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8-hydroxy-2' -deoxyguanosine (8-OHdG): A critical biomarker of oxidative stress and carcinogenesis.

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Abstract

There is extensive experimental evidence that oxidative damage permanently occurs to lipids of cellular membranes, proteins, and DNA. In nuclear and mitochondrial DNA, 8-hydroxy-2' -deoxyguanosine (8-OHdG) or 8-oxo-7,8-dihydro-2' -deoxyguanosine (8-oxodG) is one of the predominant forms of free radical-induced oxidative lesions, and has therefore been widely used as a biomarker for oxidative stress and carcinogenesis. Studies showed that urinary 8-OHdG is a good biomarker for risk assessment of various cancers and degenerative diseases. The most widely used method of quantitative analysis is high-performance liquid chromatography (HPLC) with electrochemical detection (EC), gas chromatography-mass spectrometry (GC-MS), and HPLC tandem mass spectrometry. In order to resolve the methodological problems encountered in measuring quantitatively 8-OHdG, the European Standards Committee for Oxidative DNA Damage was set up in 1997 to resolve the artifactual oxidation problems during the procedures of isolation and purification of oxidative DNA products. The biomarker 8-OHdG or 8-oxodG has been a pivotal marker for measuring the effect of endogenous oxidative damage to DNA and as a factor of initiation and promotion of carcinogenesis. The biomarker has been used to estimate the DNA damage in humans after exposure to cancer-causing agents, such as tobacco smoke, asbestos fibers, heavy metals, and polycyclic aromatic hydrocarbons. In recent years, 8-OHdG has been used widely in many studies not only as a biomarker for the measurement of endogenous oxidative DNA damage but also as a risk factor for many diseases including cancer.

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