

To support optimal mitochondrial biogenesis

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## Mito-PQQ™ may be beneficial for:

- ▶ Depression
- ▶ Chronic Fatigue Syndrome
- ▶ Fibromyalgia
- ▶ Increase in energy levels
- ▶ Anti-aging
- ▶ Athletic performance
- ▶ Type 2 Diabetes
- ▶ Obesity

Mitochondria, whose main function within cells is the production of energy in the form of adenosine triphosphate (ATP), require continuous regeneration throughout life. These vital cellular components, nicknamed the “powerhouse of the cell,” are a primary site of free radical production and are particularly susceptible to damage from oxidative stress. Because aging is associated with deterioration at the cellular level, proper *mitochondrial biogenesis* – growth and division of pre-existing mitochondria – is critical for the promotion of healthy aging, as well as optimal energy production, and protection from reactive oxygen species (oxidative stress). Mitochondrial dysfunction, with its associated ATP deficiency, is related to a host of diseases, including chronic fatigue syndrome, degenerative neurological disorders, cardiovascular disease, obesity, and even diabetes, as reduced mitochondrial biogenesis has been demonstrated in metabolic syndrome.

**Mito-PQQ™** is designed to help support optimal mitochondrial biogenesis, which not only encompasses the formation of new mitochondria, but is also accompanied by variations in size, number, and mass or density of the mitochondria. Thus, the focus of Mito-PQQ™ is on making new mitochondria and increasing their density (as opposed to strictly supporting mitochondrial function). With an increase in mitochondria density, more ATP is formed, which translates into more energy as well as a greater capacity to burn fat for energy as opposed to storing it as body fat.

## Highlights of Mito-PQQ™:

**Pyrrroloquinoline quinone (PQQ)** is a water-soluble, vitamin-like compound, although not a vitamin itself. While the body cannot make PQQ, it can be found in a variety of foods including parsley, green tea, green peppers, kiwi and papaya. It is an enzyme cofactor possessing antioxidative, neuroprotective, and cardioprotective properties.

- **Cardioprotective:** PQQ was shown to reduce myocardial infarct size (site of cardiac muscle death due to blocked blood supply in a heart attack) and protect the mitochondria from resultant oxidative damage (*Zhu BQ, et al, J Cardiovasc Pharmacol Ther. 2006*).
- **Neuroprotective:** PQQ helps to prevent neuron cell death from oxidation and enhances the production of nerve growth factor (NGF), which is important for the growth and maintenance of brain and peripheral nerve cells. NGF is essential for the survival of sympathetic and sensory neurons. Research suggests that PQQ’s involvement with NGF could play a beneficial role in helping to prevent neural diseases in the central and peripheral nervous system. (*Urakami T, et al, Biofactors. 1995-1996*).

## PQQ & Mitochondrial Biogenesis

PQQ works as a potent antioxidant and actually encourages mitochondrial biogenesis. This attribute distinguishes it from other anti-aging and energy-stimulating nutrients such as l-carnitine, which works via a transport system, shuttling fat inside the mitochondria where it can be burned as fuel. PQQ stimulates cell-signaling pathways that can initiate the potential for increased mitochondrial production. It works by influencing the activity of PGC-1, a major protein involved in the regulation of energy metabolism and mitochondrial biogenesis (*Gleyzer N, et al, Mol Cell Biol. 2005*). For this reason, PQQ may be beneficial in a wide range of conditions associated with mitochondrial dysfunction.

**Rhodiola rosea**, also known as “golden root,” is a popular adaptogenic herb, which means it works in the cells to normalize their function and stimulate healing. Adaptogens such as Rhodiola rosea assist the body in adapting to stress, anxiety, and fatigue by helping to support the adrenal glands.

Research shows that Rhodiola rosea is a powerful herb for enhancing mitochondrial energy production. It works by activating the synthesis of ATP in mitochondria and stimulating reparative energy processes (Abidov M, et al, *Bull Exp Biol Med.* 2003). Rhodiola rosea is also a potent antioxidant and helps to defend against oxidative damage to the nervous system, as well as the mitochondria.

Similar to PQQ, Rhodiola rosea exhibits both neuroprotective and cardioprotective traits. Its affect on the central nervous system mainly stems from its ability to influence and stabilize levels of the neurotransmitters dopamine, serotonin, and norepinephrine in the brain. It also helps to allow serotonin’s precursor tryptophan to cross the blood brain barrier.

Rhodiola rosea is cardioprotective in that it works to prevent stress-induced cardiac damage by decreasing myocardial catecholamine levels and reducing adrenal catecholamine release during times of stress (Maslova LV, et al, *Eksp Klin Farmakol.* 1994). These catecholamines are part of the sympathetic nervous system and are the neurotransmitters released by the adrenal glands in response to stress.

Supplement Facts	
Serving Size 2 capsules	
Servings per container 30	
Amount Per Serving	% Daily Value
Rhodiola ( <i>Rhodiola rosea</i> )(root) [standardized to contain 3% rosavins and 1% salidroside]	300 mg *
Pyrroloquinoline quinone disodium salt (as Bio-PQQ™)	20 mg *
*Daily Value not established.	

**Other Ingredients:** Cellulose (capsule), vegetable stearate, silicon dioxide.

Bio-PQQ™ is a trademark of MGC (Japan).



### How to Take:

- Take two capsules per day
- Do not take close to bedtime, due to its potential energizing effect
- Possible contraindication with Rhodiola rosea – may be too stimulating for anyone with anxiety or panic attacks
- Can be taken together with Mitochondrial NRG™ for maximum mitochondrial support

### References

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