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Fabrication of chitosan-polyvinyl alcohol and silk electrospun fiber seeded with differentiated keratinocyte for skin tissue regeneration in animal wound model

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Hybrid fibrous mat containing cell interactive molecules offers the ability to deliver the cells and drugs in wound bed, which will help to achieve a high therapeutic treatment. In this study, a coelectrospun hybrid of polyvinyl alcohol (PVA), chitosan (Ch) and silk fibrous mat was developed and their wound healing potential by localizing bone marrow mesenchymal stem cells (MSCs)- derived keratinocytes on it was evaluated in vitro and in vivo. It was expected that fabricated hybrid construct could promote wound healing due to its structure, physical, biological specifications. The fabricated fibrous mats were characterized for their structural, mechanical and biochemical properties. The shape uniformity and pore size of fibers showed smooth and homogenous structures of them. Fourier transform infrared spectroscopy (FTIR) verified all typical absorption characteristics of Ch-PVA+Silk polymers as well as Ch-PVA or pure PVA substrates. The contact angle and wettability measurement of fibers showed that mats found moderate hydrophilicity by addition of Ch and silk substrates compared with PVA alone. The mechanical features of Ch-PVA+Silk fibrous mat increase significantly through co-electrospun process as well as hybridization of these synthetic and natural polymers Higher degrees of cellular attachment and proliferation obtained on Ch-PVA+Silk fibers compared with PVA and Ch-PVA fibers. In terms of the capability of Ch-PVA+Silk fibers and MSC-derived keratinocytes, histological analysis and skin regeneration results showed this novel fibrous construct could be suggested as a skin substitute in the repair of injured skin and regenerative medicine applications.

Biography

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