TIOPROTECT

Antioxidant

FORMULA

for antioxidant protection

Resveratrol | a-Lipoic Acid

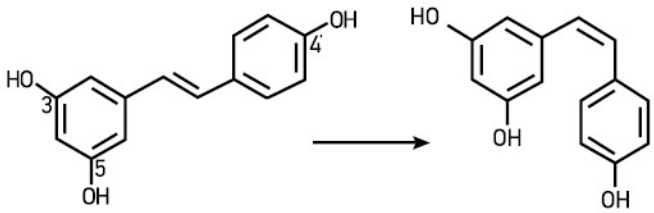
Dietary Supplement

60 capsules

Resveratrol

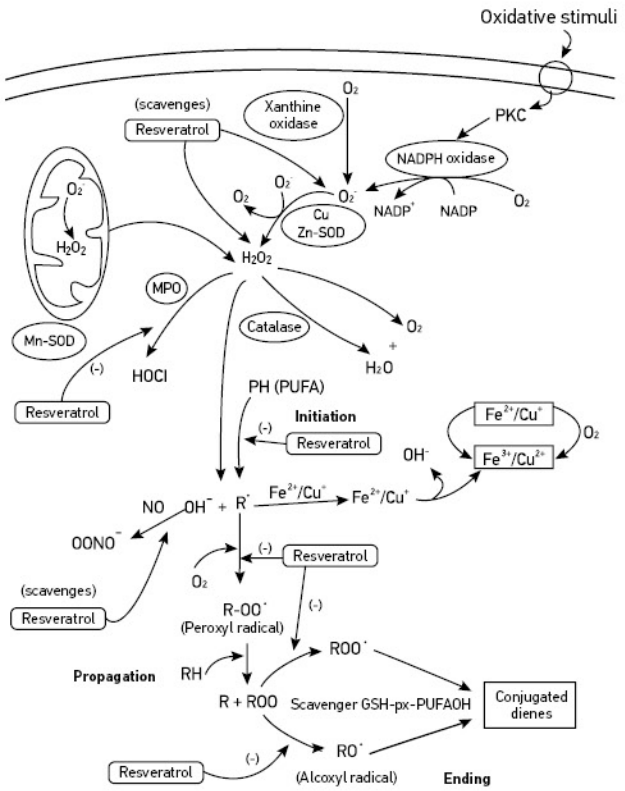
Life is a balance between oxidation and reduction. In some cases, this balance between oxidation and reduction (antioxidation) is disturbed and oxidative processes become prevalent. This results in oxidative stress and may ultimately lead to pathological situations. **Resveratrol** is a natural organic compound, polyphenol, which is naturally produced by certain plants in response to several harmful factors, such as infestation by pathogenic organisms, UV radiation and increased oxidative stress.

Resveratrol is a strong antioxidant, that neutralizes both reactive oxygen species (ROS) and harmful nitrogen radicals (RNS), as well as secondary organic radicals which derive from the reaction between biomolecures and ROS or RNS. Resveratrol increases the expression of certain enzymes responsible for balancing oxidoreduction processes within the cells. Some of these enzymes are: superoxide dismutase (SOD), catalase, heme oxygenase and glutathione peroxidase. Moreover, resveratrol decreases the activity of enzymes that take part in the production of ROS, such as xanthine oxidase, cycloxygenase, lipoxygenase, cytochrome P450 and other oxidative enzymes.
Like all other polyphenols, resveratrol is an effective chelating agent for metal ions and is therefore capable of neutralizing the creation of free radicals, which is what happens, for example, in the Fenton reaction. Resveratrol exhibits an unusually strong capability of eliminating free radicals. This property is related to the presense of three hydroxyl groups in positions 3, 4 and 5, as well as aromatic rings including a double bond in the molecure.



trans-resveratrol cis-resveratrol

Furthermore, Caruso et Al showed that the hydroxyl group in position 4 is much more drastic than the other two groups in positions 3 and 5. Resveratrol is also an effective eliminator of reactive nitrogen species (RNS) and other radicals with similar structure (•OOR), such as peroxide radicals of proteins. It is proved that it reacts directly with peroxynitrite (ONOO-). This makes the prevention or decrease of cysteine nitrosylation and tyrosine possible, which are two important antioxidant enzymes with various functional properties, that are incorporated in many proteins. It is worth mentioning, for instance, that the heat shock protein (HSP 70) contains 250 cysteine molecules, responsible for activating the cytoskeleton, that play an important role in the multiplication of cancer cells, but also in normal cellular phenomena, such as the reaction for dissolving platelet granules (thrombosis) and the reaction for releasing neurotransmitters.

