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Investigation of HT1080 tumor growth dynamics and ECM invasion in 3D OSMAN N. YOGURTCU, Department of Mechanical Engineering, Johns Hopkins University, ANGELA M. JIMENEZ VALENCIA, MENG-HORNG LEE, Department of Chemical and Biomolecular Engineering, Johns Hopkins University, SEAN X. SUN, Department of Mechanical Engineering, Johns Hopkins University, DENIS WIRTZ, Department of Chemical and Biomolecular Engineering, Johns Hopkins University — Tumors are complex arrangements of tissues made up of several components, including dense masses of cancer cells and re-organized extracellular matrix (ECM). Recent studies have revealed the crucial role that extracellular matrix components have on single cancer cell behavior, but how the interaction of ECM components affects the growth dynamics of an entire tumor is not fully understood. Here, we use human derived fibrosarcoma cell (HT1080) aggregates in combination with live cell imaging, cryo-stat sectioning, immunostaining, and confocal imaging to study changes in cell aggregate size, proliferation, and spatial distribution within 3 dimensional (3D) matrices. We compare our experimental observations with a coupled partial differential equations based mathematical model to predict cell aggregate growth and cell density distribution and determine how cell interactions play a significant role in this dynamic growth. Using this model, we investigate the distinct contributions from cell migration, proliferation, cell-matrix interactions, and matrix remodeling to the aggregate dynamics.

Osman N. Yogurtcu
Department of Mechanical Engineering, Johns Hopkins University

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