Pyrroloquinoline quinone ("Vitamin PQQ"), a water-soluble quinone compound, was named as a coenzyme for oxidoreductase in 1979, and named as an essential vitamin in 2003. PQQ is a water-soluble compound which assists in the development of healthy skin and connective tissue.

There is no question that PQQ plays a critical role in human nutrition. The levels of free PQQ in various foods have been extensively examined, and besides being found in parsley, green

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pepper and other vegetables, green tea, and fermented foods, it also occurs in the human body, and is richly present particularly in breast milk. However, of all of the foods which have Vitamin PQQ, Nattō tested the highest, with 61 ng/ml; compared with other foods such as bananas 13 ng/ml and eggs 7 ng/ml.

When PQQ is omitted from chemically defined diets in mammals it leads to growth impairment, compromised immune status, and abnormal reproductive function. The nutritional requirements of PQQ are probably in line with folic acid and biotin in terms of micrograms per day versus milligrams per day. Like essential nutrients, the immune system seems particularly sensitive to low levels of PQQ. With PQQ deprivation there are multiple defects in immune function and loss of white blood cells to respond properly.

There is evidence indicating that PQQ may reverse cognitive impairment caused by chronic and also acute oxidative stress and stimulates the production and release of nerve growth factor. It has been shown to block the formation of inducible nitric oxide synthase (iNOS), which is damaging to brain cells.

Vitamin PQQ has been found to protect against stroke in animal models. It may protect against the self-oxidation of the DJ-1 gene, and the development of alpha-synuclein, a protein both of which are associated

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with Parkinson’s disease.\textsuperscript{12} It may also have a role in beta-amyloid protein binding of nerve cells, related to Alzheimer’s disease\textsuperscript{13}

PQQ protects against the likelihood of severe stroke in an experimental animal model for stroke\textsuperscript{14} and from neurotoxicity from metalloids.\textsuperscript{15,16}

On 15 August 2008, the United States Food and Drug Administration (USFDA) granted the Mitsubishi Gas Chemical Company, Inc. (“MGC”) official approval of its application to manufacture and distribute coenzyme PQQ as a new health food ingredient.\textsuperscript{17}

\textsuperscript{15} Zhang Q, Shen M, Ding M, Shen D, Ding F. The neuroprotective action of pyrroloquinoline quinone against glutamate-induced apoptosis in hippocampal neurons is mediated through the activation of PI3K/Akt pathway. Toxicol Appl Pharmacol. 2011 Apr 1;252(1):62-72
\textsuperscript{17} Sachiko Koshiishi, MGC to develop coenzyme PQQ as new health food ingredient 8 September 2008, retrieved from http://www.mgc.co.jp/php/files_en/080908_e.pdf on 18 September 2015