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Potential Use of Probiotic Strain of Escherichia coli O83:K24:H31 to Prevent Colitis Development

Introduction

The early postnatal period is critical for development of microbiota and immature neonatal immune system together with setting appropriate immunoregulatory functions. Mode of delivery and early postnatal antibiotic administration impair the correct microbiota development affecting immune system maturation. Changes in composition and function of microbiota (i.e. dysbiosis) can have a profound effect on mutual homeostatic interaction between microbiota and host immune system. Altered anti-microbial response and immune responses can predispose these individuals to development of inflammatory disorders such as inflammatory bowel diseases. Probiotic administration seems to be reasonable way how to correct for dysbiosis and renew mutual homeostatic interaction between microbiota and host immune system.

Methods

Early postnatal probiotic administration of *Escherichia coli* O83:K24:H31 (EcO83) has been shown to limit infections and allergic diseases. In our study, the potential capacity of early postnatal administration of EcO83 and EcO83 supplementation in adulthood to prevent and/or limit the severity of colitis was evaluated using experimental mouse model of acute colitis induced by trinitrobenzen sulfonic acid (TNBS). The presence of EcO83 in gastrointestinal tract was followed by bioimaging and the impact of EcO83 in expression of selected cytokines was determined by quantitative real-time PCR. In addition to that, we have tested changes in proportional and functional characteristics in dendritic cells and T cells in the gut by flow cytometry

Results

We have observed that EcO83 persisted in neonatal gut in significant amount till 15 days after initial oral administration (within 24 hrs after delivery). On contrary, only scarce presence of EcO83 was detectable in 8-week old mice after intragastric administration. In neonatal mice, EcO83 promoted gene expression of tight junction proteins and cytokine with immunoregulatory function – *Il10*. Early postnatal EcO83 administration was able to limit the severity of TNBS induced colitis. Both macroscopic Wallace score and gene expression of pro-inflammatory cytokines were lower in mice supplemented with EcO83 compared to TNBS control group. EcO83 administered in adulthood has milder protective effect compared to early postnatal application.

Discussion

The early postnatal EcO83 administration promoted gut barrier function together with immunoregulatory capacity. Barrier function seems to be critical in preventing inflammatory bowel disease development. Similarly, the capacity of EcO83 to trigger and maintain immunoregulatory responses limiting origination of inappropriate pro-inflammatory responses could contribute to the observed protective effective and lower inflammation in EcO83 treated mice. Nevertheless, further studies are needed to clarify the long-term effects of early probiotic administration on both microbiota and host immune system in adulthood.