PhD Title: IMPULSE - IMPact of a PULSE-based partial replacement diet on metabolome and health

Helena Ferreira1,a, Marta W. Vasconcelos1,b, Ana M. Gil2,b, Elisabete Pinto1,3,c

1Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Porto, Portugal;
2Department of Chemistry and CICECO-Aveiro Institute of Materials, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal;
3EPIUnit – Unidade de Investigação em Epidemiologia do Instituto de Saúde Pública da Universidade do Porto, Portugal

OBJECTIVES

The main purpose of this PhD project is to further advance the investigation on the overall benefits of plant-based diets and test the potential of NMR-based metabolomics to assess the health impact of a pulse-based partial replacement diet.

INTRODUCTION

Plant–based diets, particularly plant–based protein food sources such as pulses, have been suggested as more environmentally friendly and healthier food alternatives. However, the metabolic pathways supporting the underlying relationship between plant-based diets and human health remain unclear.

METHODS

Course: PhD in Biotechnology (2017/2020) at CBQF in collaboration with CICECO.
Project setting: IMPULSE was conducted in the city of Porto, Portugal. Overall data collection, participants’ assessments and dietary interventions took place at CBQF.
Study design: One-group comparison, quasi-experimental dietary intervention (see figure 1).

Subjects: healthy non vegetarian/vegan volunteers, recruited at CBQF and the university campus neighbouring areas.
Dietary intervention periods: March to April 2018; October to December 2018; February to March 2020.
Ethical approval: Institute of Bioethics of the Portuguese Catholic University.

Data collection:
- Sociodemographic data, health and lifestyle-related information
- Anthropometric measurements
- 3-day food records
- Benefits and barriers surrounding pulses intake questionnaire
- Mediterranean Diet Adherence Screener
- Food waste and Sensory analysis
- Blood samples – standard biochemical analysis and NMR metabolomics
- Urine samples – NMR metabolomics
- Fecal samples – NMR metabolomics and microbiota analysis

PRELIMINARY RESULTS

Preliminary results point out to a general good acceptance by participants to the proposed diet, to an overall maintenance of anthropometric parameters and to a slight reduction in blood cholesterol levels (table 1).

Table 1. Standard blood cholesterol profile and anthropometric measurements.

<table>
<thead>
<tr>
<th></th>
<th>n=27 median (P&lt;; P&gt;)</th>
<th>Baseline</th>
<th>8 week</th>
<th>p</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>188.0 (134.0; 200.0)</td>
<td>176.0 (133.0; 193.0)</td>
<td>0.492</td>
<td>&lt;200</td>
<td></td>
</tr>
<tr>
<td>HDL-C (mg/dL)</td>
<td>58.0 (50.0; 67.0)</td>
<td>57.0 (50.0; 65.0)</td>
<td>0.181</td>
<td>&lt;60</td>
<td></td>
</tr>
<tr>
<td>LDL-C (mg/dL)</td>
<td>99.0 (91.0; 120.0)</td>
<td>92.0 (83.0; 107.0)</td>
<td>0.045</td>
<td>&lt;130</td>
<td></td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>21.9 (21.3; 24.5)</td>
<td>22.4 (21.3; 24.5)</td>
<td>0.048</td>
<td>18.5-24.9</td>
<td></td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>71.5 (66.5; 75.2)</td>
<td>71.0 (66.4; 75.2)</td>
<td>0.509</td>
<td>&lt;94; &lt;100</td>
<td></td>
</tr>
<tr>
<td>Fat mass (%)</td>
<td>30.6 (25.6; 33.3)</td>
<td>30.2 (23.9; 33.7)</td>
<td>0.318</td>
<td>&lt;10-20%; &lt;18-20%</td>
<td></td>
</tr>
</tbody>
</table>


FINAL CONSIDERATIONS

Data consolidation is needed, as well, further cross validation through metabolomics approaches. We expect our findings to contribute to the generation of new health biomarker patterns and insights in the understanding of the interactions between plant-based diets and human metabolism. In the frame of the TRUE project our results will help support both international and national programs on the promotion of pulses and plant-based diets.

ACKNOWLEDGMENTS

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