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**Using Polymer Confinement for Stem Cell Differentiation: 3D Printed vs Molded Scaffolds.<sup>1</sup>**

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Additive manufacturing technologies are increasingly being used to replace standard extrusion or molding methods in engineering polymeric biomedical implants, which can be further seeded with cells for tissue regeneration. The principal advantage of this new technology is the ability to print directly from a scan and hence produce parts which are an ideal fit for an individual, eliminating much of the sizing and fitting associated with standard manufacturing methods. The question though arises whether devices which may be macroscopically similar, serve identical functions and are produced from the same material, interact in the same manner with cells and living tissue. Here we show that fundamental differences can exist between 3-D printed and extruded scaffolds which can impact stem cell differentiation and lineage selection. We will show how polymer confinement inherent in these methods affect the printed features on multiple length scales. We will also and how the differentiation of stem cells is affected by substrate heterogeneity in both morphological and mechanical features.

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