LEAD-INDUCED CYTOTOXICITY AND OXIDATIVE STRESS IN HUMAN BREAST CARCINOMA (MCF-7) CELLS

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Abstract: Lead is ubiquitous in the human environment as a result of industrialization. Historical literature extensively documents that chronic, excessive exposure to lead is associated with increased rates of infertility, miscarriage, stillbirth, and poor infant outcomes. Research indicates that exposure to lead during pregnancy is only one source from which a fetus can be exposed to lead. Pregnancy and breastfeeding can cause a state of physiologic stress that increases bone turnover of lead. However, the molecular mechanisms of toxicity are still largely unknown. In this research, we hypothesized that oxidative stress plays a key role in lead nitrate-induced toxicity in human breast carcinoma (MCF-7) cells. To test this hypothesis, we performed the MTT and the trypan blue exclusion test for cell viability, and lipid peroxidation assay to determine the cellular level of MDA production in MCF-7 cells subjected to lead. The results obtained from the MTT assay indicated that lead nitrate significantly decreases the viability of MCF-7 cells in a dose-dependent manner. Upon 48 h of exposure, the cell viability (mean ±SE, n = 6) compared to untreated control was 100 ± 2%, 102 ± 3%, 105 ± 6%, 112 ± 3%, 102 ± 2%, 97 ± 4%, 74 ± 2% and 33 ± 1% in 0, 0.80, 1.58, 3.12, 6.25, 12.50, 25, and 50.00 μg/mL of lead nitrate, respectively. Similar result was obtained with the trypan blue exclusion test. Data generated from lipid peroxidation assay resulted in a significant increase (p < 0.05) in malondiadehyde (an end product of lipid peroxidation) with increasing doses of lead nitrate. In summary, findings from this study demonstrated that lead nitrate is cytotoxic to MCF-7 cells. This cytotoxicity is found to be associated with oxidative stress.

Keywords: Lead nitrate, lipid peroxidation, MDA, cytotoxicity, MCF-7 cells

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