

# 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 it's life history traits
- Microbes present within the gut are involved in extraction and metabolism of nutrients not fully digested in the small intestine<sup>1</sup>
- Cardiovascular disease (CVD) is a leading cause of mortality globally and is highly impacted by diet<sup>1</sup>

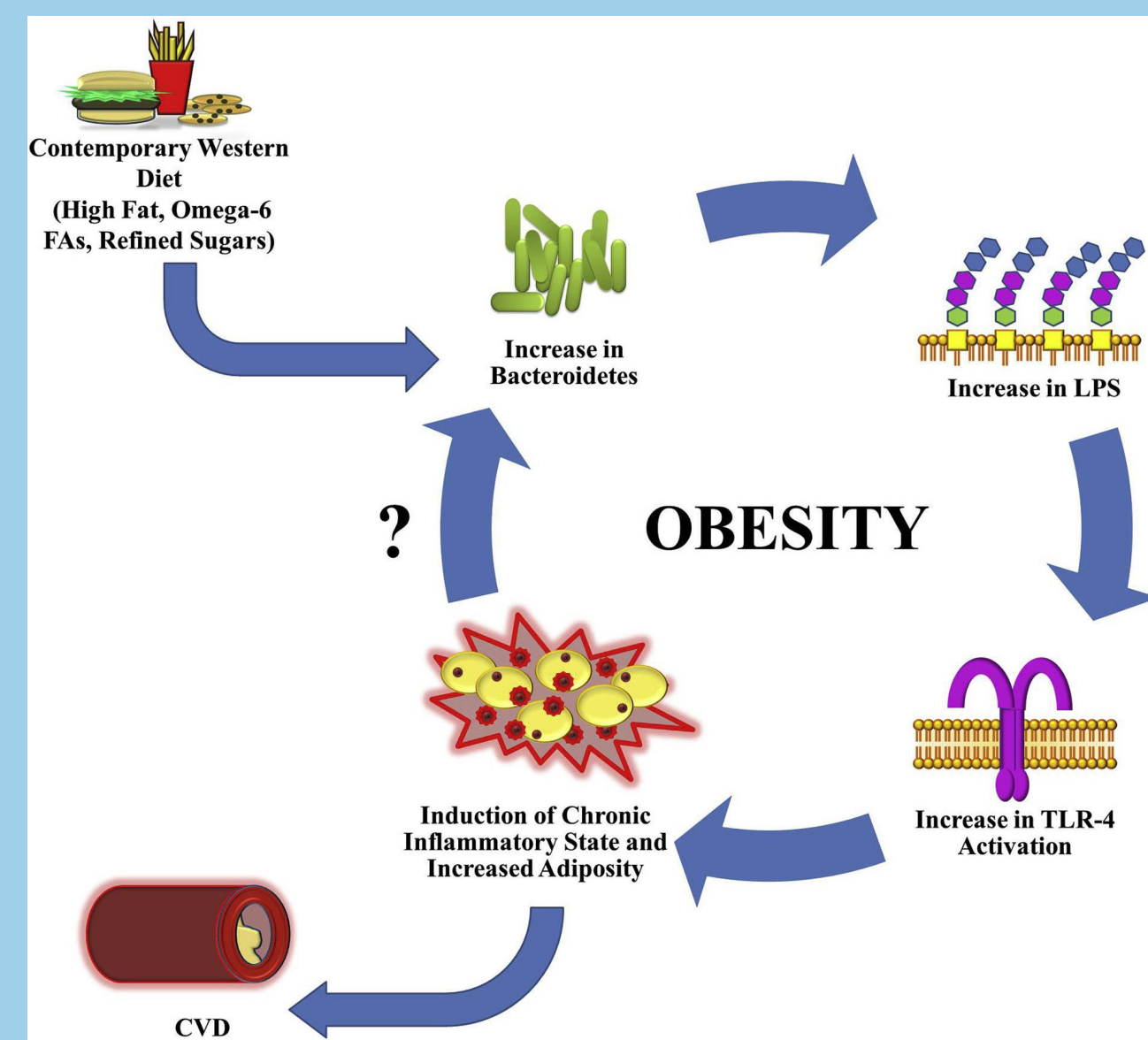


Figure 1. Etiology of cardiovascular risk in obesity due to microbiota shift<sup>2</sup>

