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

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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 the mean intensity and mean number of 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 determining the relative DNA fragmentation rates indicative for apoptosis.

RESULTS: The mean number of γ -H2AX foci increased dose dependent for both radiation qualities, but the mean intensity of γ -H2AX foci after α -radiation is much higher than after γ -radiation refered to the same dose. These data are confirmed by microscopic observations. Furthermore it seems to be that α -particles induce more apoptosis than γ -rays at the same dose and at a similar mean number of radiation-induced γ -H2AX foci.

CONCLUSIONS: γ -rays and α -particles induced the phosphorylation of H2AX; the variation in the mean intensity and the mean number of radiation-induced γ -H2AX foci is dependent on radiation quality.

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