bioZera – Novel 3D Bioprinter and Electrospinning Platform Designed For Custom Tissue Engineering

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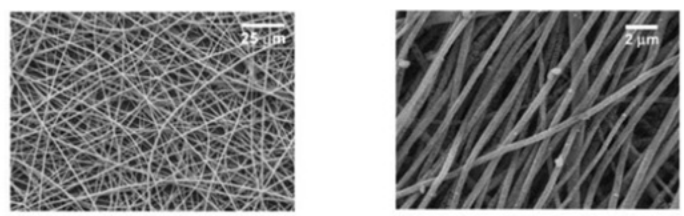
Background

3D bioprinting can be defined as the printing of biopolymers and high-concentration cell solutions. 3D bioprinters allow for the fabrication of replacement human-scale tissues and organs, often with the structural integrity and biological function similar to native tissues. Typically, 10 to 1000 µm resolution is required to form these tissue-like structures, with higher-viscosity materials for structural support and lower-viscosity materials for cell viability and function. Unlike bioprinting, which gives users geometric control, electrospinning allows for the control of microstructural porosity, density, and tensile strength. Due to the limited capabilities of existing commercially available systems, researchers will typically use several different bioprinters and electrospinning machines to achieve their desired end product. This approach requires investment into multiple pieces of capital equipment, which can be costly and require additional lab space. There exists an opportunity for a combination bioprinting/ electrospinning platform giving users the capability of fabricating tissue with high tensile and compressive strength, while maintaining geometric control.

Technology Breakthrough

We have developed a novel 3D bioprinter and electrospinning platform designed for custom tissue engineering. This hybrid system aims to merge the positive aspects of each technology, particularly for the creation of tissue scaffolds capable of resisting high tensile loads (i.e. ligament, tendon, bone-ligament interface, etc.). Along with this system, a new tissue-engineering strategy has been developed that can be used to tune the structure and mechanical properties of an innovative biologic-synthetic material to be used as a ligament-to-bone scaffold. These scaffolds are either cultured *in-vitro* and then implanted, or implanted directly into the injured site where regeneration is induced *in-vivo*.



A **B**

A. Unaligned and B. Aligned electrospinning of polymer fibers.

Key Advantages

- *Combined 3D bioprinter and electrospinner allows for geometric control and manipulation of microstructural material properties with high tensile and compressive strength*
- *Enables macroscale structural features of the replacement tissue to match that of the targeted native tissue and minimizes the complexity of scaffold integration into the existing anatomy*
- *Initial focus will be on the repair or replacement of the ligaments and bones of the hand and wrist; this has the potential to immediately restore full functionality to the thumb carpometacarpal (CMC) joint, one of the most important joints in the human body*
- *Large global market opportunity with widespread application proliferation potential in the following sectors:*
  - *Biomedical engineering, tissue engineering, tissue scaffolds, regenerative medicine*
  - *Ligament repair and reconstruction*
  - *3D printing and electrospinning*

Intellectual Property

Provisional Application 62/533,604
Provisional Application 62/534,020

Contact

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