

Abstract

Role of the mismatch base repair and gene mutation in human tumoral cell lines exposed to low-energy light ions.

L. Baggio¹, R. Cherubini¹, F. A. Cucinotta², S. Favaretto¹, S. Lora³, P. Stoppa^{1,4}, J. R. Williams⁵

¹INFN-Laboratori Nazionali di Legnaro-Padova, Italy

²NASA Johnson Space Center, Houston, TX-USA

³CNR-FRAE Institute, Legnaro-Padova, Italy

⁴Dipartimento di Biologia, Università di Padova - Padova, Italy

⁵Johns Hopkins University, Oncology Center, Baltimore, MD-USA

cherubini@lnl.infn.it

In the recent years experimental evidence has shown an increased biological effectiveness of low-protons and alpha particles with respect to X-/gamma-rays for several cellular and molecular endpoints (see, for instance, refs. Belli et al., 1992, 1993, 1998; Cera et al., 1997; Folkard et al., 1996). The role of cell cycle control proteins in the radiation injuries as well as the biochemical mechanisms involved in the increased effectiveness of high LET radiation are still poorly understood and the available data are conflicting (see, for instance, Balcer-Kubiczek et al., 1995; Kroneberg et al., 1997; Yang et al., 1997; Ohnishi et al., 1999; Whisnant-Hurst et al., 1999)

To contribute to understanding of the biochemical mechanisms involved in the cell response to the high LET, low-energy accelerated light ions, we have undertaken a systematic investigation of cell inactivation, gene mutation and protein expression induced by protons and alpha particles with different radiation quality in human tumoral colorectal cell lines.

In the present work we will report preliminary results on cell inactivation and (early) p53 expression in DLD-1 (p53 mut; MMR mut) and HCT116 (p53 wildtype; MMR mut) human tumoral cell lines irradiated with ⁶⁰Co gamma rays, 7.7 keV/um protons, 80 and 104 keV/um helium-4 ions. Experiments are performed at the light ion irradiation facility of the 7 MV CN Van de Graaff accelerator and at the Radiobiology Laboratory of the INFN-Laboratori Nazionali di Legnaro, Padova-Italy. Gamma irradiation are carried out at the ⁶⁰Co gamma beam facility of the CNR-FRAE Institute in Legnaro, Padova-Italy.

REFERENCES

1. E. K. Balcer-Kubiczek et al, Radiation Research (1995) 142, 252-262
2. M. Belli et al, Intern. J. Radiation Biology (1992) 61, 625-629
3. M. Belli et al, Intern. J. Radiation Biology (1993) 63, 331-337
4. M. Belli et al, Intern. J. Radiation Biology (1998) 74, 501-509
5. F. Cera et al., Proc. of 12th Symp. on Microdosimetry, Oxford, U.K., 1996 (Eds. D. Goodhead, P. O'Neill, H. Menzel - The Royal Society of Chemistry, 1997), 191-194
6. M. Folkard et al., Intern. J. Radiation Biology (1996) 69, 729-738
7. A. Kroneberg et al., NASA 8th Annual Space Radiation Health Investigators' Workshop, BNL, Upton NY, 1997
8. T. Yang et al., Oncogene (1997)14, 1511-1519
9. T. Ohnishi et al., Radiation Research (1999)151, 368-372
10. N. Whisnant-Hurst et al., Radiation Research (1999) 151, 263-269