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Deformation and viability of an encapsulated cell through a microfluidic contraction MOHAMMAD NOORANIDOOST, RANGANATHAN KUMAR, University of Central Florida — Deformation and viability of an encapsulated cell moving through a sudden contraction in a capillary tube is studied using a front-tracking method. A cell-laden droplet is initiated in a capillary tube which is allowed to migrate with the flow. When it moves through a sudden contraction, high shear stresses are experienced around the droplet where the velocity is maximum. The interplay between these stresses and interfacial forces, as well as the geometrical constraint squeezes the droplet resulting in the deformation of the inner cell. A cell viability model is used to relate the cell deformation to cell viability. Deformation and viability of the cell are highly dependent on encapsulating droplet properties and the geometry of the contraction. For a fixed geometry of the contraction, viscosity and size of the encapsulating droplet can be adjusted to minimize cell deformation. Increasing droplet size for low viscosity of the droplet shell helps reduce the deformation and maintain the viability of the cells. The deformation is enhanced for capillary tubes with narrow and long contractions, which leads to a lower cell viability. This study can be useful in biomedical applications to improve viability of cells migrating in channels with sudden obstacles.

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