Abstract

The gut microbiota is crucial for maintaining physiological balance and influences metabolic processes, immune responses, and intestinal barrier function. Dysbiosis, or the imbalance of microbial composition, is associated with a range of health complications, including chronic inflammatory conditions such as non-specific intestinal inflammations. Inflammatory processes associated with dysbiosis and changes in microbial metabolites can directly affect the activation of neutrophils, impacting the pathogenesis of various diseases. Probiotics, defined as live microorganisms which, when administered in adequate amounts, confer a health benefit on the host, offer the potential for positive modulation of these inflammatory conditions

The aim of this thesis was to explore how experimentally induced intestinal dysbiosis affects the heterogeneity of neutrophils in the bone marrow. Dysbiosis was induced by administering antibiotics to mice, which were subsequently treated with the probiotic strain *Escherichia coli* O83:K24:H31 (EcO83). Neutrophil phenotypes were assessed using flow cytometry based on the expression of surface markers CD11b, Ly6G, CD62L, and CXCR2. Meanwhile, gene expression related to their antimicrobial functions and the inflammatory environment was analyzed by quantitative PCR.

The results presented in this thesis showed that dysbiosis significantly affects the presence of cellular populations in the bone marrow, particularly $CD11b^{+}Ly6G^{+}$ neutrophils and their subpopulations with variable expression of $CD62L^{+/-}$ and $CXCR2^{+/-}$. A significant impact of dysbiosis on the permeability of the epithelium in both the small and large intestines and the modulation of cytokine production in various tissues was observed, along with the corrective effect of the given probiotic.

Within this thesis, certain insights into the interactions between gut microbiota and neutrophils, which are crucial for the organism's defense capabilities, were identified. The probiotic intervention with EcO83 demonstrated potential for restoring and stabilizing microbial diversity, suggesting the possibility of using probiotics

therapeutically to modulate immune functions in the context of gastrointestinal and systemic diseases associated with dysbiosis.

Keywords: Neutrophils, dysbiosis, cytokines, antibiotics, probiotics, *Escherichia coli*