Tejada-Simon MV, Pestka JJ. Proinflammatory Cytokine and Nitric Oxide Induction in Murine Macrophages by Cell Wall and Cytoplasmic Extracts of Lactic Acid Bacteria. Journal of Food Protection, Number 12, December 1999, pp. 1372-1496.

Abstract
Cells from a number of bacterial genera have been shown to possess mitogenic and polyclonal activating properties when cultured with cells of the immune system. Based on previously reported health immune-enhancing effects of fermented dairy products, we tested the potentiating effects of representative lactic acid bacteria and their extracts on leukocyte function. Specifically, the effects of in vitro exposure to heat-killed cells of Bifidobacterium, Lactobacillus acidophilus, L. bulgaricus, L. casei, L. gasseri, L. helveticus, L. reuteri, and Streptococcus thermophilus, their cell walls, and their cytoplasmic extracts on proliferation as well as cytokine and nitric oxide (NO) production were examined in the RAW 264.7 macrophage cell line. A similar strategy was applied to murine cultures composed of peritoneal, spleen, and Peyer's patch cells. Both the cell wall and cytoplasmic fractions of lactic acid bacteria were able to stimulate cloned macrophages to produce significant amounts of tumor necrosis factor-α, (interleukin) IL-6, and NO. Pronounced enhancement of IL-6 production by peritoneal cells was observed when cultured with those extracts, whereas, effects were not noted in spleen and Peyer's patch cell cultures from mice. Based on the results, it appears that, as a group, the lactic acid bacteria were capable of stimulating macrophages and possibly other immune cells to produce cytokines and NO, and both their cell walls and cytoplasm contributed to these capacities.