Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Emergence of organized structure in co-culture spheroids: Experiments and Theory[1] ROLAND SANFORD, Rocester Institute of Technology, DAN KOLBMAN, University of Chicago, WEI SONG, MINGMING WU, MINGLIN MA, Cornell University, MOUMITA DAS, Rocester Institute of Technology
— During tissue morphogenesis, from formation of embryos to tumor progression, cells often live and migrate in a heterogeneous environment consisting of many types of cells. To understand how differences in cell mechanobiological properties impact cellular self-organization and migration, we study a co-culture model composed of two distinct cell types confined in a three-dimensional spherical capsule. The cells are modeled as deformable, interacting, self-propelled particles that proliferate at specified timescales. A disordered potential is introduced to mimic the effect of the extracellular matrix (ECM). By varying the mechano-adhesive properties of each type, we investigate how differences in cell stiffness, cell-cell adhesion, and cell-ECM interaction influence collective properties of the binary cell population, such as self-assembly and migration. The predictions of the model are compared to experimental results on co-cutures of breast cancer cells and non-tumorigenic breast epithelial cells.

[1]This work was partially supported by a Cottrell College Science Award from the Research Corporation for Science Advancement

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Date submitted: 09 Nov 2016 Electronic form version 1.4