Oxygen and Aging

What Causes Aging?

The basic concept of aging is that the body loses its ability to efficiently deal with damaged cells and cannot keep ahead in regenerating new cells. It is like falling behind in a race. At some point, the body comes in last place or doesn't finish the race at all.

There are thousands of research papers that point to the production of free radicals as the primary cause of aging. Free radicals are unstable molecules in the body created as part of the waste products or normal cellular metabolic activities. Usually molecules contain electrons in pairs. When there is a loss or gain of an electron, this destabilizes the molecule.! It becomes highly reactive and destabilizes other molecules. These unstable molecules are what are called "free radicals". The body attempts to balance and neutralize these free radicals, but over a period of time free radical damage accumulates damaging cells and organs.

While the aging process is normal, some individuals experience an overabundance of free radical production. Sometimes this is caused by pollution. Highly processed foods, cigarette smoke, alcohol consumption, overuse of prescription and over-the-counter medications, prolonged stress and anxiety can also be responsible for free radical damage.

To understand how the body neutralizes free radicals, it is important to also understand the metabolic process that goes on inside every cell in the body. Metabolism is a term that describes how the cells process molecules. The molecules are either synthesized or degraded. Energy and structures of the body are the two main results of metabolism.! Energy is created in the form of chemical energy that the body can use, called ATP.

ATP:

ATP energy requires oxygen as the potential rate-limiting step. This means that the amount of oxygen will determine the efficiency and amount of ATP that can be produced at any one time. From Harper's Biochemistry, the established definition of aging is a process "…which allows the respiratory chain to function at the maximum rate until the tissue has become virtually depleted of oxygen" (Ref. Robert K. Murray, MD, Ph.D., Daryl K. Granmer, MD, Peter A. Mayes, Ph.D., D.Sc., Victor W. Fodwell, Ph.D., Harper's Biochemistry, 25th Edition, Appleton & Lance, Stanford, Connecticut, 2000, Page 140).

So the key to producing ATP energy at the maximum rate is the availability and amounts of available oxygen. ATP is produced from carbohydrates, fats, and proteins. Carbohydrates produce glucose, which the body breaks down into ATP.

Glucose from carbohydrates is the major source of production of ATP. Fats can also be a source of ATP production.! If oxygen levels are not optimal, this can limit ATP production made from carbohydrates. The body will use an alternate source to help produce ATP, fatty acids. However, the fatty acids will also require oxygen to produce
ATP. So there are two results from less than optimal amounts of oxygen. One is that carbohydrates produce less ATP.

A second is that fatty acids are increased in the bloodstream as an alternative source to help produce ATP. Fatty acids deplete the available oxygen for the production of ATP by burning glucose from carbohydrates. Thus increasing fatty acid levels can eventually lead to a change in metabolism, where smaller amounts of ATP are produced from carbohydrates and more are produced from fatty acids.

Fatty Acids:

Fatty acids can be highly damaging in the body. Fatty acids are highly reactive with cell membranes. This can result in free radical damage to cell membranes. Increasing fatty acid levels can deplete oxygen levels, to the point where there is no longer enough oxygen to burn all the fatty acids. This can result in increasing levels of partially oxidized fatty acids.

Partially oxidized fatty acids have been proven highly harmful to the body. For example, one of the aspects of heart disease is that fatty acids help clog vascular walls. However, it is partially oxidized fatty acids, called partially oxidized LDL, that are the culprits involved in clogged arteries. Thus, the depletion of oxygen can be highly stressful to vascular walls, cell membranes, and many other structures and functions in the body.

By understanding the aging process in relation to changes in metabolism, and the gradual shift to using more fatty acids to produce ATP, we can understand the origin of a great deal of excess free radical damage.! It can all start from a lack of oxygen available to burn glucose produced from carbohydrates, to produce ATP.

An example of the aging process and the decreased ability to produce ATP from carbohydrate sources is that the accumulation of glucose can occur in cells when it is not efficiently burned to produce ATP. This can lead to the glucose reacting inside the cell with proteins and fats, resulting in cellular damage.

Another example, increasing levels of partly oxidized fatty acids, occurs when less ATP
is utilized from carbohydrates and more from fats. This results in increasing levels of damage to vascular walls and cell membranes.

Still another example, free radical damage can be highly reactive in the fatty brain tissue, which can help explain why the brain degenerates, as we grow older. For instance, in Parkinson's Disease, the major problem is that the molecule called L-dopa is oxidized
at a rapid rate before it can produce the neurotransmitter dopamine. It is low levels of dopamine that are considered the primary cause of Parkinson's and it is the high rate of oxidation of L-dopa that is considered the primary cause of low levels of dopamine.

There are many other examples that can describe the degenerative processes that can result from increasing levels of fatty acids in the bloodstream that compensate for the lowered ability to produce ATP from carbohydrates.

An approach to consider neutralizing the accumulation of free radicals resulting from increasing fatty acids in the bloodstream is to find methods and supplements to increase oxygen in the bloodstream. This will help maintain optimal levels of glucose, burned by oxygen, and converted to ATP. More oxygen will help decrease the need for fatty acids as an alternative energy source of the body. Increasing oxygen in the bloodstream is a method to help decrease free radical accumulation. This can be considered anti- aging.

The concept of increasing oxygen levels in the bloodstream can be helpful in understanding methods to help slow down and reverse aging, degeneration, cellular breakdown, and death. It is known that optimal amounts of antioxidants, proper nutrition, proper exercise, supplements, and many other positive ideas to increase health, ultimately do not stop or reverse aging.

It is obvious that increasing levels of free radical accumulation eventually overtax even the healthiest individuals. Antioxidants and other methods to neutralize free radicals are ways that balance and keep the body in harmony, but these methods do not cure the root cause of aging, which is considered by many scientists to be the

increasing accumulation and load of free radicals, until breakdown and death.

Keeping metabolism optimal can help at the root cause of free radical accumulation. There are other methods to help keep metabolism and especially ATP production from carbohydrates, at optimal levels. For instance supplements that help optimize the mitochrondia, the section in cells where ATP is produced, can benefit ATP production from glucose. There are other methods and examples that can help optimize ATP production. However, increasing oxygen levels may be the primary method of combating the undeniable aging process.