Modelling physical limits of migration by a kinetic model with non-local sensing

Nadia Loy

DISMA, Departement of mathematical sciences, Politecnico di Torino

Corso Duca degli abruzzi, 24, Torino.

nadia.loy@polito.it

Abstract

Migrating cells choose their preferential direction of motion by sensing different signals and stimuli coming from the external environment. In some situations, physical limits [1] may hamper the cell from moving in certain direction or even from sensing beyond a regon that practically acts like a physical barrier. For example, such physical limits may be represesented by cell overcrowding leading to volume filling effects or by the presence of regions with a small porosity of the extracellular matrix, eventually preventing cell migration. Starting from the model proposed by [2], we propose a non-local kinetic model in which the sensing radius depends on position, sensing direction and time as cells speed might be determined on the basis of information achieved before reaching physical limiting configurations. We analyze how the actual possible sensing of the environment influences the dynamics by recovering the appropriate macroscopic limits and by integrating numerically the kinetic transport equation.

References

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