MOLECULAR MECHANISMS OF HIGH GLUCOSE-INDUCED TOXICITY IN HUMAN BREAST ADENOCARCINOMA (MCF-7) CELLS

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Abstract: Glucose is a simple sugar that your body relies on it to produce energy. It has been shown that high glucose is related to many long-term health problems including the kidneys, nerves, eyes and vision, risk of heart disease and stroke, erectile dysfunction in men and pregnancy complications in women. Epidemiological data have suggested an increased cancer rates in diabetic patients, for which the underlying mechanism is poorly understood. Hence, the aim of the present investigation was to evaluate the cell viability of human breast adenocarcinoma (MCF-7) cells exposed to different doses (0, 5, 10, 20, 40, 80 mg/mL) of D-glucose by the means of trypan blue exclusion test and MTT assay, respectively. The degree of DNA damage and early stage apoptosis were also tested by the means of alkaline single cell gel electrophoresis (Comet) assay, and flow cytometric analysis using Annexin V FITC/PI, respectively. The results of MTT assay indicated that low dose (5 mg/mL) of D-glucose slightly increase cell viability upon 2 h of exposure. On the other hand, high doses (10-80 mg/mL) of D-glucose significantly reduce the viability of MCF-7 cells in a dose and time-dependent manner. Similar trend was obtained with the trypan blue exclusion test. Data obtained from the comet assay indicated that D-glucose causes DNA damage in MCF-7 cells in a dose-dependent manner. The flow cytometric assessment (Annexin V FITC/PI) showed a strong dose-response relationship between high glucose exposure and annexin V positive cells undergoing early stage apoptosis in MCF-7 cells. Based on these direct in vitro findings, our study provides clear evidence that elevated level of D-glucose induced cytotoxic and genotoxic effects, and apoptosis in MCF-7 cells. This finding indicates that elevated level of glucose may be is associated with diabetic complications in vascular endothelium of the female breasts.

Keywords: D-glucose, MCF-7 cells, trypan blue, MTT assay, DNA damage, apoptosis

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