

P24 & FP – Lipid-based nutrient supplement fortified with prebiotics increase SCFA production and enhance bifidobacterial growth in moderately undernourished infants' microbiota

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Background: The central role of gut microbiota in undernutrition, an underlying cause of 45% deaths in children under five in developing countries, is now recognized. Proof of concept studies using methods to produce results that can be extrapolated to human subjects are needed to document new therapeutics including gut health as now recommended.

Objective: The study aimed to assess the effect of lipid-based nutrient supplement fortified with inulin and FOS (LNSp) on moderately acute malnourished (MAM) infants' colonic microbiota in a Simulator of the Human Intestinal Microbial Ecosystem (SHIME).

Methodology: Faecal samples were obtained from 3 MAM infants aged 10 months living in rural Burkina Faso, West Africa.

Faecal inocula were prepared and submitted to 3 treatment conditions during 13 days in a SHIME model: control (SHIME feed alone), LNS (SHIME feed +2g LNS) and LNSp (SHIME feed + 2g LNS + 1.5g native inulin +1.5g FOS)

Samples were taken daily and analysed for short chain fatty acids (SCFA) namely acetate, propionate, butyrate, branched chain fatty acids (BCFA) content, and to determine the microbial composition through Illumina sequencing. Differences in SCFA production between treatment conditions were analysed using linear mixed models. To assess the shift in microbial composition, a differential expression analysis were performed to identify operational taxonomic units (OTU) that were most affected by treatment conditions.

All statistical analysis were performed in R version 3.5.0. Alpha was set at 5% for all hypothesis tests.

Results: SCFA concentration was obtained for all samples (n=117). LNSp induced a significantly higher production of acetate, propionate and butyrate compared to control and LNS. When LNS were compared to control, all but acetate production were statistically similar. The production of BCFA was significantly higher in the LNS treatment group.

The Sequencing data was available for 114 samples. Results included 7373 OTUs belonging to 6 phyla and 84 genera. LNSp treatment resulted in a significant increase of Bifidobacteria counts by 7 to 9 fold compared to control and by 6 to 7 folds compared to LNS alone. Conversely, potentially harmful bacteria like veillonella, enterobacteriaceae and bilophila were downregulated by 4 to 8 folds.

Conclusions / Implications for practice: Fortifying LNS with prebiotics (Inulin and FOS) resulted in microbial community enrichment in Bifidobacteria, a decrease of potential pathogens and an increase in SCFA production in a SHIME model for MAM infants. These beneficial effects need to be confirmed through In vivo studies that would also investigate the repercussion of such effects on child growth and health.

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