Aptamer-Functionalized Hydrogel as Biomimetic Extracellular Matrix for Protein Sequestration and Cell Attachment

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The extracellular matrix (ECM) has the functions of providing mechanical support to the tissue via cell attachment and a reservoir of biomolecules for biochemical stimulation of cells. Hydrogels have flexibility in tuning mechanical properties, but they usually lack the ability to interact with cells and sequester biomolecules. Aptamers have high binding affinities and specificities towards their target molecules. They can be used to functionalize hydrogels, and allow for interaction with cells and biomolecules. We developed a dual aptamer-functionalized hydrogel to achieve the binding of cells and the sequestration of proteins with the objective of mimicking the extracellular matrix.

The dual aptamer-functionalized hydrogel exhibited a macroporous structure, which allowed for subsequent loading of growth factors. With the aptamer against vascular endothelial growth factor (VEGF), we found that the aptamer-functionalized hydrogel could retain VEGF for sustained release. The aptamer against c-MET receptor promoted endothelial cell attachment within the hydrogel. The work demonstrates the potential of dual aptamer-functionalized hydrogel as a biomimetic ECM.