- 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<sup>3,4</sup>

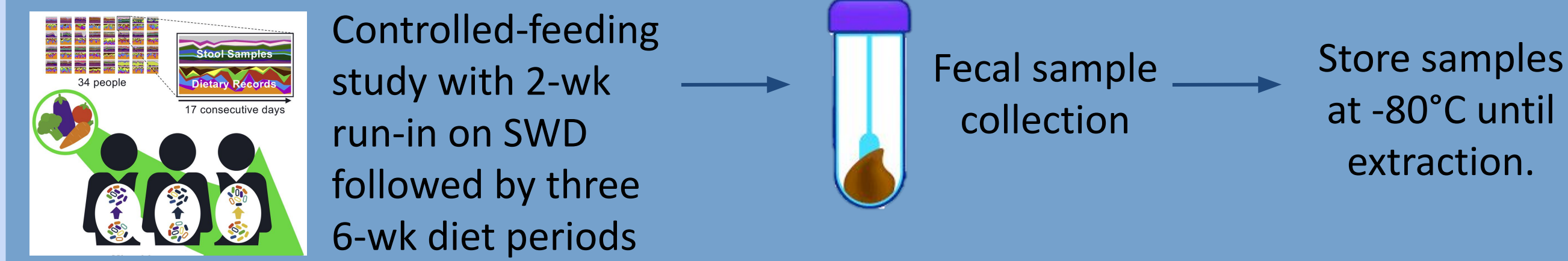
### Objectives

- 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

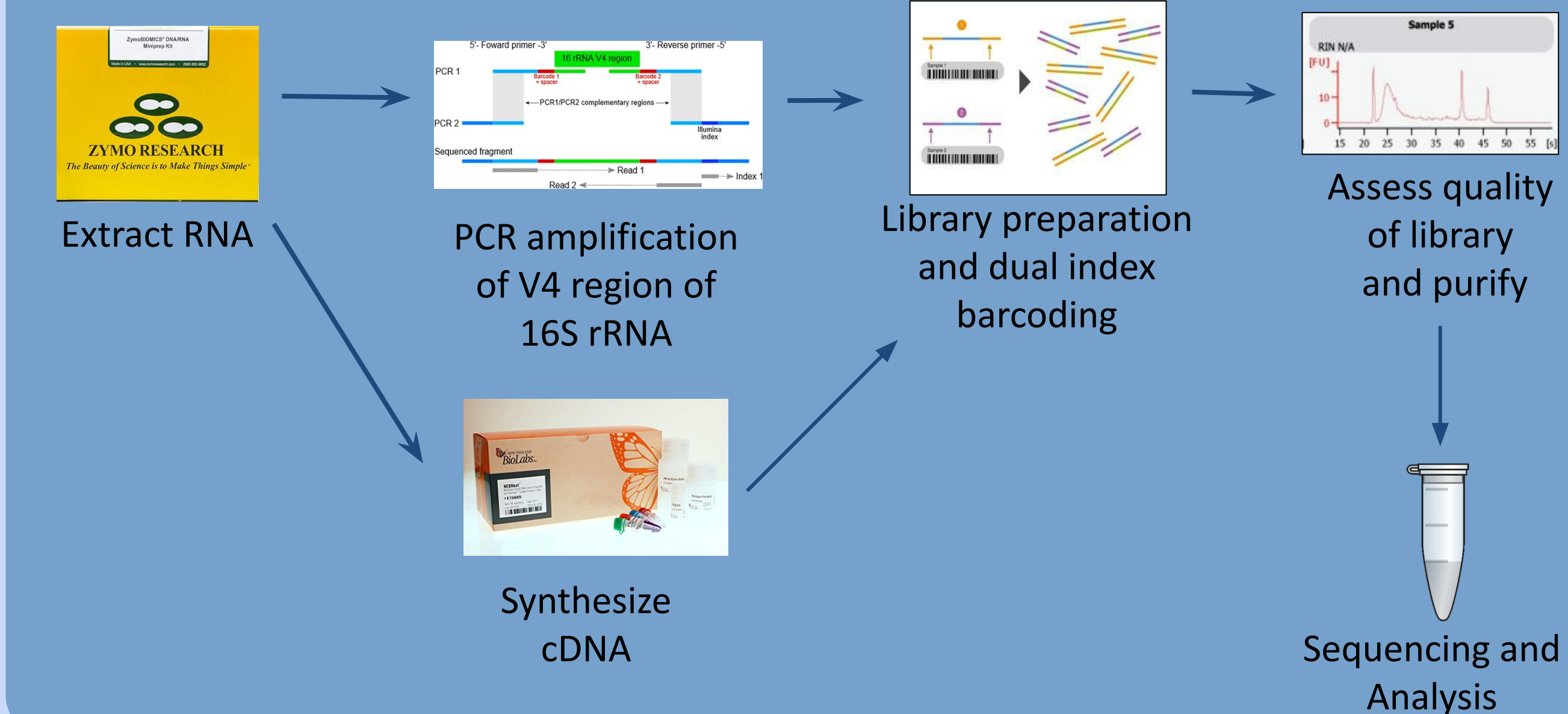


