Mathematical modelling of stem cells-initiated cancer development, treatment and relapse

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Motivated by clonal selection observed in acute myeloid leukemia (AML), we propose mathematical models describing evolution of a multiclonal and hierarchical cell population. The models in a form of partial and integro-differential equations are applied to study the role of self-renewal properties and growth kinetics during disease development and relapse. Effects of different time and space scales are investigated. It is shown how resulting nonlinear and nonlocal terms may lead to a selection process and ultimately to therapy resistance. The results are compared to AML patient data. Model based interpretation of clinical data allows to assess parameters that cannot be measured directly. This might have clinical implications for future treatment and follow-up strategies.