Austin Journal of Plant Biology

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Austin Publishing Group

Editorial

Fatigue May Relay on the Increase of Oxidative Stress

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Received: November 01, 2016; **Accepted:** December 27, 2016; **Published:** December 30, 2016

Editorial

Fatigue is a common symptom in people with stress, it is also a very common social problem at present. Fatigue can be defined as a failure to maintain the required or expected force or power output. In general, it can be divided into physical and mental fatigue. Physical fatigue manifests mainly as physical deteriorations of muscle tone and exercise tolerance, due to an accumulation of lactic acid and other metabolites. Regular exercise combined with a balanced diet may be the most effective strategy through with to maintain or promote good health [1]. Several studies have shown that exogenous antioxidants can reduce exercise-induced oxidative stress. For the sake of convenience, more and more people are choosing to take complementary and alternative medicines to eliminate fatigue-related metabolites and improve athletic ability. Many studies have shown that herbal medicines can improve various parameters of immune function, then, further enhance the energy metabolism to release the fatigue state. Many drugs present are taken on such a treatment strategy.

In Haifeng Ma's experimental study [1] we can know that he had explored the antifatigue effects of acupuncture on the young male athletes with exhaustive physical exercises. We found that the acupuncture treatment ameliorated fatigue by back regulating the perturbed energy metabolism at an accelerated speed than the group enjoyed an extended rest, which demonstrated that acupuncture could serve as an alternative fatigue-relieving approach. In Chiting Horng's experimental study [2], all rats were trained on a treadmill for 12 days before an exhaustive exercise program was performed. Motivation was provided by an electric shock zone at the rear of each compartment. Serum Urea Nitrogen (SUN), Superoxide Dismutase (SOD) and Malondialdehyde (MDA) were detected in the serum. Taken together, the endurance time to exhaustion, total antioxidant ability (TEAC values) and blood SOD activity were increased and blood lactate and SUN and MDA levels were decreased. So a conclusion was made that the main mechanism of antifatigue was the theory of free radical. Free radical production during exercise contributes to fatigue, and antioxidant treatment which was related to oxidative stress might be a therapeutic approach. In Jinting Shao's study [3], A loaded swimming test demonstrated that the swimming times of the low-, medium-and high-dose groups were longer than those of the control group. Examinations revealed that the liver and muscle glycogen, lactate dehydrogenase and blood glucose concentration levels of the treatment groups were higher than those of the control group ($P<0.05$). Quantitative polymerase chain reaction showed that the gene expression levels of glucose transport protein 4 and AMP-activated protein kinase in the medium-dose group exhibited the largest increases, compared with the other treatment groups, and were 3.0- and 1.8-fold higher than those in the control group, respectively. The results of the present study indicated that G. eucheumoides exerts an antifatigue effect on mice. In Aiping Chi's study [4], a 4-week weight-loaded swimming test of mice was established and polysaccharides were orally administrated during exercise. The biochemical parameters related to fatigue were determined, such as exhaustive time, Blood Urea Nitrogen (BUN), Blood Lactate acid (Bla) levels and Lactic Dehydrogenase (LDH) activity in serum, Superoxide dismutase (SOD), Glutathione peroxidase (GSH-Px) activities, Malondialdehyde (MDA) and glycogen levels in skeletal muscle. The results demonstrated that polysaccharide from Ziyang green tea was a selenium-polysaccharide protein conjugate (Se-TP), and Se-TP administration significantly prolonged exhaustive time and increased glycogen level and GSH-Px activity in muscle, in addition, markedly decreased BUN, Bla levels and LDH activity in serum and MDA level in muscle. In conclusion, Se-TP treatment can significantly improve exercise-induced fatigue and decrease the oxidative stress induced by the exhaustive exercise. From the experiments we can make a conclusion that most of the antifatigue effect for all kinds of drugs may decrease the oxidative stress effect.

To a sum, SOD is important in protecting against oxygen free radical damage that results in direct peroxidative damage to cellular components. MDA, the end product of lipid peroxidation, is a good marker of free radical-mediated damage and oxidative stress. During high intensity exercises, blood glucose is metabolized and oxidized to pyruvate, and Lactic Acid (LC) is produced from the pyruvate at a greater speed than tissues are capable of removing it. Increased lactate results in a further reduction in blood pH, which may induce various biochemical and physiological side effects, including glycolysis and the release of phosphofructokinase and calcium ions, through muscular contraction. The enzyme GSH-Px scavenges free radicals, inhibits free radical reactions, prevents membrane lipid peroxidation, and preserves cell membrane structure and functions. SOD and GSH-Px are recognized as primary antioxidant enzymes; their activities become weaker during fatigue or other disease conditions, so that the improvement of their activities can help to avoid fatigue development.

The more commonly used biochemicals were SOD, MDA, LC, GSH-Px et al. As parameters, they offer important information to reflect the changes in our bodies. And they can be an indicator for the states of our bodies. These biochemicals are main related to the changes of oxidative stress, they also reflect the degree of fatigue. Therefore, I think fatigue is main relay on oxidative stress, we can explain fatigue in the term of oxidative stress.

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Citation: Shui S. Fatigue May Relay on the Increase of Oxidative Stress. Austin J Plant Biol. 2016; 2(1): 1016.

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Austin J Plant Biol - Volume 2 Issue 1 - 2016
ISSN: 2472-3738 | www.austinpublishinggroup.com

Citation: Shui S. Fatigue May Relay on the Increase of Oxidative Stress. Austin J Plant Biol. 2016; 2(1): 1016.