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Mechanical and experimental models of collective cell migration reveals the importance of intercellular interactions

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Scratch assays are routinely used to study the collective spreading of cell populations. In general, the rate at which a population of cells spreads is driven by the combined effects of cell migration and proliferation. To examine the effects of cell migration separately from the effects of cell proliferation, scratch assays are often performed after treating the cells with a drug that inhibits proliferation. Mitomycin-C is a drug that is commonly used to suppress cell proliferation in this context. However, in addition to suppressing cell proliferation, Mitomycin-C also causes cells to change size during the experiment, as each cell in the population approximately doubles in size as a result of treatment. Therefore, to describe a scratch assay that incorporates the effects of cell-to-cell crowding, cell-to-cell adhesion, and dynamic changes in cell size, we present a new stochastic model that incorporates these mechanisms. We then employ this stochastic model to quantify relative contributions of crowding effects and random motility into the collective cell migration in the scratch assay experiments containing malignant PC-3 prostate cancer cells.

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