

## **In silico Repopulation Model of Various Tumour Cells during Treatment Breaks in Head and Neck Cancer Radiotherapy**

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**Abstract :** Advanced head and neck cancers are aggressive tumours, which require aggressive treatment. Treatment efficiency is often hindered by cancer cell repopulation during radiotherapy, which is due to various mechanisms triggered by the loss of tumour cells and involves both stem and differentiated cells. The aim of the current paper is to present in silico simulations of radiotherapy schedules on a virtual head and neck tumour grown with biologically realistic kinetic parameters. Using the linear quadratic formalism of cell survival after radiotherapy, altered fractionation schedules employing various treatment breaks for normal tissue recovery are simulated and repopulation mechanism implemented in order to evaluate the impact of various cancer cell contribution on tumour behaviour during irradiation. The model has shown that the timing of treatment breaks is an important factor influencing tumour control in rapidly proliferating tissues such as squamous cell carcinomas of the head and neck. Furthermore, not only stem cells but also differentiated cells, via the mechanism of abortive division, can contribute to malignant cell repopulation during treatment.

**Keywords :** radiation, tumour repopulation, squamous cell carcinoma, stem cell

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