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### **Cell-ECM Interactions During Cancer Invasion<sup>1</sup>**

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The extracellular matrix (ECM), a fibrous material that forms a network in a tissue, significantly affects many aspects of cellular behavior, including cell movement and proliferation. Transgenic mouse tumor studies indicate that excess collagen, a major component of ECM, enhances tumor formation and invasiveness. Clinically, tumor associated collagen signatures are strong markers for breast cancer survival. However, the underlying mechanisms are unclear since the properties of ECM are complex, with diverse structural and mechanical properties depending on various biophysical parameters. We have developed a three-dimensional elastic fiber network model, and parameterized it with in vitro collagen mechanics. Using this model, we study ECM remodeling as a result of local deformation and cell migration through the ECM as a network percolation problem. We have also developed a three-dimensional, multiscale model of cell migration and interaction with ECM. Our model reproduces quantitative single cell migration experiments. This model is a first step toward a fully biomechanical cell-matrix interaction model and may shed light on tumor associated collagen signatures in breast cancer.

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