1. What are the major parameters of the tumor model in Module 3?

The researchers found that there are three major types of intervention impacting the density of cycling or non-cycling CSCs and DCs:

* Reducing DC lifetime or lifespan of DC (and the minimal and maximal age of the initial DC subpopulation) increases cycling CSC density. It decreases DC density and macroscopic growth rate (no effect on non-cycling CSC density).
* Reducing the proliferation rate or decreasing the probability of entering the cell cycle (p0) decreases cycling CSC, DS density, and macroscopic growth rate (no effect on non-cycling CSC density).
* Increasing differentiation, by:
* increasing the maximal differentiation rate (**pmax**)
* Increasing the density of CSC neighbors by decreasing the dampening coefficient **k**
* Decreasing the number of CSC neighbors giving the half-maximal differentiated rate, **a**

reduces the number of non-cycling CSCs and the macroscopic growth rate (no effect on cycling CSCs or DCs).

1. What are the main features of the total number of tumor cells as a function of time?

The **total number of tumor cells over time follows a dynamic pattern** influenced by **CSC proliferation, differentiation, and DC death rates.**

* Three phases are identified:
* The Initial growth phase
* Followed by the exponential phase qualified as a “macroscopic growth rate”
* The final phase is when the population growth decreases up to a “quasi-steady state”; at which the number of cells remains constant.

1. What is the main novelty of the approach discussed in the lecture from earlier cancer treatments?

The model predicts that targeting differentiation alone to be successful in curing cancer must be combined with antiproliferative agents. In addition, the approach differentiates from previous models by incorporating environmental feedback and the influence of neighboring cells on differentiation.

1. What is the relation between the extreme (max and min) values of the differentiation rate and the extreme values of the cell density?
2. What is the relation between the proliferation rate and the number of vacancies around the cell?