Modelling tumoral heterogeneity for chemotherapy optimization

Cécile Carrère [1], Assia Benabdallah[2], Guillemette Chapuisat[3]

[1] Université Pierre et Marie Curie

[2] Aix Marseille University

[3] Aix Marseille University

To prevent the emergence of drug resistance during cancer chemotherapy, most medical protocols use the maximal tolerated dose (MTD) of drug possible. In a series of in vitro experiments, M.Carré showed that such protocols fail if resistant cells are present in the initial tumour. However, smaller doses of treatment maintain a small, stable tumour sensitive to the drug. An ODE model of these experiments is designed, and then studied under different frameworks to create new treatment protocols, stabilizing the tumor while maintaining its heterogeneity. We use mainly analysis of ODEs, optimal control theory and Hamilton-Jacobi-Bellman framework, each corresponding to different treatment objectives.

References

[1] C.Carrère , *Optimization of an in vitro chemotherapy to avoid resistant tumours* , Journal of Theoretical Biology , 2017