## Experimental Design

### 1. Sample preparation



### 2. RNA extraction & Library preparation



## Results

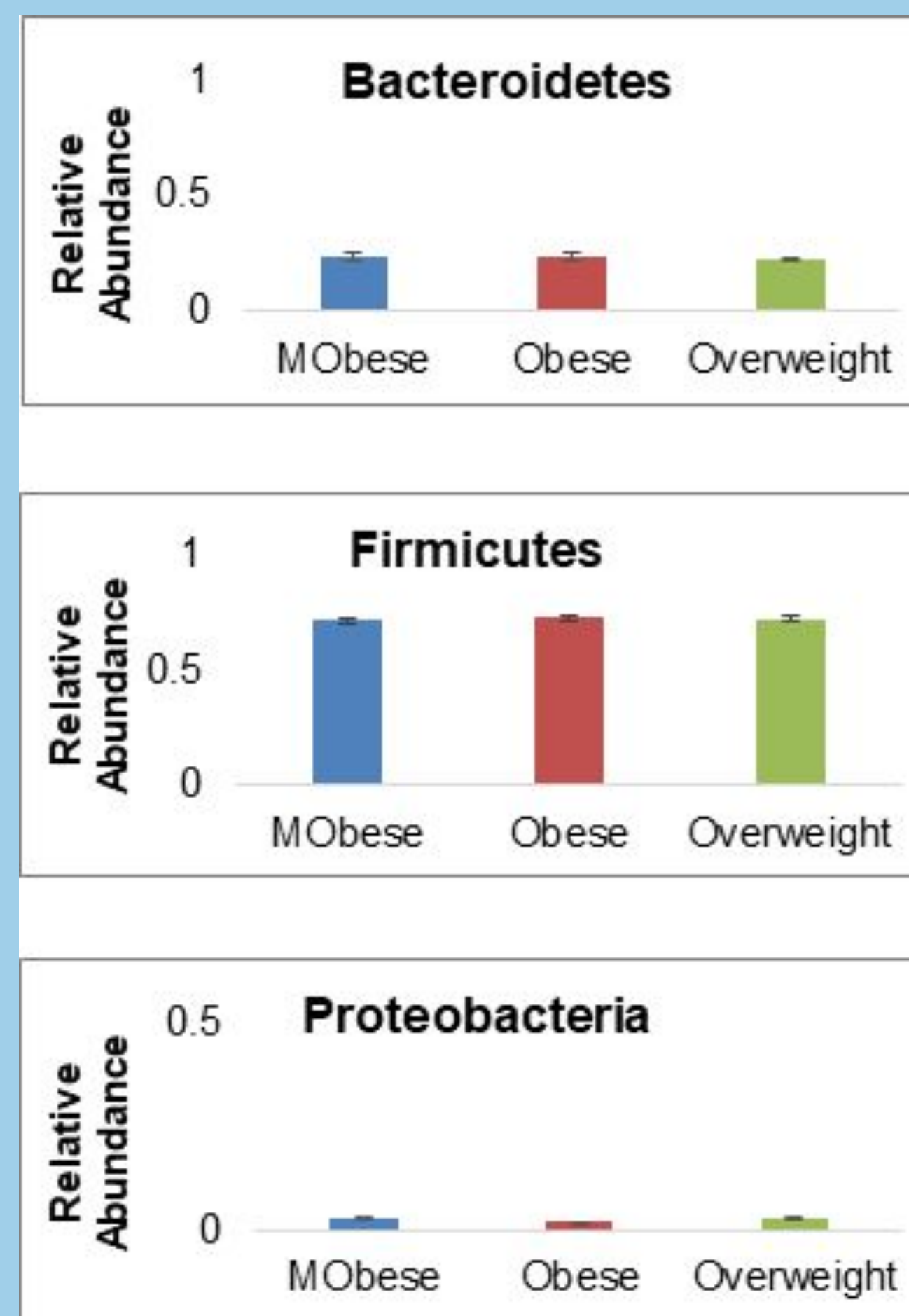


Figure 2. Relative abundance of the most prominent bacteria phyla in participants with overweight, obesity, and morbid obesity (n=42)

