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Review

Electrochemical biosensors as a tool for antioxidant capacity assessment

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Abstract

Oxidative stress arises from the excess of free radicals due to environmental or behavioural stressors, or simply to a malfunction of the antioxidant production. It produces damage to lipids, proteins or DNA, impeding normal cell functioning and leading to numerous human diseases, as well as to the aging process. Antioxidants respond to this problem, scavenging the free radicals. This article critically reviews the electrochemical biosensors developed for the evaluation of the antioxidant capacity of specific compounds. Three different sensing approaches are described, based on cytochrome *c*, superoxide dismutase and DNA. Due to the ability of these devices to perform simple, fast and reliable analysis, they are promising biotools for the assessment of antioxidant properties.

Keywords: Reactive oxygen species (ROS); Antioxidant; Biosensor; Cytochrome *c* (cyt *c*); Superoxide dismutase (SOD); DNA

Contents

1. Introduction

Free radicals, such as reactive oxygen species (ROS), are highly unstable molecules with available electrons, generated *in vivo* during metabolic processes. These molecules are neutralised by antioxidants, naturally produced by the body. However, environmental or behavioural stressors (pollution, sunlight exposure, cigarette smoking, excessive alcohol consumption, etc.) or simply a malfunction of the antioxidant antioxidant production may lead to a free radical excess, resulting in oxidative stress. Oxidative stress produces damage to lipids, proteins or DNA, impeding normal cell functioning. These biochemical alterations are implicated in a growing list of human diseases, such as cancer and Alzheimer's disease, as well as in the aging process. Since antioxidants are naturally present in vegetables, a balanced diet helps the body to prevent these diseases.

The determination of free radicals and antioxidants has been widely investigated in the food technology and human health fields. Traditional techniques such as spectrophotometry, fluorescence, and gas or liquid chromatography [1,2], are being replaced by other innovating technologies. In this direction,

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