Genotoxic and Cytotoxic Responses of Recombinant *Salmonella typhimurium* TA1535 Induced by Simulated Space Radiation Qualities

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Introduction: For risk assessment, mutagenic potential of heavy ions as component of galactic cosmic radiation is of major concern for tumor induction and radiation late effects. Genetically modified TA1535 *Salmonella typhimurium* (SWITCH) reveal genotoxicity by dose dependent increase of bioluminescence induction and cytotoxicity by dose-dependent decrease in GFP fluorescence. By this, bacterial inactivation and mutation induction by ionizing radiation are analyzed in parallel.

Methods: Heavy ions exposures (linear energy transfer – LET 37 to 10238 keV/µm) were performed with the SWITCH test at GANIL.

Results: Hit numbers necessary to inactivate the bacteria depend on LET. For genotoxicity induction, for very high LET radiation the number of hits required is much less then for lower LET radiation. The power of the genotoxic response seems to be inversely related to LET. While 200 kV X-rays resulted in maximal induction, half-maximal induction of genotoxic potential is reached at LET of about 60 keV/µm. At LETs much greater than 100 keV/µm genotoxic potential decreases further to about 5 % for lead ion exposure (>10000 keV/µm).

Conclusion: The SWITCH test shows space-relevant radiation qualities to peak for inactivation cross sections at LET 100-300 keV/µm, while genotoxic potential is reduced when compared to sparsely ionizing radiation.

References:

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