
Abstract:
Infant formulas containing non-digestible oligosaccharides (NDO) similar to the composition in breast milk or a combination of lactic acid bacteria (LAB) and NDO have been shown to harbor preventive effects towards immune-regulatory disorders. The aim of this study was to investigate the immune-modulatory potential of non-digestible short chain galacto- and long chain fructo-oligosaccharides (scGOS/lcFOS) mimicking the natural distribution of oligosaccharides in human breast milk in presence or absence of certain LAB strains in human monocyte derived dendritic cells (MoDC). Immature human MoDC prepared from peripheral blood of healthy non-atopic volunteers were screened in vitro after stimulation with specific scGOS/lcFOS in presence or absence of LAB. IL-10 and IL-12p70 release was analyzed after 24 hours in cell-free supernatants by enzyme-linked immunosorbent assay (ELISA). A luminex-based assay was conducted to assess further cytokine and chemokine release by MoDC. To investigate the resulting T cell response, stimulated MoDC were co-incubated with naïve T cells in allogeneic stimulation assays and intracellular Foxp3 expression, as well as immune-suppressive capacity was determined. Oligosaccharides did not induce relevant amounts of IL-12p70
production, but did promote IL-10 release by MoDC. Furthermore, scGOS/lcFOS mixtures exerted a significant enhancing effect on LAB induced IL-10 secretion by MoDC while no increase in IL-12p70 production was observed. Blocking toll like receptor (TLR)4 abrogated the increase in IL-10 in both the direct stimulation and the LAB stimulation of MoDC, suggesting that scGOS/lcFOS act via TLR4. Finally, scGOS/lcFOS-treated MoDC were shown to upregulate the number of functional suppressive Foxp3 positive T cells following allogeneic stimulation. Our results indicate anti-inflammatory and direct, microbiota independent, immune-modulatory properties of scGOS/lcFOS mixtures on human MoDC suggesting a possible induction of regulatory T cells (Tregs). The tested combinations of LAB and scGOS/lcFOS might represent a useful dietary ingredient for the maintenance of intestinal homeostasis via the induction of Tregs.