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Metastatic growth in vivo and in silico

In this research project we want to study a tumour growth model adapted to the modelling of a targeted radiotherapy. This therapeutic approach, developed in particular in the TIRO research laboratory in Nice (France), consist of inducing a iode accumulation capacity in non-thyroidian cancer cells based on the gene expression of the Natrium iode symporter (NIS), thus facilitating the destruction of the tumour through a iode 131 radiotherapy. In preclinic models, the NIS transfer in cancerous cells can equally be used for the in vivo tracking of proliferating cancer cells and derived metastases.

Our aim is the development of a metastatic growth model distinguishing proliferating and quiescent cells. This model will be based on an ODE model established by Gyllenberg and Webb in 1989 which describes the primary tumour growth in terms of a dynamic exchange between proliferating and quiescent cell compartments, and on a size structured model initiated in 2000 by Iwata, Kawasaki and Shigesada describing metastatic growth. We will revisit the Gyllenberg-Webb model in view of its applicability in a preclinic context. Furthermore, a new metastatic growth model will be proposed. The parameter identifiability in these models will be treated.