

The impact of a higher protein diet on metabolism and gut microbiota: a 12-week study in individuals with excessive body weight

PROJECT DESCRIPTION

Overweight and obesity increase the risk of developing several diseases having a negative effect on people's health. The prevalence of these conditions is increasing worldwide, but successful treatments are lacking. As excess body weight is a result of an imbalance between calories in and calories out, dietary intake plays an important role in maintaining a healthy body weight and overall health status. Calories come from carbohydrate, fat and protein, but they are not the same as each of these nutrients can impact metabolism in a different way. Nonetheless, little is known regarding the optimal quantity of macronutrients on improving body weight and overall health. Diets higher in protein have received special attention as more energy is burned for its digestion/absorption, people feel fuller for longer periods of time, and it confers metabolic advantages. However, further research is needed to elucidate their exact role regulating energy metabolism, short and long-term weight maintenance, and overall health. Well-designed studies using state-of-the-art equipment can help elucidate the mechanisms by which high-protein diets act in states of both normal weight and overweight/obese individuals.

The overall purpose of this research is to investigate the impact of a 12-week higher protein diet on inflammatory, metabolic, and hormonal markers of obesity-associated conditions and to correlate this response to compositional shifts within the gut microbiota. Moreover, resting energy expenditure, body composition, appetite sensations and soy metabolomics will be explored.

This study will be a randomized, parallel group, clinical trial of a 12-week nutritional intervention. A sample size of $n=78$ participants will be randomly allocated into one of the following groups:

- Control group (CON): Participants will be asked to maintain their usual dietary intake over 12 weeks. Participants' usual dietary intake is expected to reflect the North American dietary pattern (i.e. ~15% of total energy intake coming from protein, ~50% from carbohydrate and ~35% from fat).
- High-protein group (HP): Participants will be asked to maintain their usual dietary intake and consume a nutritional supplement composed of soy protein, honey and yogurt twice daily (in

two snacks) over 12 weeks. The addition of the nutritional supplement to a North American Dietary pattern (described on the CON group diet) will result in a diet composed of, approximately, 22% of protein, 48% of carbohydrate and 30% of fat of total energy intake. The amount of protein is considered higher than the North American dietary pattern (i.e. 15%); however, still within the Acceptable Macronutrient Distribution Range (AMDR) recommended by the Dietary Guidelines for Americans (10-35%).

The following variables will be analyzed:

- Interleukin (IL)-6.
- Gut microbiota diversity and composition, specifically taxa that have been associated with health benefits, obesity, and weight loss.
- Systemic inflammatory biomarkers (high-sensitivity C-reactive protein [hs-CRP], IL-8, IL-10 and tumor necrosis factor- α [TNF- α]);
- Metabolic blood markers [glucose, insulin, lipid panel (i.e. total cholesterol, LDL, HDL, and triglycerides), peptide tyrosine-tyrosine (PYY), glucagonlike peptide-1 (GLP-1), ghrelin, adiponectin, leptin, free glycerol, free fatty acids, and thyroid stimulating hormone (TSH)];
- Resting energy expenditure;
- Body composition;
- Appetite sensations (hunger, satiety, fullness, and prospective food consumption);
- Soy polyphenols' metabolomics.

At baseline and after 6 and 12 weeks, individuals will attend our Human Nutrition Research Unit where all assessments will take place. In order to assess participants' adherence and follow-up, dietary intake, body weight and appetite sensations will be assessed weekly during the 12-week intervention period. Additionally, participants will be contacted by phone weekly and reminded to maintain their journal/log. Dietary intake will be assessed by a 3-day dietary record (2 week days and 1 weekend day) at baseline, at mid-point and end of the study. Participants will also be asked to complete a 1-day dietary record on one weekday, each week of the study. The purpose of this regular assessment is to avoid daily fluctuations in eating patterns, also ensuring a personalized feedback for those experiencing weight fluctuations. Both of these assessments (i.e. 1-day and 3-day dietary records) will be conducted using the online Automated Self – Administered 24-hour Recall (ASA24) Canada. The ASA24 is a validated web-based program that uses the validated U.S. Department of Agriculture's Automated Multiple-Pass Method, and is modified to support the Canadian food supply. Participants will receive a digital scale and will

be asked to weight themselves daily. Participants from the HP group will also be asked to rate their appetite sensations on a 100-mm VAS paper sheet. Appetite sensation should be completed in the morning (after waking up and while fasting) and 30 minutes after consuming the supplement snacks in order to assess hunger, satiety, fullness, and prospective food consumption.

FACULTY-DEPARTMENT

Agricultural, Life & Environmental Sciences - Agricultural, Food & Nutritional Science

OPEN TO STUDENTS FROM THE FOLLOWING INSTITUTIONS

Chinese universities participating in the [*Double First-Class Initiative*](#).

DESIRED FIELD OF STUDENT STUDY

Nutrition and Biology

INTERNSHIP LOCATION

Edmonton Campus

NUMBER OF INTERNSHIP POSITIONS

1

INTERNSHIP DATES

Start: July 2, 2019

End: October 2, 2019

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.