# On a multiscale model for glioma invasion: interplay between phenotypic heterogeneity, acidity and vasculature.

Martina Conte[1], Christina Surulescu[2]

[1]Departamento de Matemática Aplicada - Universidad de Granada
Campus Fuentenueva S/N, 18071 Granada, Spain

[2]Felix-Klein-Zentrum für Mathematik - Technische Universität Kaiserslautern,
Paul-Ehrlich-Str. 31, 67663 Kaiserslautern, Germany

The processes of glioma growth, development, and migration in the brain are influenced by a multitude of intrinsic and extrinsic factors, which are responsible for the typical features of tumor aggressiveness and invasiveness. Here, we propose a multiscale model for the description of glioma growth and invasion in the tissue with a specific focus on the effects of vasculature availability and hypoxia.

Starting from the microscopic interactions between glioma cells, healthy tissue, and protons, we consider a system of coupled kinetic transport equations for endothelial cells (ECs) and tumor cells. Intratumor heterogeneity is included in the setting on the basis of the go-or-growth hypothesis. Using a parabolic scaling, we derive the macroscopic model describing tumor and ECs evolution. This system is then coupled with the equations accounting for proton dynamics, healthy tissue degradation, and emergence of necrotic regions. We analyze the system evolution and present the numerical simulations performed to assess the role of vasculature, acidity, and phenotypic heterogeneity in tumor invasion and progression.