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higher in cancer, Hashimotos, glaucoma, autonomic disease

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Review Article

Use of Malondialdehyde as a Biomarker for Assessing Oxidative Stress in Different Disease Pathologies: a Review

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Abstract

Malondialdehyde (MDA) is widely used as a biomarker for assessing oxidative stress in biomedical fields. Lipid peroxidation is a chain phenomenon resulting in the formation of various active compounds that result in cellular damage. Biomonitoring of MDA has been used in both in-vivo and in-vitro studies as a key biomarker for various disease patterns including hypertension, diabetes, atherosclerosis, heart failure and cancer. Higher levels of MDA are reported in patients of various categories including lung cancer patients, complex regional pain syndrome patients and glaucoma patients. The findings suggest the validity of the MDA assay as a reliable tool in finding out the oxidative stress in different disease pathologies. The present review emphasizes on the reliability and efficacy of MDA estimation in various health disorders.

Keywords: Malondialdehyde, Lipid peroxidation, Free radicals, Oxidative stress

Introduction

Oxidative stress is the state of imbalance between the reactive oxygen species (ROS) and the ability of a biological system to detoxify readily the reactive intermediates. Development of oxidative stress because of free oxygen radical generation has been implicated in the pathogenesis of many diseases including Parkinson's disease, Alzheimer's disease, atherosclerosis, heart failure, myocardial infarction and even cancer. FRs are unstable moieties that tend to interact with cellular structures. ROS and FR are continuously formed in the body of animals by a partial reduction of oxygen. The superoxide radical ($\cdot O_2^-$), one of the ROS, is known to be generated in brain. It is involved in the reduction of certain iron complexes including cytochrome C and ferricethylenediaminetetraacetic acid (Fe^{3+}-EDTA) (1). Similarly, nitric oxide ($NO\cdot$) and peroxyl ($RO_2\cdot$) radicals are highly unstable moieties formed in the human body that disrupt proteins and promote DNA damage. ROS are also engaged in disruption of the integrity of polyunsaturated fatty acids. Hypochlorous acid (HOCl), peroxynitrite ($ONOO^-$), hydrogen peroxide (H_2O_2) and ozone (O_3) are the non-radical forms of ROS that can easily enter free radical reactions.

The antioxidant system of the body defends the ROS produced in the body. Superoxide dismutases (SOD) help the body to remove the superoxide radicals by converting it to hydrogen peroxide (H_2O_2). Catalases further catalyze the conversion of hydrogen peroxide to water and