Dibromoacetonitrile-induced protein oxidation and inhibition of proteasomal activity in rat glioma cells

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ABSTRACT

Dibromoacetonitrile (DBAN) is a disinfection byproduct of water chlorination. The present study was designed to investigate the potential oxidative protein modifications and alterations in proteasomal activity induced by DBAN in C6 glioma cells (C6 cells). Cells were exposed to 50–400 ppb DBAN for 24 h or 48 h. Cellular viability and lactate dehydrogenase (LDH) leakage were unaffected at 24 h. However, at 48 h after exposure to high concentrations of DBAN, there was a significant decrease in cell viability accompanied by a significant increase in LDH leakage. Exposure to DBAN for 48 h significantly enhanced formation of reactive oxygen species (ROS) in a concentration-related manner. Incubation of C6 cells for 24 h or 48 h caused 1.3–2.4-fold increase in levels of lipid peroxidation as indicated by malondialdehyde (MDA) + 4-hydroxy-2,5-dienal (4-HNE). Further, DBAN induced a concentration and time-dependent increase (1.5–5-folds) in the levels of protein carbonylation. At 48 h, proteasomal activities were found to decrease to 80%, 72%, 46%, and 34% of control with 50 ppb, 100 ppb, 200 ppb, 400 ppb DBAN, respectively. In conclusion, the present study indicates that exposure of C6 cells to DBAN results in generation of ROS, lipid peroxidation, accumulation of oxidized proteins and inhibition of proteasomal activity.

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