Understanding of mesenchymal stem cells (MSCs) immunoregulatory mechanism in the eosinophilic and neutrophilic lung inflammation.

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Introduction

Nowadays, a perspective of stem cell-based therapy holds a great promise for inflammatory diseases, including asthma. Due to immunosuppressive properties and regenerative potential, mesenchymal stem cells (MSCs) seem to be an exciting perspective.

Aim

To understand the mechanism of MSC-mediated immunomodulation in experimental asthma models.

Material and methods

C57/BL6 mice were challenged for 14 days with 10 µg/ml or 100 µg/ml house dust mite (HDM) extract, to induce eosinophilic and neutrophilic lung inflammation, respectively. Additionally, mice were administrated with adipose tissue-derived MSCs on the 6th or 13th day of the experiment. On the 15th day, mice were sacrificed. Histological staining was performed to assess the pathological changes within the lung tissue. Moreover, RNA

isolated from the whole lung was subjected to next-generation sequencing (NGS). Data were analyzed using the "R" software and Ingenuity Pathway Analysis (IPA)

Results

First, we confirmed the decrease in inflammation and collagen deposition within the lung after MSCs administration. Whole lung transcriptomic profiling revealed different regulatory patterns among the groups. Interestingly, we found a relatively low number of genes commonly regulated in both models, while the majority were differentially regulated. Moreover, bioinformatic analysis revealed unique differentially regulated canonical and noncanonical pathways in eosinophilic (IL-7, PD-1/PDL-1, p38MAPK signaling), and neutrophilic lung inflammation (lipid mediators signaling) after MSC administration.

Conclusions

We found novel putative immunological and metabolic mechanisms of MSC-mediated suppression of eosinophilic and neutrophilic lung inflammation, respectively.