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Probiotic bacteria induce a differential cytokine production pattern in human peripheral blood mononuclear cells

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Certain probiotic bacteria have been shown to modulate immunological responses both in vitro and in vivo studies. Relatively little is known about the mechanisms that regulate the beneficial effects of probiotic bacteria at the level of host cells or the whole organism. In addition, there is only limited amount of comparative data between different probiotic strains. One of the factors that could contribute to the beneficial effects of probiotics could be the cytokine expression pattern that they elicit. The aim of the present study was to analyze cytokine production patterns in human peripheral blood mononuclear cells (PBMC) in response to stimulation with different probiotic bacterial strains. PBMC were purified by a density gradient centrifugation over Ficoll-Paque gradient from freshly collected, leukocyte rich buffy coats obtained from healthy blood donors. The optimal stimulation dose was determined to be 1:1 bacteria:host cell ratio. To characterize cytokine production pattern induced by probiotic bacteria PBMCs were stimulated with probiotics and cell culture supernatants were collected at different time points after stimulation. Cytokine levels in cell culture supernatants were determined by ELISA (TNF- α , IFN- γ , IL-12, IL-10). The study included *Lactobacillus rhamnosus* GG, *Lactobacillus rhamnosus* Lc705, *Propionibacterium freudenreichii* ssp. *shermanii* JS and *Bifidobacterium breve* Bb99 strains. Also some bacterial combinations were used. *Streptococcus pyogenes* (group A streptococcus) was used as a positive control. There were differences in the ability of different bacterial strains to induce cytokine responses. Some of the studied strains showed practically no induction of cytokine response whereas some strains were extremely potent in inducing cytokine response. *Lactobacillus* strains were the best inducers of proinflammatory cytokines. Anti-inflammatory IL-10 production was best induced by *Bifidobacterium* and *Propionibacterium* strains. Combinations of two or more probiotic strains did not induce synergistic effects in cytokine production. Our study shows that in vitro the ability of different probiotic bacterial strains to induce cytokine response vary greatly. Surprisingly, combinations of two different probiotic bacterial did not show any synergistic enhancement in cytokine response, rather the response was more an average from the individual responses induced by each bacteria.