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Oxidative Stress and Carcinogenesis

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Abstract: *Oxidative stress is a critical factor in the initiation and progression of cancer, arising from an imbalance between the production of Reactive Oxygen Species and the body's antioxidant Défense mechanisms. Reactive oxygen species, including free radicals, are generated through normal cellular metabolism as well as external exposures such as radiation, pollution, and toxins. When present in excess, these molecules can damage essential cellular components, particularly DNA, leading to mutations, genomic instability, and disruption of normal cell cycle regulation. The process of carcinogenesis is closely linked to oxidative stress, as persistent oxidative damage contributes to the activation of oncogenes and the inactivation of tumour suppressor genes. Additionally, oxidative stress promotes chronic inflammation, which further enhances tumour development by creating a microenvironment conducive to uncontrolled cell proliferation and survival.*

Antioxidants play a vital protective role by neutralizing reactive oxygen species and maintaining cellular redox balance. Both endogenous antioxidant enzymes and dietary antioxidants help mitigate oxidative damage and reduce cancer risk. Understanding the relationship between oxidative stress and carcinogenesis provides valuable insights into preventive strategies, including dietary interventions, lifestyle modifications, and the development of targeted therapies..

Keywords: Oxidative Stress, Carcinogenesis, Reactive Oxygen Species, DNA Damage, Antioxidants, Cancer Prevention