Laser bioprinting of 3D structures in organ on chip devices

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Bioprinting techniques have been increasingly utilized in organ-on-chip (OoC) technology to produce more complex biomimetic structures, aiming to replicate, more accurately, the processes that occur in living organisms [1]. Bioprinting allows for the precise placement of cells in OoC platforms, making cell patterning a sterile, automated process that enables tight control over cell distribution, thus achieving high degrees of biomimicry. In this work, we report the use of Laser Induced Forward Transfer (LIFT) for the development of complex cell structures of tumor and LN cells, while perfusing the device with cell culture media, in order to study the metastatic behavior of cancer cells in lymphatic vessels. LIFT is employed as a 3D bioprinting technique, utilizing multilayer printing of 2D layers, rapidly immobilizing cells [2] and extracellular matrices, for better imitation of the cancer tissue microenvironment. The design of the microfluidic chip includes culture chambers, as well as microchannels, so as to replicate blood and lymphatic flows. For chip fabrication, an LCD 3D printer is utilized in combination with a biocompatible, translucent resin.

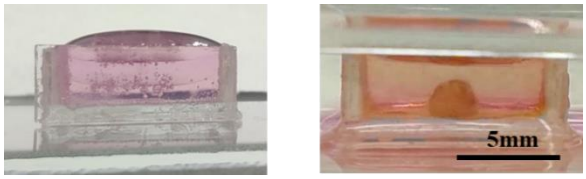

Figure 1. A) Day 0 of multilayer printing B) Day 7 of 3D structure formed

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