Probiotics and Intestinal Microbiota Can Influence on the Course of Experimental Autoimmune Encephalomyelitis in Rats.

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Introduction

Intestinal microbiota has protective, metabolic and immunological functions. Probiotics, including enterococci, can exhibit the antimicrobial effects and correct immunopathological conditions. Recently the influence of probiotic on the central nervous system (CNS) became the center of scientific interests. Previously we have shown the influence of probiotic Enterococcus faecium L3 on the IL-10 mRNA expression in rats with dysbiosis induced by antibiotics (Tarasova et al., 2010). Moreover, commensal, probiotic, and pathogenic bacteria in the gastrointestinal tract can activate neural pathways and CNS signaling systems (Foster et al, 2013). At the same time probiotics may induce activation of regulatory T cells that mediate immunological tolerance. These effects can be important in treatment of chronic inflammatory diseases of central nervous system with autoimmune component such as multiple sclerosis.

The aim of this work was to investigate the ability of E. faecium to attenuate the severity of EAE in rats and to compare the composition of intestinal microbiota in rats with paralysis of limb and rats without clinical symptoms.

Materials and Methods

EAE was induced in female Wistar rats by inoculation of homological spinal cord homogenate (HSCH) with complete Freund's adjuvant. The severity of neurological disorders was estimated by clinical index from 0 (without disorders) to 6 (mortality). Probiotic strain E. faecium L3 was administrated per os (8.0lg CFU/rat/day) for 16 days (group E) beginning since the inoculation of HSCH. The control group (group C) received physiological saline solution instead of probiotic. The cell populations in blood were analyzed using Flow Cytometry (FC) on the 14th and 28th days after inoculation of HSCH. The fecal samples from animals were collected on the 21th day after EAE induction to study of gut microbiota by real time PCR method.

Results

Inoculation of spinal cord homogenate induced paralysis and paresis in 97% of injected rats. The treatment with E. faecium L3 reduced the number of rats with illness and decreased the severity of disease compared with group C. Weight of the rats treated with probiotic was lower then in group C. However, the clinical symptoms of EAE developed in rats with probiotic treatment earlier than in group C. The FC analysis found that the number of CD8+ T cells populations was increased in the blood of rats with mild form of EAE treated by E. faecium L3. The imunoregulatory index (CD4+/CD8+) was 1.79 in group C and 0.78 in group E. The analysis of microbiota composition showed the reduction the number of Lactobacillus spp. in fecal simples of rats with neurological disorders and meaningful increase in the number of Faecalibacterium prausnitzii in animals without any symptoms of the EAE.

Conclusion

Administration of E. faecium led to the reduction of severity and duration of EAE. The protective effect of probiotic was mediated by CD8+ regulatory T cells population. At the same time intestinal microbiota in particular the content of Lactobacillus spp. and F. prausnitzii modulated gut immunity and influenced the development of EAE in rats.