MitoTone®

Nutritional Support for Mitochondrial Energy Production

DESCRIPTION

MitoTone®, provided by Douglas Laboratories®, is a unique dietary supplement designed to provide a broad spectrum of beneficial mitochondrial energy production support nutrients in physiologically meaningful amounts.

FUNCTIONS

Mitochondria are the cellular components responsible for generating the energy required to sustain life. Energy is produced from the flow of free electrons through the electron transport chain produced by oxidative phosphorylation. Because mitochondria serve as the powerhouse of the cell, their proper functioning is essential to the integrity and optimal performance of the living organism.

Cumulative oxidant stress is a major cause of mitochondrial dysfunction and is implicated as a principal underlying event in numerous degenerative diseases and age-related decline in physical and mental performance. Free radicals are normal byproducts of mitochondrial respiratory chain function. They can be damaging when produced in excessive amounts and not neutralized by naturally occurring antioxidants. Their accumulation may lead to peroxidation of membrane lipids, decline in oxidative phosphorylation, inefficient electron transport, and further increased oxidant flux. Repletion with specific nutrients necessary to support electron transport chain function and antioxidant protection appears to nutritionally support many age- and disease-associated deficits in mitochondrial function.

Coenzyme Q10. Coenzyme Q10 is a critical rate-limiting constituent of the mitochondrial electron transport chain, the biochemical pathway in cellular respiration from which ATP (adenosine triphosphate) and metabolic energy are derived. When mitochondrial energetics are inhibited, such as occurs during stress, degenerative disease, or aging, demand for coenzyme Q10 increases which must be met by dietary intake in order to optimize mitochondrial function. Mitochondria are exposed to high levels of oxidant stress (i.e. free radical damage) during cellular respiration. Coenzyme Q10 is one of the key antioxidant nutrients that protect mitochondrial membrane lipids and proteins and mitochondrial DNA from free radical-induced oxidative damage. It also regenerates and extends the action of vitamin E by reducing the α-tocopherol radical, thus further protecting against membrane lipid peroxidation.

Acetyl-L-Carnitine (ALCAR). This multifunctional nutrient facilitates the transport of fatty acids into mitochondria where they are oxidized, thus providing a major source of energy for the heart, brain, and skeletal muscle. ALCAR also stimulates the synthesis of cardiolipin which plays a crucial role in mitochondrial membrane structure and function. Cardiolipin plays a pivotal role in maintaining mitochondrial proton gradients, permeability of inner mitochondrial membrane to small molecules, and activity of mitochondrial membrane translocase proteins. Cardiolipin content declines with age and oxidative stress.

Alpha-Lipoic Acid. Alpha-lipoic acid is a required coenzyme involved in the energy metabolism of proteins, carbohydrates, and fats. It is also a potent antioxidant that neutralizes free radicals generated both inside and outside of membranes. In addition to its direct antioxidant activity, alpha-lipoic acid helps recycle vitamins C and E and stimulates the synthesis of glutathione.

Vitamin C and Vitamin E. Vitamin C is a critical part of the glutathione/alpha-lipoic acid antioxidant pathway. Vitamin E protects against mitochondrial membrane lipid peroxidation, thereby preserving membrane stability and function.

N-Acetyl-L-Cysteine (NAC). NAC is a nutrient precursor to glutathione and is effective at raising intracellular glutathione levels. Like alpha-lipoic acid, glutathione is an important antioxidant protector of mitochondrial membranes.

Magnesium Malate and Sodium Succinate. Malic acid and succinic acid are key metabolic intermediates in the Kreb's citric acid cycle which is primarily responsible for the release of energy (as ATP) from food fuels.

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Magnesium is a requisite cofactor for numerous mitochondrial enzymes.
Creatine. Creatine phosphate constitutes a major energy reserve by providing a readily available high-energy phosphate which in turn can be used to reform ATP from ADP. This prevents the rapid depletion of ATP that results from intense muscle activity or reduced mitochondrial function.

Vitamin B1 (Thiamin), Vitamin B2 (Riboflavin), and Niacinamide. Thiamin, riboflavin and niacinamide stimulate the synthesis of NADH, FAD, and NAD respectively which play key roles in the functioning of the citric acid cycle.

