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Direct Numerical Simulation of Cell Printing RUI QIAO, PING HE, Clemson University — Structural cell printing, i.e., printing three dimensional (3D) structures of cells held in a tissue matrix, is gaining significant attention in the biomedical community. The key idea is to use desktop printer or similar devices to print cells into 3D patterns with a resolution comparable to the size of mammalian cells, similar to that in living organs. Achieving such a resolution in vitro can lead to breakthroughs in areas such as organ transplantation and understanding of cell-cell interactions in truly 3D spaces. Although the feasibility of cell printing has been demonstrated in the recent years, the printing resolution and cell viability remain to be improved. In this work, we investigate one of the unit operations in cell printing, namely, the impact of a cell-laden droplet into a pool of highly viscous liquids using direct numerical simulations. The dynamics of droplet impact (e.g., crater formation and droplet spreading and penetration) and the evolution of cell shape and internal stress are quantified in details.

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