Direct modulation of goblet cell function by galacto-oligosaccharides

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Prebiotic galacto-oligosaccharides (GOS) are non-digestible food ingredients that are thought to benefit the host indirectly by stimulating the growth and/or activity of beneficial bacteria in the colon. Hence, human adenocarcinoma derived LS174T cells, which exhibit a goblet cell like phenotype, were used to examine possible direct effects of prebiotic GOS on goblet cell function. LS174T cells were treated with GOS and the expression of goblet cell secretory product genes mucin 2 (MUC2), trefoil factor 3 (TFF3), resistin like molecule beta (RETNLB) and Golgi sulfotransferase genes, carbohydrate (N-acetylglucosamine 6-O) sulfotransferase 5 (CHST5) and galactose 3-O-sulfotransferase 2 (GAL3ST2), was determined by qRT-PCR and Western blot analysis. QRT-PCR analysis demonstrated that MUC2 and CHST5 expression were upregulated 2-4 fold while RETNLB and TFF3 expression were upregulated 6-8 fold at 72h. Immunofluorescence microscopy and Western blot data revealed that GOS treatment increased the level of RETNLB, TFF3 and CHST5 at 96h treatment. In addition, IL-13 with GOS resulted in synergistic induction of RETNLB and CHST5. GOS treatment did not alter IL-8 secretion. Collectively, the data indicate that GOS may directly enhance mucosal barrier function by modulating the expression of goblet cell products independent of an inflammatory response.