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Biphasic gels for regenerative applications

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Abstract

Polymeric gels are widely used for regenerative medicine to control the functions of cells and drug delivery applications. Molecular structure and corresponding 3-dimensional architecture of the gels play a major role in regulating these functions in regenerative applications. Molecularly, most polymeric gel materials are homogenous in nature and forms gel like structure in presence of suitable solvent, most commonly water. As a result, these gels are often limited to exert differential signal at the molecular level. To address this, biphasic polymeric gel materials are developed by coupling segments with different physicochemical characteristics. Specifically, these biphasic gels are designed from polyethylene glycol and urethane segments and through molecular engineering of different segments. Depending on the segmental structure, these biphasic gels exhibits molecular properties which can be adapted to encapsulate therapeutic molecules, controlled release kinetics, and cellular functions. Preliminary analysis shows that biphasic gels developed from biocompatible segments are capable to encapsulate and release model drug molecules and biological macromolecules. Additionally, these materials were able to control adult stem cells structure and functions which can be used for tissue regeneration. In general, the versatile character of biphasic gel materials represents a novel class of biological material which can be adaptable to different conditions and applications.

Biography

Debanjan Sarkar is an Assistant Professor in the Department of Biomedical Engineering at University at Buffalo, State University of New York. He completed his Ph.D. from University of Akron and postdoctoral studies from Harvard Medical School, Brigham and Women's Hospital. His research focuses on biomaterial based engineering of stem cell for tissue engineering and drug delivery. He has published more than 15 papers in reputed journals, and has 5 patent applications. Additionally, he has coauthored several book chapters and presented in many conferences.