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CONCEPT OF FREE RADICALS & AYURVEDA PERSPECTIVE

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ABSTRACT

The phenomenon of growth, decline and death – ageing has been the source of considerable speculation. The universality of this phenomenon suggests that the reactions which cause it are basically the same in all the living beings. Due to improper oxidation of food particles/body substances, there is emission of free radicals in to the body. These free radicals have high affinity to assail with other stable molecules so as to find an unpaired electron to get stabilized. So free radicals, by the continuous interactions with the molecules, either gets stabilised or destruct the other molecule. This ultimately leads to the increased catabolism and then to ageing. In Ayurveda the term oxidation is denoted in Ayurveda by the term paaka and paaka is the function of agni. So ama is the improper product of paaka due to impaired agni.

KEYWORDS: Free radicals, Antioxidants, Aama, Agnimandya, Rasayana.

INTRODUCTION

Oxygen is an element indispensable for life. When cells use oxygen to generate energy, free radicals are created as a consequence of ATP (adenosine triphosphate) production by the mitochondria. These by-products are generally reactive oxygen species (ROS) as well as reactive nitrogen species (RNS) that result from the cellular redox process. These species play a dual role as both toxic and beneficial compounds. The delicate balance between their two antagonistic effects is clearly an important aspect of life. At low or moderate levels, ROS and RNS exert beneficial effects on cellular responses and immune function. At high concentrations, they generate oxidative stress, a deleterious process that can damage all cell

structures. Free radicals and oxidants play a dual role as both toxic and beneficial compounds, since they can be either harmful or helpful to the body. They are produced either from normal cell metabolisms in situ or from external sources (pollution, cigarette smoke, radiation, medication). When an overload of free radicals cannot gradually be destroyed, their accumulation in the body generates a phenomenon called oxidative stress. This process plays a major part in the development of chronic and degenerative illness such as cancer, autoimmune disorders, aging, cataract, rheumatoid arthritis, cardiovascular and neurodegenerative diseases.[1]

A molecule with one or more unpaired electron in its outer shell is called a free radical.

BENEFICIAL & DELETERIOUS ACTIVITY OF FREE RADICALS[2]

Beneficial Activity

At low or moderate concentrations, ROS and RNS are necessary for the maturation process of cellular structures and can act as weapons for the host defense system. Indeed, phagocytes (neutrophils, macrophages, monocytes) release free radicals to destroy invading pathogenic microbes as part of the body's defense mechanism against disease.

Deleterious Activity

When produced in excess, free radicals and oxidants generate a phenomenon called oxidative stress a deleterious process that can seriously alter the cell membranes and other structures. Oxidative stress results from an imbalance between formation and neutralization of ROS/RNS. If not regulated properly, oxidative stress can induce a variety of chronic and degenerative diseases as well as the aging process and some acute pathologies (trauma, stroke).

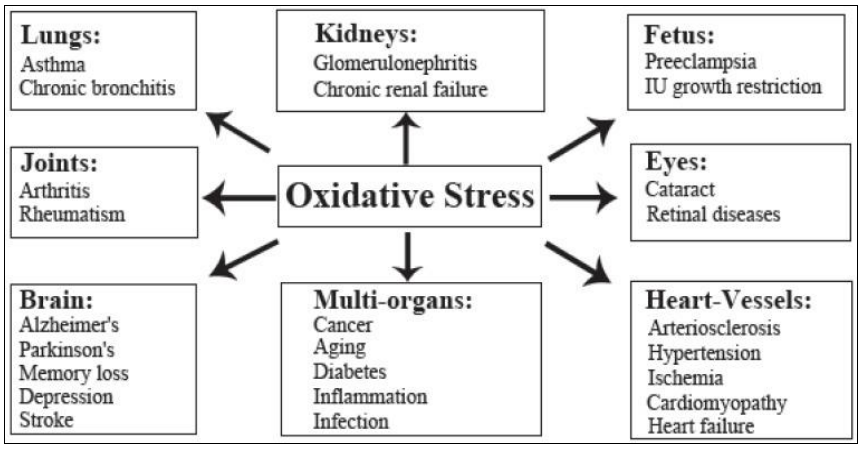

Figure 1: Oxidative Stress Induced Diseases in Humans.

