Traveling waves model tumor invasion

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Cell migration, which is involved in wound healing, cancer and tumor growth, and embryonic growth and development, has been a topic of interest to mathematicians and biologists for decades.

In a paper published recently in the *SIAM Journal on Applied Dynamical Systems*, authors Kristen Harley, Peter van Heijster, Robert Marangell, Graeme Pettet, and Martin Wechselberger study a model describing cell invasion through directional outgrowth or movement in the context of malignant tumors, in particular, melanoma or skin cancer. Tumor cells move up a gradient, based on the presence of a chemical or chemoattractant – this process is called haptotaxis. Receptors on the exterior of cell walls detect and allow passing of the chemoattractant. Based on the locations of these receptors, cells determine the most favorable migration direction.

Continuum mathematical models that describe cell migration usually give rise to traveling waves—waves in which the medium moves in the direction of propagation at a constant speed. In this paper, the authors prove the existence and uniqueness of traveling waves to the model of malignant tumor invasion. The model described takes into account the speed of the traveling waves, which corresponds to the rate of invasion of cells, as well as the extracellular matrix concentration (the medium surrounding cells that provides structural and biochemical support to cells). Movement of cells through diffusion is omitted as it is shown to play a relatively small role in the migration process.

More information: Existence of Traveling Wave Solutions for a

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