Decellularized spinal scaffold

A series of complex influencing factors lead to failure of neural regeneration after spinal cord injury (SCI). Up to now, there is no robust treatment that can restore the loss of function caused by injury. Because damaged spinal axons do not spontaneously regenerate in their naturally inhibitory microenvironments, biomaterials that induce neural regeneration to appear as attractive treatments to improve the microenvironmental conditions after SCI. In this study, we report the novel use of decellularized (DC) scaffolds to provide contact guidance for axonal regrowth in vivo. The idea is that the scaffolds comprise some cytokines and a physical compartment that may facilitate regeneration. To evaluate the efficacy of scaffolds in supporting neural regeneration after SCI, the scaffold was implanted into an injured spinal cord of the rat. The injured spinal scaffolds showed a significant increase of the expression of GAP43, NF200 and Nestin in the scaffold implant groups compared with controls without the scaffold. In addition, the motor function has a better recovery. Together, these results demonstrate that spinal acellular scaffold is capable of promoting Axon regeneration after SCI and may serve as a potential tool in the treatment of spinal cord injury [1].

Allogeneic organ transplantation remains the ultimate solution for end-stage organ failure; however, shortage of donor organs has resulted in extending transplantation waiting lists. Body organs are complex structures, mostly composed of various collections of tissues, made up of various extracellular matrixes and cellular components. In the field of regenerative medicine, organs are decellularized to remove cellular components to produce acellular extracellular matrix (ECM) or as known as Decellularized scaffolds. These scaffolds, since they lack cellular components and maintain ECMs, are “rejectless” when implanted, able to act as an inductive template for recellularization.

Decellularized scaffolds have become an emerging approach for treatment. The clinical use of decellularized scaffolds has been documented for applications such as blood vessels, cardiac valves and renal bladders. Even though, the current applications may be limited to tissue-level and anatomically simple organs, they ultimately provide the foundation for future complex and functioning organs regeneration.

The use of decellularized scaffolds in regenerative medicine has provided several breakthroughs recently. Despite the variability in modalities and organs used, these scaffolds have been proved a capacity to promote regeneration. In vitro studies, relying on bioreactors, researchers investigated the effect (role) of these scaffolds on cell proliferation and organ construction. In vivo implantations of decellularized scaffolds explored the effect of the scaffold on promoting angiogenesis and local regeneration.

This rapid burgeoning of knowledge has spawned an expanding gap between research and clinical application [2].

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Zhu J, Lu Y, Yu F, Zhou L, Shi J, Chen Q, Ding W, Wen X, Ding YQ, Mei J, Wang J. Effect of decellularized spinal scaffolds on spinal axon regeneration in rats. J Biomed Mater Res A. 2017 Oct 7. doi: 10.1002/jbm.a.36266. [Epub ahead of print] PubMed PMID: 28986946.
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https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5295461/