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국문 강연제목: 세포 이동분석으로 본 세포의 집단적 행동 형성

영문 강연제목: Social Behavior of Cells – in the Perspective of Cell Migration

Abstract(영문): Cells, the fundamental units of life, exhibit “social behavior” through dynamic communication with neighboring cells and their surrounding environment. Rather than acting as isolated entities, cells form collective systems in which higher-order biological functions such as collective migration and tissue organization emerge. These collective traits are not simple sums of individual cellular properties but arise from complex interactions among cells, a “black box” that remains largely elusive. Here, we investigate the social behavior of cells through the lens of collective migration during the epithelial–mesenchymal transition (EMT). By inducing graded levels of EMT in epithelial cells, we generated heterogeneous populations encompassing epithelial, intermediate, and mesenchymal states. Using machine learning–based classification of molecular and morphological features, we predicted the migratory trajectories of individual cells. We found that while the motility of fully epithelial and mesenchymal cells could be explained by their individual functional traits, intermediate-state cells were poorly predictable. This unpredictability likely resulted from intermingled interactions among cells in different states, since intermediate state cells displayed with higher heterogeneity and plasticity. Notably, mixtures of heterogeneous cell states enhanced continuous collective migration, driven by various modes of collision between diverse cell–cell pairs. Together, these findings reveal that cell migration emerges as a form of cooperation among heterogeneous cells, linking single-cell plasticity and intercellular communication to the emergence of robust collective behavior.

Brief Biosketch

KAIST 신현정 교수 연구실에서 석·박사 학위를 취득한 후, 현재 브라운대학교 Ian Wong 교수 연구실에서 박사후연구원으로 재직 중입니다. 세포역학, 기계생물학, 수리생물학적 접근을 통해 세포가 생성하는 힘과 움직임을 연구하고 있습니다. 이러한 연구를 기반으로 세포의 물리적 특성과 동역학을 질병 진단 및 치료 방법과 연계하는 것을 목표로 하고 있습니다. / After receiving his M.S. and Ph.D. degrees in Prof. Jennifer H. Shin laboratory at KAIST, Hyuntae Jeong is currently a postdoctoral researcher in Prof. Ian Wong’s laboratory at Brown University. His research focuses on cell

mechanics, mechanobiology, and mathematical biology, investigating how the physical forces and movements generated by cells can be linked to disease diagnosis and therapeutic strategies.