On a system of partial integro–differential equations modelling cancer invasion

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The process of invasion of tissue by cancer cells is crucial for metastasis – the formation of secondary tumours – which is the main cause of mortality in patients with cancer. In the invasion process itself, adhesion, both cell-cell and cell-matrix, plays an important role. A mathematical model of cancer cell invasion of the extracellular matrix is proposed by incorporating cell-cell adhesion as well as cell-matrix adhesion. Considering the interactions between cancer cells, extracellular matrix and matrix degrading enzymes, the model consists of a system of reaction-diffusion partial integro-differential equations, with non-local (integral) terms describing the adhesive interactions between cancer cells and the host tissue, i.e. cell-cell adhesion and cell-matrix adhesion. The existence and uniqueness of global in time classical solutions and their uniformly boundedness is proven. Moreover, using computational simulations the effects of the relative importance of cell-cell adhesion and cell-matrix adhesion on the invasion process is shown. In particular the roles of cell-cell adhesion and cell-matrix adhesion in generating heterogeneous spatio-temporal solutions is discussed. The presentation bases on the paper:

M. Chaplain, M. Lachowicz, Z. Szymańska, D. Wrzosek, Mathematical modelling of cancer invasion: The importance of cell-cell adhesion and cell–matrix adhesion, **Math. Models Methods Appl. Sci.**, 2011, to appear.