

Technical Support

Products #2800 & 2801

BioProtect™

What is a Free Radical?

A free radical is an atom or molecule containing an unpaired electron, which seeks another electron in order to achieve a more stable, less reactive configuration. Free radicals cause biological damage, generally by oxidative processes. Free radicals include superoxide, nitric oxide, hydroxyl radicals and fatty acid peroxy radicals. The harmful effects of free radicals may be expressed directly as damage to cell components, or indirectly by a disturbance in the redox state of the cell that maintains the metabolic central processes.

The Oxygen Paradox

The foundation of energy metabolism is based on efficient oxidation of carbohydrate and fat by mitochondria which depends upon oxygen. Paradoxically, oxygen also creates damaging molecules in the body called reactive oxygen species (ROS). Thus, oxidative stress can be considered a condition experienced by cells in the presence of oxygen. Damaging oxidizing agents include ROS, such as hydrogen peroxide, lipid peroxides, and free radicals. Tissues can be damaged by ROS when the body's defenses are overwhelmed. Free radicals indiscriminately attack neighboring molecules to make up for their own deficiency and they initiate chain reactions. Free radicals and ROS may damage vital components of cells, including DNA and proteins, for example, the lens proteins of the eye.¹ Free radicals can oxidize LDLs; oxidized LDLs are implicated in events that can cause damage to arteries.²

What Can Cause ROS and Free Radicals (in vivo)

Energy production: The body's metabolism requires an oxygen-rich environment. Mitochondrial ATP production depends upon molecular oxygen to completely oxidize fat and carbohydrate. Impaired mitochondria can "leak" superoxide, which can further damage mitochondrial energy producing systems.³

Detoxification: The liver, intestine and kidney modify potentially damaging compounds using oxidative enzymes classified as cytochrome P450 oxidases. These enzymes use molecular oxygen inefficiently, yielding superoxide.⁴

Chronic inflammation: Inflammation can lead to tissue damage. During inflammation free radicals and ROS are produced in amounts that can eventually overwhelm cellular defense mechanisms.⁶

Diet: The typical U.S. diet is low in fruits, vegetables and associated phytochemicals believed to minimize free radical damage.⁵

Leaky gut syndrome: "Leaky gut syndrome" characterized by increased intestinal permeability, can increase the uptake of potentially damaging substances.⁷

Aging: Aging diminishes the ability to respond adequately to oxidative stress.⁸

BioProtect's™ Multiple Antioxidant Nutrients

Mixed, natural carotenoids. Typical fruits and vegetables supply alpha carotene, beta carotene, lutein, zeaxanthin, and lycopene.

Beta carotene, the major precursor of vitamin A, is a powerful lipid-soluble antioxidant able to quench singlet oxygen and to inhibit free radical chain reactions. Beta carotene is aided by other carotenoids to block free radicals and to boost the immune system.⁹ Recent studies indicate that natural mixed carotenoids (including isomers of beta carotene) are better absorbed and function as more effective antioxidants than synthetic (all trans) beta carotene.¹⁰ (Lycopene is a member of the carotenoid family which imparts a healthy red color to fruits and vegetables.) Lycopene is not found in the natural mixed carotenoids found in the sea algae *Dunaliella salina*. **BioProtect™** blends the lycopene produced from specially bred and cultivated tomatoes with the natural mixed carotenoids isolated from *Dunaliella salina*. Unlike the synthetic beta carotene or mixed carotenoids found in other products, BioProtect™ provides a full spectrum blend of the natural carotenoids, beta carotene, alpha carotene, lycopene, zeaxanthin, cryptoxanthin, and lutein. Biotics Research Corporation was the first supplement manufacturer to incorporate natural, mixed carotenoids throughout its product line.

Vitamin E, emulsified. Vitamin E functions as the body's major lipid-soluble antioxidant. It quenches free radicals and singlet oxygen, and it protects membrane lipids against free radical attack, and it reduces LDL oxidation *in vitro*.¹¹ Vitamin E blocks the formation of nitrosamines and also enhances the immune system, including activation of phagocytic activity of white cells in elderly patients.¹²

Vitamin C. Vitamin C (ascorbic acid) is a versatile water soluble antioxidant found in blood and tissues. Several organs and cell types, including adrenal glands and lymphocytes, accumulate high levels of vitamin C. Elevated serum vitamin C is associated with enhanced immune function, reduced



heavy metal toxicity and increased liver clearance of toxins.¹³ Ingested vitamin C can inhibit the formation of nitrosamines and fecal mutagens. As an example of the synergistic effects of antioxidants, vitamin C can recycle vitamin E.¹⁴ Recent saturation studies indicate that the RDA for vitamin C should be increased to at least 200 mg for healthy young adults.¹⁵

Sulfur amino acids. Methionine functions primarily as the source of the thiol amino acid, cysteine, which helps maintain proteins in a reduced state. Methionine can complex heavy metals via cysteine, and as a methyl donor, methionine assists detoxication reactions. N-acetyl-L-cysteine is a stable derivative of cysteine absorbed rapidly deacetylated to yield free cysteine in cells where it increases glutathione levels and enhances detoxification reactions.¹⁶

