

Singlet Oxygen- Enriched Air- Induce the Body to Protect and Heal Itself

Energy in the body is produced in cellular breathing process where ATP is created. A side effect of the aerobic cellular breathing process is the production of reactive oxygen species (ROS) such as peroxides, hydroxyl radical, superoxide, singlet oxygen and so on. Most of these side products are free radical, which are highly reactive molecules. It has been shown that prolonged exposure to high ROS levels causes non-specific tissue damage by attacking membrane phospholipids, proteins, and DNA. Damage from ROS has been suspected to be cause cancer, cardiovascular and neurological diseases, psychiatric diseases, lung and kidney disorders, liver and pancreatic diseases, hypertension, infertility, aging, and so on [Brieger *et al.* 2012; Rahman *et al.* 2012].

However, it has become clearer that low to intermediate ROS levels, singlet oxygen in particular, play an essential role in the regulation of the body's functions through the induction of low level stress [D'Autréaux & Toledano, 2007]. This results in a form of stress-response hormesis [Gems & Partridge, 2008], which is a term referring to beneficial effects of a treatment that at high levels is actually harmful [Southam & Ehrlich, 1943]. This effect stems from low level activation of the intrinsic cellular ROS defense mechanism, which deals with oxidative stress, in addition to increasing the activity of phase II response enzymes that protect from damage beyond the ROS. As a result, low ROS levels lead to stress resistance, which manifests itself as reduced damage to tissues and slower aging, and ultimately, to an extended life span [Ristow & Zarse, 2010]. At the cellular level, ROS will induce mechanisms that regulate growth, programmed cell death, and other cellular signaling. At the systems level they contribute to complex functions such as blood pressure regulation, improved cognitive and immune function, and prevention of the development of degenerative and chronic diseases [Brieger *et al.* 2012; Rahman *et al.* 2012]. These competing effects make it clear that the level of ROS needs to be maintained within a certain range in the body, since not only ROS levels that are too high will interfere with the body's functions in such a way that potentially can lead to a disease and even death, but also ROS levels that are too low will have a similar detrimental effects.

Singlet Oxygen-Induced Damage Prevention and Healing

As mentioned, singlet oxygen has been found to be directly involved in the induction of said protective cellular mechanism. In plants, singlet oxygen has been shown be a stronger inducer of the cellular defense against oxidative stress,

compared to other ROS such as superoxide or peroxide [Leisinger *et al.*, 2001; Camp *et al.* 2003].

Singlet oxygen is an energetically excited form of the ubiquitous oxygen molecule, O_2 , which makes it a more active form of oxygen. Oxygen makes up about 20% percent of the air and is essential to life. It is most commonly found in the atmosphere as the dioxygen molecule, O_2 , which is directly involved in the production of energy required for all the body's functions.

The oxygen molecule is a diradical and normally exists in its lowest electronic state that is a triplet state (3O_2). Oxygen in the triplet state is not very reactive. However, excitation of the molecule will result in the rearrangement of the electron spins and the orbital occupancy to form singlet oxygen (1O_2), that is highly reactive. The excitation of oxygen happens naturally by pigments such as by chlorophyll, the green pigment in leaves that plays an essential role photosynthesis. Oxygen that is produced as a side product in photosynthesis, can be excited by chlorophyll, which acts a photosensitizer, especially at high light intensity or drought [Krieger-Liszkay, 2005]. Artificial photosensitizers have been developed, and are used, amongst other, for the production of singlet oxygen enriched air.

Our technology, that is patent-protected, provides a unique metal-based non-irradiative method for producing singlet oxygen-enriched atmosphere from atmospheric air. To our knowledge, this is the first time free singlet oxygen has been shown to be produced due to interaction of flowing air with metals

The singlet oxygen-enriched air produced by our invention enhances cellular energy production and, subsequently, metabolism. Making one feel more energized and refreshed, mind more alert and thought process faster and sharper. In addition, it has been shown that exposure to singlet oxygen-enriched air, reduces the level of ROS produced by monocytes as part of their defense mechanism against bacteria, cancer cells and other harmful elements. Monocytes are white blood cells that are involved in the inflammatory reaction in the body. The high levels of ROS produced during an inflammatory reaction have been shown to cause excessive tissue damage. Therefore, the reduction of the ROS levels will mitigate said damage. [Hulten *et al.* 1999]

In summary, breathing singlet Oxygen-enriched air induces the activation of natural defense and healing mechanisms in the body, which leads to heightened neural functions, faster healing of damaged tissues, reduced susceptibility to disease and injury, and, ultimately, increased longevity.

References

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