RADIATION-INDUCED DNA DAMAGE AND ITS REPAIR IN BREAST CANCER CELLS

Chorna I.V., Shkandala A.Yu., student
Sumy State University,
Department of Biophysics, Biochemistry, Pharmacology and Biomolecular Engineering

The development of drug resistance in tumor cells is a multi-factorial process. Besides, a cross-resistance between anticancer drugs and radiation represents a challenge for most anticancer therapies.

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

Initial radiation-induced DNA damage and kinetics of DNA repair were assessed using comet assay under alkaline and neutral conditions. The alkaline comet assay detects single and double DNA strand breaks whereas neutral condition detects mainly double-strand breaks.

Results showed the similar level of baseline DNA damage in non-irradiated cells of both sub-lines. In MCF-7(wt) cells, comparing with MCF-7(DOX/R) cells, there was detected a higher level of DNA damage (in 1,75 times) when tested immediately (0 min) after 2 Gy exposure. MCF-7(DOX/R) cells showed "fast" DNA single-strand breaks repair, since there were no statistically significant differences in the levels of DNA migration between control and irradiated cells of that sub-line after 30 min of repair. A complete reparation of DNA damage was observed in MCF-7(wt) cells in 180 min after 2 Gy dose of X-ray treatment. A decreased level of radiation-induced DNA damage was revealed by the neutral comet assay in MCF-7(DOX/R) cells comparing with MCF-7(wt) cells. The formation of DNA double-strand breaks in MCF-7(DOX/R) cells was significantly less (49±4 a.u.) than those in MCF-7(wt) cells(136±9 a.u) 48 h after exposure to 4,5 Gy X-rays. The present results suggest that differences in radiosensitivity between both breast carcinoma cell lines can be attributed to differences in the number of initially radiation-induced DNA single and double-strand breaks and rate of DNA repair. MCF-7(DOX/R) cells may have up-regulated detoxification and DNA repair enzymes in response to chronic exposures to doxorubicine.

Актуальні питання теоретичної та клінічної медицини : збірник тез доповідей Міжнародної науково-практичної конференції студентів та молодих вчених, м. Суми, 10-12 квітня 2013 р. / Відп. за вип. М.В. Погорєлов. — Суми : СумДУ, 2013. — С. 107.