# Laser induced forward transfer of cells towards engineered grafts

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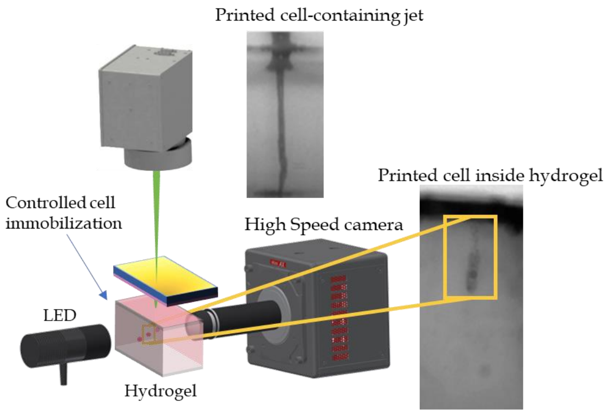
The impact of laser on the life sciences has been increased significantly in recent years.[1] Specifically, bioprinting is a rapidly expanding additive manufacturing process, which offers a great potential for the fabrication of living tissue by precise printing of cells and biomaterials in a variety of substrates. This technique has the ability to imitate native tissue functions, with a great potential in regenerative medicine. Between the main bioprinting techniques, Laser Induced Forward Transfer (LIFT) offers the highest degree of spatial resolution, accurate and controlled deposition of bioinks and post-printing cell viability. In this study, a variety of cell-laden bioinks are printed mixed with different biomaterials, utilizing a Nd:YAG laser source at 532 nm wavelength. All bioinks were characterized using a rheometer-on a-chip. Cells are deposited on top of, or inside scaffolds made from biomaterials. Hence, using light and guiding it with the proper optical set up, controlled immobilization of cells in any desired depth inside extracellular matrices (ECM), can be achieved. To investigate the transfer dynamics, a high-speed camera has been integrated in the LIFT set-up, enabling the monitoring of the immobilization phenomenon within the ECM. In parallel, the dynamics between laser and bioinks has been examined, to examine the morphological characteristics of the printed jets in relation to the laser parameters. Hence, the morphological characteristics of the cell-laden jets, are examined in detail, during the printing process (i.e jet dimensions and impact velocities). It has been showed that, as the laser fluence increases (400-1000 mJ/cm$^2$), the cells are deposited at different depths exceeding 3 mm inside hydrogel. This study highlights the unique advantages of LIFT bioprinting to develop highly controlled building structures and paves the way for the fabrication of ex vivo tissues.

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**References**: [1] M. A. Chliara, S. Elezoglou, and I. Zergioti, "Bioprinting on Organ-on-Chip: Development and Applications," Biosensors, vol. 12, no. 12. MDPI, Dec. 01, 2022. doi: 10.3390/bios12121135.