ANTIOXIDANTS AND HEALTH[3]

The body has several mechanisms to counteract oxidative stress by producing antioxidants, either naturally generated in situ (endogenous antioxidants), or externally supplied through foods (exogenous antioxidants). The roles of antioxidants are to neutralize the excess of free radicals, to protect the cells against their toxic effects and to contribute to disease prevention.

ANTIOXIDANT PROCESS[4]

The antioxidant process can function in one of two ways: chain-breaking or prevention. When an antioxidant destroys a free radical, this antioxidant itself becomes oxidized. Thus, while in one particular system an antioxidant is effective against free radicals, in other systems the same antioxidant could become ineffective. Therefore, the antioxidant resources must be constantly restored in the body.

AYURVEDA CONCEPT OF FREE RADICALS[5]

A living organism is e union of four components i.e Sense, Organ, Psyche and soul. It is the combination of three body humours, (Tridosh), seven basic tissues (Sapta dhatus) and three excretions (Trimalas). The five major elements of the body are panchmahaboota which are based on the existence in relation to nature and environment. The union of these four components, are regulated by another three factors called Pran, Agni & Ojha. Agni is of 13 types. The one which is responsible for digestive power (Jathragani) is considered to be the most important.

When Pran, Agni & Ojha are weakened, the interaction of three doshas is disturbed leading to the destabilization of the equilibrium of the body humors or disturbed normal physiology. These changes are manifested in the form of symptoms of a disease.

Regarding the management of a disease, Ayurveda believes in the concept of natural healing of a disease by the regression of the causative factor (Swabhavoparamvada). The treatment part is bersons and the other which cures the diseases. In the modern concept, level of hormones and enzymes go down. These processes lead to the abnormal physiology resulting to the accumulation of toxic materials, unwanted body components, free radicals, reduced immunity, low vitality etc. Ubiquitous presence of free radicals have prompted the scientists to investigate their role in different biochemical pathways of a living system. Now it is well establishing that free radicals play an important role in regulating ageing process, memory,

immune system, inflammatory disorders, diabetes, atherosclerosis, would healing, phagocytosis etc.

In Ayurveda this new situation is coined as the accumulation of doshas and in modern science one of the symptoms of this unwholesome habit is the excess generation of free radicals and the accumulation of the lipid peroxides such as lipofusins in the nerve cells. The concept of ama is a well established theorem of Ayurveda. The definition of ama given by vagbhata clearly tells that ama is a product of improper oxidation. Here the term oxidation is denoted in Ayurveda by the term paaka and paaka is the function of agni. So ama is the improper product of paaka due to impaired agni. It is also said that ama acts like poison and it always tend to get mixed with other dosha/dhatus/malas hence named as saamadosha/saamadhatu/saamamala. The saamatva in the body creates symptoms like fatigue, heaviness and lassitude.[3]

MANAGEMENT[6]

The ideal treatment modalities are pachana, deepana , and rasayana chikitsa (pachana does the digestion of undigested remnants of food, deepana enhances the digestive fire and rasayana does the antioxidant action). The beauty of Ayurveda is that it emphasis on prevention of disease than cure.

Nutrient Anti-oxidants

Vit. E, C, A (Beta carotene), Lycopene, Selenium, Flavonoids, Omega-3 & Omega-6 fatty acids.

Rasayana Drugs

Some of them are Rubia cordifolia, strychnos nuxvomica, Moringa oleifera, semecarpus anacardium, Mucuna pruriens, Bacopa monnieri, Nardostachys jatamansi etc. These medicinal plants have anti-oxidant property and can be used as a medicine to manage the free radical mediated diseases.

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