Plant Polyphenols Stimulate Adhesion to Intestinal Mucosa and Induce Proteome Changes in the Probiotic Lactobacillus acidophilus NCFM

Scope: Plant phenolics, known to exert beneficial effects on human health, were supplemented to cultures of the probiotic bacterium Lactobacillus acidophilus NCFM (NCFM) to assess their effect on its adhesive capacity and the abundancy of individual proteins.

Methods and results: The presence of resveratrol and ferulic acid during bacterial growth stimulated adhesion of NCFM to mucin and human intestinal HT-29 cells, while tannic acid improved adhesion only to HT-29 cells and caffeic acid had very modest effect overall. Some dosage dependence was found for the four phenolics supplemented at 100, 250 or 500 μg/mL to the cultures. Notably, 500 μg/mL ferulic acid only stimulated adhesion to mucin. Analyses of differential whole-cell as well as surface proteomes revealed relative abundancy changes for a total of 27 and 22 NCFM proteins, respectively. These changes include enzymes acting in metabolic pathways, such as glycolysis, nucleotide metabolism and stress response as well as being known moonlighting or surface-associated proteins.

Conclusion: The five plant phenolics found in various foods stimulate the adhesive capacity of NCFM in diverse ways and elicited relative abundancy changes of specific proteins providing molecular level insight into the mechanism of the putative beneficial effects of the polyphenols.

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