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Effects of Cell Compressibility, Motility and Contact Inhibition on the Growth of Tumor Cell Clusters

We analyze the effects of cell migration, compression, and contact inhibition on the growth of tumor cell clusters using the Cellular Potts Model (CPM) in a monolayer geometry. Cell proliferation, motility, cell-to-cell adhesion, contact inhibition, and cell compressibility are incorporated in the model. We find that increased motility has a direct effect on the growth rate of clusters. Cell lines with greater motility overcome the attractive forces of cell-to-cell adhesion and have more space to proliferate. We analyze the interplay between cell motility and compressibility within the CPM, and find that more motile cells are generally smaller than their more sedentary counterparts, which can lead to smaller clusters. We obtain an explicit inverse-relationship between the cell compressibility and motility parameters and use this relationship to compensate for motility-induced cell compression. Clusters of motile cells that do not experience significant compression grow faster than those composed of less motile cells. In addition, contact inhibition amplifies the effect of motility. Strict contact inhibition in the CPM penalizes clumped cells by halting their growth, giving motile cells a greater advantage. We have begun testing our model with *in vitro* data obtained from a collaborator and our model is reflective of the data.