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Design and Structure-Function Characterization of 3D Printed Synthetic Porous Biomaterials for Tissue Engineering

Cambre N Kelly [1], Andrew T Miller [1], Scott J Hollister [2], Robert E Guldberg [3], Ken Gall [1]

Affiliations
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Abstract

3D printing is now adopted for use in a variety of industries and functions. In biomedical engineering, 3D printing has prevailed over more traditional manufacturing methods in tissue engineering due to its high degree of control over both macro- and microarchitecture of porous tissue scaffolds. However, with the improved flexibility in design come new challenges in characterizing the structure-function relationships between various architectures and both mechanical and biological properties in an assortment of clinical applications. Presently, the field of tissue engineering lacks a comprehensive body of literature that is capable of drawing meaningful relationships between the designed structure and resulting function of 3D printed porous biomaterial scaffolds. This work first discusses the role of design on 3D printed porous scaffold function and then reviews characterization of these structure-function relationships for 3D printed synthetic metallic, polymeric, and ceramic biomaterials.

Keywords: 3D printing; printed architecture; scaffolds; structure-function; tissue engineering.

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