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Clustered DNA double-strand breaks formation under the influence of ionizing radiation with different physical characteristics.

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The patterns of induction and repair of clustered DNA double-strand breaks (DSBs) (DSBs) in normal human skin fibroblasts under the action of γ-rays 60Co, protons, accelerated ions 11B, 20Ne, 15N and 12C were investigated. Using immunocytochemical staining method, radiation-induced γH2AX/53BP1 foci were analyzed in detail in 3D images.

It was found that the action of accelerated heavy ions with low and intermediate energies produces complex clusters including up to six or more individual γH2AX/53BP1 foci, in contrast to the action of γ-rays. The largest and most complex foci clusters are formed by the action of 20Ne ions.

The repair kinetics of radiation-induced γH2AX/53BP1 foci in cells under the action of heavy ions proceeds significantly slower than under γ-irradiation. It was shown that with decreasing energy of accelerated particles and increasing of LET, the efficiency of clustered DNA DSBs repair decreases.

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