Probiotic Metabolites Promote Anti-Inflammatory Functions of Immune Cells

Fu, Richard

Wu, Danielle

The microbiome is an important factor in human health and disease. Recent reports demonstrate that short-chain fatty acids (SCFA), type of bacterial metabolites, ameliorate autoimmune diseases, indicating a link between the gut microbiome, immune cells and inflammation. In this study, we investigated the potential health benefits of probiotic bacterial metabolites by evaluating their functions in regulating the differentiation of anti-inflammatory and pro-inflammatory immune cells, and determining the underlying mechanisms. Using conditioned media from the probiotic bacteria, Lactococcus lactis and Lactobacillus reuteri, we demonstrated that bacterial metabolites induced differentiation of immunosuppressive anti-inflammatory T-regulatory (Treg) cells. Consistently, butyrate, a bacterial-derived SCFA, enhanced the differentiation of Treg cells from naïve CD4+ T cells. Furthermore, butyrate inhibited the maturation of pro-inflammatory antigen-presenting dendritic cells (DCs) from hematopoietic progenitor cells. Mechanistically, we found that butyrate promoted Treg cell differentiation via increasing expression of transcription factor Foxp3 and the anti-inflammatory cytokine IL-10. In addition, it suppressed the maturation of DCs by inhibiting the expression of CD11c and MHC Class II, critical molecules for pathogenic CD4+ T cell activation. Taken together, these studies reveal novel functions of probiotic metabolites, SCFA, in regulating the differentiation/activation of anti-inflammatory and pro-inflammatory immune cells, thus inhibiting inflammation and promoting human health.

Awards Won:

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