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Analysis of a basic mathematical model of CAR-T cell therapy for glioblastoma

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CAR-T (Chimeric Antigen Receptor T) cell therapy has been proven to be successful against leukaemias and lymphomas [1, 2]. Encouraged by positive treatment results scientists begin to test that therapy on different solid tumours, including glioblastoma – an aggressive primary brain tumour. We will focus on the presentation of a mathematical model, formulated as a system of two ordinary differential equations, describing the competition of CAR-T and glioblastoma tumour cells and taking into account their immunosuppressive capacity. The model is formulated in a general way, however, we follow [3] where the exponential tumour growth was assumed. In [3] several simulations were performed to study the interactions between the tumour and CAR-T cell population. Although the authors reported several significant results, little was said from an analytical point of view. Here we study the basic mathematical properties of the solutions including the existence and stability of steady states. In [3] one boost of CAR-T cells was considered. We show that it is not efficient, and eventually, the tumour grows. Therefore, we consider the effect of constant treatment (for simplicity) and look for the conditions guaranteeing the cure.

References

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