

AbstractID: 3141 Title: Fitting the Zaider-Minerbo TCP model to cell megacolony culture dose response in vitro data

**Purpose:** To investigate the effects of radiation damage, tumor repopulation and cellular sublethal damage repair.

**Method and Materials:** An expression of the Zaider-Minerbo model obtained by Stavreva *et al.* is used to fit published dose-response *in vitro* data from two cellular megacolony cultures.

**Results:** The data analysis shows the importance of the linear-quadratic mechanism of cell damage for the description of *in vitro* cell dynamics. In a previous work, where *in vivo* data were analyzed, the employment of the single hit model and cell repopulation produced the best fit, while ignoring the quadratic term in the current analysis leads to poor fits. Also, the best-fit value of the probability of sublethal damage repair,  $\tau$ , for both cell cultures tends to infinity, indicating that full recovery of the cells occurs between any two consecutive fractions.

**Conclusion:** We conclude that the Zaider-Minerbo model assuming full recovery of the cells between fractions accompanied by cell repopulation best fits the data from both cellular cultures investigated in the current work. However, a model assuming no repopulation returned a fit statistically indistinguishable from the fit produced by the Zaider-Minerbo model, though at the expense of unusual best fit values of the cell radiosensitivity characteristics and a large value of  $\tau$ . Therefore, we recommend the design of experiments using different fractionation regimes producing diverse data to help better analyze the TCP models and rank the models in accordance with statistical criteria.