SENSITIZATION TO X-RAY-INDUCED CELL DEATH BY N-*t*-BUTYL-α-PHENYLNITRONE IN CULTURED CHINESE HAMSTER V79 CELLS

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Active oxygens are known to be responsible for cell injuries. Aerobic cells are protected against such damage by active oxygens by both enzymatic and nonenzymatic antioxidants. The ingestion of extracellularly added antioxidants further protects against active oxygen-induced cell injuries. Therefore, it is important to find effective antioxidants and to investigate their antioxidizing mechanisms. Recent studies reported that N-*t*-butyl-α-phenylnitrone (PBN) was an excellent antioxidant and clearly protected against ischemia-reperfusion injury in the rat brain. X-rays produce hydroxyl radicals, an active oxygen from, and induce cellular damage such as mutation, transformation and death.

In the present study the effects of this substance on X-ray-induced cell death were investigated using cultured Chinese hamster V79 cells. The cells were treated with the medium with or without 10 mM PBN for 3h prior to X irradiation. The X-ray dose-response curves were obtained from their colony-forming abilities. The curves obtained showed that PBN enhanced X-ray-killing effects by mainly modifying the mean lethal dose. When X-ray-induced double-strand breaks (DSB) of DNA were examined by pulse-field gel electrophoresis as a criterion relating to cell death, PBN was found to diminish the induction of DSB. Examination of X-ray-induced base alterations of DNA by a high-performance liquid chromatography equipped with an electrochemical detector as another criterion showed that PBN enhanced the formation of some modified bases (8-hydroxyguanine and 8-hydroxyadenine). Though a correlation between DNA DSB and cell death is generally accepted, the present results indicated that PBN sensitized X-irradiated Chinese hamster V79 cells to cell death by increasing the base alterations.