ALGINATE PROTECTS DIFFERENTIATION PC12 CELLS AGAINST APOPTOSIS VIA CASPASE-DEPENDENT MANNER

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Background: Increased oxidative stress is a widely accepted factor in the development and progression of Alzheimer’s disease and the ability of cells to control the balance between the generation and quenching of reactive oxygen species is important in combating its potentially damaging effects.

Methods: Using NGF-differentiated rat PC12 adrenal pheochromocytoma cells, the levels of Bcl-2, Bax, Caspase-3, PARP, p53, AIF, NF-κB, Nrf2, MAPKs, HSPs, intracellular reactive oxygen species (ROS) and calcium were determined after exposure to H$_2$O$_2$ in the presence and/or absence of alginate.

Results: H$_2$O$_2$ treatment PC12 induced a time-dependent activation of caspase-3 and PARP, p53, AIF, NF-κB, HSPs, with consequent increases in intracellular ROS and calcium levels. In addition, H$_2$O$_2$ induced an abrupt increase in phosphorylation of JNK, p38 and ERK without any significant change in total JNK, p38 and ERK protein levels. Pretreatment of PC12 cells with alginate (0.083w/v), caused by about 39% higher viability relative to the H$_2$O$_2$ treated cells and inhibited Bax, caspase-3, NF-κB and Hsp90 expression. In addition a downregulation of p53 was observed while no change was seen on the level of AIF. Alginate also attenuated H$_2$O$_2$-induced JNK, p38 and ERK activation/phosphorylation in a dose-dependent manner without any effect on total JNK, p38 and ERK levels. In addition, alginate reduced H$_2$O$_2$-induced generation of reactive oxygen species (ROS) and increased intracellular calcium. Besides, alginate increased Hsp-70 and Bcl-2 expression.

Conclusion: Alginate treatment for 24 hours prior to H$_2$O$_2$ protected against the apoptosis, calcium and ROS accumulation in H$_2$O$_2$-treated cells.