

Induction of Cytogenetic Damage by HZE ⁵⁶Fe Particles *In Vivo* in Both Dividing and Non-Dividing Tissues

A.L. Brooks¹, S. Bao¹, K. Rithidech², L. A. Braby³

¹Washington State University, Tri-Cities, Richland, WA 99352-1643 ²Suny at Stony Brook, Stony Brook N.Y. 11795 ³Texas A & M University, College Station TX. 77843

A chief concern for prolonged manned space flight is the risk associated with radiation exposure. An important component of this radiation exposure is from Galactic Cosmic Rays containing high energy, heavy ions (HZE). Since ⁵⁶Fe ions are the most densely ionizing particles present in Galactic Cosmic Rays, studies are being conducted at Brookhaven National Laboratory using the Alternating Gradient Synchrotron (AGS) to define the biological effects associated with exposure to these particles. Genomic instability has been suggested as a potential mechanism for the radiation-induced cancer and as marker for cancer risk. These studies are directed toward understanding the relationships that exist between initial genetic damage in important cell types and the induction of genomic instability. Wistar Rats were exposed to graded dose of ⁵⁶Fe particles (1000 MeV/AMU) at 0.0, 0.2, 0.5 and 1.0 Gy using a dose rate of 0.2 Gy/min. Cells from regions of the respiratory tract that are known to be either sensitive (deep lung) or resistant (trachea) to the induction of cancer from high LET radiation and bone marrow cells which demonstrate genomic instability were isolated after exposure, placed in short term culture and cytogenetic damage evaluated. Indicators of cell proliferation and the frequency of chromosome aberrations and micronuclei exposure. To date we have data, which demonstrates that there was a decrease in mitotic index in the bone marrow as a function of dose (slope 0.29 X Dose) and an increase in mitotic index as a function of time (0.5-5 hours) between exposure and sacrifice for each treatment. The frequency of initial chromosome damage is being evaluated and will be related to the potential for the induction of genomic instability in these cells. Research supported by a Grant # 1 RO1 CA74053-01 from NIH/NCI and NASA with Washington State University Tri-Cities.

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