Fabrication of aligned porous collagen scaffolds having dispersed reduced graphene oxide (RGO)

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Collagen is a major structural protein of connective tissues and a material attracting attention because of a good biocompatibility in the field of tissue engineering. In this study, we fabricated a collagen scaffold with conductivity using the fact that cell activity can be actively generated under an electrical stimulus. In order to import conductivity, graphene oxide was dispersed into collagen suspension by ultra-sonication. Then, it was reduced by adding L-ascorbic acid as a reducing agent. We induced an aligned porous structure by directional freezing and lyophilizing at -55℃ for directional cell growing when the collagen scaffold is planted in the cell. Cross-linking of collagen was followed to enhance the mechanical properties of the collagen scaffolds. Successful cross-linking was obtained by immersing the scaffolds in 50 mM N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride solution in 95% ethanol for 24hr at room temperature. We confirmed the structures of the collagen scaffolds with different concentration of RGO and freezing conditions.