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Fragmentation of cancer cells[1] SIVA VANAPALLI, NABIOLLAH KAMYABI, Texas Tech University — Tumor cells have to travel through blood capillaries to be able to metastasize and colonize in distant organs. Among the numerous cells that are shed by the primary tumor, very few survive in circulation. In vivo studies have shown that tumor cells can undergo breakup at microcapillary junctions affecting their survival. It is currently unclear what hydrodynamic and biomechanical factors contribute to fragmentation and moreover how different are the breakup dynamics of highly and weakly metastatic cells. In this study, we use microfluidics to investigate flow-induced breakup of prostate and breast cancer cells. We observe several different modes of breakup of cancer cells, which have striking similarities with breakup of viscous drops. We quantify the breakup time and find that highly metastatic cancer cells take longer to breakup than lowly metastatic cells suggesting that tumor cells may dynamically modify their deformability to avoid fragmentation. We also identify the role that cytoskeleton and membrane plays in the breakup process. Our study highlights the important role that tumor cell fragmentation plays in cancer metastasis.

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