Biomimetic Herbal Cellulosic Scaffolds: Toward Feasible 3D Scaffolds for Human Tissue Engineering

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Abstract

Herbal-derived cellulosic matrices have recently absorbed high attention as customizable and defect-fillable scaffolds for human tissue engineering mainly due to their capability to mimic microenvironment for cell attachment, regeneration, and differentiation. However, A lack of a reproducible approach for the preparation of the scalable three-dimensional plant-derived scaffolds pushes scientists to seek a feasible protocol for their decellularization that provides ideal extracellular matrices for 3D human tissue culture. Though some decellularization tactics may work on certain plants, some approaches destroyed their mechanical features like surface roughness, hydrophilicity, mechanical properties, porous constructions, and lattice structures. Present work aimed to investigate various alternative methods for the acellularization of different plant tissues including aloe vera, avocado, radish, zucchini, and watermelon to create a cellulosic scaffold for human bone regeneration. Obtained samples were assessed using a microscope after dyeing with safranin O as well as scanning electronic microscope (SEM) for the effects of decellularization on the diversity in the structure and shape of these scaffolds, and osteogenic induction of the mesenchymal stromal cells. Data presented here paved the way for selecting the best way to provide a suitable approach for preparing 3D natural scaffolds for different specific applications in human tissue engineering and regenerative medicine.

Keywords: Decellularization, 3D plant derived scaffold, Mesenchymal stromal cells, tissue regeneration

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