Mesenchymal stromal cell

Mesenchymal stem/stromal cells (MSCs) are multipotent cells with immunomodulatory effects that have been attempted as a possible treatment for neurologic disorders.

Since currently available drugs for neurologic disorders are limited, special attention has been paid to MSCs. With the ability to differentiate into neural cells, it has been shown that MSCs exert their effects in a paracrine manner by producing extracellular vesicles (EVs). Extracellular vesicles are small vesicles with a size of 30-1000 nm that are released by cells, such as MSCs, T cells, B cells, etc. EVs contain various molecules, including proteins, lipids, mRNAs, and microRNAs (MicroRNAs). In recent years, the administration of EVs in models of neurological disorders has been shown to improve neurological dysfunctions. MicroRNAs from MSC-EVs as one of the important mediators which regulate various genes and reduce neuropathological change have been identified in different neurological disorders. Here, we review the effects of EVs MicroRNAs from MSCs on different neurological disorders and their potential applications [1)].

They) are widely used in clinical trials because of their ability to modulate inflammation. The success of MSCs has been variable over 25 years, most likely due to an incomplete understanding of their mechanism. After MSCs are injected, they traffic to the lungs and other tissues where they are rapidly cleared. Despite being cleared, MSCs suppress the inflammatory response in the long term. Using human cord tissue-derived MSCs (hCT-MSCs), Min et al. demonstrated that hCT-MSCs directly interact and reprogram monocytes and macrophages. After engaging hCT-MSCs, monocytes and macrophages engulfed cytoplasmic components of live hCT-MSCs, then downregulated gene programs for antigen presentation and costimulation, and functionally suppressed the activation of helper T cells. They determined that low-density lipoprotein receptor-related proteins on monocytes and macrophages mediated the engulfment of hCT-MSCs. Since a large amount of cellular information can be packaged in cytoplasmic RNA processing bodies (p-bodies), we generated p-body deficient hCT-MSCs and confirmed that they failed to reprogram monocytes and macrophages in vitro and in vivo. hCT-MSCs suppressed an inflammatory response caused by a nasal lipopolysaccharide challenge. Although both control and p-body deficient hCT-MSCs were engulfed by infiltrating lung monocytes and macrophages, p-body deficient hCT-MSCs failed to suppress inflammation and downregulate MHC-II. Overall, we identified a novel mechanism by which hCT-MSCs indirectly suppressed a T-cell response by directly interacting and reprogramming monocytes and macrophages via p-bodies. The results of this study suggest a novel mechanism for how MSCs can reprogram the inflammatory response and have long-term effects to suppress inflammation [2)].

Cell therapy using mesenchymal stromal cells (MSCs) offers new perspectives in the treatment of traumatic brain injury (TBI).

see Autologous bone marrow mesenchymal stromal cell.

see Mesenchymal stem cells.

Stefani et al., showed that mouse bone marrow-derived mesenchymal stromal cells (MSCs), when primed with low-dose irradiation (irMSCs), undergo changes in their immunogenic and angiogenic capacity and acquire anti-tumoral properties in a mouse model of glioblastoma (Glioblastoma).

Following grafting in GL261 glioblastoma, irMSCs migrate extensively and selectively within the tumor and infiltrate predominantly the perivascular niche, leading to rejection of established tumors and cure in 29% of animals. The therapeutic radiation dose window is narrow, with effects seen between 2 and 15 Gy, peaking at 5 Gy. A single low-dose radiation decreases MSCs inherent immune suppressive properties in vitro as well as shapes their immune regulatory ability in vivo. Intra-tumorally grafted irMSCs stimulate the immune system and decrease immune suppression. Additionally, irMSCs enhance peri-tumoral reactive astrocytosis and display anti-angiogenic properties. Hence, the present study provides strong evidence for a therapeutic potential of low-dose irMSCs in cancer as well as giving new insight into MSC biology and applications [3].

1)
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2)
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