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## **The End of Linear-Quadratic Era in Radiation Biology**

We review mathematical and biological grounds for the linear-quadratic (LQ) model of irradiated cell survival. The LQ model was a tool of choice in quantitative radiation biology for more than 60 years. We show that some of the premises of the LQ model are unrealistic, especially for intermediate and high doses of radiation. Furthermore, we develop a more realistic cell survival model based on rigorous accounting for microdosimetric effects [1]. The new model is applicable to low, intermediate, and high acute doses of radiation, and unlike the LQ model, it does not assume that the distribution of the number of primary lesions is Poisson. For small doses, the new model can be approximated by the LQ model. However, for high doses, the best fitting LQ model grossly underestimates cell survival. The same is also true for the conventional LQ model, only more so. It is shown that for high doses, the microdosimetric distribution can be approximated by a Gaussian distribution, and the corresponding cell survival probabilities are compared.

This is a joint work with Dr. Marco Zaider from the Memorial Sloan-Kettering Cancer Center, New York.

### REFERENCES

- [1] L.G. Hanin and M. Zaider (2010), Cell-survival probability at large doses: an alternative to the linear-quadratic model, *Physics in Medicine and Biology*, v. 55, pp. 4687-4702.