AbstractID: 9238 Title: Cell Repopulation, the LQ Model and Partial Repair as Reflected by Fractionated Animal Data

In works on modeling the tumor control probability (TCP) in case of external fractionated radiotherapy, cell recovery is accounted for on the basis of the Linear-Quadratic (LQ) model of cell damage. Routinely, complete recovery of the cells between two consecutive fractions is assumed. Cell repopulation is usually ignored or accounted for by incorporating a regrowth term in the Poisson approximation of a non-dynamic binomial TCP expression. It can be shown that the latter approach is conceptually incorrect. Recently Zaider and Minerbo obtained a correct TCP expression accounting for the combined effects of cell kill and cell dynamics. This TCP expression, as well as a binomial TCP, was fit to a set of fractionated dose-response rat's rhabdomyosarcoma data. The binomial TCP based on the LQ model assuming full cell recovery failed to describe the data. A binomial model based on the assumption of partial recovery of the cells resulted in a statistically acceptable fit. However, the obtained parameter values are biologically unrealistic. Therefore, this model too had to be rejected. Finally, the Zaider-Minerbo model resulted in both a statistically acceptable fit and biologically realistic best-fit parameters. It is interesting to note that the best-fit value of the LQ parameter β is nearly zero. This suggests that for this tumor site the impact of the β mechanism is negligible and regrowth is predominant in determining the macro-response.