

Three ways mitochondria play a critical role in cognitive health

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All-natural supplement MGCPQQ can activate mitochondria, promote cognitive function

While it is impossible to avoid getting older, it is possible to mitigate aging's physical and mental effects. In Europe, the number of people over the age of 85 is estimated to hit 19 million in 2020 and 40 million by 2050 (1). As the population grows older, it is important for nutraceutical professionals to stay educated on how the body ages and up to date on the latest research for combatting age-related concerns like memory loss and decreases in energy and focus. Therefore, it is critical that healthcare and nutrition professionals understand the role that mitochondria have in the body and how they can be optimized.

Mitochondria power eukaryotic cells, which are cells that contain a nucleus and organelles. They create energy (ATP) by breaking down fatty acids found in food and regulating cellular metabolism. Mitochondria also have their own DNA, mtDNA, that plays an important role in how energy is used throughout the body.

As the body ages, so do mitochondria, leading to a decline in their efficiency and function. One of the most popular and supported theories toward mitochondrial dysfunction is known as the mitochondrial free radical theory of aging (2). Free radicals are unstable, electrically charged molecules within human cells. This theory further details that reactive oxygen species (ROS), a form of free radicals that originated from oxygen molecules, are produced in mitochondria. These ROS harm DNA and proteins, in turn damaging important and functional parts of mitochondria and

leading to the production of more ROS. This cycle continues and deterioration increases as time goes on. Free radicals can be produced by external sources like air pollution and habits like smoking, eating fried foods, and drinking alcohol (3).

Daily and frequent harm to mitochondrial DNA from free radicals and declined mitochondrial biogenesis – the increase and division of mitochondria within cells – can lead to many signs of aging. This damage can cause death and degeneration of nerve cells and is regarded as a precursor for Alzheimer's, Parkinson's, dementia and other neurodegenerative diseases.

Therefore, for the body to age healthily, cells must continuously create new, well-functioning mitochondria. When people age and lose the ability to exercise the way they used to, their energy consumption naturally declines, thus resulting in a decline in mitochondrial biogenesis. To create more mitochondria, it is necessary that the body recognizes the need for more energy: As energy is consumed, mitochondrial biogenesis is activated.

While it's true that regular exercise can help prevent the side effects of aging, people



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can also seek mitochondria-boosting supplements for additional support. Pyrroloquinoline quinone, PQQ, is a nutrient found naturally in certain fruits, vegetables and some meats that is widely recognized for creating new mitochondria. PQQ disodium salt is the primary ingredient in MGCPQQ®, an all-natural health supplement created by Mitsubishi Gas Chemical Co., Inc. in Japan through a proprietary fermentation process. Through extensive research, MGCPQQ has been proven to help support mitochondrial activation and Nerve Growth Factor (NGF) by revolutionizing brain health through its three pillars: grow, energize, and protect.

GROW

At age 40, the volume of the brain starts to decrease at a rate of 5 percent per decade, while neurons and their connecting pathways start to shrink, as well (4). MGCPQQ may stimulate and synthesize NGF, a protein that is critical to the growth, health and survival of neurons, especially our sensory neurons (5).

An animal study examining the possibility of nerve-inducing effects of MGCPQQ through a nerve tube model with over a 1-cm segmental deficit, proved that rats given MGCPQQ had a “more mature, high-density, newly regenerated nerve”. The study concluded that MGCPQQ was a “potent enhancer” for regeneration of peripheral nerves (5). MGCPQQ does not only benefit nerves in the brain – it has also been shown that by supporting NGF, MGCPQQ can help nerves in other organs recover from damage.

ENERGIZE

Mitochondria’s primary function is to produce energy, but as they age, they lose energy and efficiency. When this happens, cells begin mitophagy, an essential regulation process that selectively removes damaged mitochondria. The body self-regulates defective mitochondria by inducing mitochondrial biogenesis, which helps restore the damaged mitochondria removed through mitophagy.

Mitochondrial biogenesis slows over time, but nutrients like PQQ can help promote it, boosting mitochondrial function. For more efficient energy production, increasing mitochondria and raising NAD⁺ levels are critical. In a recent study, PQQ was reported to produce mitochondria or raise the NAD⁺ / NADH ratio 500 to 1,000 times higher than Resveratrol and Nicotinamide Mono Nucleotide (NMN), other ingredients known to support mitochondrial function (6). Human clinical studies show that



users taking 20 mg of MGCPQQ for eight weeks may experience improved vigor as documented through a short form of the Profile of Mood States, an assessment to test distinctive mood states (7).

MGCPQQ is certified in Informed-Choice (8) and Informed-Sport (9) quality assurance programs, guaranteeing that MGCPQQ is manufactured to high-quality standards and that every batch of MGCPQQ is diligently tested for substances that are banned from the World Anti-Doping Agency (WADA) list (10). This ensures that MGCPQQ is safe for athletes and other consumers who want to boost energy.

PROTECT

At the age of 80, the brain, specifically the hippocampus – the part of the brain that controls our memory – begins to decline (4). The human brain processes many different types of memory: working memory (learning, reasoning, and comprehension), semantic memory (facts and concepts), episodic memory (long term), and implicit memory (motor skills, unconscious thoughts) as well as processing ability. Clinical studies show that MGCPQQ’s antioxidative, neuroprotective and mitochondria-supporting functions as well as enhancement of NGF can have a positive impact on memory recall and brain functions such as spatial awareness (11).

The same study that showed improved vigor after participants took 20 mg of MGCPQQ for 8 weeks also showed that the subjects had a decrease in anxiety, depression and confusion. Overall, the study concluded that there was a decrease in levels of stress, depression, anxiety, and fatigue and an increase in levels of sleep duration and mood.

In an animal study testing MGCPQQ’s effect on memory, rats that were fed a PQQ-supplemented diet displayed better learning ability than the rats that were fed the Coenzyme Q10 (CoQ10)-supplemented diet. When both the control and PQQ-diet group were subjected to oxidative stress for 48 hours, the rats that were fed the PQQ- and CoQ10-supplement showed better memory function than the control rats. The study

concluded that MGCPQQ may be effective in preventing neurodegeneration caused by oxidative stress (12).

MGCPQQ has been vigorously tested and researched by Mitsubishi Gas Chemical to ensure its quality and safety for the consumer. Studies have shown no adverse effects. The nutrient is the only supplement of its kind registered on the European Union’s list

of Novel Food Ingredients and available as a food ingredient in Europe. The same safe and effective ingredient is sold in the United States and Japan as BioPQQ (13), and it is the only supplement in its class with New Dietary Ingredient (NDI) notification from the U.S. Food and Drug Administration (FDA) and GRAS (Generally Recognized as Safe) status. It is also certified as a food ingredient by Japan’s Ministry of Health, Labour, and Welfare.

MGCPQQ delivers more than cognitive benefits; this nutrient can improve mood, energy and sleep, targeting many facets of both aging and overall health. To learn more about MGCPQQ and where to find the ingredient, visit www.mgcpqq.eu.

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