Docket #: S24-241

3D Printing of Organoid Slurries

Researchers at Stanford have developed methods for 3D printing and post-biomanufacturing of organoid slurries in a high yield stress matrix.

Biomanufactured tissues and organs on demand has been a long-standing challenge in the field of tissue engineering. Despite the advancements allowed by 3D bioprinting, current techniques remain sub-optimal for both printing dynamics and post-biomanufacturing maturation of the cells in the printing structure.

Stage of Development
Research – in vitro

Stage of Research
The inventors have developed methods for the biomanufacturing of large-scale tissue constructs. This includes methods for preparing a tissue and allowing the printed cell structure to incubate in the biocompatible matrix. The printed cell structure is generally removed from the biocompatible matrix when it has sufficient strength to be self-supporting or has developed into a contiguous tissue.

Applications

- The biocompatible matrix can comprise a foam, emulsion, colloid, granular medium, or gel.
- The biocompatible matrix can include one or more types of diverse growth media or can include polyacrylic acid.
- The cell bioink can comprise a slurry of compacted organoids such that they are deformed from their equilibrium shape.
- The cell bioink has a cell density similar to that of native tissues, and it is substantially free of exogenous material such as collagen or gelatin.

Advantages

- An extended time can be allowed for at least a portion of the cells in the printed cell structure to develop into a contiguous tissue. Depending on the type of cells, this can range from 24 hours up to 15-to-50 days, unlike other state-of-the-art methods where cells must be removed from the printing matrix almost immediately.
- The biocompatible matrix can include a rheological modifier to tune the self-healing time of the matrix; a rapid, self-healing matrix can help alleviate deformation of the printed cell structure due to the stiffness of the matrix from the high yield stress during printing.
- The cell bioink can be deposited in the matrix by any type of extruder sufficient to deposit the cell bioink, including a 3D printer or syringe.

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