
Abstract
The probiotic effects ascribed to lactic acid bacteria (LAB) and their fermented dairy products arise not only from whole microorganisms and cell wall components but also from peptides and extracellular polysaccharides (exopolysaccharides) produced during the fermentation of milk. There is a lack of knowledge concerning the immune mechanisms induced by exopolysaccharides produced by lactic acid bacteria, which would allow a better understanding of the functional effects described to them. The aim of this study was to investigate the in vivo immunomodulating capacity of the exopolysaccharide produced by Lactobacillus kefiranofaciens by analyzing the profile of cytokines and immunoglobulins induced at the intestinal mucosa level, in the intestinal fluid and blood serum. BALB/c mice received the exopolysaccharide produced by L. kefiranofaciens for 2, 5 or 7 consecutive days. At the end of each period of administration, control and treated mice were sacrificed and the numbers of IgA+ and IgG+ cells were determined on histological slices of the small and large intestine by immunofluorescence. Cytokines (IL-4, IL-6, IL-10, IL-12, IFNgamma and TNFalpha) were also determined in the gut lamina propria as well as in the intestinal fluid and blood serum. There was an increase of IgA+ cells in the small and large intestine lamina propria, without change in the number of IgG+ cells in the small intestine. This study reports the effects of the oral administration of the exopolysaccharide produced by L. kefiranofaciens in the number of IgA+ cells in the small and large intestine, comparing simultaneously the production of cytokines by cells of the lamina propria and in the intestinal fluid and blood serum. The increase in the number of IgA+ cells was not simultaneously accompanied by an enhance of the number of IL-4+ cells in the small intestine. This finding would be in accordance with the fact that, in general, polysaccharide antigens elicit a T-independent immune response. For IL-10+, IL-6+ and IL-12+ cells, the values found were slightly increased compared to control values, while IFNgamma+ and TNFalpha+ cells did not change compared to control values. The effects observed on immunoglobulins and in all the cytokines assayed in the large intestine after kefiran administration were of greater magnitude than the ones observed in the small intestine lamina propria, which may be due to the saccharolytic action of the colonic microflora. In the intestinal fluid, only IL-4 and IL-12 increased compared to control values. In blood serum, all the cytokines assayed followed a pattern of production quite similar to the one found for them in the small intestine lamina propria. We observed that the exopolysaccharide induced a gut mucosal response and it was able to up and down regulate it for protective immunity, maintaining intestinal homeostasis, enhancing the IgA production at both the small and large intestine level and influencing the systemic immunity through the cytokines released to the circulating blood.