

Carcinogenesis in APCMin/+ mice is altered in response to low-dose radiation

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Introduction

The current model for radiation protection is based on the linear-no-threshold (LNT) hypothesis that purports that cancer risk linearly increases with radiation dose. Recent radiobiological work has suggested, however, that the LNT model is inaccurate at low doses (i.e. <100 mGy) and that low-dose radiation (LDR) may induce non-specific adaptive responses. Thus, further work is required to fully determine the role of low doses on cellular homeostasis and carcinogenesis.

Study Objective

The focus of the current study is to determine the role of chronic LDR from beta-emission, tritium, and gamma-irradiation, Co60, on carcinogenesis. Specifically, this study will elucidate the cellular molecular changes and resulting pathological changes (i.e. tumorigenesis) in response to LDR. Moreover, this work will compare the molecular and systemic changes resulting from tritium exposure with those from gamma irradiation.

Conclusion

Initial analyses indicated notable changes in epigenetics, gene expression, and tumorigenesis in response to LDR. Survival curves showed that, despite changes at the molecular level, tritium did not affect overall survival, whereas gamma-irradiation produced a hormetic response; suggesting a difference in the relative biological effectiveness (RBE) of tritium versus gamma at low doses. Thus, this work has important implications, not only in understanding the effects of LDR on cellular homeostasis, but in the context of radiation risk assessment.

Future work

Ongoing work will further analyze preserved samples from this study and will attempt to correlate the differences seen at the molecular levels (i.e. DNA methylation, gene expression) to changes at the macroscopic level (i.e. tumorigenesis, survival). This work is done in collaboration with ongoing COG-SRD project 25306.7350559.0003