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COMMENTARY

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Psychological Disorders and Oxidative Stress

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Commentary

The term Oxidative stress is an imbalance between the cellular production of reactive oxygen species (ROS) and counteracting antioxidant mechanisms. With high oxygen consumption and a lipid rich environment in brain is considered highly susceptible to oxidative stress or redox imbalances. Thus, the fact that oxidative stress is implicated in several mental disorders including depression, anxiety disorders, schizophrenia and bipolar disorder, is not surprising.

Although several elegant studies have been established a link between oxidative stress and psychiatric disorders, the causal relationship between oxidative stress and psychiatric diseases is not fully determined. Within the mitochondria, oxidative phosphorylation takes place and it is a major source of ATP in aerobic organisms. It also produces free radicals as a by-product, including reactive oxygen species [ROS], reactive nitrogen species [RNS], carbon centered and sulfur centered radicals. With an unpaired number of electrons, free radicals are atoms or groups of atoms that are highly reactive substances which results in chain reactions, with each step forming a free radical. The oxygen reduction to water generates ROS as intermediates that can cause damage.

The primary ROS generated in humans are hydrogen peroxide, superoxide radical and hydroxyl radical. During the process of auto-oxidation of hemoglobin and photolysis the superoxide radical is generated. This superoxide is not peculiarly reactive by itself, but it can be catalytically converted by superoxidase dismutases [SOD] to H_2O_2, which decomposes to yield the highly reactive hydroxyl radical in the presence of iron. Oxidative stress considered as a state of cellular imbalance, were ROS production exceeds antioxidant response mechanisms which help to neutralize the ROS-mediated oxidative damage to DNA, RNA and lipids resulting a variety of different pathophysiological consequences.

Anxiety and Oxidative Stress

In brief, anxiety is caused by a stressful event such as that of public speaking is a normal reaction to immediate stress and in fact it is a motivation to do better. Incase anxiety becomes irrational, persistent and excessive; it leads to pathological and often exhibit into anxiety disorders.

There are various types of anxiety disorders including post-traumatic stress disorder, panic disorder and obsessive compulsive disorder and generalized anxiety disorders. It's probable that multiple signaling pathways involving antioxidant, anti-inflammatory, or anti-apoptotic mechanisms may regulate anxiety like behavior. Further evidence states that the hypotheses of NOX-derived ROS are involved in the pathophysiology of anxiety and bipolar disorders.

Depression and Oxidative Stress

A complex and heterogeneous disorder that has negative impact on quality of life, morbidity or mortality, and cognitive function is known as depression. Several years ago, the oxidative stress has received much attention with regards to psychiatric illnesses and also been proposed as a contributing factor in the pathogenesis of depression. Several lines of evidence specify the involvement of oxidative and nitrosative stress in the pathophysiology of major depression. Therefore, for novel anti-depressants the oxidative and nitrosative mechanisms have been proposed as targets. It was studied that the individuals who are suffering with depression has been displayed with lower serum or plasma antioxidant potentials and reduced brain GSH levels. In depressed patients the circulatory levels of F2-isoprostanes are increased and are correlated with

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the severity of depressive symptoms and urinary excretion of 8 hydroxydeoxyguanosine seems to be higher when compared to healthy controls.

Bipolar Disorder and Oxidative Stress

Bipolar disorder is characterized by intermittent episodes of mania or hypomania that usually interlaced with depressive episodes. This is also a serious mood disorder which is clinically presented as unusual shifts in mood, energy and cognitive levels, with or without depressive episodes.

Symptoms are different from the normal ups and downs, and this disorder may seriously damage relationships, job life or school performance, and even tend to suicide.

In several studies it has been reported that patients with bipolar disorder have significant alterations in lipid peroxidation, antioxidant enzymes, and nitric oxide levels, such as increased lipid peroxidation and increased Nitric Oxide levels.

Conclusion

Here the accumulating evidence implicates of free radical mediated pathology, altered antioxidant capacity, neurotoxicity and inflammation in neuropsychiatric disorders. It is also stated up to what extent oxidative stress contributes to specific clinical symptomatology of these complex and debilitating psychiatric ailments remains to be seen. A major question remains still regarding the causal role of oxidative stress in these illnesses, which is highly critical for early and preventive intervention.