

Tumor growth instability and the onset of invasion

M. Castro Ponce; C. Molina París; T.S. Deisboeck

Abstract-

Motivated by experimental observations, we develop a mathematical model of chemotactically directed tumor growth. We present an analytical study of the model as well as a numerical one. The mathematical analysis shows that: (i) tumor cell proliferation by itself cannot generate the invasive branching behavior observed experimentally, (ii) heterotype chemotaxis provides an instability mechanism that leads to the onset of tumor invasion, and (iii) homotype chemotaxis does not provide such an instability mechanism but enhances the mean speed of the tumor surface. The numerical results not only support the assumptions needed to perform the mathematical analysis but they also provide evidence of (i), (ii), and (iii). Finally, both the analytical study and the numerical work agree with the experimental phenomena.

Index Terms- immune system competition, multicellular spheroids, theoretical-analysis, capillary formation, factor expression, cell motility, human gliomas, field

Due to copyright restriction we cannot distribute this content on the web. However, clicking on the next link, authors will be able to distribute to you the full version of the paper:

[Request full paper to the authors](#)

If your institution has an electronic subscription to Physical Review E, you can download the paper from the journal website:

[Access to the Journal website](#)

Citation:

Castro, M.; Molina-Paris, C.; Deisboeck, T.S. "Tumor growth instability and the onset of invasion", Physical Review E, vol.72, no.4, pp.041907.1-041907.12, October, 2005.