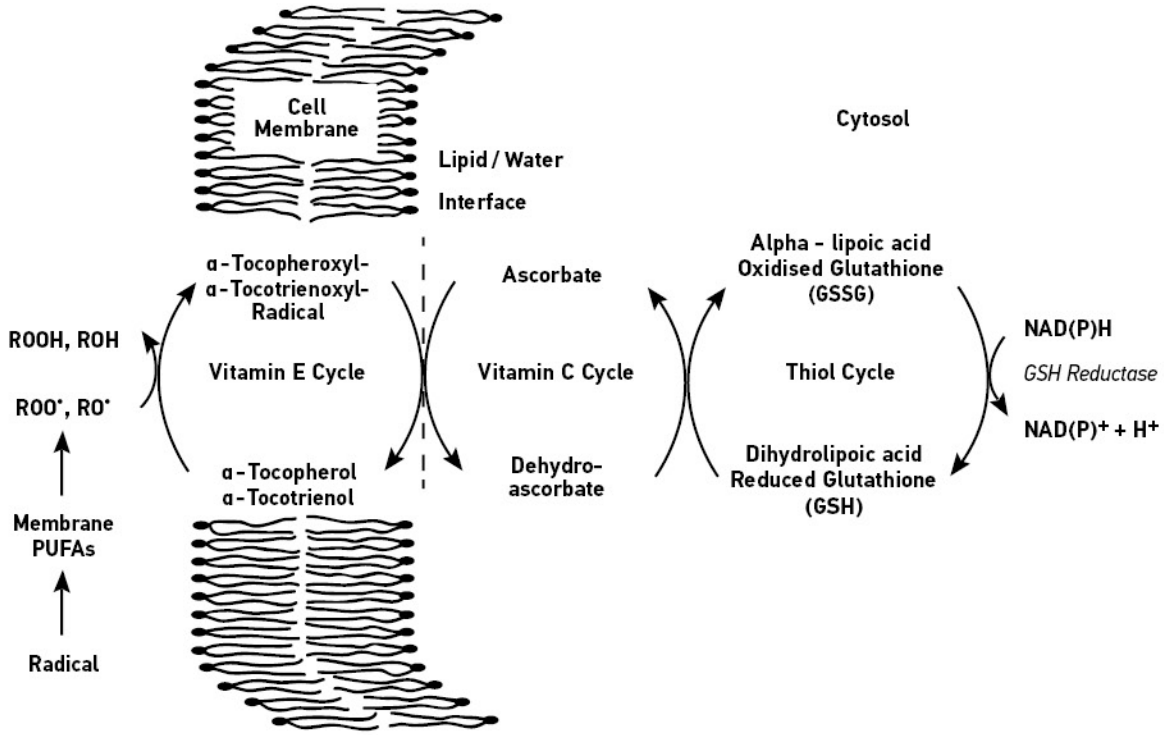


Resveratrol blocks lipid peroxidation, mostly that occuring at the membrane, through elimination. It prevents the oxidation of polyunsaturated fatty acids that are present in low-density lipoproteins, LDL. The antioxidant properties of resveratrol are also connected to the activation of enzymes responsible for the removal of reactive oxygen species that are produced in the human body. The main enzymes activated in neural cells, as well as in other cell types in the body, are mitochondrial superoxide dismutase (SOD_2) and catalase. Such observations were reported in several studies, both in vitro and in vino.

