

Going Nutty: Walnut Consumption Effects on Gut Microbiota and Cardiovascular Health

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Introduction

Background

- An organism's gut microbiome has observable impact on its life history traits
- Microbes present within the gut are involved in extraction and metabolism of nutrients not fully digested in the small intestine¹
- Cardiovascular disease (CVD) is a leading cause of mortality globally and is highly impacted by diet¹

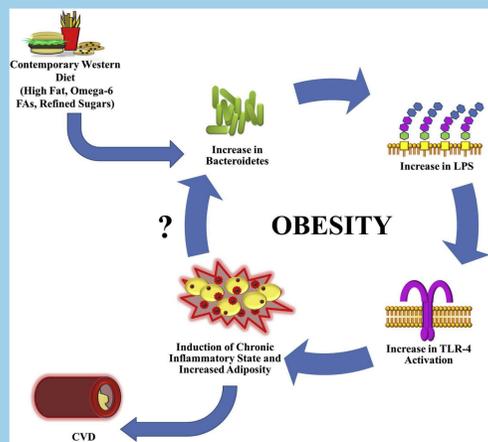


Figure 1. Etiology of cardiovascular risk in obesity due to microbiota shift²

- Metatranscriptomics is a method where functional genes and pathways are identified by isolating the mRNA of an organism
- Metabolizable energy from walnuts is overestimated by 21%, suggesting that walnut-derived nutrients are accessible to the gut microbiota^{3,4}

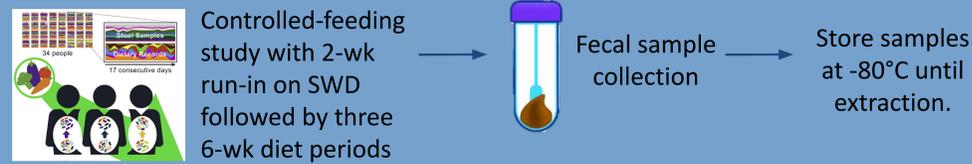
Objectives

- Analyze the effects on the gut microbiome of three different study diets: 1 containing walnuts and 2 containing different vegetable oil blends
- Investigate how changes in the gut microbiome are related to CVD risk factors
- Examine the chemical pathways being utilized and the subsequent impact on cardiovascular health

