

Biomimetic Approaches for Regeneration

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Scaffolds provide three-dimensional environments for stem cells and serve as templates for tissue regeneration. Our lab develops biomimetic scaffolds that recapitulate advantageous features of the extracellular matrix (ECM) and impart engineering design to facilitate regeneration. Novel phase separation techniques have been developed to create ECM-mimicking nanofibrous scaffolds. Porous network design facilitates cell seeding/migration, mass transport, and tissue regeneration. To minimize surgical intervention, we developed biodegradable polymers that can self-assemble into nanofibrous hollow microspheres as novel injectable scaffolds. To mimic the biomolecular activities in development, we have developed scaffolds that release various biological molecules in a controlled fashion to direct cell fate and function. These biomimetic approaches have been demonstrated to advantageously facilitate stem cell-based regeneration.