The Oxidative Stress and Antioxidants in Scientific Research

Bilimsel Araştırmalarda Oksidatif Stres ve Antioksidanlar

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Abstract

Oxidative stress, which is caused by the effect of many factors in living organisms, must be constantly balanced by the antioxidant system. The continuous formation of free oxygen radicals for many reasons, especially aerobic respiration, increases oxidative stress. The antioxidant system is formed by various enzymes, vitamins and many other structures. All these antioxidant structures are constantly working to neutralize oxidative stress products and to establish a balance. In order to maintain the oxidant-antioxidant balance, lifestyle changes such as healthy and balanced nutrition and increasing mobility are of great importance in living organisms. Today, oxidative stress and antioxidants are frequently measured both in various experimental models established in experimental animals and in clinical studies, which is becoming increasingly important. For this reason, oxidant-antioxidant balance indicator parameters are very valuable in scientific research. In addition, newly established different in vivo models have started to measure oxidative stress and antioxidant status. For this reason, our internationally indexed journal TJHS will give priority to scientific research on oxidant-antioxidant balance and publish current scientific developments in this field.

Keywords: Oxidative status, antioxidant status, oxidative stress, antioxidant activity.

Özet

Canlı organizmalarda birçok faktörün etkisi ile oluşan oksidatif stres sürekli biçimde antioksidan sistemce dengelenmelidir. Oksijenli solunum başta olmak üzere birçok sebeple sürekli olarak serbest oksijen radikallerinin oluşumu oksidatif stresi artırır. Antioksidan sistem çeşitli enzimler, vitaminler ve bunların dışındaki birçok yapı tarafından oluşturulur. Bütün bu antioksidan özellikli yapılar, sürekli olarak oksidatif stres ürünlerini etkisiz hale getirmek ve bir denge kurmak için çalışmaktadırlar. Oksidan-antioksidan dengesinin korunması için, canlı organizmalarda, sağlıklı ve dengeli beslenilmesi, hareketliliğin artırılması gibi yaşam tarzı değişikliklerinin büyük önemi bulunmaktadır. Günümüzde giderek önemini arttıran biçimde, hem deney hayvanlarında kurulan çeşitli deneysel modellerde hem de klinik çalışmalarda oksidatif stres ve antioksidanlar sıklıkla ölçülmektedir. Bu sebeple oksidan-antioksidan denge göstergesi parametreler bilimsel araştırmalarda çok değerlidir. Ayrıca yeni kurulan farklı invivo modeller de oksidatif stres ve antioksidan durumu ölçmeye başlamıştır. Bu sebeple uluslararası alan indeksli dergimiz TJHS, oksidan-antioksidan denge ölçülen bilimsel araştırmalara öncelik verecek ve bu alandaki güncel bilimsel gelişmeleri yayınlayacaktır.

Anahtar kelimeler: Oksidan durum, antioksidan durum, oksidatif stres, antioksidan aktivite.

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Introduction

Oxidative stress, which is caused by the effect of many factors in living organisms, must be constantly balanced by the antioxidant system (1-5). The continuous formation of free oxygen radicals for many reasons, especially aerobic respiration, increases oxidative stress. The antioxidant system is formed by various enzymes, vitamins and many other structures. Although superoxide dismutase, catalase, glutathione peroxidase, glutathione S transferase, paraoxonase 1, arylesterase, glutathione, vitamins A, C and E are the main antioxidants, there are many antioxidant structures apart from these (6-10). All these antioxidant structures are constantly working to neutralize oxidative stress products and to establish a balance. In order to maintain the oxidant-antioxidant balance, lifestyle changes such as healthy and balanced nutrition and increasing mobility are of great importance in living organisms. If the balance in question is disturbed due to reasons such as weakening of the antioxidant system or excessive increase in oxidative stress, oxidative damage begins in cells, tissues and organs (11-15). Oxidative damage gradually damages many structures, especially the cell membrane, organelle membrane, nucleus membrane, genetic material. It disrupts protein, carbohydrate and lipid structures. As the oxidative damage that starts in this way accumulates and increases, physiological processes such as aging are accelerated, and hundreds of multifactorial fatal diseases such as cancer, cardiovascular diseases and diabetes mellitus are triggered (16-20). For this reason, the measurement and evaluation of oxidative stress and antioxidants is a current and important issue in health-related scientific research. The number of experimental and in vivo studies in this field is increasing day by day (21-22).

As the number of studies increases, novel research methods are also developing. Due to the fact that the oxidant and antioxidant system is formed by many components, some of these components were tried to be measured separately. In the second stage, the idea was carried out by measuring oxidative stress products such as protein carbonyl, malonaldehyde, which are formed by oxidative damage. Finally, parameters such as total oxidant status, total antioxidant status and oxidative stress index have been developed to show the general status of the antioxidant and oxidant system. However, new generation parameters such as native thiol, total thiol and calculated thiol-disulfide balance, ischemia modified albumin have begun to be measured frequently (17-18).

Thiols are also known as mercaptans. Thiols are organic compounds containing compounds of hydrogen and sulfur atoms attached to a carbon atom. The plasma thiol pool contains mainly albumin thiols, protein thiols, low molecular weight thiols. Thiols can undergo oxidation reactions via oxidants and form disulfide bonds. Disulfide bond is a covalent

bond and is also called SS bond or disulfide bridge. Under oxidative stress, cysteine residues alternately form disulfide bonds between protein thiol groups and low molecular weight thiols. Native thiol and total thiol measurement dynamically displays thiol balance. The disulfide bonds can be reduced back to thiol groups, thus maintaining the dynamic thiol disulfide equilibrium (17-18).

Paraoxonase 1 and arylesterase antioxidant and enzymes that work for vascular health are used to determine ischemic lesions and to show antioxidant status. LDL oxidation accelerates atherosclerosis. Inflammation and oxidative stress lead to oxidation of LDL. The release of monocyte chemoattractant protein-1 from endothelial cells will lead to the migration of monocytes. These phagocytize oxidized LDL (oxLDL) into foam cells. PON1 hydrolyzes oxLDL. oxLDL converts back to LDL. Thus, PON1 inhibits the progression of atherosclerosis. It contributes to the cholesterol balance and the prevention of oxidation and ensures the protection of vascular health (20-21).

In addition to health sciences, there are various studies to investigate the balance of oxidative stress-antioxidant capacity in sports sciences (22). Examination of antioxidant capacity in sports sciences expands the scope of antioxidant research.

Conclusion

Nowadays, oxidative stress and antioxidants are frequently measured both in various experimental models established in experimental animals (1-14) and in clinical studies (15-21), which is becoming increasingly important. For this reason, oxidant-antioxidant balance indicator parameters are very valuable in scientific research. In addition, newly established different in vivo models have started to measure oxidative stress and antioxidant status (23). For these reasons, our internationally indexed journal TJHS will give priority to scientific research on oxidant-antioxidant balance and publish current scientific developments in this field.

Conflict of interest: There is no conflict of interest.

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