

The Impact of a Dried Fruit and Vegetable Supplement and Fiber Rich Shake on Gut and Health Parameters in Female Healthcare Workers: A Placebo-Controlled, Double-Blind, Randomized Clinical Trial

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BACKGROUND

- + Results from epidemiological studies show a strong association between increased fruit and vegetable consumption and decreased risk for the development of chronic diseases, such as cardiovascular disease and type 2 diabetes.
- + A main contributing factor for the development of these diseases is overnutrition-induced obesity, which is characterized by increased proinflammatory cytokines, impaired insulin signaling and ultimately dysregulation of glucose and lipid metabolism.
- + Obesity is also characterized by altered gut microbiome and loss of microbial diversity.
- + Plants contain phytochemicals that function as antioxidants and anti-inflammatory agents. In addition, polyphenols and microbiota-accessible carbohydrates found in fruits and vegetables shape the composition and associated functions of the gut microbiota.

AIM

The aim of this study was to evaluate the effects of a dried fruit and vegetable supplement on the gut microbiome and clinical indicators of lipid and glucose metabolism as well as systemic inflammation in overweight/obese females.

An additional pilot experiment investigated the verum group to evaluate the response to a high fiber smoothie.

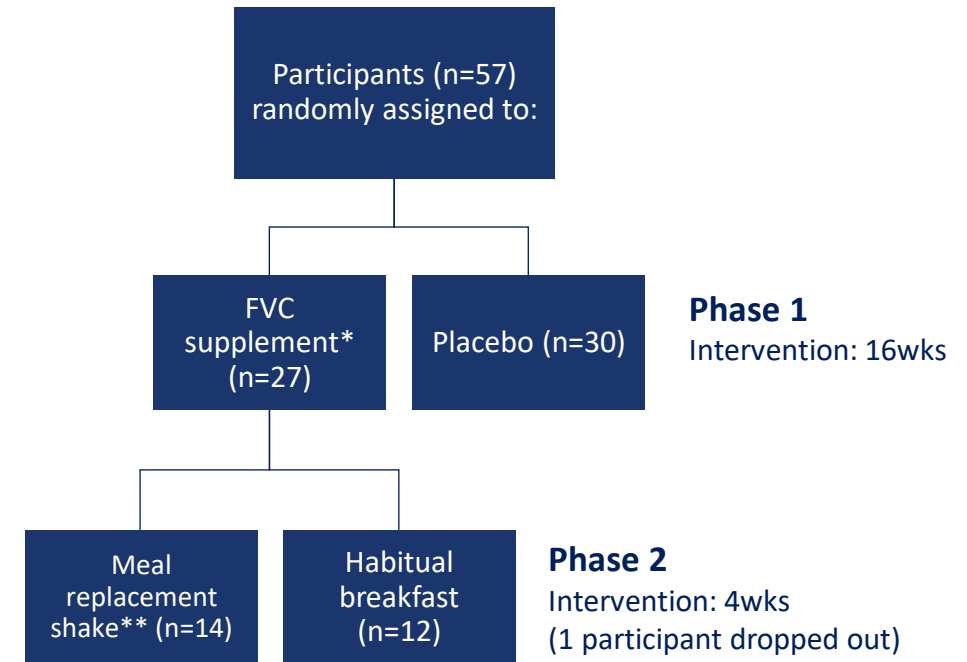
METHODS

Randomized, double-blinded, placebo-controlled

+ Participants

- Pre-menopausal
- 25 - 50 years of age
- BMI: 25 - 40 kg/m²
- Working in the healthcare field
- Not currently smoking
- No diagnosis of metabolic or intestinal disease
- Fruit and vegetable intake <3 servings per day
- No medications or nutritional supplements that affect gut health or immunity
- Not pregnant or lactating

- + Blood and fecal samples collected at the start of the intervention (baseline) and at 2 and 4 months for all subjects (Phase 1) and also at 5 months for Phase 2.



