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## Abstract

Rapid assessment of the invasion potential of various cancers in three-dimensional (3D) cell culture via layer-by-layer printing of cells encapsulated in hydrogels has been studied. Microarray bioprinting technology on microwell chips has been explored to create 3D cancer-like tissue structures and study cancer cell migration. Alginate, a negatively charged biopolymer, forms hydrogels via ionic crosslinking.

Oxy-methacrylated alginate (OMA) is polymerized via near-ultraviolet light in the presence of photoinitiators. Our goal is to demonstrate rapid creation of cancer tissue-like structures via microarray 3D-bioprinting and develop a high-throughput, 3D cancer cell migration assay. To achieve this goal, layer-by-layer cell culture conditions were optimized in OMA by varying exposure time, photoinitiator concentration, alginate concentration, and cell seeding density. 3D cancer cell migration was demonstrated by printing two layers of hydrogels into the microwells: the bottom layer with a mixture of alginate and matrigel, and the top layer with Hep3B cells in alginate. Printed cells were cultured for fourteen days to investigate cell migration in 3D. As a result, it was found that migration of liver cancer cells needs to be extended for longer times. Also, bidirectional migration potential and leaching of additives (e.g., Matrigel) over time from alginate matrices will be investigated.