Probiotic bacteria can induce monocyte-derived dendritic cells maturation?

September 24 2008

Probiotic bacteria are widely used to relieve the symptoms of many disorders such as inflammatory bowel syndrome, diarrhea, and allergies. Probiotic mixtures have also been found to reduce the symptoms of diarrhea. In children a probiotic bacterium L. rhamnosus GG has been shown to prevent the onset of atopy and allergies. However, the mechanisms that cause these beneficial actions are yet to be characterized. One of the factors contributing to the health promoting effects of probiotic bacteria could be their capacity to induce cytokine production that further regulates the development of innate and adaptive immune responses.

Cytokines are small signaling molecules secreted by immune cells that direct the activation of innate and adaptive immune responses during microbial infections. Cytokines activate and recruit immune cells to the site of infection and increase host responses to pathogens. Many clinical trials have proven probiotic bacteria to be effective in preventing certain diseases or relieving their symptoms. However, there is a need for novel probiotic bacteria for clinical use.

A research article to be published on September 28, 2008 in the *World Journal of Gastroenterology* addresses this question. The research team led by Prof. Ilkka Julkunen from the National Public Health Institute (Finland) in collaboration with Valio Ltd (Finland), systematically screened nine potentially probiotic bacteria for their abilities to induce maturation and cytokine production in human monocyte-derived dendritic cells (moDC). MoDC were stimulated with different probiotic

bacteria and cytokine levels were measured by enzyme-linked immunosorbent assay (ELISA). Maturation marker proteins from the surface of moDCs were stained with fluorescent dyes and detected by flow cytometry. The article further investigated the signaling pathways involved in bacteria induced cytokine gene expression by using pharmacological inhibitors.

All studied bacteria induced the maturation of moDCs. More detailed analysis with Streptococcus thermophilus THS, B. breve Bb99, and L. subsp. cremoris ARH74 indicated that these bacteria induced the expression of moDC maturation markers HLA class II and CD86 as efficiently as pathogenic bacteria. The bacterial strains studied differed in their ability to induce moDC cytokine gene expression. S. thermophilus induced the expression of pro-inflammatory (TNF-gamma?, IL-12, IL-6, and CCL20) and Th1 type (IL-12 and IFN-gamma?) cytokines, while B. breve and L. lactis were also potent inducers of anti-inflammatory IL-10. The results suggest that potentially probiotic bacteria are able to induce moDC maturation, but their ability to induce cytokine gene expression varies significantly from one bacterial strain to another. This article also demonstrates that mitogen-activated protein kinase (MAPK) p38, phosphatidylinositol 3 (PI3) kinase, and nuclear factor-kappa B signaling pathways are involved in bacteria-induced cytokine production.

This data is helpful in selecting new probiotic bacteria for in vivo trials and the knowledge of the cytokine production profiles of different probiotic bacteria may help in selecting specific probiotic strains for therapeutic purposes.

Reference: Latvala S, Pietilä TE, Veckman V, Kekkonen RA, Tynkkynen S, Korpela R, Julkunen I. Potentially probiotic bacteria induce efficient maturation but differential cytokine production in human monocyte-derived dendritic cells. World J Gastroenterol 2008;

14(36): 5570-5583
www.wjgnet.com/1007-9327/14/5570.asp

Source: World Journal of Gastroenterology