Commentary
Volume 12:7, 2021

Journal of Tissue Science and Engineering

ISSN: 2157-7552 Open Access

Applications in Biofabrication and Formation of Microtissues

Bowlin Speer*

Department of Biomedical Engineering, University of Memphis, Tennessee, United States

About the Study

The *in vitro* creation of massive, solid organs with high density of living cells is a key issue in the field of biofabrication. In order to sustain cell viability, diffusion of oxygen and nutrients, as well as the elimination of metabolic waste products, limit existing designed tissues to thicknesses of about 100-200 m. Natural organs and tissues are significantly larger, with a branching circulatory network that perfuses the entire organ and ensures that all cells have appropriate nutrition and oxygen supply.

While the science of biofabrication and tissue engineering tries to overcome this critical barrier, the field of induced pluripotent stem cells stem cells is well on its way to offering a copious source of immune-matched cells for a range of tissues and organs. Although we don't now have a way to make huge 3D organs and tissues *in vitro* from this supply of cells, multicellular building blocks could be beneficial in the future.

Microtissue building blocks can't make big vascularized organs *in vitro* in their current state, but they can resemble the size and complexity of pancreatic islets, which have diameters of about 200 microns. With the right supply of differentiated cells, technologies like micromolds, which can be scaled up, could create enough islets for transplantation to attain insulin independence. Building blocks may be useful in the quest to manufacture big vascularized organs *in vitro* if they are integrated with other biofabrication technologies.

Bioprinting, a cutting-edge technology detailed in another chapter of this book, is based on the idea of inkjet printing and employs cells and ECM materials to layer-by-layer produce 3D constructions. Micro-mold-produced building blocks could be used as a bioprinting material. Another technology that could be integrated with microtissue building blocks is cell sheets. Culturing cells coupled to a thermo-responsive polymer produces cell sheets.

When the cells attain confluence, the temperature is lowered, allowing an intact cell sheet to be released. To make larger structures, building blocks with fixed shapes can be coupled with cell sheets. Finally, scaffolds and building blocks might be merged, which is a big and active area of research. The many natural and synthetic scaffolds that have been designed for cell attachment will easily connect to and spread on the building blocks.

There are major obstacles to overcome if the goal is to create a big vascularized organ *in vitro* using only building blocks, and it is instructive to explore these challenges in the context of current development in that direction. Building blocks, regardless of their shape, self-assemble in 24 to 48 hours from mono-dispersed cells. Micro-molds can be scaled up to make enough building blocks, and building blocks can be manufactured as very big structures, requiring fewer pieces for assembly.

Because these building parts can be merged in 48 to 72 hours, assembling a massive structure from individual sections may theoretically be done in a short amount of time. This, of course, is dependent on the amount of time it takes for the cells to mature, and it does not include the time it takes to cultivate the enormous number of cells required to make the building parts. The fusion of overlapping toroids provides a size range of lumens, all smaller than the building unit's lumen, and the building parts with lumens have begun to resemble a rudimentary vascular network. However, neither the density nor the width of capillaries is approximated by these neo-lumens. They could be beneficial for recreating the network of capillaries that connect to small-diameter arteries and veins.

How to cite this article: Speer, Bowlin. "Applications in Biofabrication and Formation of Microtissues." *J Tiss Sci Eng* 12 (2021) : 252.

***Address for Correspondence:** Dr. Bowlin Speer, Department of Biomedical Engineering, University of Memphis, Tennessee, United States; E-mail: Bspeer@1wlin.edu*

Received: December 10, 2021; **Accepted**: December 24, 2021; **Published**: December 31, 2021