On a multiscale model involving cell contractivity and its effects on tumor invasion

Christian Stinner

TU Kaiserslautern

Tumor cells migrate through the healthy tissue in order to reach blood vessels and distal organs, where they initiate further tumors, called metastases. Thereby, the cancer cell migration is influenced by various processes taking place at different spatial and temporal scales.
We propose a multiscale model which focuses on the influence of cell contractivity on cancer cell migration. Thereby, cell contractivity describes the ability of the cancer cell to modify its shape according to the surrounding tissue. Our model takes into account both the subcellular level (microscale), where changes of contractivity are initiated, and the macroscopic level of the cell and tissue populations.
The resulting PDE-ODE system involves in particular haptotactic and chemotactic cross-diffusion as well as a temporal delay. We prove the local existence and uniqueness as well as the global existence of solutions and present numerical simulations to illustrate the solution behavior. This talk is based on joint works with G. Meral, C. Surulescu, A. Uatay and M. Winkler.