Acetaldehyde promots DNA adducts formation, DNA fragmentation and lipid peroxidation in rats

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Air pollution is a major environmental risk for human health. The mutagenicity of polar organic extracts collected from São Paulo city was recently investigated. The most mutagenic fractions contained ketones, aldehydes and quinolines. It is well know that aldehydes induce oxidative stress and cellular death. In the present study, we evaluated DNA damage and lipid peroxidation in liver of rats treated intraperitoneally with acetaldehyde 150 mg/Kg (5% v/v in NaCl 0,9%) during 8 days and 60 mg/kg during 30 days. We examined lipid peroxidation by the quantification of malondialdehyde (MDA), by HPLC coupled to fluorescence detection. The MDA levels in the acetaldehyde-treated rats were 70% higher compared to control. To evaluate acetaldehyde genotoxicity the Comet assay was performed. DNA migration was assessed by fluorescence microscopy. A significant increase of DNA strand breaks was observed in the liver of acetaldehyde-treated rats in comparison with the control group. The induction of DNA damage was, also, analyzed by the quantification of 8-oxo-7,8-dihydro-2'-deoxyguanosine (8-oxodGuo), 1,N^2-etheno-2'-deoxyguanosine (1,N^2-εdGuo) and 1,N^2-propano-2'-propanodeoxyguanosine (1,N^2-propanodGuo), a product of the reaction of DNA with acetaldehyde, by HPLC coupled with eletrochemical detection and mass espectrometry. Compared with control rats, liver of acetaldehyde-treated animals showed a significant increase in DNA adduct levels. Our results confirm that acetaldehyde is highly cytotoxic and genotoxic. DNA and lipid damage can be useful in the elucidation of the biochemical mechanisms linking aldehydes exposition and increased risk of cancer.

Key Words: Acetaldehyde, DNA adducts, DNA strand breaks, lipid peroxidation

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