The Torch
Vol. 3 (31)

From 3D to 4D

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With the innovation of 3D technology, came the advancement of artificial printing tissues and organs technique. The 3D technology used an appropriate static scaffold on which cells grew when kept inside a biochamber filled with nutrients on reception of appropriate stimuli or signals. This scaffold was the most important aspect of the entire technology. For example, artificial ears were built using a biodegradable scaffold of the ear. However, a static scaffold posed the problem in making tissues that move or change shape on receiving any particular stimulus. A high density of cells was also not supported by scaffolds, which if used can help in better cellular interaction, promoting better tissue development. To bring a relief to this, there is the recent development of gelatin-like hydrogels based 4D materials. These hydrogels can change shape depending on water absorption which can be in turn used for formation of blood vessel like structures. These are easily biodegradable and show enormous cell compatibility along with supporting high cell densities. By modulating the concentration and crosslinking of the polymer, the rate of water absorption and the rate of change in shape can be controlled. Thus, the 4D bioprinting technology and the 4D materials show great promise towards the brighter new of developing more complex structures and in turn, more complex systems.

Keywords: 3D bioprinting, Artificial tissues, 4D materials, Hydrogels, Scaffold, Stimuli

Citation:
Anwesha Laha. From 3D to 4D. The Torch. 2022. 3(31). Available from:
https://www.styvalley.com/pub/magazines/torch/read/from-3d-to-4d.