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Interplay of physical constraints and chemotaxis in fibroblasts' directional decision[1] QUANG LONG PHAM, DAVID CHEGE, TIMOTHY DIJAMCO, ROMAN S VORONOV, New Jersey Inst of Tech — Fibroblast migration in engineered tissue pores depends on physicochemical balance between physical constraints and chemotactic signals transported via diffusion. Herein, the interplay of the two factors in directing the chemotaxis of individual fibroblasts in tissue-like micropores was examined. We employed two microfluidic models: (1) an array of straight channels of different widths (12-75 m), (2) a bifurcation of two channel widths (15 and 45 m). Cell velocity and direction were assessed using the 1st model while the directional decision was studied using the 2nd. Diffusive chemical gradient was modeled with flow-free transport physics. In the presence of a stable gradient, cells migrated steadily from the sink to the source of chemoattractant. Interestingly, migration speed is independent of the channel size. When cells reach a bifurcation of similar chemical gradient, they explored both directions by two leading edges but then retract from the smaller channel. Over 95% of the time, they selected fatter channel. When encountering a bifurcation with a high gradient in the small channel and low in the large one, cells biased to small channel, suggesting that directional choice was dominated by chemical signal, not by physical constraints.

[1]Interplay of physical constraints and chemotaxis in fibroblasts directional decision

Quang long Pham
New Jersey Inst of Tech

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