Effects of Autoimmune Disease on Mesenchymal Stem Cells

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Background
- Mesenchymal stem cells (MSCs) have a broad-ranging clinical potential and are a central building block in tissue engineering.
- There are over 950 registered MSC clinical trials with the FDA, with over 10,000 patients.
- The most common and longest utilized source for MSCs are bone marrow and adipose tissue.
- Currently, it is believed that MSCs therapeutic ability comes from their ability to produce factors and cytokines that stimulate tissue repair, modulate inflammation, and direct immune responses.

Figure 1. Sources of MSCs. MSCs can be obtained from many different tissues. Many studies collected for this analysis observed MSCs obtained from bone marrow and adipose tissue.

Figure 2. MSCs regulate immune cells. MSCs have the ability to exert effects on immune cells.
- Although therapeutic efficacy of these cells has been clearly demonstrated in different disease animal models and in numerous human phase III clinical trials, only very few phase III trials using MSCs have demonstrated the expected potential for therapeutic benefit.
- A major controversy is to use autologous or allogeneic MSCs.

Alllogeneic VS. Autologous

Figure 3. Autologous source vs Allogeneic source. This demonstrates where autologous MSCs are obtained in comparison to allogeneic MSCs.

Figure 4. Autologous vs. Allogeneic Therapy. There are advantages and disadvantages of both therapies. However, autologous therapy remains the desired practice to avoid increased risks.

Materials & Methods

Figure 7. Methods for collecting relevant records. This is the direction of which the literature searches are being conducted to collect data for the meta-analysis.

Current Study
- Our hypothesis: There is a common biomarker / panel of biomarkers that indicate a healthy MSC donor.
- Aim 1: Meta-Analysis to determine potential candidates
- Aim 2: Verify in presence of donors
- Aim 3: Evaluate pre-clinical effects of selected markers in vitro and in vivo

Figure 5. MSCs from MS mouse are not therapeutic. MS mice treated with MS-MSCs were ineffective, while MS mice treated with healthy MSC had delayed onset and reduced disease severity. (Zhang et al.)

Figure 6. MSCs from 60+ yo humans are not therapeutic in mouse model of MS. MSCs from persons under the age of 35, but not over the age of 60, were effective in treating a mouse model of MS. (Sinagra et al.)

Figure 8. Multiple sclerosis results. Results obtained from a single researcher by conducting literature search for all four search terms in PubMed and Scopus search engines.

Results
- Autoimmune disease alters the gene expression of MSCs.
- In each disease family, there are still discrepancies if genes are upregulated or downregulated.

Table 2. Autoimmune diseases alter MSC gene expression. There are differentially expressed genes when observing MSCs from pathology in comparison to healthy MSCs.

Future Directions
1. Identify biomarkers in elder and slavish populations.
2. Investigate biomarkers in elder and slavish populations.

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References