A DELICATE BALANCE

The Importance of the Redox State of Glutathione

All aspects of life depend upon controlled biochemical reactions among the molecules that make up the billions of cells in the human body. Through these reactions, chemicals share and transfer *electrons* to maintain the physical and chemical organization that defines life and health. Derangements of these reactions can lead to disability and death.

What are oxidation and reduction?

Some chemicals have an "extra" electron, making them highly reactive. These are called *free radicals* or *oxidants*. An oxidant will steal an electron from a neighboring molecule, creating a new oxidant and setting off a chain reaction that damages other molecules of cells and tissues. This process is called *oxidation*, and the compound that has lost an electron is *oxidized*.

In the everyday world there are many familiar examples of oxidation – fats and oils become rancid; metals rust; rubber becomes brittle. The rancid fat, the rusty metal, the crumbly rubber are all oxidized.

As the name implies, oxidative reactions are triggered by oxygen. Because we live in an oxygen environment and require oxygen to burn fuel (food) for energy, such reactions are a basic part of life. In the human body, however, there are checks and balances in the form of *antioxidants* that can terminate oxidative chain reactions. They do so by donating an electron to the unstable particle, thereby neutralizing it and rendering it harmless. This process is called *reduction*, and the particle that has gained an electron is *reduced*.

What is redox balance?

Both oxidation and reduction are normal processes of life, but they must be maintained in balance. This is called *redox balance* – a shortened term for **red**uction-**ox**idation describing the balance of oxidants and antioxidants. Redox balance is a primordial

requirement for the protein functions of cells, and therefore for life itself. Antioxidants maintain the delicate redox balance needed for good health.

Some antioxidants are only available from dietary sources, such as vitamins C and E. Some are synthesized internally, such as superoxide dismutase. Glutathione is a special antioxidant that is supplied by both the diet and internal synthesis.

Every cell in the body is capable of producing glutathione, and its paramount importance is evident from the fact that Nature has placed it everywhere in the body. The highest concentrations are in the areas responsible for processing toxic compounds and oxidants that enter the body via food, beverages, drugs or the air – the liver, the kidneys, the lining of the intestines and the lining fluid of the lungs. The critical jobs of glutathione in these tissues are to:

- eliminate oxidants
- remove heavy metals
- block the absorption of ingested toxic chemicals
- protect the redox balance of cell proteins
- help immune cells kill inhaled germs

How can we know if we have enough glutathione?

Plasma levels of glutathione are measurable but are not particularly useful in assessing the health of the total glutathione system, because glutathione is distributed unevenly throughout the body and plasma levels are not indicative of levels in other tissues. Therefore, scientists sought and recently created a way to measure redox balance, which gives a more accurate picture of how well the body is producing and using glutathione. Redox balance is assessed by measuring the ratio of glutathione to oxidized glutathione products in the blood. A higher ratio indicates better protection and the potential for better health.[1]

Using this method, researchers have found that redox balance tips more toward oxidation as age advances, beginning in one's mid-forties.[2] Redox balance is more oxidized in association with chronic conditions including type 2 diabetes,[3] age-related

macular degeneration,[3] cardiovascular disease[4] and chronic lung diseases,[5] as well as with lifestyle habits such as smoking cigarettes[6] and drinking too much alcohol.[7]

How can we rebalance?

Redox balance can be improved by enhancing glutathione status. Glutathione status is responsive to the diet and can be enhanced by increasing one's intake of glutathione-containing foods and/or by taking glutathione supplements. Glutathione supplements are available under the brand name Setria® Glutathione.

Good food sources include fresh fruits and vegetables and freshly prepared meats, including poultry and fish. In particular, cruciferous vegetables are important because they not only provide glutathione, but also increase the body's ability to make glutathione internally.

If poor lifestyle choices such as smoking and overindulging in alcohol are present, of course, ceasing these habits will also improve glutathione status.

These choices grow increasingly important as a person moves through the fifth decade of life and thereafter. As we age we must compensate for the loss of enzyme function and other factors that diminish our capacity to produce glutathione. Improvements in both dietary and lifestyle habits are key to maintaining a healthy glutathione system and proper redox balance.

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References

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