Quantification of γ-H2AX foci following γ-rays and α-particles in Jurkat cells.

Marcus Unverricht[1], Ulrich Giesen[2], Ralf Kriehuber[1]

[1] Radiation Biology Unit S-US, Department of Safety and Radiation Protection, Forschungszentrum Jülich, D- 52425 Juelich, Germany
[2] Physikalisch-Technische Bundesanstalt, D-38116 Braunschweig, Germany

PURPOSE: Phosphorylation of histone H2AX occurs at sites flanking DNA double-strand breaks (DSBs) and can provide a measure of the number of DSBs within a cell. We investigated whether the mean intensity measured by flow cytometry and the mean number of radiation-induced γ-H2AX foci vary as a function of radiation quality and dose. Furthermore we investigated the relation between the induction of apoptosis and radiation-induced γ-H2AX foci.
MATERIALS AND METHODS: Jurkat cells were irradiated with different doses of either low linear energy transfer (LET) ^{137}Cs γ-rays or high LET ^{241}Am α-particles. The γ-H2AX foci were detected using immunocytochemistry and quantified by measuring the mean intensity by flow cytometry and counting the number of γ-H2AX foci with a fluorescence microscope. Apoptosis 24h after irradiation was detected via Annexin-V-FITC/ PI-assay.
RESULTS: For both radiation qualities, the mean number of γ-H2AX foci is increased as a function of dose and was fairly similar at identical absorbed radiation dose. Apoptosis in Jurkat cells is more efficiently induced by α-particles at similar mean numbers of γ-H2AX foci per cell. The mean γ-H2AX signal intensity of single nuclei is increased after exposure to α-particles when compared to γ-irradiation at the same absorbed radiation dose.
CONCLUSIONS: The mean intensity of radiation-induced γ-H2AX foci is dependent on radiation quality in Jurkat cells.