*FVC supplement: dried fruit and vegetable juice powder concentrate (Juice Plus+® Fruit, Vegetable and Berry Blends)

**Meal replacement shake: High fiber smoothie (Juice Plus+ Complete®)

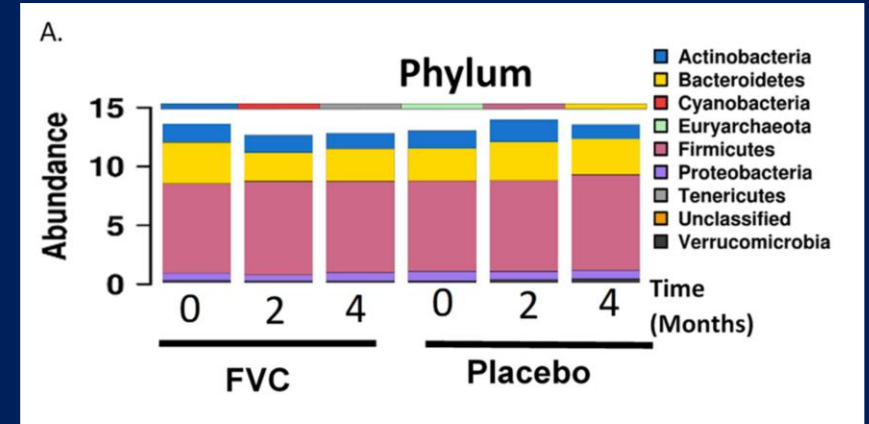
RESULTS – PHASE 1

(0 - 16 weeks with FVC/placebo)

Blood analytes

- + At baseline, no differences between the FVC and placebo group for age, estradiol levels, weight, BMI, body fat %, blood cholesterol, triglycerides and fasting glucose.
- + No differences observed between groups after 2 and 4 months for blood lipids, fasting glucose or cytokines.
- + FVC supplementation for 4 months, improved glucose clearance compared to placebo.

Microbiome/Fecal



- + No treatment-induced changes were observed for α and β diversity at 2 and 4 months, as well as no changes at phylum level.
- + After 4 months, there was a difference between groups for the short-chain fatty acid butyrate.

RESULTS – PHASE 1

(17 – 20 weeks with FVC + Complete vs. FVC)

Blood

- + No treatment-induced changes were detected for plasma lipids, cytokines or leptin.

Microbiome

- + No changes were observed at phylum level
- + A shift in β -diversity was observed when consuming the FVC + Shake for one month.
- + The shift resulted from changes in genera like: Bacteroides, Bifidobacterium, Faecalibacterium and Roseburia.
- + Bifidobacterium, Faecalibacterium and Roseburia are bacterial populations known to respond to prebiotics.

