Kaneka UBIQUINOL®
FOR HEART HEALTH
Active antioxidant form of CoQ10

Kaneka NUTRIENTS

WHITE PAPER

Ubiquinol's Role in Cardiovascular Health

This white paper explores the scientific evidence behind ubiquinol's role in supporting cardiovascular health, with a focus on its biochemical properties and mechanisms of action. Ubiquinol, the active antioxidant form of CoQ10, plays a crucial role in maintaining mitochondrial function, combating oxidative stress, and facilitating cardiovascular wellness. Key areas covered include its ability to protect LDL from oxidation, support endothelial function, and sustain mitochondrial integrity to support heart health.

This paper also addresses ubiquinol's role in maintaining the health of the cardiovascular system.

Cardiovascular disease continues to pose a significant global health challenge, impacting over half a billion people and causing millions of fatalities every year, one-third of which occur in individuals under age 70.[1] Risk factors for heart disease include factors that cannot be controlled, such as family history and genetics, and key modifiable lifestyle factors, including unhealthy diets lacking in nutrient density, physical inactivity, and tobacco use. As more and more people become aware of the importance of maintaining a heart-healthy lifestyle, coenzyme Q10 (CoQ10) has gained attention as a valuable addition to cardiovascular wellness regimens.

CoQ10 exists naturally within the body in two distinct forms: ubiquinone, the oxidized form, and ubiquinol, the active antioxidant form. Notably, ubiquinol functions as a lipid-soluble antioxidant, playing a crucial role in protecting against oxidative stress and contributing to the maintenance of overall heart health. Its role in cellular energy production is crucial for the healthy functioning of the heart, one of the most energy-demanding organs in the body. Furthermore, ubiquinol is integral to other mitochondrial roles that are key to cellular homeostasis and proper function, which have been identified as critical to maintaining the health of the heart and blood vessels.[2-4]

This white paper provides detailed insights into the science behind ubiquinol, its unique biochemical properties, and how it supports cardiovascular health. The paper also addresses the oxidative processes that specifically affect blood vessels and highlights research on Kaneka Ubiquinol®, demonstrating the scientifically validated benefits of supplementation for supporting cardiovascular health.

The Science Behind Ubiquinol

Ubiquinol and ubiquinone are two forms of CoQ10, a lipid-soluble molecule produced naturally in the body. As the active antioxidant form of CoQ10, ubiquinol plays a significant role in the production of cellular energy, supporting mitochondrial function and cellular health.

Ubiquinol is found in every cell of the body. It is required for 95% of cellular energy production, providing the heart, lungs, and other organs with the energy needed to function at optimal levels. Energy production occurs in the mitochondria, often described as the powerhouse of the cell. This process happens in the mitochondrial electron transport chain (ETC) with the transfer of electrons, enabling the creation of adenosine triphosphate (ATP), the cell's primary energy molecule. Here, ubiquinol's lipid solubility allows it to penetrate the double-lipid barrier of the mitochondria, where it facilitates the transfer of electrons, supporting the efficient production of ATP.[5]

Ubiquinol plays a second critical role enabled by its lipid-soluble nature. Through its antioxidant mechanism, ubiquinol is able to neutralize free radicals, including reactive oxygen species (ROS), that are formed in the lipid membrane as a byproduct of energy production. Mitochondria are the biggest source of ROS in the body, which, if not neutralized, cause elevated oxidative stress. Ubiquinol neutralizes ROS by donating electrons, stabilizing them, and helping to prevent further damage. This process helps halt the cascade of free radical damage, which destabilizes cell structures and can impact cell and mitochondrial function over time.

Oxidative Stress and Cardiovascular Health

Oxidative stress occurs when there is an imbalance between the production of ROS — highly reactive molecules generated within the mitochondria during normal metabolic processes — and the body's ability to neutralize them, known as antioxidant capacity. This imbalance leads to an accumulation of oxidative damage that impacts lipids, proteins, and cell membranes, affecting their structure and function.[6,7] The influence of oxidative stress on cellular structures can affect the health of vessels, heart cells, and tissues, which can ultimately impact cardiovascular health.

Oxidative damage also impacts mitochondrial function, resulting in inefficiencies in energy production and the release of more free radicals, creating a cycle of cellular damage.[8] Oxidative stress can also lead to changes in the inner cells of blood vessels called endothelial cells.[9]

How Oxidative Stress Impacts Vessel Health

The health of blood vessels affects the overall health of the cardiovascular system. The endothelial cells, which form the inner lining of the vessels (endothelium), have a dynamic role in regulating blood flow, blood vessel tone, immune responses, and vessel growth.[10] The cumulative effects of oxidative stress on these cells can contribute to reduced endothelial function.[11,12]

The following illustrates how this occurs:

Oxidation of LDL – The oxidation of LDL (low-density lipoprotein) is a complex process associated with many factors. Oxidation of LDL particles creates "oxidized LDL" (oxLDL), which generates additional free radicals and triggers processes that can lead to the accumulation of oxLDL on inner vessel walls. Over time, these changes may impact the ability of vessels to maintain a healthy blood flow.

