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.