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Cell-Instructive Hydrogel for a Control of Stem Cell Phenotype

Kuen Yong Lee, Hyo-Seok An and Jae-Won Lee

Department of Bioengineering, Hanyang University, Republic of Korea

Controlling the cell phenotype using synthetic extracellular matrices such as hydrogels has been widely investigated, and especially a use of cell-instructive systems is essential to regulate the phenotype of mesenchymal stem cells (MSCs). In this presentation, we report a biomimetic system that provides a stem cell niche using cell-instructive alginate-based microgels. Alginate microgels were prepared by the water-in-oil emulsion method, solidified in the presence of calcium chloride, and then modified with a peptide derived from E-cadherin receptor. Chondrogenic differentiation of MSCs is typically influenced by cell aggregate formation and cadherin is a key factor in mediating cell-cell interactions. These spherical microgels with a similar size to that of cells formed an aggregate in the presence of MSCs, resulting in excellent cell viability and enhanced chondrogenesis *in vitro*. This approach to controlling cell-interactive features of hydrogels may be useful in 3-D stem cell culture and tissue engineering applications.