Efficacy of pea hull fibre supplementation on gastrointestinal transit time-induced proteolytic fermentation and enhancement of wellness in older adults, individuals with lifestyle-related chronic disease and overweight children

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SPG Contributions	Project Status	Duration/Timeline of Project (Year to Year)	Total Project Cost
$212,715.00	Completed	May 2015 – August 2019	$212,715.00

Project Description

The market for fibre ingredients has been dominated by soluble fibres such as dextrans and fructans. However, the use of these highly fermentable fibres, with their potential unpleasant gastrointestinal side effects, is currently experiencing a backlash in the popular press, medical and nutrition communities, and research literature. In addition, the US Food and Drug Administration (FDA) is excluding such soluble fibres from the dietary fibre content listed on the Nutrition Facts label in the US due to insufficient research for specific health benefits in healthy people (e.g. improved laxation). This provides a significant market advantage for insoluble fibre sources such as hull fibres. Pea hull fibre, a primarily insoluble fibre, has been shown to exert a significant laxation in long-term care residents, constipated children, and adults with chronic disease. However, research is needed to show the benefits of pea hull fibre in healthy individuals and how pea hulls work to promote wellness. The purpose of this project is to study the effects of pea hull fibre on gastrointestinal function, appetite, and wellness, as well as gut bacteria (microbiota) and its health effects in children, older adults, and people with chronic disease.

Outcome

The study explored the potential impact of pea hull fibre (PHF) on fecal microbiota. Study 1 was conducted in older adults. Participants consumed snacks providing 10 g/day of PHF or control each for 2-week periods and recorded daily Bristol Stool Form Scale (BSFS), stool frequency, and GI symptoms, as well as completing the Gastrointestinal Symptom Rating Scale (GSRS) and Simplified Nutritional Appetite Questionnaire (SNAQ) bi-weekly. One stool sample was collected per period for microbiome sequencing. Participants reported 1.7 ± 1.0 stools/day and 76% normal transit stool form during baseline and no change with PHF. GSRS syndrome scores were similarly unchanged. Daily abdominal noises, flatulence, and bloating increased with PHF vs. control confirming gas-producing fermentation in some individuals. There was no evidence to suggest a PHF induced microbiome response with the exception of a subgroup responding with flatulence (fermenters) who demonstrated a suppression in the bacterial genus Clostridia with PHF. Appetite, as assessed by SNAQ, improved with PHF.

Study 2 explored the effects of PHF-fortification in individuals with chronic kidney disease (CKD). In addition to monitoring GI function and wellness, the aim was to determine the effects of PHF on blood markers of inflammation and nitrogen compounds (uremia), and fecal microbiota. Participants were randomized to snacks containing 15 g/day of PHF or control, each for 4 weeks. GI symptom reporting confirmed that PHF was well tolerated. However, there was no evidence to suggest that PHF improved uremia. Potential impacts of PHF on microbiome and associations with inflammatory and uremic biomarkers are currently being explored.

Study 3 was conducted in children. Participants consumed snacks with or without 10 g/day of PHF each for 2-week periods. Appetite, GSRS, BSFS (modified version), and dietary intake were assessed. Snacks with added PHF significantly improved fiber intake, did not increase energy intake, and were well tolerated. Reported stool frequency was 1.1 ± 0.6 stools/day at baseline and did not differ with PHF, nor did stool form. In conclusion, PHF was well tolerated in the populations studied. However, consuming PHF did not nodulate stool form or frequency. As PHF snacks improved SNAQ appetite scores, PHF may be appropriate for older adults at nutritional risk. PHF did not modulate markers of disease in the CKD participants. In children with low fiber intakes, consuming snacks with added PHF snacks increased fiber intake without displacing dietary fiber intake from other sources.

Fecal microbiome profile may be predictive of fermentation and GI symptom response to PHF, suggesting that research on specific health effects may need to consider baseline gut microbiota profile. Further research, with longer intervention periods, is needed to determine the effects of PHF on GI function in individuals exhibiting constipation and unbalanced microbiota (dysbiosis).

Research Objective

OBJECTIVE 1

To examine pea hull fibre and its effects on glycemic index (GI) function, specifically reduced GI transit time, wellness, appetite, microbiota and inflammatory proteolytic fermentation products in three target populations.