

The use of cecal samples from Wistar rats in *in vitro* fermentation to determine the effect of Fish and Pomegranate oil in gut microbiota alterations induced by a Western diet

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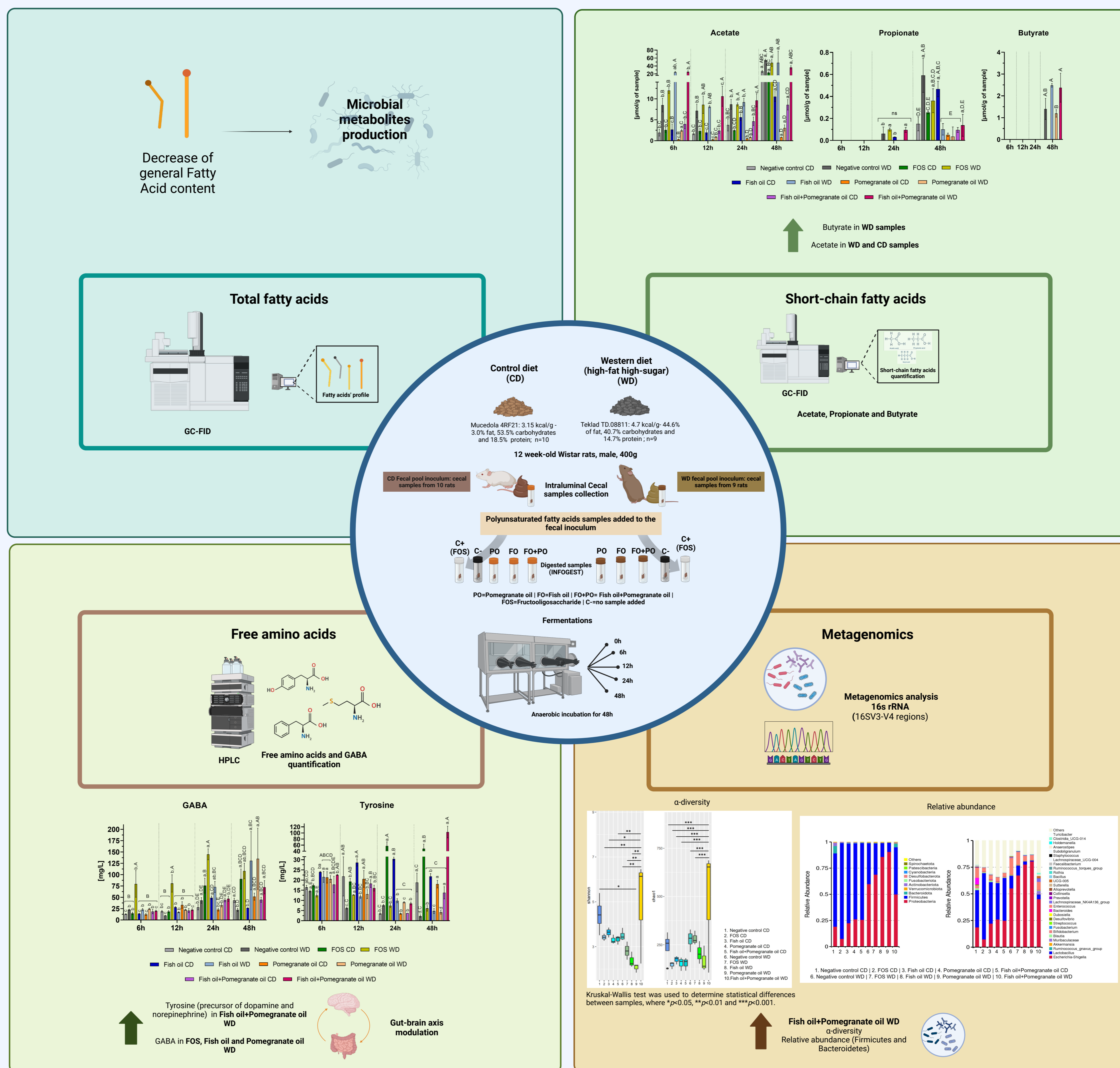
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ABSTRACT

The influence of gut microbiota in the onset and development of several metabolic diseases, such as obesity and diabetes, has gained attention over the last few years. Indeed, diet plays an essential role in gut microbiota modulation. **Western diet (WD), characterized by high-sugar and high-fat consumption, alters gut microbiome composition, diversity index, microbial relative levels, and functional pathways.** Several polyunsaturated fatty acids have been showing promising health effects, but their impact on gut microbiota is still overlooked. The effect of **Fish oil (omega-3 source - EPA and DHA) and Pomegranate oil (puniceic acid source), and a mixture of both oils** in gut microbiota was determined by subjecting the oil samples to *in vitro* fecal fermentations using as fecal inoculum **cecal samples from rats from two different dietary groups: control diet (CD) and high-fat high-sugar diet (WD).** 16S amplicon metagenomics sequencing showed that **Fish oil+Pomegranate oil from the WD group increased α -diversity.** This sample can also **increase the relative abundance of the Firmicutes and Bacteroidetes** phylum as well as ***Akkermansia* and *Blautia***, which were affected by the WD consumption. All samples were able to **increase butyrate and acetate concentration in the WD group.** Amino acids are precursors of important neuroactive molecules. **Tyrosine concentrations, a precursor for dopamine and norepinephrine, increased in the Fish oil+Pomegranate oil WD sample.** **GABA**, an important neurotransmitter, was also **increased in WD samples.** These results suggest a positive impact of these oils' mixture on gut-brain axis modulation. It was demonstrated, for the first time, the great potential of using a mixture of both Fish and Pomegranate oil to restore the gut microbiota changes associated with WD consumption.

METHODS & MAIN RESULTS & CONCLUSIONS



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