Reduced endothelial function – Increased oxidative stress may result in reduced nitric oxide (NO) production, affecting vessel function and the ability of the vessels to dilate effectively.

The Impact of Modern Lifestyles on Heart Health

Increased oxidative stress is associated with modern lifestyles, including:

- Chronic stress
- Imbalanced diets and processed foods
- Sedentary living
- Sleep deprivation
- UV radiation
- Smoking and alcohol consumption
- Exposure to environmental pollutants and other toxins

These external factors influence the production of free radicals, including ROS, cumulatively elevate oxidative stress, and contribute to decreased ubiquinol levels and age-related declines in cardiovascular health.

Three Ways Ubiquinol Promotes Cardiovascular Health

Ubiquinol's dual role in antioxidant defense and cellular energy production makes it essential for vascular health, contributing to the proper functioning of the circulatory system and promoting cardiovascular health.

"When there are more mitochondria around, that generates more free radicals. It's important for ubiquinol to be maintained at healthy levels because ubiquinol is what mops up all those free radicals."

Sr. Scientific and Regulatory Advisor Risa Schulman, Ph.D.

1. Safeguarding Heart Cells and Mitochondria

The heart has the highest concentration of mitochondria — and therefore ubiquinol — of any organ, which is essential for meeting its high-energy demands and protecting against oxidative stress. The heart is responsible for around 8% of the body's total ATP consumption, even though it accounts for only 0.5% of total body weight. Heart muscle cells — cardiomyocytes — are unique in that they contain giant mitochondria to enable the rapid supply of ATP necessary to pump the heart, which only stores enough energy to function for about 10 seconds.[13]

However, the high metabolic rate of cardiomyocytes leads to elevated ROS production, leaving them vulnerable to oxidative damage, especially as people age and their antioxidative and cell repair capacities naturally begin to fall off. In this context, ubiquinol's antioxidant properties and its location within the mitochondria give it a highly protective role,[8] helping to maintain the health and function of endothelial and cardiac cells. Ubiquinol also supports critical mitochondrial roles. Mitochondria are involved in the regulation of programmed cell death (apoptosis), cellular aging (senescence), substrate flow, and anti- and pro-inflammatory responses, all of which contribute to the cell homeostasis that underpins overall wellness.

Mitochondrial fission (the division of a single mitochondrion into two) and fusion (the merging of two or more mitochondria) are dynamic processes that occur continuously within cells and are essential for maintaining cellular homeostasis. Fission allows mitochondria to isolate and remove damaged segments for recycling, while fusion enables mitochondria to share contents, such as DNA and proteins, which helps sustain function and reduce oxidative damage. This balance is critical in cardiomyocytes, where mitochondrial activity is directly linked to energy production and capacity for neutralizing free radicals. Disruptions in fission and fusion can lead to mitochondrial fragmentation, impaired cellular energy output, and increased susceptibility to apoptosis, contributing to common age-related cardiovascular conditions.

By helping to preserve mitochondrial integrity and supporting mitochondrial repair mechanisms, ubiquinol helps maintain mitochondria in good health. Together, these functions help ensure proper cardiovascular cell performance.

"Fission and fusion of the mitochondria is a constant and dynamic process that serves a regulatory function for the whole cell and is linked with overall wellness and healthy aging."

Dr. Schulman

2. Protecting LDL From Oxidation

Ubiquinol is the predominant form of CoQ10 in the blood, comprising 95% of the total plasma CoQ10 (ubiquinol and ubiquinone) in a healthy adult.[14,15] Since blood is primarily water, lipid-soluble substances like ubiquinol cannot float freely through the bloodstream. However, ubiquinol binds to blood lipids, primarily LDL particles, which are soluble in the blood and can carry the ubiquinol with it. This makes ubiquinol transportable within the aqueous environment of the blood.

LDL is very susceptible to oxidation, which changes its properties in ways that can impact endothelial cells and vascular health. While bound to LDL particles, ubiquinol can exert its antioxidant benefits where they are most needed, protecting LDL from oxidation and helping to maintain a healthy endothelial environment.[16,17]

3. Enhancing eNOS Production for Vasodilation

Endothelial nitric oxide synthase (eNOS) is an enzyme that produces NO, a signaling molecule essential for maintaining the structure and function of the endothelium and facilitating its natural repair mechanisms. NO also triggers vasodilation in response to a demand for greater blood flow.

Ubiquinol supports nitric oxide synthesis by enhancing eNOS activity, thereby promoting vasodilation and helping maintain healthy endothelial function, vascular tone, and arterial elasticity — all of which are critical for cardiovascular health.[18]

"The presence of nitric oxide is known to help maintain and preserve the health of endothelial cells, keeping them pink and plump and well-connected, like a nicely laid brick wall."

