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Mechanical guidance through cell-cell and cell-surface contact during multicellular streaming CHENLU WANG, Biophysics Graduate Program, University of Maryland, College Park, MEGHAN DRISCOLL, Department of Physics, University of Maryland, College Park, SATYANDRA K. GUPTA, Department of Mechanical Engineering, University of Maryland, College Park, CAROLE PARENT, LCMB, National Cancer Institute, National Institutes of Health, WOLFGANG LOSERT, Department of Physics, University of Maryland, College Park —
During collective cell migration, mechanical forces arise from the extracellular matrix (ECM) through cell-surface contact and from other cells through cell-cell contact. These forces regulate the motion of migrating cell groups. To determine how these mechanical interactions balance during cell migration, we measured the shape dynamics of Dictyostelium discoideum cells at the multicellular streaming stage. We found that cells can coordinate their motion by synchronizing protrusion waves that travel along their membranes when they form proper cell-cell adhesion and cell-surface adhesion. In addition, our experiments on live actin labeled cells show that intracellular actin polymerization actively responds to the change of cell-cell/surface adhesion and helps to stabilize multicellular migration streams. Our finding suggests that the coordination of motion between neighboring cells in collective migration requires a balance between cell-cell adhesion and cell-surface adhesion, and that the cell cytoskeleton plays an important role in this balance.

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