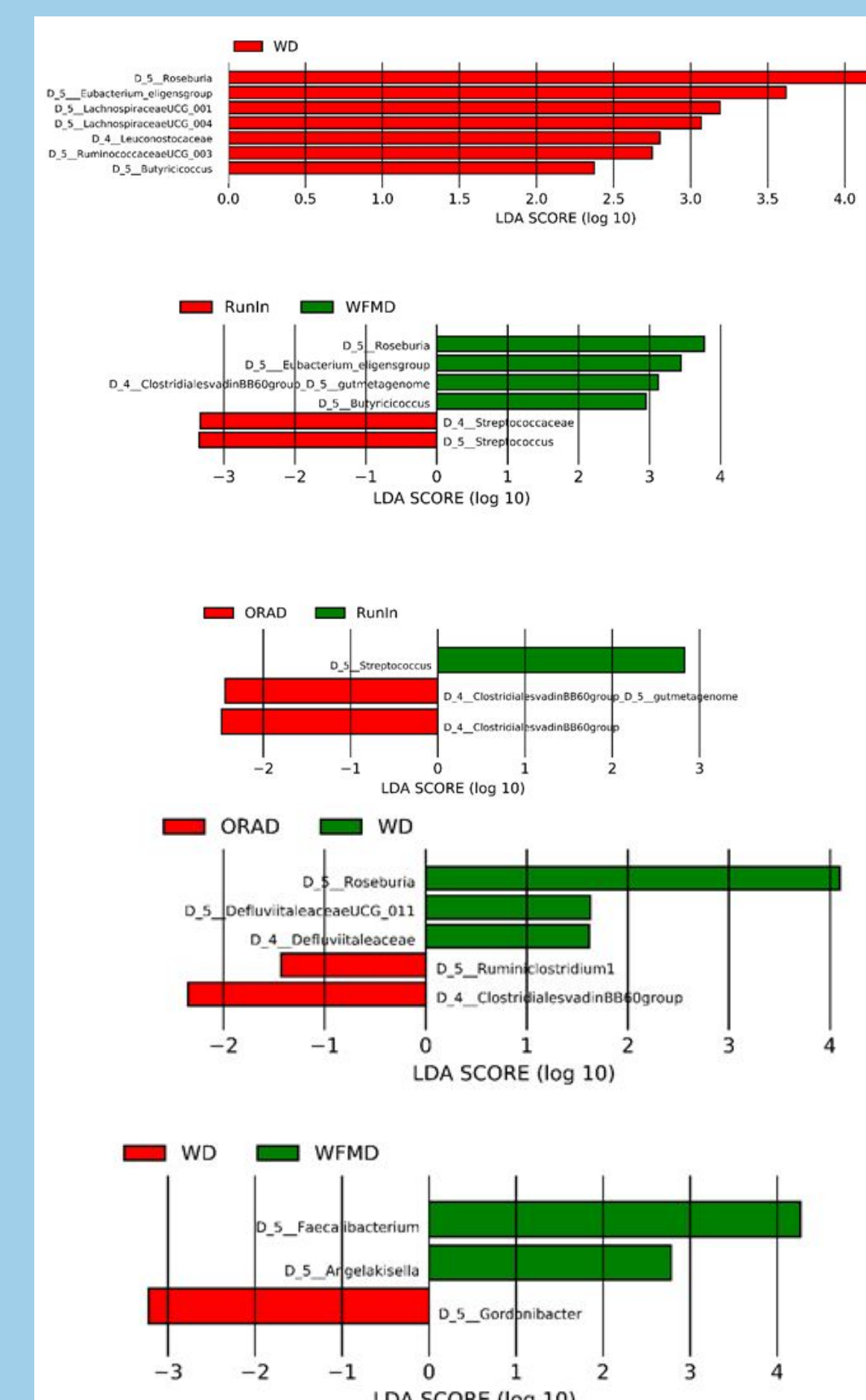


FIGURE 3. Comparisons of enriched bacteria between walnut diet, walnut fatty acid matched diet, oleic acid replaces  $\alpha$  linolenic acid diet and the run-in diet in adults at increased cardiovascular risk (n=42)