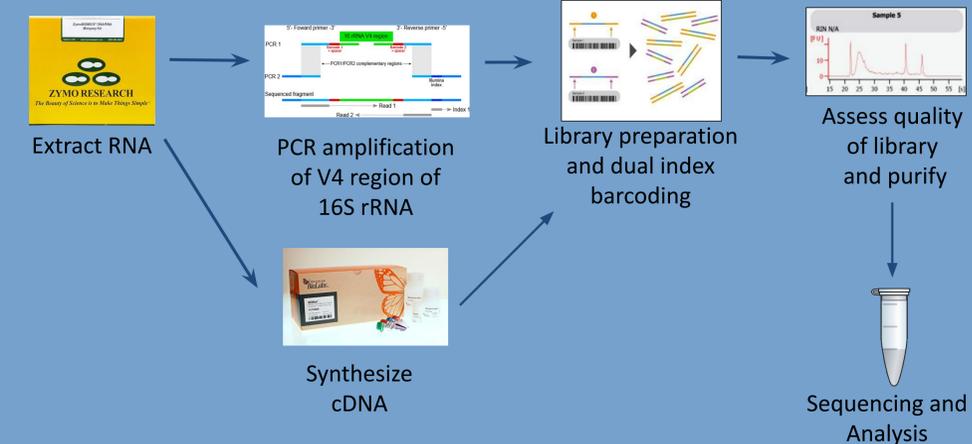


Experimental Design

1. Sample preparation



2. RNA extraction & Library preparation



Results

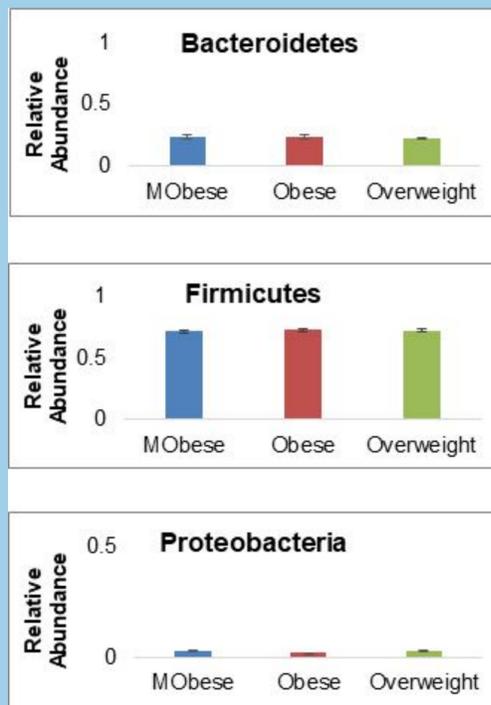


Figure 2. Relative abundance of the most prominent bacteria phyla in participants with overweight, obesity, and morbid obesity (n=42)

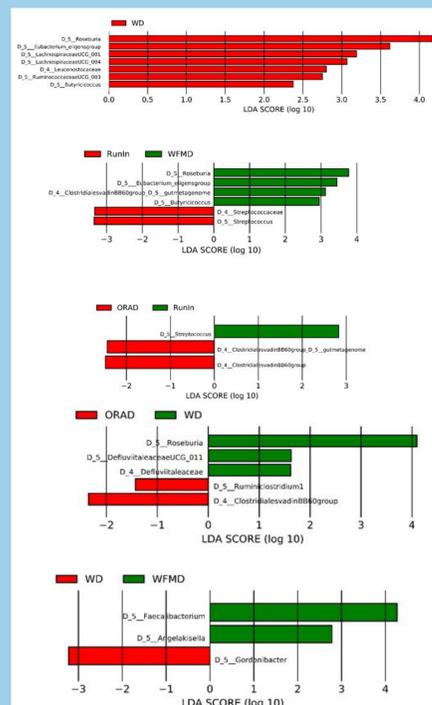


Figure 3. Comparisons of enriched bacteria between walnut diet, walnut fatty acid matched diet, oleic acid replaces α linolenic acid diet and the run-in diet in adults at increased cardiovascular risk (n=42)

Results (cont.)

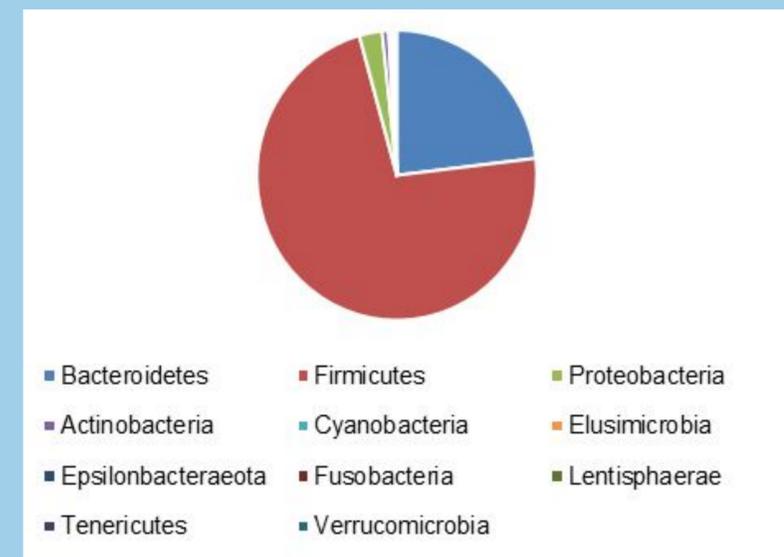


Figure 4. The average relative abundance of bacterial phyla in WD, WFMD and ORAD diets in individuals with increased CVD risk factors.

Discussion

- The WD, WFMD and the ORAD diet showed enrichment of certain species of bacteria in the gut microbiome which play an important role in altering the gut environment.
- Walnuts contain ellagitannins which are metabolized by the bacteria to produce substances that provide cardiovascular benefits⁵
- These diets led to enrichment of bacterial species with positive effects on the gut epithelium, gut lining, and cardiovascular risk factors^{6,7}
- Demonstrates that walnut consumption can alter the gut microbiota in a way that provides cardiovascular benefits and a stable gut environment.

Future Directions

- Metatranscriptomic Analysis
 - Gain a better understanding of what genes are "turned on," rather than those that could be
 - In-depth knowledge about which metabolic pathways are affected and altering the gut environment.

References

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