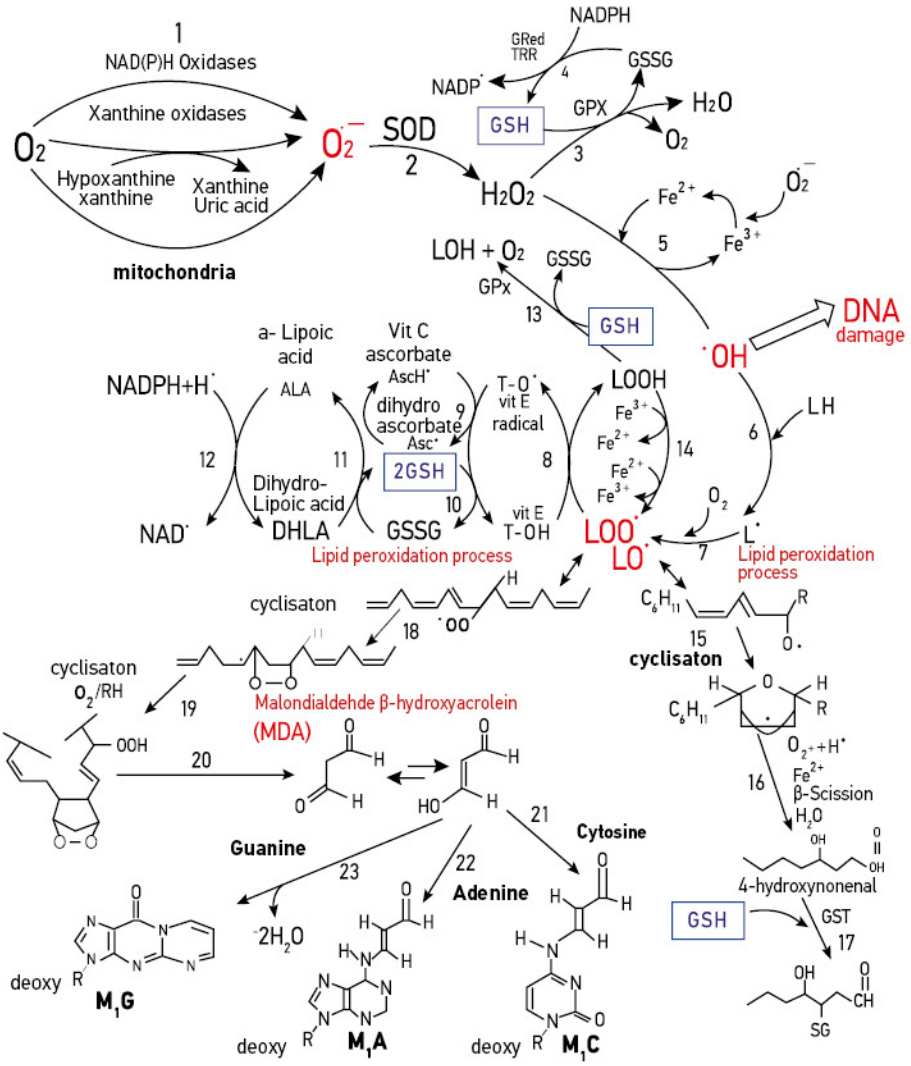
α-lipoic acid

A-lipoic acid, also known as thioctic acid, is synthesized in small amounts by plants and animals, including humans. **Lipoic acid** is endogenously synthesized, connented via covalent bonding to specific proteins, and it is an important co-agent to mitochondrial enzyme complexes that catalyse critical reactions related to energy production and catabolism (decomposition) of acetic acids and amino acids. In every case, it is covalently bound to a conserved lysine residue, which is one of the enzyme complex proteins. The pyruvate dehydrogenase complex converts pyruvate into acetyl-coenzyme A (CoA), which is an important substrate for energy production via the citric acid cycle. The α-ketoglutarate dehydrogenase complex converts α-ketoglutarate into succinyl-CoA, which is another important intermediate of the citric acid cycle. The activity of the branched-chain α-ketoacid dehydrogenase complex results in the catabolism of the branched-chain amino acids: leucine, isoleucine and valine. The glycine cleavage system is a multiple enzyme complex that catalyses glycine oxidation in order to form 5, 10-methylenetetrahydrofolate, which is an important co-agent of nucleic acid synthesis.

A-lipoic acid is both hydrosoluble and liposoluble, which renders it capable of acting upon cell membranes and the cytoplasm. Furthermore, α-lipoic acid is a strong antioxidant and its fuctions, as Biewenga et Al described them, include: the neutralization of reactive oxygen species and the rejuvenation of exogenous and endogenous antioxidants, such as vitamin C and E, as well as glutathione. It acts as a chelating agent for ions and metals, but it also restores oxidized proteins.



