

Greater sensitivity of collective migration during electrotaxis*

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During development and disease, cells migrate in response to physical, chemical, and electrical stimuli. While it is well known that many cell types exhibit electrotaxis, a quantitative understanding of how cell-cell interactions affect electrotaxis is needed to employ electric fields in applications such as tissue engineering. Here, the combined effect of intercellular interactions and electric fields on the directional migration of non-transformed mammary epithelial cells, MCF-10A, was analyzed. Our data show that clustered cells become directed within electric fields 50% weaker than isolated cells require; however, clustered cells take ~2-4 fold longer to align. This trade-off of dynamics for greater sensitivity correlates with the intrinsic persistence of collective movement. Thus, clustered cells take longer to redirect and align with an electric field. These findings help define the operating space for using electric fields to affect cell movement in biomedical applications.

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