**Improved Retention of Interleukin-10 Modified Stem Cells is Seen in a Scaffold in vivo**

Carolyn Holladay,¹ Thomas Ritter², Michael Sefton³, Mary Murphy², Timothy O’Brien², Abhay Pandit¹

¹Network of Excellence for Functional Biomaterials; ²Regenerative Medicine Institute, Galway, Ireland; ³Institute of Biomaterials and Biomedical Engineering, University of Toronto, Canada

abhay.pandit@nuigalway.ie

**Introduction**

Stem cell therapy is a possible treatment for a variety of conditions including myocardial infarction. However, limited benefits have been observed in clinical trials, possibly due to very low stem cell survival rates. In a recent study on stem cell injection into infarcted hearts, Pons et al. demonstrated that after 24 hours, only 10% of the transplanted stem cells remained in the infarct area (1). It is hypothesized that stem cell retention within a graft can be improved by modifying cells to produce interleukin-10 (IL-10), an anti-inflammatory cytokine and delivering the cells via a scaffold.

**Materials and Methods**

Rat mesenchymal stem cells (rMSCs) were stably transfected non-virally and selected for 6 weeks in G418 media. Scaffolds were loaded with 200,000 normal or IL-10 modified rMSCs, stained with CM-DiI, and implanted into the backs of syngeneic Lewis rats. At each time point, the animals were euthanized and patches explanted. Stereology was used to determine volume fraction of stem cells in the implants. ELISA was used to determine IL-10 level in the tissue. ANOVA was used to determine statistical significance over time. Student’s t-test was used to compare samples at each time point.

**Results**

![Figure 1: Representative micrographs of normal and IL-10 modified rMSCs in explanted patches at each timepoint. The rMSCs are red, and nuclei are stained with DAPI (blue). The scale bar represents 50 µm.](image)

Stereological analysis of explanted patches indicated that the volume fraction of rMSCs within the implant was significantly greater in patches containing IL-10 modified rMSCs than in patches containing normal rMSCs after 7 and 21 days in vivo, as shown in Figure 2.

![Figure 2: Volume fraction of normal (■) and IL-10 modified (□) rMSCs in explanted scaffolds at 2, 7 and 21 days. rMSC volume fraction did not change over time in the IL-10 modified group, but the volume fraction in the unmodified group significantly decreased. The IL-10 modified rMSCs have a significantly higher volume fraction at 7 days (n=6, p<0.05).](image)

**Discussion and Conclusions**

Thus, the volume fraction of the stem cells within the implant area was significantly increased by modifying the stem cells to increase IL-10 secretion levels. This difference was significant at 7 and 21 days. While there was a significant decrease in stem cell volume fraction in the normal rMSC group, there was no significant change in the volume fraction of IL-10 modified stem cells over time.

**Reference**


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