

Oxidative Stress and Changed Gene Expression Profiles in Fiber-/Particle-Induced Carcinogenesis

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ABSTRACT Exposure to ambient air pollution (particles, fibres) is associated with pulmonary diseases and cancer. The mechanisms of induced health effects are believed to involve inflammation and oxidative stress. Oxidative stress mediated by airborne particles and/or fibres may arise from direct generation of reactive oxygen species (ROS) from the surface of particles/fibres, soluble compounds such as transition metals or organic compounds, and activation of inflammatory cells capable of generating ROS and reactive nitrogen species (RNS). Generation of ROS/RNS can directly cause covalent modifications to DNA or they can initiate the formation of genotoxic lipid hydroperoxides. The resulting oxidative DNA damage can lead to changed gene expression such as upregulation of tumor promoters and downregulation of tumor suppressor genes and thus may be implicated in cancer development. The present review describes the important role of free radicals in particle-/fibre-induced cellular damage, the interaction of ROS with target molecules, especially with DNA, and the modulation of specific genes and transcription factor caused by oxidative stress.