3D Printed Auxetic Scaffolds for Tissue Engineering

An auxetic scaffold for tissue engineering to improve the viability and quality of printed cells through circulation of nutrients

The auxetic scaffold utilizes the material ability of the scaffold walls to resist fracture, to change the inner volume through continuous stretching and compressing. This volume change causes a microfluidic circulation within the structure. The microfluidic circulation in combination with the one way valves, that are placed on walls of the scaffold, allow for nutrients and growth factor to continuously enter and be circulated in the structure while waste is circulated to the exit valve and removed from the scaffold.

Summary Bullets

- Faster cell growth rate- decreases average cell age in the finished product and increases vitality
- Affordable and timely approach for regenerating tissues and replacing native tissues
- Continuous entry and circulation of nutrients results in less variability between cells

Solution Advantages

- Faster cell growth rate- decreases average cell age in the finished product and increases vitality
- Affordable and timely approach for regenerating tissues and replacing native tissues
- Continuous entry and circulation of nutrients results in less variability between cells
- Serve as a control device that can be integrated into larger systems, allowing for scaled-up manufacturing

Potential Commercial Applications

This technology has applications in biofabrication, especially in the fabrication of organs that are higher vitality and better quality, as well as in the biomanufacturing process of cellular therapies to improve the yield and cell product quality. Additionally it has potential in biopharmaceutical manufacturing in improving regenerative medicine.

Background and More Information

Printed tissues and organs have been demonstrated in the past decade and are highly desired since the current demand for transplant organs far outweighs the supply. Bioprinting is one of the most promising tools to making engineered tissues; in order for the tissue cells to grow a scaffold, a structure that provides a favorable microenvironment for cell growth, is used. Current scaffolds are solid, allow for little control of the inner

microenvironment, and provide limited nutrient and growth factor while trapping waste. Thus, there is a need for a scaffold structure which allows greater control of the microenvironment, expels waste, and allows for a continuous supply of nutrients.

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Publications

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Images

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