Oxygen, Oxidation and Acid

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Oxygen is the 8th element. In biology, it holds special roles as being the major component of water, as well as a the only nutrient that we must intake every 3-6 minutes. The body is 65% oxygen by weight, since water is 89% oxygen.

Oxygen and the Brain

While the brain only represents 2% of the body's weight, it consumes 20% of the oxygen. Functional MRI's of the brain demonstrate increased activity in specific areas based on the task, such as thinking, talking, emoting, moving, etc.

Decreased oxygen in the air, such as at high altitudes, first impairs judgment before causing blackout and then death. On the other hand, excess oxygen can be toxic by causing increased oxidation and by causing constriction of blood vessels and other short-term and long-term damage.

Chronic oxygen deprivation, due to decreased oxygen content in the air, sub-optimal breathing (too fast or shallow), lung or heart disease, anemia, or toxins such as mercury and lead, can be a component of chronic diseases including anxiety, depression, memory loss, Alzheimers, high blood pressure and infection.

Oxygen
Oxygen comprises 65% of body weight, the next closest element is carbon at 16%
Increased oxygen concentration in the air decreases blood flow to the brain, while increased carbon dioxide increases blood flow
Slow breathing, by virtue of increasing carbon dioxide content of the blood, can increase blood and oxygen to the brain and other organs
Yogic breath retention (kumbhaka), directed by a qualified teacher or health practitioner, may enhance blood and oxygen delivery to the brain
"Medical oxygen" treatments, including hyperbaric, ozone, hydrogen peroxide and bicarbonate may have important and different effects on physiology.

Oxidation

Each atom of oxygen, by virtue of its chemical nature (has 6 electrons while wanting 8) seeks two electrons. In nature, oxygen exists mostly as O_2, which means that two atoms are attached to each other, and, like kids sharing toys, somewhat unhappily share their electrons, satisfying each atom's "desire" for 2 more electrons.

Oxygen prefers to get its two electrons from two molecules of hydrogen, which are more than happy to share their electrons. This molecule, H_2O, water, has unique characteristics which enables life.

At times, oxygen exists by itself as a single atom, and aggressively takes electrons from wherever it can. Rusting of our favorite toy or tool occurs when oxygen in the air takes some electrons from iron. This process is called "oxidation". The term oxidation is also used whenever one substance takes electrons from another. The converse of oxidation, "reduction" is the donation or losing of electrons by a "reducing agent". When something "burns", it is oxidized or reduced. Chlorine is an oxidizing agent, which acts as a disinfectant by grabbing electrons from bacteria and other contaminants. Our immune system generates oxidizing agents for defense.

Acidity and Alkalinity

Acids and bases, a hot topic in holistic medicine, refer to the tendency to seek or donate electrons, and begins with water. A small percentage of water exists in two parts: a positively charged hydrogen atom that no longer has its electron (H+) and a negatively charged hydroxide molecule (OH-) which has taken custody of that hydrogen's electron. This H+ is seeking an electron, and is therefore an oxidizing agent. "Acids" have more H+ than OH-, and therefore seek electrons. "Alkaline" or "basic" substances have more OH- than H+, and seek to donate some of their electrons. The pH of a liquid is a measure of this tendency, with 7 being neutral (water), 1 the most acidic and 14 the most basic. Since the pH scale is logarithmic, each value less than 7 is 10 times more acidic. A pH of 1 is 10^6, or a million times more acidic than water. A strong acid with a pH of 1-2 will burn whatever it touches. A strong base, with a pH of 13-14, such as lye (Draino), will also "burn". Some foods such as lemon, while highly acidic (pH 2) may cause alkalinization of the body. More on this in a future article.

Mitochondria

Mitochondria are specialized organelles within each cell that generate energy by the oxidation of carbohydrate, fat or other molecules. This energy is used by the cell to do its work. The most active cells-muscle, brain and liver, can contain up to10,000 mitochondria; less active cells as little as 100 or less. Exercise and activity stimulates mitochondrial replication.

Byproducts of mitochondrial oxidation are molecules called "reactive oxygen species" (ROS), which are missing electrons and can cause damage by oxidizing the cell's contents. This is in large part a mechanism of aging. Anti-oxidants, in foods and generated by a well-functioning body extinguishes these ROS's. As mentioned above, special ROS's are used to kill bacteria and other undesirables, including cancer cells.

Medical Oxygen and Yoga

Oxygen and oxidation are utilized in different forms in both conventional medicine (many cancer treatments) and holistic medicine. Like the other amazing things discovered by the yogis of 5000 years ago, yogic breathing (prana-yama), including retention, can improve health by altering concentrations of oxygen in our body (see table). Improper yoga and excess exercise, and diets and lifestyle that increase oxidative stress will accelerate illness and aging. As with many scientific dis-cover-ies, an important resource for our health may be right at the tip of our nose!

IMPORTANT NOTES:

1. **This educational material may not be used to influence medical care without supervision by a licensed practitioner.**

3. Dr. Cheikin's website has related articles and references such as "Yoga and Truth", "Listening to Your Pain" and others.

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