Thermoresponsive Printer Filament for Tissue Engineering

VANDERBILT UNIVERSITY
CTTC Center for Technology Transfer & Commercialization

Summary

Vanderbilt researchers have developed a thermoresponsive filament material for use in 3D printing that can be readily dissolved via cooling. This material has use in a multitude of different applications. One potential application is lost-wax casting for tissue engineering. The present material enables the user to print an intricate vascular structure, embed the structure in an engineered tissue construct, and then dissolve the printed structure to create a hollow vascular network embedded within the tissue construct.

Addressed Need

When creating engineered tissue, a vascular network is required to allow for exchange of fluids and nutrients. Although additive manufacturing techniques are increasingly popular in tissue engineering, the current techniques that are used to form vascular channels in engineered tissue require complex, specialized hardware and have limited mechanical properties that affect the performance of the resulting tissue construct. To overcome this issue, Vanderbilt researchers created a novel polymer filament that can be used in a simple off-the-shelf 3D printer, reducing the cost and complexity of manufacturing intricate anatomical structures while still providing the user with sufficient printing resolution.

Technology Description

This novel filament is compatible with fused deposition modeling (FDM) 3D printers. An FDM style printer heats a thermoplastic filament to its melting point and, layer by layer, ejects the material to form a three dimensional object. Since FDM printers are capable of rendering fine detail in the resulting printed object, the use of this material provides a means to achieve high resolution parts that can act as a sacrificial template and dissolve on-command. In addition to being thermoresponsive, the material is also biocompatible and thus does not harm the cells when used in an engineered tissue construct.

Unique Features

- Material is thermoresponsive and can act as a sacrificial template in lost-wax casting
- Filament can be used in an off-the-shelf FDM 3D printer
- Decreases cost of forming complex anatomical structures

Technology Development Status

The filaments have been developed and tested in a FDM printer. Further development and testing is ongoing.

Intellectual Property Status

A patent application has been filed.

CTTC CONTACT:
Philip Swaney, PhD
(615) 322-1067
philip.swaney@vanderbilt.edu

INVENTORS:
Leon Bellan, PhD
Department of Mechanical Engineering
Bellan Lab for Advanced Materials

VU REFERENCE: VU 19034

Visit **http://cttc.co/technologies** for available Vanderbilt technologies for partnering