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Electric field control of the cell orientation CHRISTOPHER WESTMAN, RENAT SABIRIANOV, University of Nebraska Omaha — Many physiological processes depend on the response of biological cells to external forces. The natural electric field at a wound controls the orientation of the cell and its division.[1] We model the cell as an elongated elliptical particle with given Young's modulus with surface charge distribution in the external electric field. Using this simple theoretical model that includes the forces due to electrostatics and the elasticity of cells, we calculated analytically the response of the cell orientation and its dynamics in the presence of time varying electric field. The calculations reflect many experimentally observed features. Our model predicts the response of the cellular orientation to a sinusoidally varying applied electric field as a function of frequency similar to recent stress-induced effects.[2]

1. Bing Song, Min Zhao, John V. Forrester, and Colin D. McCaig, "Electrical cues regulate the orientation and frequency of cell division and the rate of wound healing *in vivo*", PNAS 2002, vol. 99 , 13577-13582.

2. R. De, A. Zemel, and S.A. Safran, "Dynamics of cell orientation", Nature Physics 2007, vol.3, 655.

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