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Effects of TNF-alpha on Endothelial Cell Collective Migration

DESU CHEN, Biophysics Program, University of Maryland, College Park, DI WU, JOSE HELIM ARANDA-ESPINOZA, Bioengineering Department, University of Maryland, College Park, WOLFGANG LOSERT, Department of Physics, University of Maryland, College Park — Tumor necrosis factor (TNF-alpha) is a small cell-signaling protein usually released by monocytes and macrophages during an inflammatory response. Previous work had shown the effects of TNF-alpha on single cell morphology, migration, and biomechanical properties. However, the effect on collective migrations remains unexplored. In this work, we have created scratches on monolayers of human umbilical endothelial cells (HUVECs) treated with 25ng/mL TNF-alpha on glass substrates. The wound healing like processes were imaged with phase contrast microscopy. Quantitative analysis of the collective migration of cells treated with TNF-alpha indicates that these cells maintain their persistent motion and alignment better than untreated cells. In addition, the collective migration was characterized by measuring the amount of non-affine deformations of the wound healing monolayer. We found a lower mean non-affinity and narrower distribution of non-affinities upon TNF-alpha stimulation. These results suggest that TNF-alpha introduces a higher degree of organized cell collective migration.

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