Lecithin. The various phosphatides contained in lecithin maintain cell membrane stability and fluidity and are precursors to the synthesis of cardiolipin.

Red Grape Extract. The skins, seeds, and stems of red and black grapes are rich in dark red-violet flavonoids, the proanthocyanidins. Proanthocyanidins are among the most powerful free radical scavengers yet discovered. Proanthocyanidins appear to be especially effective in neutralizing highly reactive hydroxyl and singlet oxygen radicals. Both of these reactive oxygen species are generated during mitochondrial functioning.

INDICATIONS

MitoTone may be taken as a dietary supplement for individuals who wish to increase their intake of a broad spectrum of important mitochondrial support nutrients.

FORMULA (#MIT)

Two tablets contain:

Vitamin C (L-ascorbic acid)	250 mg
Vitamin E (d-alpha tocopheryl succinate)	150 I.U.
Vitamin B1 (thiamin mononitrate)	20 mg
Vitamin B2 (riboflavin)	20 mg
Niacinamide	50 mg
Magnesium Malate (providing 36 mg elemental magnesium and 255 mg malic acid)	300 mg
Co-Enzyme Q10 (ubiquinone)	50 mg
Acetyl-L-Carnitine	200 mg
N-Acetyl-L-Cysteine	100 mg
Alpha-Lipoic Acid	100 mg
Red Grape Extract	25 mg
Creatine Monohydrate	200 mg
Sodium Succinate**	300 mg
Lecithin	200 mg
Supplying (approximately):	
Phosphatidylcholine	100 mg

**Provides 85 mg elemental sodium.

SUGGESTED USE

Adults take two tablets daily as a dietary supplement, or as directed by a healthcare professional.

SIDE EFFECTS

No adverse side effects have been reported.

STORAGE

MitoTone®

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Store in a cool, dry place, away from direct light. Keep out of reach of children.

REFERENCES

Beal MF, Howell N and Bodis-Wollner I, Eds. Mitochondria & Free Radicals in Neurodegenerative Diseases. Wiley-Liss, Inc., New York, 1997.
Eaton S, Bartlett K and Pourfarzam M. Mammalian mitochondrial β-oxidation. Biochem J 1996;320:345-357.
Hagen TN, Yowe DL et al. Mitochondrial decay in hepatocytes from old rats: membrane potential declines, heterogeneity and oxidants increase. Proc Natl Acad Sci 1997;94:3064-3069.
Johns DR. Mitochondrial DNA and disease. N Engl J Med 1995;333:638-644.
Littaru GP. Energy and Defense: Facts and Perspectives on Coenzyme Q10 in Biology and Medicine.Casa Editrice Scientifica Internazionale, Italy, 1995.
Luft R. The development of mitochondrial medicine. Proc Natl Acad Sci1994;91:8731-8738.
Schultz JB, Matthews RT, Henshaw DR et al. Neuroprotective strategies for treatment of lesions produced by mitochondrial toxins: implications for neurodegenerative diseases. Neuroscience 1996;71:1043-1048.
Shigenaga MK, Hagen TM and Ames BN. Oxidative damage and mitochondrial decay in aging. Proc Natl Acad Sci USA 1994;91:10771-10778.
Shoffner JM and Wallace DC. Oxidative phosphorylation diseases and mitochondrial DNA mutations: Diagnosis and treatment. Ann Rev Nutr 1994;14:535-568.
Trounce I, Byrne E and Marzuki S. Decline in skeletal muscle mitochondrial respiratory function: possible factor in ageing. Lancet 1989;I(8639):637-639.
Wallace DC. Mitochondrial genetics: A paradigm for aging and degenerative diseases? Science 1992;256:628-632.
Yu BP et al. Mitochondrial aging and lipoperoxidative products. In: Pharmacological Intervention in Aging and Age-Associated Disorders. Kitani A, Aoba A and Goto S Eds. Ann N Y Acad Sci 1996;786:44-56.

For more information on MitoTone® visit douglaslabs.com

† These statements have not been evaluated by the Food and Drug Administration.
This product is not intended to diagnose, treat, cure, or prevent any disease.

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Your patients trust you.