



# Health and Wellness

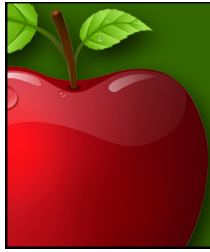
## POCKET TOOLS TRAINING

### Anti-Oxidants

Everywhere we look, there seems to be a new supplement or food boasting it's anti-oxidant ingredients. All of a sudden, vitamins A and E have taken center stage as the ringleaders of the anti-oxidant family. We are encouraged to increase our consumption of anti-oxidants if we are sick or we exercise regularly. Some people even assert that anti-oxidants are the answer to a host of health ailments, such as cancer, chronic stress, arthritis and fatigue. So what exactly are these seemingly miraculous molecules known as anti-oxidants? *Merriam Webster's Dictionary* defines an anti-oxidant as: "a substance (as beta-carotene or vitamin C) that inhibits oxidation or reactions promoted by oxygen, peroxides, or free radicals." (Merriam Webster, 2013)

To begin understanding the benefits of anti-oxidants, one must first understand the process of oxidation, how oxidation affects our bodies, and the role of free radicals. Oxygen is all around us on plant earth. It is produced by plants through the process of photosynthesis. Our atmosphere contains 21% oxygen at any given moment. Oxygen is a very unique chemical element. It has the ability to combine with almost any other element. In fact, it seeks the opportunity to do so, as it is highly reactive. When oxygen does combine with another element, it tends to steal away that element's electron. Once this happens, the robbed element becomes an official "free radical". This process is constantly happening in our bodies, because of cellular metabolism. As we know, metabolism and energy production (ATP) requires oxygen in order to occur. During these processes, as oxygen is used, free radicals are produced. Our immune system also employs the use of free radicals to rid our bodies of pathogens. This is explained later during a discussion on our natural anti-oxidant producing capabilities. In addition to natural body processes, free radicals are produced in our bodies as a result of exposure to external pollutants such as cigarette smoke, air pollution and herbicides. This is important for firefighters to understand, because we are typically exposed to more environmental pollutants than the general public by nature of our job duties.

So, are free radicals harmful to our bodies? The answer is yes and no. They can be harmful if not dealt with properly. This is where anti-oxidants come into play. The body contains its very own anti-oxidant protective system that is able to handle the production of free radicals. If, however, free radicals are produced more rapidly than this system can control, cellular damage can occur. As stated earlier, free radicals are molecules that have been robbed of one or more electrons. Because of this, these radicals travel throughout the body in desperate attempts to recover their lost electron(s). In order to do this, they must do one of two things: (1.) Steal the electrons from another cell's molecules, or (2.) Be deactivated by an anti-oxidant. Here's where the damaging part happens: if this free radical steals it's electrons from somewhere else, it essentially has



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created yet another free radical. This process can continue in a chain like reaction until all cells in a particular tissue have been affected (damaged). When enough cells are damaged in this way, an immune system response is triggered. Anti-oxidant molecules have the unique ability to stop this process by deactivating (restoring electrons) to free radicals, while remaining stable. (Davis)

It is interesting to note that during times of increased oxygen consumption, free radical production dramatically increases. This indicates that during bouts of heavy exercise, one can assume that free radical production increases. If the body's natural anti-oxidant defenses are overpowered, cellular damage can accumulate during and after exercise. If enough cellular damage occurs in a specific area, this leads to tissue damage. When exercising, we bring excess oxygen into specific muscle tissues to produce energy and movement. This increases that particular muscle group's risk of free radical damage. The body combats this with an acute inflammatory response at the site of tissue damage -which could very easily be a contributing factor to delayed onset muscle soreness.

Antioxidants are important for preventing damage to cells caused by free radicals. As stated before, our bodies produce some antioxidants naturally such as vitamin E and Coenzyme Q10. We also derive many antioxidants from the food we eat daily. It is important to note that antioxidants are not a one size fits all approach to combating free radicals. Some antioxidants prevent free radical formation, while others actually function as electron donors to stop the free radical chain reaction process. Vitamin C, found in many fruits is a powerful preventer in the development of free radicals, while Vitamin E (found in polyunsaturated fatty acids) is a powerful "breaker" of the free radical chain reaction. The most abundant sources of anti-oxidants are fruits and vegetables, which contain polyphenols and flavonoids.

### Works Cited

Davis, J. (n.d.). *How Antioxidants Work*. Retrieved from WebMD:  
<http://www.webmd.com/food-recipes/features/how-antioxidants-work1>

Mary B. Grosvenor, L. S. (2010). *Visualizing Nutrition: Everyday Choices*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Merriam Webster. (2013, October 1). *Antioxidant-definition*. Retrieved October 24, 2013, from Merriam Webster's Online Dictionary: <http://www.merriam-webster.com/dictionary/antioxidant>



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