Reduced glutathione (GSH). GSH quenches free radicals and helps regulate the redox balance of cells.¹⁷ The important defensive enzyme glutathione peroxidase employs GSH to reduce lipid peroxides and hydrogen peroxide. Glutathione transferase detoxifies potentially damaging chemicals as part of the phase 2 liver detoxification system.¹⁸ Consequently, toxic exposure can deplete the liver of GSH. Orally administered GSH can raise serum glutathione levels.¹⁹

Taurine. This derivative of cysteine contains oxidized sulfur and does not occur in proteins. It occurs in high levels of heart muscle emphasizing its role in modulating calcium flux and neuron excitability.²¹ In cultured human cells, taurine, together with zinc and vitamin E, stabilizes cell membranes.²⁰ It participates in detoxification reactions and functions as an antioxidant.

Trace minerals. Zinc is linked to antioxidant functions in a variety of ways. It serves as a cofactor for copper/zinc dependent superoxide dismutase, the enzyme that converts superoxide to hydrogen peroxide. Zinc is a component of metallothionein, the most abundant zinc containing protein, which is believed to have a role in heavy metal detoxification. Zinc also stabilizes plasma membranes.²²



Selenium as selenocysteine serves as the cofactor for glutathione peroxidase, a group of enzymes that degrade cytoplasmic hydrogen peroxide and reduce fatty acid peroxides to stable forms.²³

Sorbic acid. This GRAS food additive increases the effectiveness of antioxidant mixtures.²⁴

Coenzyme-Q10, emulsified. This lipid soluble nutrient is believed to protect mitochondrial membrane lipids from oxidation.²⁵ It may also recycle vitamin E. As part of the electron transport system in mitochondria, coenzyme-Q10 plays an important role in oxidative phosphorylation. Suboptimal coenzyme-Q10 levels impair mitochondrial respiration and ATP production, especially in aging heart muscle. Clinical studies have shown that emulsification increases the efficiency of coenzyme-Q10 absorption by up to three fold.²⁶

Superoxide Dismutase. SOD is the primary enzymatic free radical scavenger of mammals. In fact SOD is the only enzyme specifically designed to disarm free radicals in the body. SOD catalyzes the conversion of superoxide to hydrogen peroxide and oxygen, thus converting oxygen radicals to less reactive forms of oxygen molecules. Three forms of SOD exist in animals: copper/zinc SOD occurs in the cytoplasm and another copper/zinc SOD occurs in blood and interstitial fluid. This extracellular SOD is bound to the endothelium of blood vessels. Mitochondria contain manganese SOD, the third form of SOD. For these reasons, copper, zinc and manganese are considered antioxidant nutrients. A double blind, placebo controlled study indicates that orally ingested vegetable culture source SOD (proprietary product from Biotics Research Corporation) significantly increases erythrocyte SOD activity in humans.²⁷

Catalase plays a significant role in metabolism. Hydrogen peroxide produced from the action of SOD on superoxide remains a strong oxidizing agent and is one of the reactive oxygen species (ROS) found in the body. To cope with hydrogen peroxide production, cells contain a series of enzymes that convert hydrogen peroxide to oxygen and water. Peroxisomes contain catalase to dispose of hydrogen peroxide generated by peroxisomal metabolism. Thus, catalase complements SOD activity. **BioProtect™** supplies vegetable culture source catalase (proprietary product from Biotics Research Corporation).

Summary of Noteworthy BioProtect™ Features:

As in nature, **BioProtect™** provides a wide array of antioxidants and synergists, ranging from vitamins and minerals to phytochemicals and enzymes, especially:

- Balanced, broad spectrum antioxidants and synergists
- Increased bioavailability: emulsified vitamins and cofactors vegetable culture trace minerals
- Natural mixed carotenoids, including lycopene
- Food form polyphenols
- Plant source superoxide dismutase and catalase.

References

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Supplement Facts

Serving Size: 3 Capsules

Servings Per Container: 90

	Amount Per Serving	% Daily Value
Vitamin A (as natural mixed carotenoids)	7,500 IU	150%
Vitamin C (ascorbic acid)	300 mg	500%
Vitamin E (d-alpha tocopheryl acetate and mixed tocopherols)	90 IU	300%
Zinc (as zinc gluconate)	15 mg	100%
Selenium (from vegetable culture †)	75 mcg	107%
Coenzyme Q10	3 mg	*
L-Glutathione (reduced)	30 mg	*
L-Methionine	105 mg	*
Taurine	105 mg	*
N-Acetyl-L-Cysteine	105 mg	*
Superoxide Dismutase (from vegetable culture †)	90 mcg	*
Catalase (from vegetable culture †)	90 mcg	*

*Daily Value not established

Other ingredients: Gelatin, water, potassium sorbate and glycerin.

† Specially grown, biologically active vegetable culture containing naturally associated and/or organically bound trace elements and phytochemicals including polyphenolic compounds with SOD and catalase, dehydrated at low temperature to preserve associated enzyme factors.

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Product Information

BioProtect™ is available in bottles of 90 and 270 capsules.

