

## Forming Chondral-like Tissues in 3D Tri-copolymer Scaffolds and Cultured in the Self-designed Bioreactor

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### **Abstract**

Cartilage of human beings has a relatively slow metabolism in comparison with other normal tissues; damage to cartilage is of great clinical consequence since the limited intrinsic healing potential. Cartilage tissue engineering is a rapidly emerging field which holds great promise for function repair and artificial/engineered tissue substitutes. However, current clinical therapies for cartilage repair are still less than satisfactory and rarely recover full function or return the pathological tissue to its native normal state. A small molecule, kartogenin (KGN), can promote chondrocytes differentiation both in vitro, and in two osteoarthritis animal models. The purpose of this research is aimed to optimize the chondrogenic process in mesenchymal stem cells (MSCs) based chondrogenic constructs to provide a potential for KGN usage in cartilage tissue engineering. From this study, we demonstrated that KGN treatment can promote MSCs condensation and cell clusters formation within tri-copolymer scaffold. *Acan*, *Sox9* and *Col2a1* gene expression were significantly up-regulated in three dimensional (3D) culture condition. The lacunae-like structure showed active deposition of type II collagen and aggrecan deposition. Based on the current results, the combination of tri-copolymer/MSCs with KGN successfully induced the chondrogenesis process in both genetic and morphologic aspect. Culturing in the self-designed bioreactor system becomes more possible while small molecule is used instead of growth factors. We expect that this research provides an example for small molecule regulated practice and thus offer a new combination for cartilage tissue engineering.