## Results (cont.)

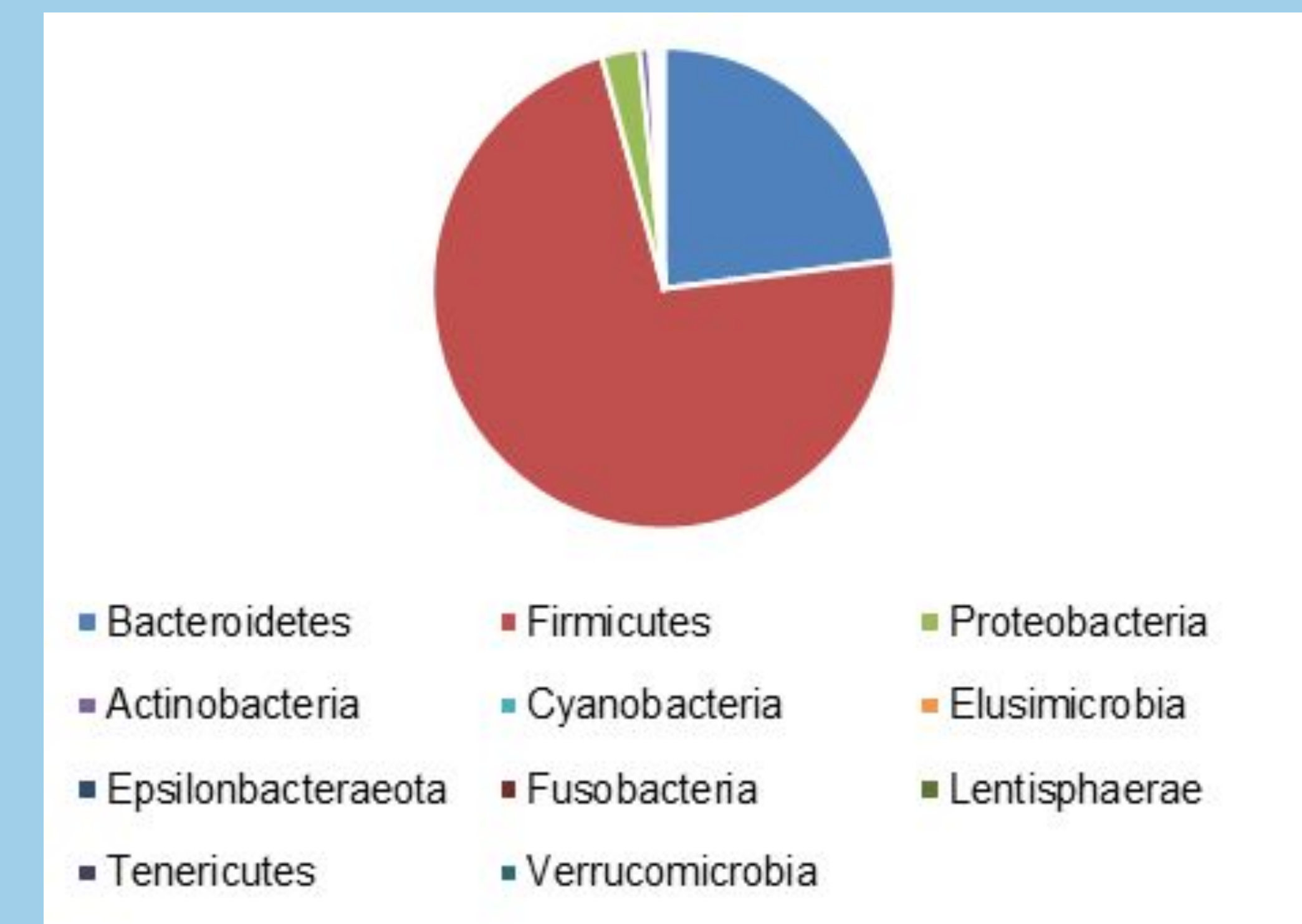


FIGURE 4. The average relative abundance of bacterial phyla in WD, WFMD and ORAD diets in individuals with increased CVD risk factors.

## 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 benefits<sup>5</sup>
- These diets led to enrichment of bacterial species with positive effects on the gut epithelium, gut lining, and cardiovascular risk factors<sup>6,7</sup>
- 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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## Acknowledgements

