the sole 2'fucosyllactose arm suggesting a large responder/non-responder status exists to 2'ucosyllatose supplementation. Significant improvements in BDI, STAI Y1 and Y2, PANAS-SF and CAR values were detected across sole oligofructose, sole 2'fucosyllatose and oligofructose/2'fucosyllactose arms (all $P < 0.05$). Both sole oligofructose outperformed both maltodextrin in improvements in BDI, STAI Y1 and Y2, PANAS-SF scores and CAR values (all $P < 0.05$). Additionally sole oligofructose documented significantly greater reductions in BDI, STAI Y1 and Y2 compared to sole 2'fucosyllactose supplementation (all $P < 0.05$). No differences between interventions were documented in PSQI scores (all $P > 0.05$). Lastly, using fold change data ((post-pre/pre)) and bacterial taxa and mood states data and Spearman's rank correlation we found strong negative correlations between increases in Bifidobacterium and reductions (improvements) in BDI, STAI Y1 and Y2, PANS-NA and CAR scores (all < 0.05). We also found mild associations between changes in numerous bacterial taxa including Faecalibacterium, Eubacterium, Anaerostipes, Blautia and Lachnospiraceae incertae sedis and, Lactobacillus/Enterococcus, Roseburia, Akkermansia, Ruminococcus2. Lactococcus and Gemmiger and improvements in several mood state parameters (BDI, STAI Y1 and Y2, PANAS-SF and PSQI) (all $P < 0.05$). Lastly, despite sole oligofructose showing signs of clustering no difference in urinary metabolites were detected between interventions.

Please provide a statement about what, in your opinion, makes this paper outstanding and why it fits into the grant category you selected. (limit 250 words)

This paper fits into both the fundamental and applied research categories as is one of the first large scale prebiotic trials to demonstrate that supplementation with either sole oligofructose or oligofructose in combination

with 2'fucosyllactose can result in significantly noticeable improvements in depression and anxiety scores in adults with mild to moderate levels of anxiety and depression when compared to maltodextrin (placebo) supplementation. Along with significant improvements in cortisol awakening response. This suggesting that supplementation with prebiotics and prebiotic candidates may have the potential to have a profound positive impact on mood state. Additionally, this paper clearly demonstrates substantial differences in microbial response between sole oligofructose, sole 2'fucosyllactose and oligofructose/2'fucosyllactose combination supplementation. Specifically, we identified notable differences in bifidobacteria response with a large bifidobacteria responder and non-responder status seen in response to 2'fucosyllactose supplementation which was overcome in the presence of oligofructose. This suggesting that combining oligofructose with 2'fucosyllactose may be a way to overcome the responder/non-responder status associated with 2'fucosyllactose supplementation and may be of clinical significance given the current increasing focus on the use of human milk oligosaccharides in healthy and diseased states adults as a means of targeted manipulation of the gut microbiota.

By typing your full name below and completing this application, you verify that you are the first author of this research and that this paper is original research.

Peter PJ Jackson

Notes

PDF - <https://prebioticassociation.org/wp-content/uploads/2024/03/EFFICAD-Trial-Paper.pdf>

Added by Morgan Johnston on March 18, 2024 at 5:38 pm