

## How can we use high fidelity CA approach to help in planning more effective multi-dose radiotherapy?

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During this talk I would like to, at least partially, answer that question. Multi-fraction radiotherapy protocols (fractional dose and timing) are currently a standard radiotherapy approach used in the clinic, however they are products of human selection based on received wisdom, physicians' experience and intra-day patient timetabling rather than due to systemic study. Clearly, the potential treatment protocol space for a given total dose or treatment length is gigantic and far beyond the capacity of traditional experimental/medical methods to explore.

Therefore, we have developed a high fidelity numerical simulation of tumour growth to which we have added a single-, and then multi-, fraction irradiation and response module. With the fully developed and calibrated model we are then in a position to apply novel search methods over multi-fraction radiotherapy protocols to discover likely candidates to trial in the clinic.

This talk would be based on our three key papers:

S.D. Angus, M.J. Piotrowska: 'A Matter of Timing: Identifying Significant Multi-Dose Radiotherapy Improvements by Numerical Simulation and Genetic Algorithm Search', *PLoS ONE*, 9(12), 2014, e114098.

S.D. Angus, M.J. Piotrowska: 'A numerical model of EMT6/Ro spheroid dynamics under irradiation: calibration & estimation of the underlying irradiation-induced cell survival probability', 320, 2013, 23—32, *Journal of Theoretical Biology*.

M.J. Piotrowska, S.D. Angus: 'A Quantitative Cellular Automaton Model of in vitro Multicellular Spheroid Tumour Growth', *Journal of Theoretical Biology*, 258, 2009, 165-178.