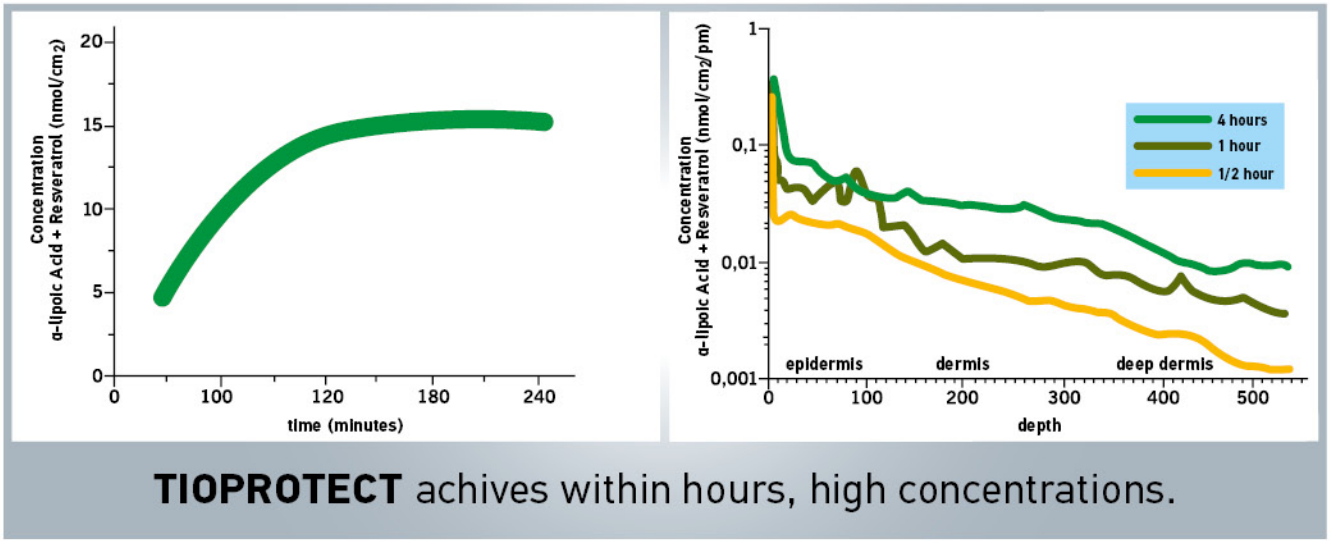
In most cells containing mitochondria, α-lipoic acid is converted into disulfide of lipoic acid via a reaction catalysed by dihydrolipoamide dehydrogenase (DLD) and NADH. In cells without mitochondria, α-lipoic acid can be converted into disulfide of lipoic acid via NADPH, along with glutathione and thioredoxine reductases.



Therefore, **α-lipoic acid** is of great interest, due to its properties. It is known that it neutralizes hydroxyl radicals, singlet oxygen, hydrogen peroxide, hypochlorous acid, peroxynitrite and nitrogen oxide. Moreover, it eliminates both peroxyl and peroxide radicals, rendering α-lipoic acid and disulfide of lipoic acid, an oxido-reductive couple, one of the strongest antioxidants for biological systems. In addition to this, these two molecules have additional antioxidant effects via chelating activity to mercury, iron and other transition metals.

After absorption by the cells of various tissues, **α-lipoic acid** is converted to disulfide of lipoic acid and can be easily transferred out of the cell in order to act effectively upon the extracellular fluid. This capability contributes the most to its antioxidant dynamics. Kagan mentions that the disulfide of lipoic acid / α-lipoic acid couple has a reduction potential of -0.32 V, in comparison to the reduced glutathione / oxidized glutathione couple (GSH / GSSG), which has a potential of -0.24 V. This difference proves that disulfide of lipoic acid exhibits a higher reduction potential inside the cell and, as a result, it is capable of providing greater protection against oxidative damage than glutathione, which constitutes a standard cellular protection. Schupke et Al have traced a series of **lipoic acid** metabolites that is able to provide a certain level of protection within the cell systems. These metabolites are producted via the β-oxidation of the pentanoic lipoic acid side chain. Some of these metabolites are 3-methyl-lipoic acid, 3-keto-lipoic acid and dihydro-lipoic acid. The complete β-oxidation of lipoic acid has been experimentally confirmed by Harrison and McCormick. They knew that CO2 is a metabolic product of the substrate produced by the deconstruction of acetyl-coenzyme A (CoA) via the citric acid cycle. The results indicated that 25% of the administrated dose is consumed as14CO2 within 2 hours after administration, reaching a percentage of 30% after 24 hours. The writers concluded that 60% of the lipoic acid dose had been metabolised through β-oxidation.

In addition to this, Biewenga confirmed the role of β-oxidation in human as well, by measuring the appearance of dihydro-lipoic acid in the plasma. The highest concentrations were observed approximately 189 minutes after the oral administration of 1 g of lipoic acid. The precise functions of these metabolites are not fully understood, but it is believed that these ingredients might contribute to the benefits of the therapeutic use of lipoic acid.



TIOPROTECT achives within hours, high concentrations.

COMPOSITION IN ACTIVE INGREDIENTS	Per daily dose (3 caps.)
a-lipoic acid	600mg
Polygonum cuspidatum	300mg
Equivalent to resveratrol	60mg

HELPS IN CASES

- **where strong antioxidant action is required to protect sensitive structures of the body.**

DOSAGE

- Take 1-3 capsules daily after meal.

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PRECAUTIONS • The product should not be taken in the following cases: (1) Hypersensitivity to resveratrol or lipoic acid. (2) Low blood sugar. • Do not exceed the recommended daily dose. • Dietary supplements should not be used as a substitute of a balanced diet. • Keep away from young children. • This product is not intended for the prevention, cure or treatment of a human disease. • Consult with your doctor if you are pregnant, breast-feeding, taking pharmaceutical treatment or having health problems.

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