

In Vitro Study Of BMP-2 Gene Transfected Bone Marrow Derived Mesenchymal Stem Cells In APA microcapsules

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INTRODUCTION An alternative approach to somatic gene therapy is to deliver a therapeutic protein by implanting non-autologous recombinant cells that are immunologically protected from graft rejection with alginate microcapsules. This study is to investigate the in vitro characterization of BMP-2 gene modified bone marrow derived mesenchymal stem cells(MSCs) encapsulation in alginate.

METHODS: An electrostatic droplet generator was employed to produce BMP-2 or β -gal (control gene) gene modified MSCs encapsulated in alginate-poly-L-lysine alginate (APA) microcapsules. The viability of the encapsulated cells was demonstrated by the X-gal staining. The BMP-2 proteins secreted from the encapsulated gene modified stem cells were determined by the ELISA methods. An co-culture system (fig.1) was used to evaluate the effects of gene products from the microcapsules on the non-gene modified MSCs.

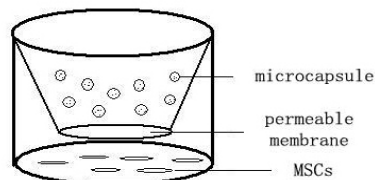


Fig.1: Co-culture system: permeable membrane (pore size:7 μ m) permits diffusion of media components

RESULTS: The X-gal staining of the encapsulated cells were still positive 28 days after encapsulation(fig.2). The secreted BMP-2 proteins could be detected 30 days after encapsulation(fig.3). The ALP activity in co-cultured MSCs was higher than it was in control group with statistical significant difference($P<0.05$) which indicated that the gene products could induced the MSCs differentiated into the osteoblast.

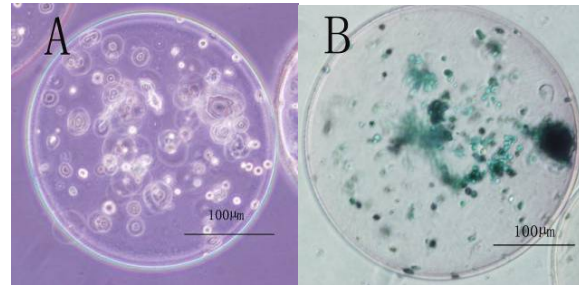


Fig.2: A: microcapsule with good shape. B: X-gal staining at the 28th day after microencapsulation

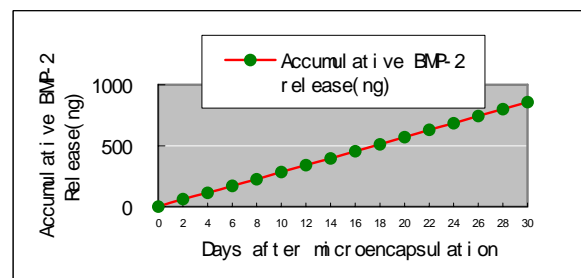


Fig.3: Accumulative BMP-2 release from the encapsulated cells

DISCUSSION & CONCLUSIONS: The results demonstrated that the gene modified cells could survive in the APA microcapsules and were capable of a constitutive synthesis and delivery of biologically active BMP-2 proteins for at least 28 days and thus are of potential utility for enhancement of bone repair and bone regeneration. Both in vitro and in vivo study is needed to evaluate the immuno-isolation effect of the microcapsules in the future.

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