Probiotic modulation of dendritic cell function in Crohn's disease patients

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Background

The inflammatory bowel disease (IBD) is a chronic and relapsing disorder driven by aberrant immune response resulted from a dysregulated intestinal microbiome, which consists of two major phenotypic forms including Crohn's disease (CD) and ulcerative colitis (UC). Dendritic cells (DCs) play a crucial role in the regulation of innate and adaptive immunity in autoimmune diseases. Probiotics regulate DC function and can modulate the DC-mediated cytokine secretion in a strain-specific manner. Here, we assessed the immunomodulatory efficacy of four probiotic bacteria on induction of pro/anti-inflammatory cytokines, co-stimulatory molecules and signal-transducing receptors (TLRs, and integrin αvβ8)in DCs from Iranian IBD patients and healthy controls.

Materials/methods

Human monocyte derived DCs from IBD patients including (3 UC, 3 CD) and healthy controls were exposed to four probiotic bacteria including *Lactobacillus salivarius*, *Bifidobacterium bifidum*, *Bacillus coagulans* and *Bacillus subtilis* natto. The expression of co-stimulatory molecules (CD80 and CD86) was assessed by flow cytometry on immature and coinfected DCs. The resultant culture supernatants were analyzed for production of anti-inflammatory cytokines (IL-10 and TGF-β) by ELISA. The mRNA expression level of TLR-2, TLR-4, TLR-9, integrin αvβ8 and IL-12P40 were examined by quantitative RT-PCR.

Results

Our results showed that Induction of semi-maturation markers CD80 and CD86 of DCs by probiotic bacteria is disease-dependent and independent dose. Only *B. bifidum* at both MOI 10 (76%) and 100 (77.6%) could induce DCs isolated from CD patients Additionally, All four probiotics enhanced anti inflammatory cytokine production (IL-10, TGF-β) from stimulated DCs compared with untreated DCs and DCs treated with LPS. *L. salivarius* significantly induced the IL-10 and TGF-β production only in DCs from UC patients in a non-dose-dependent manner ($P < 0.05$). *B. bifidum* significantly increased the production of IL-10 and TGF-β in DCs from UC and CD patients at both MOIs compared with untreated DCs. The expression level of TLR2 and integrin ß8 also were significantly increased by *B. bifidum* (MOI 10 and 100) and the expression of TLR4 & TLR9 and IL12p40 were significantly decreased

Conclusion

Several experimental and clinical studies have shown the beneficial effects of probiotic bacteria in immunomodulation of mucosal and systemic immune responses, immune function and treatment of inflammatory diseases DCs play a key role in linking the innate and adaptive immune systems, and are critical targets for immunomodulation by various probiotic species. However, understanding how these microorganisms contribute to homeostasis of gut-associated immunity and human health remains a major challenge. In this studay B. bifidum (at both MOI 10 and 100) showed the better effect in immudolatory function in DCs of Iranian CD patients CD patients.

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Keywords

Inflammatory Bowel diseases, Crohn's disease, ulcerative colitis, Tolerance dendritic cell, probiotic ,