COMPLETE C

"The undiscovered world of vitamin C"

When we think of vitamin C, what is the first thought that pops into our mind; Orange juice? An orange, chalky wafer to help you get over a cold? Maybe a multi vitamin table? Unbeknownst to many of us, there is a lot more to this extraordinary little vitamin than what we might think. No longer are people taking vitamin C for the simple goal of abstaining from getting sick. With the help from one of its close co workers, the bioflavonoids, vitamin C takes on a plethora of new roles in the fight against diminishing health. From combating insulin resistance to preventing arthritis, vitamin C takes on a new identity, pushing the old perceptions aside and introducing a whole new identity with still yet to be discovered wonders.

Vitamin C – *The Antioxidant*

Vitamin C (or the levorotatory isomer of ascorbic acid) is one of the most amazing and interesting of all the vitamins. It is one of the first vitamins discovered to now be widely known to cause scurvy for its deficiency (Higdon J, 2006), hence the name, *a* meaning "no", and *scorbuticus* meaning "scurvy".

Ascorbic acid acts vinylogously, which means that the double carbon bond (vinyl group) transfers electrons between the –ol group and the carbonyl (*figure 1*). It has two resonance forms that make it stable when dehydrogenated, as in many tautomers. However, the adjacent double bond stabilizes its deprotonated form. What this all means is that when free radicals come along and try to swipe vitamin C of its electrons (as in oxidation), the product is a perfectly stable, non reactive form of ascorbate.

Vitamin C acts as an antioxidant by being ready and willing (in regards to entropy) for oxidation. When an atom or molecule is oxidized, there is an electron stolen from its outermost valence shell, which leaves an unpaired electron spinning around in that orbital. Molecules don't like this. It leaves the molecule reactive and in panic mode, much like us when we get our wallet or purse stolen. To account for this, the molecule seeks desperately to find another electron to fill its void, usually from a nearby molecule. This is how oxidative stress initiates many life threatening diseases. When DNA, RNA, lipids or critical proteins get oxidized, very bad things happen.

When a reactive oxygen species steals electrons from ascorbic acid, it just laughs as it now becomes monodehydroascorbate and then transitions to its dehydroascorbate form. In this new but stable form, this conjugate base poses no threat to cellular damage via oxidation. It just continues on its merry way, hoping to get reduced somewhere along the way, but if not, no harm no foul.

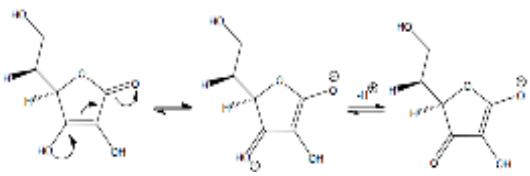

Figure 1. Electron dynamics upon oxidation of ascorbic acid

Vitamin C – *The Multi-Tasker*

While a superb antioxidant to say the least, ascorbic acid is widely known to possess other benefits. When combined with vitamin E, ascorbic acid plays a beautiful role in reducing circulating TNF-α and isoprostanes in human models (Rizzo MR et al., 2008). This means drastic reductions in inflammation. In the same study, it was found that supplementation with ascorbic acid improved insulin action through a rise in non-oxidative glucose metabolism. A definite plus for diabetics.

Ascorbic acid also has wonderful immune boosting properties. There has been evidence that vitamin C administration actually enhances synthesis of immunoglobin G and M (S Vallance, 1977). There is even studies that suggest vitamin C reducing risk of colds (Walker GH et al., 1967) and greatly increasing immune response via white blood cell count and activation (Denson KW et al., 1961). Not stopping there, more recent findings suggest vitamin C to be a selective killer of cancer cells through a very interesting and unanticipated mechanism. Extracellular ascorbate actually initiates cancer cell death via apoptosis and pyknosis/necrosis by generating reactive H_2O_2 species within cancer cells only (Qi Chen et al., 2005).

Bioflavanoids

The word “bioflavonoid” actually refers to a class of metabolic by products in plants, in which three main types of bioflavonoids are classified: flavonoids, isoflavonoids, and neoflavonoids. These flavonoids all share the main skeletal structure (*figure 2*) and differ in their biological activity depending on type and orientation of functional groups. Bioflavonoids provide outstanding antioxidant activity and thus provide a fierce tag team when combined with vitamin C. However, fighting free radicals is not the only contribution bioflavonoids make to the animal kingdom. Reports of reduction in cancer cells and heart disease have been linked to flavonoid supplementation (Stauth, 2007, Ververidis F et al., 2007). Cancer and inflammation have been shown to be greatly reduced via reduction in NF-kappa B expression in humans (Yamamoto et al., 2001) as well as possessing anti-microbial properties (Cushnie TPT et al., 2005).

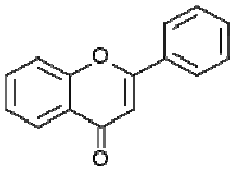

Figure 2. Structural formula of flavonoid skeleton

Bioflavonoids have a very unique way of doing their antioxidation and detoxification that is unorthodox to the pharmacodynamics of other supplements. Our bodies tend to see flavonoids as a potential threat (which they are not), and tries to get rid of them (Balz F, 2007). Its through this process that the liver synthesizes and recruits armies of detoxification enzymes (Phase II enzymes), potentially helping to eliminate mutagens and carcinogens, and therefore may be of value in cancer prevention, inducing these mechanisms that help kill cancer cells and inhibit tumor invasion.(Zhou J et al., 2009).

Let us not forget about the citrus bioflavonoids, which is what the bioflavanoids in the Complete C formula is comprised mostly of. This group of flavonoids include: quercitrin, tangeritin, hesperidin, and rutin (a cousin to quercitin). In addition to their antioxidant capabilities and anti-tumor and cancer properties, citrus bioflavonoids exhibit substantial effects on capillary permeability and circulation (Struckmann, JR 1999). Quercitin in particular, has demonstrated anti proliferatory effects on retroviruses via inhibition of reverse transcriptase (Ono K et al., 1990). Certain relatives of rutin (namely hydroxyethylrutosides) have been shown in clinical studies to have positive results in the treatment of bruising, hemorrhoids, and varicose veins (Belcaro G et al., 2008).

Besides the wonderful array of flavonoids found in the Complete C, the formula goes on to include yet even more top of the line antioxidants and phyto medicinals. The Viva Antioxidant Blend contains grape seed extract, which research shows to possess myriads of beneficial actions, too many for this article to name and expand on. However, one health benefit of considerable relevance to the rest of the formula is its noteworthy capabilities to reduce platelet aggregation and inflammation (Vitseva O et al., 2005) through none other than.. antioxidation. One of the best ways to increase the lifespan of a person is to protect our precious DNA from oxidation. This is why CoQ10 (coenzyme Q10) is included in the mix, to reduce oxidative damage to DNA (Quiles JL et al., 2004). Lycopene and Lutein are two carotenoids that are included for their antioxidant capacities as well, along with alpha lipoic acid, which maintains healthy redox states of some of our favorite antioxidants: vitamin C, E, and glutathione (Biewenga GP et al., 1997).

Purpose

There are two kinds of vitamin C supplements on the market: the kind that can be found on a swivel rack at a Gas N' Sip manufactured by cheapie brand "X", or the kind of formula that allows vitamin C to do what it was designed and has the potential of doing. Viva Vitamins' Complete C takes vitamin C to new heights and unleashes ascorbic acid's full and almost undiscovered potential. For those of us who are serious about supplementation when it comes to vitamin C, Compete C provides the security in knowing that the ascorbic acid provided along with it's associates are providing health benefits far above and beyond what might be expected from vitamin C alone.

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