

1 Chemistry Honors/ First Block

2 27 October 2014

### 3 **Antioxidants and Their Effect on Free Radicals**

4 Human physiology consists of many different types of molecules that react with  
5 each other in various ways, some for good and some for bad. One good reaction that  
6 benefits the body is the relationship between free radicals and antioxidants. The intake of  
7 antioxidants prevents the uncontrollable formation of free radicals. Studies have proven  
8 that antioxidants may be helpful in curing diseases or illnesses by using antioxidant  
9 treatments. In the reaction that takes place between antioxidants and free radicals, the  
10 geometric shapes changes throughout the process which is important in determining the  
11 reasoning the atoms work together.

12 Free radicals are atoms or groups of atoms with an unpaired number of electrons  
13 that can be formed when oxygen interacts with certain molecules. This creates energy  
14 which is released through reactions with neighboring molecules, such as proteins, lipids,  
15 carbohydrates, and nucleic acids. Antioxidants are molecules which can safely interact  
16 with free radicals and terminate the chain reaction before vital molecules such as DNA  
17 are damaged (Antioxidants and Free). Free radicals can be defined as reactive chemical  
18 species having a single unpaired electron in an outer orbit. Free radicals can cause  
19 "oxidative stress," a process that can trigger cell damage that can actually cause illnesses  
20 such as cancer, diabetes, and cardiovascular disease (Antioxidants and Health). There is  
21 an importance for the consumption of antioxidants within our diet such as beta-carotene,  
22 vitamin C, and vitamin E that binds to and reduces the destructive activities of aqueous

1 peroxy radicals. The amount of free radicals is decreased by antioxidants therefore  
2 improving the overall health of the person.

3       The interplay between free radicals, antioxidants, and co-factors is important in  
4 maintaining health, aging and age-related diseases. Parkinson's Disease is one of the  
5 major progressive neurological disorders for which no preventative or long-term effective  
6 treatment strategies are available (Result). Parkinson's Disease is a progressive disorder  
7 of the nervous system that affects your movement (Parkinson's). Since there is evidence  
8 that free radical damage is involved in Parkinson's Disease, Vitamin E, a potent  
9 antioxidant was studied in people with early Parkinson's Disease in the 1980's by  
10 Shumin Zhang(Antioxidants: Vitamin). According to Zhang's studies, his team gathered  
11 detailed information on the diets of 76,890 women and 47,331 men enrolled in two huge  
12 studies of diet and health, both studies enrolled healthcare workers. Compared with those  
13 who ate the fewest servings of vitamin E-filled food, those who ate the most had 32%  
14 fewer cases of Parkinson's disease after 12 to 14 years.

15       Atoms form molecules which share electrons to maintain equal pairs. A polar free  
16 radical forms when the molecule splits leaving an atom with unpaired electrons. Radicals  
17 can have positive, negative or a neutral charge. Free radicals attack the nearest stable  
18 molecule, "stealing" its paired electron. When the "attacked" molecule loses its electron,  
19 it becomes a free radical itself, beginning a chain reaction (Antioxidants and Free). The  
20 chain reaction causes oxidative stress which then can progress in millions of cells causing  
21 damage or death to the cells. Polar antioxidants terminate these chain reactions by  
22 removing free radical intermediates. Antioxidants do this by being oxidized themselves,  
23 so antioxidants are often reducing agents. Antioxidants are very stable which allows them

1 to be able to donate an electron to a free radical to neutralize it and allow our bodies to  
2 excrete them safely and harmlessly ( Kalash). For example, the most reactive free radical  
3 molecule is the hydroxyl radical. It can be made by X-rays or gamma rays splitting water  
4 molecules. The hydroxyl radical, written HO, is so reactive that it only takes one billionth  
5 of a second to react with neighbouring molecules, usually by stealing hydrogen atoms  
6 from other molecules. The hydroxyl radical regains the lost electron and forms a water  
7 molecule (H<sub>2</sub>O). To regain its' electron pair, the hydroxyl radical has changed another  
8 molecule by removing a hydrogen electron from it. With antioxidants, the chain reaction  
9 does not keep repeating itself to cause a genetic mutation (Gieseg).

10       After concluding research, it has been proven antioxidants help the human body  
11 in many ways and research is still being conducted to fully understand how much  
12 antioxidants can affect the human body. Understanding the fundamentals of chemical  
13 bonds between antioxidants and free radicals can truly explain what happens between  
14 them. Using the concepts of chemical bonding, it is shown how the mechanism of  
15 antioxidants are used to eventually eradicate the free radicals that act as the source for  
16 different illnesses. The intake of antioxidants prevents and formation of the harmful free  
17 radicals, the treatment of antioxidants can be effective for illnesses.

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## Works Cited Page

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