Self Healable Double Network Tough & Adhesive Hydrogel for Stem Cell Laden Artificial Cartilage

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Functional artificial cartilage replacing and facilitating regeneration of damaged cartilage has been spotlighted for cartilage recovery. Further, Stem cell therapy has been attracting attention as a solution for healing damaged tissue. However, strategy for stem cell therapy with artificial cartilage was still challenging to figure out maintain of cell activity o lesion site without loss. In this study, mussel adhesive protein (MAP) hydrogel was used to overcome the disadvantages of existing stem cell therapies. MAP has been researched on tissue engineering by focusing on its strong adhesiveness and biocompatibility. In this research, we design novel type of MAP containing histidine (His) to contribute metal coordination with conserving non cross-linked free 3,4-dihydroxyphenylalanine (DOPA) to increase adhesiveness of the hydrogel. To provide optimal condition for cartilage regeneration, toughness and self-healing was introduced in hydrogel by introducing multi-arm polyethylene glycol (PEG) crosslinking and metal coordination. The double networked hydrogel was constructed through EDC/NHS and zinc ion coordination and it showed compatible cytotoxicity *in vitro* cell culture system.