The alpha-particle induced bystander effect for sister chromatid exchanges in *Fancg*-deficient CHO cells

H. Nagasawa[1], P.F. Wilson[2], L.H. Thompson[2], J.S. Bedford[1], and J.B. Little[3]
[1] Department of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, CO 80523
[2] Biosciences Directorate, Lawrence Livermore National Laboratory, Livermore, CA 94551
[3] Center for Radiation Sciences and Environmental Health, Harvard School of Public Health, Boston, MA 02115

Fanconi anemia (FA) is a rare chromosomal instability and cancer predisposition syndrome that is transmitted either as an autosomal-recessive or X-linked trait. Many studies have reported higher frequencies of spontaneous chromosomal aberrations (CA) in stimulated peripheral lymphocytes or primary fibroblasts derived from FA patients, and CA frequencies in FA cells are increased by higher oxygen tension and decreased after treatment with superoxide dismutase (SOD). Recently, an isogenic *Fancg*-deficient Chinese hamster ovary (CHO) mutant, denoted KO40, was constructed and characterized (Tebbs *et al.*, DNA Repair 4: 11-22, 2005). Interestingly, KO40 cells do not show increased levels of spontaneous CA or sister chromatid exchanges (SCE) and are more broadly sensitive to various DNA damaging agents than typical FA cells. We studied the effects of low-dose alpha-particle irradiation-induced bystander effects in KO40 and control CHO cell lines. Cultures of G0/G1-phase cells were irradiated with 3.86-MeV plutonium-238 alpha particles such that <1% of the cell nuclei were traversed by an alpha particle, and BUdR-labeled "harlequin" cells in the second post-irradiation mitosis were stained by the FPG technique and scored for SCEs. At these low doses of alpha particles, SCE frequencies increased approximately 30% over background levels in wild-type AA8 and *Fancg*-complemented KO40 cells (40BP6). However, SCE frequencies in *Fancg*-deficient KO40 cells increased approximately 50% over background levels (which were not significantly different from AA8 or 40BP6). These results suggest that KO40 cells are more sensitive to ROS-mediated bystander damage than wild-type cells. Results from these and additional studies will be presented. This work was supported by grants DE-FG03-01ER63235 and DE-FG02-05ER64089 from the U.S. Department of Energy, Low Dose Radiation Research Program.