Biomimetic Construction of 3D Cardiac Tissue Based on Aligned Nanofibers/Hydrogel Composite Scaffolds

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The anisotropic and oriented structure of cardiac tissue are compatible with the biophysical properties and the pumping function of the heart. Specifically, cardiac fibers are parallel and oriented, but from the endocardium to the epicardium, the orientation of fibers is gradually deflected. Many advances have been achieved to guide the cellular alignment, but few to individually control the 3D multi-layers orientation, and achieve sufficient contact of the cells between layers. Herein, we propose a 3D composite scaffold based on the aligned PLGA electrospinning nanofiber membranes encapsulated by collagen hydrogel to mimic the anisotropic structure and extracellular matrix of native cardiac tissue. The results show that the scaffold with aligned nanofibers has the ability to induce cells anisotropic arrangement, maturation and directional beating. The 3D hydrogel environment also provides potential for future endothelialization studies.

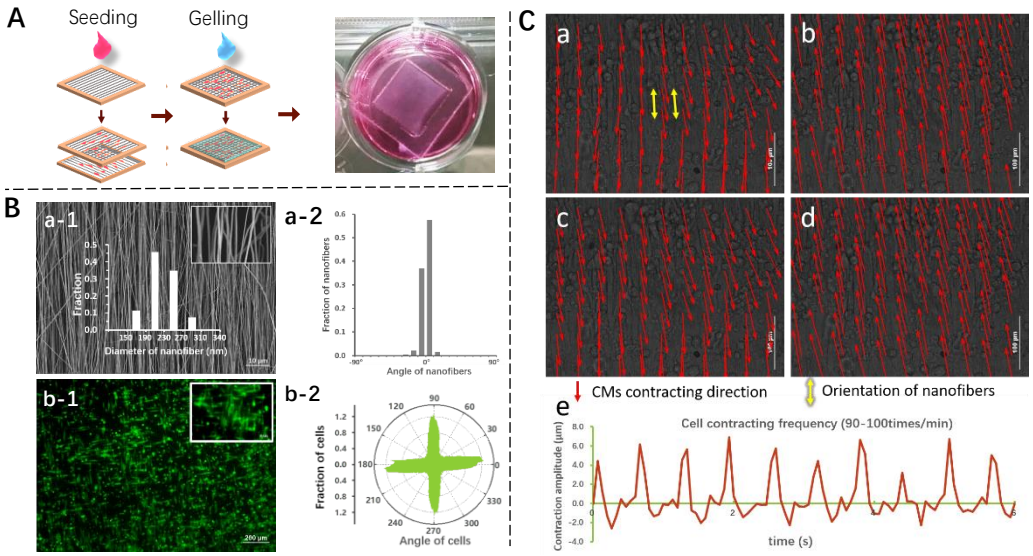

Figure 1. **A)** The process of constructing 3D cardiac tissue. **B)** (a)The SEM image of aligned nanofiber film, and the orientation distribution, (b)Fluorescence staining of orthogonal double-layer CMs, and the angle of cells. **C)** (a-d) The orientation of CMs contracting, and (e)the CMs contracting frequency.

Reference

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