

Characteristics of Intestinal Microecology during Mesenchymal Stem Cell-Based Therapy for Mouse Acute Liver Injury

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Background: The mechanisms of mesenchymal stem cell (MSC) transplantation to protect against acute liver injury have been well studied within the liver. However, the associated changes in the intestinal microbiota during this process are poorly understood.

Methods: In this study, compact bone-derived MSCs were injected into mice after carbon tetrachloride (CCl₄) administration. Potential curative effect of MSC was evaluated by survival rate, biochemical and pathological results. Overall structural changes of microbial communities and alterations in the intestinal microbiota were assessed by sequenced 16S RNA amplicon libraries from the contents of the cecum and colon.

Results: MSCs significantly reduced the serum levels of aspartate transaminase and alanine transaminase and improved the histopathology and survival rate. Lower expression and discontinuous staining of zonulaoccludens, as well as disrupted tight junctions, were observed in CCl₄-treated mice at 48 h compared with MSC-transplanted mice. Moreover, MSC transplantation led to intestinal microbiota changes that were reflected in the decreased abundance of Bacteroidetes S24-7 and Bacteroidaceae and increased abundance of Firmicutes Clostridiales, Rumino coccaceae, and Lacto bacillus at the initial time point compared with that in CCl₄-treated mice. In addition, phylogenetic investigation of communities by the reconstruction of unobserved states (PICRUSt) based on the Green genes database revealed functional biomarkers of MSC-transplanted mice involved in cell motility, signal transduction, membrane transport, transcription and metabolism of lipids, cofactors, and vitamins, terpenoids and polyketides, as well as xenobiotics.

Conclusion: MSC infusion may be related to initial alterations on intestinal mucosal biology and homeostasis, which benefit liver repair.

Keywords: Mesenchymal stem cell, acute liver injury, intestinal, microbiota, microecology