سمینار هفتگی ماده چگال نرم

عنوان سمینار

Force density relation in mesenchymal cell motility

ارائه دهنده

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چکیده

Biological processes that require cell migration include a variety of complex and critical processes such as embryonic development, the immune response, and cancer metastasis. Although most of the biochemical processes in cell movement are known, some biomechanical aspects of this highly complex process remain unclear. Mesenchymal motility is a type of motility in which projections of the cytoskeletal network (lamellipodia and filopodia) have primary control over the mechanics of the cell on surfaces, and polymerization of F-actin filaments assembles the network and generates protrusion forces. We mathematically modeled the lamellipodial dynamics of moving cells on surfaces.In a single cell level, the cytoskeletal F-actin network inside the lamellipodium is described as a viscoelastic gel, and force generation and assembly of such a network at the front leading migration edge are extracted from the known properties of F-actin filaments. The model introduces a general mechanism for mesenchymal motility. We use this model to specifically explain experimental findings on B16-F1 melanoma cancer cells, and we extract the relationship between the density of the F-actin network and generated forces at the leading edge membrane of these cells. We conclude that lamellipodial dynamics include a robust correlation of F-actin area density and the protrusion rate of the leading-edge membrane. Also, the height of the lamellipodial network changes proportional to the F-actin area density which results in a nearly incompressible F-actin network.

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