

Engineering biomolecular microenvironments for cell instructive biomaterials

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Engineered cell instructive microenvironments with the ability to stimulate specific cellular responses is a topic of high interest in the fabrication and development of biomaterials for application in tissue engineering. Cells are inherently sensitive to the in vivo microenvironment that is often designed as the cell “niche”. The cell “niche” comprising the extracellular matrix and adjacent cells, influences not only cell architecture and mechanics, but also cell polarity and function. Extensive research has been performed to establish new tools to fabricate biomimetic advanced materials for tissue engineering that incorporate structural, mechanical and biochemical signals that interact with cells in a controlled manner and to recapitulate the in vivo dynamic microenvironment. Bioactive tunable microenvironments using micro and nanofabrication have been successfully developed and proven to be extremely powerful to control intracellular signaling and cell function. This review is focused in the assortment of biochemical signals that have been explored to fabricate bioactive cell microenvironments and the main technologies and chemical strategies to encode them in engineered biomaterials with biological information.