EFFECT OF IONIZING RADIATION ON GROWTH AND APOPTOSIS OF BREAST CARCINOMA CELLS

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Radiotherapy is widely used for treatment of human breast cancer, along with chemotherapy and hormone therapy. However, the effectiveness of cancer treatment is limited by a frequent development of tumor cell resistance to specific chemotherapeutic drugs or irradiation.

The aim of the study was to compare the effect of X-radiation on cytomorphological changes in human breast carcinoma MCF-7 cells, sensitive (MCF-7(wt)) and resistant (MCF-7(DOX/R)) to doxorubicin.

It was found that MCF-7 (DOX/R) were more refractory to X-ray-induced (1.5, 3.0 or 4.5 Gy) growth inhibition and cytotoxic effect in comparison with MCF-7 (wt) cells. Acridine orange (AO) was used as a vital fluorescent dye for staining of cells. AO has two different staining characteristics. In fixed tissues it is used as a metachromatic dye, differentially staining single-stranded nucleic acids orange and double-stranded nucleic acids green. In living cells AO serves as a pH indicator, becoming trapped in acidic compartments such as lysosomes and phagosomes, which then fluoresce a orange-red color. In non-irradiated cells of both sub-lines lysosomes were randomly distributed throughout the cytoplasm. Micronuclei were stained a light-green color and macronuclei – a dark-green color.It was found that after action of ionizing radiation lysosomes were generally clustered around the degenerating nucleus in cells of both sub-lines.This would be consistent with the known role of lysosomes in the autodigestion of degenerating organelles in eukaryotic cells. A red ring of lysosomes was seen tightly encircling the condensed nucleus in MCF-7 (wt) cellsafter 1.5 Gy dose of X-ray treatment, while in cells of MCF-7 (DOX/R) sub-line - after higher radiation doses (3.0 and 4.5 Gy).Our results are consistent with acidification of the apoptotic nucleus, possibly by fusion with lysosomes which release their digestive contents into the dying nucleus.

The results of our study suggest that doxorubicin-resistantbreast cancer cells were also more refractory to X-radiation-dependent changes of cytomorphology in comparison with doxorubicin-sensitivebreast cancer cells.