Tissue engineering

Tissue engineering is a biomedical engineering discipline that uses a combination of cells, engineering, materials methods, and suitable biochemical and physicochemical factors to restore, maintain, improve, or replace different types of biological tissues.

Biological aspects require that the material used be non-toxic, non-irritating, non-carcinogenic, and biocompatible [1)]

The utilization of epidermal stem cells for wound healing and tissue regeneration has been attracting increased attention from researchers. In addition, the advances in tissue engineering have increased the interest in applying EPSCs in tissue-engineered scaffolds to further reconstitute injured tissues [2) 3)].

A high-throughput cell-assembly method, with the advantages of adjustability, ease of operation, and good precision, is remarkable for artificial tissue engineering. Here, we present a scientific solution by introducing high rotational symmetrical coherent acoustic waves, in order to enable the shape and arrangement of the acoustic potential wells to be flexibly modulated, and therefore to assemble on a large area diverse biomimetic arrays on a microfluidic platform. Ring arrays, honeycomb, and many other biomimetic arrays are achieved by real-time modulation of the wave vectors and phase relation of acoustic beams from six directions. In the experiments, human umbilical vein endothelial cells (HUVECs), arranged in ring structures, tend to connect with the adjacent cells and reach confluency, thus directing the in vitro two-dimensional vascular network formation. Higher rotational symmetry of the six coherent acoustic waves provides much more flexibility and diversity for acoustic cell assembly. With the advantages of efficiency, diversity and adjustability, this acoustic chip is expected to fulfill many applications, such as in biochemistry, bioprinting and tissue engineering related research [4)].

see intervertebral disc tissue engineering.

1)
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