

Biochem Biophys Res Comm, 282, 228-235 (2001).

Polyamine Cytotoxicity in the Presence of Bovine Serum Amine Oxidase

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The toxicity of extracellular spermine was studied using three cell lines: FM3A, L1210, and NIH3T3 cells in the presence of fetal calf serum. Amine oxidase in fetal calf serum produces aminodialdehyde generating acrolein spontaneously, H₂O₂, and ammonia from spermine. Spermine toxicity was prevented by aldehyde dehydrogenase, but not by catalase. Similar concentrations of spermine and acrolein were needed to produce toxicity. Other aldehydes (formaldehyde, acetaldehyde, and propionaldehyde) and hydrogen peroxide were less toxic than acrolein. Spermidine and 3-aminopropanal, which produces acrolein, also exhibited severe cytotoxicity. The degree of cytotoxicity of spermine, spermidine, and 3-aminopropanal was nearly parallel with the amount of acrolein produced from each compound. These results suggested that acrolein is a major toxic compound produced from polyamines (spermine and spermidine) by amine oxidase.