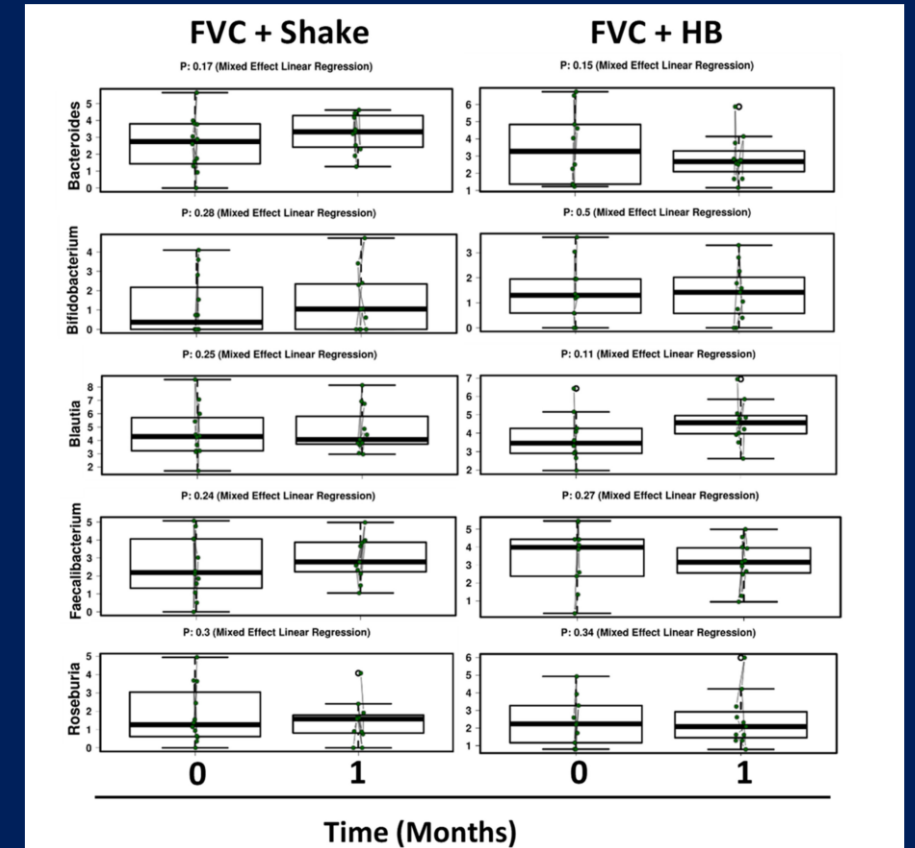


Fig. Box plots demonstrating the top significant genera (Bacteroides, Bifidobacterium, Blautia, Faecalibacterium, Roseburia) altered by Shake consumption for 1 month.

SUMMARY

The results suggest that a dried fruit and vegetable supplement, with a high fiber meal replacement can alter the intestinal microbiota. The increase of the short-chain fatty acid butyrate suggests an expansion of butyrate-producing species. The researchers also observed an improvement in glucose clearance and suggested that this combination of supplements can improve glucose metabolism and may reduce the risk of insulin resistance.



Article

The Impact of a Dried Fruit and Vegetable Supplement and Fiber Rich Shake on Gut and Health Parameters in Female Healthcare Workers: A Placebo-Controlled, Double-Blind, Randomized Clinical Trial

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Abstract: Phytochemicals from fruits and vegetables are known to reduce inflammation and improve overall health. The objective of this study was to determine the effect of a fruit and vegetable concentrate (FVC) and high fiber component on the gut microbiome in an overweight/obese, female population. **Methods:** The study was a randomized, double blind, placebo-controlled trial with 57 asymptomatic, pre-menopausal, overweight/obese females between 25–50 years of age working in healthcare. Blood and fecal samples were collected before and after two, four and five months of daily supplementation. Metabolic parameters were measured, and the gut microbiome analyzed. **Results:** No effect was observed with FVC supplementation for blood lipids, glucose and immune parameters. There was an improvement in glucose clearance. The FVC supplement did not result in taxonomic alterations at phyla level, or changes in α or β diversity, but reduced Bacteroides abundance and increased fecal butyrate. An additional high fiber component improved levels of health associated bacteria. **Conclusion:** The results suggest that a dried fruit and vegetable supplement, with a high fiber meal replacement can alter the intestinal microbiota and improve glucose clearance, suggesting that this combination of supplements can improve glucose metabolism and possibly reduce the risk of insulin resistance.

Keywords: dried fruit and vegetable supplement; polyphenols; fiber; microbiome; glucose metabolism

1. Introduction

Epidemiological studies have long demonstrated a strong association between increased fruit and vegetable consumption and a decreased risk for the development of chronic diseases such as cardiovascular disease and type 2 diabetes (T2DM) [1–3]. Many of these diseases are driven by overnutrition-induced obesity where the adipose tissue hypertrophy results in increased proinflammatory molecules, impaired insulin signaling and ultimately dysregulation of glucose and lipid metabolism [4]. In addition, obesity is characterized by altered gut microbiome and loss of microbial diversity [5,6].

The health promoting properties of plants go beyond the provision of basic micro- and macronutrients as they also contain phytochemicals that function as antioxidants, phytoestrogens and anti-inflammatory agents [1]. Over the last decade it has become clear that plant components including polyphenols and microbiota-accessible carbohydrates (MACs)