Dr. Schulman

"The cell and the mitochondria each have their own DNA, and they talk to each other. If things aren't going well with the mitochondria — if there are too many free radicals and things are starting to break down — the mitochondrion calls for a 'clean up in aisle 7.' It can ask the cell to turn on inflammatory processes and other repair mechanisms."

Dr. Schulman

When Supplementation Becomes Beneficial

Aging increases oxidative stress due to the natural decline in the body's antioxidant mechanisms. Around age 40, the body's ability to convert ubiquinone to ubiquinol diminishes, which can lead to a reduction of ubiquinol levels and an imbalance of ubiquinol/ubiquinone in the blood. The cumulative effect of environmental factors such as pollution and lifestyle influences like diet and stress levels may further intensify oxidative stress, negatively affecting overall wellness.

These factors are associated with reduced mitochondrial function, which can contribute to the decline of cellular and organismal health evident in aging.[19,20] Aging and increased oxidative stress are further characterized by the oxidation of cell membranes and DNA, cell senescence, and disrupted cellular energy production.

The Kaneka Ubiquinol® Advantage

As the active antioxidant form of CoQ10, Kaneka Ubiquinol® requires no conversion in the body to perform antioxidant functions.[21] This makes it readily available to support the generation of cellular energy and mitigate oxidative stress in the body, thereby promoting cellular and mitochondrial health.

When taken as a supplement, Kaneka Ubiquinol®, in contrast to ubiquinone, presents a distinct advantage in bioavailability. Kaneka Ubiquinol® has been shown to be two times better absorbed than conventional CoQ10.[22] This enhanced absorbability becomes increasingly significant with aging and in the presence of oxidative stress.

In a clinical study, healthy adults taking 200 mg of Kaneka Ubiquinol® daily for at least 30 days saw an increase in ubiquinol levels by approximately eight times compared to their baseline levels.[23]

Ubiquinol's value extends beyond its absorption efficacy. Ubiquinol plays a vital role in promoting healthy mitochondrial function, which is essential for regulating apoptosis, aiding in the clearing of damaged cells, and preventing premature cell death. Additionally, it helps prevent oxidation and enhances cellular energy production.[24,25] At the molecular level, Ubiquinol has been shown to play distinct roles related to critical biological processes, including effects on gene expression.[24,26]

Additional Evidence From Ubiquinol Research

Research shows that adequate ubiquinol blood levels correlate with markers associated with cardiovascular health, including N-terminal pro-brain natriuretic peptide (NT-proBNP) and C-reactive protein (CRP).[27,28] Studies demonstrate that Kaneka Ubiquinol® supports heart health by:

- Improving gamma-glutamyl transferase (GGT), a blood marker associated with cardiovascular health[29-31]
- Yielding higher absorption than conventional CoQ10 supplementation[22]

What Makes Kaneka Ubiquinol® Different?

With over 85 human clinical studies performed using Kaneka Ubiquinol® and over 17 years of positive consumer experience, Kaneka Ubiquinol® stands out for its rigorous scientific backing, patented manufacturing process, superior bioavailability, and safety profile. This comprehensive approach underscores our commitment to quality, efficacy, and consumer trust. Bioidentical to the body's natural ubiquinol, Kaneka Ubiquinol® leads the CoQ10 supplement space as a superior, trusted product.

Dedication to Scientific Research and Clinical Trials

Kaneka Nutrients' dedication to scientific research and clinical trials has set a solid foundation for the efficacy and safety of our ubiquinol products. With 50 years of combined CoQ10 (ubiquinol and ubiquinone) testing and research, including pivotal studies published in peer-reviewed journals like *Regulatory Toxicology and Pharmacology*, we have established a substantial body of evidence supporting the health benefits of Kaneka Ubiquinol®. We are the trusted brand used by researchers in clinical trials, including those funded by the National Institutes of Health. These studies confirm the bioavailability and safety of ubiquinol and demonstrate its benefits in areas like cardiovascular wellness and healthy aging.

Patented, Proprietary Manufacturing Process

Kaneka Ubiquinol® is a proprietary CoQ10 made by non-genetically modified natural yeast strains through a patented microbiological fermentation process. This method ensures the production of the trans-isomer ubiquinol, which is bioidentical to the CoQ10 naturally produced in the human body. Our proprietary approach yields a pure, high-quality product, ensuring the body can use it effectively. Kaneka Ubiquinol® does not contain the impurities commonly found in synthetic CoQ10 ingredients.

Made in the USA

As a trusted leader in ubiquinol production, Kaneka Nutrients manufactures in the United States to ensure the highest standards of quality, reliability, and purity — delivering the safety and efficacy needed for your premium product formulations.

An Ally in Cardiovascular Wellness

Whether you are a healthcare practitioner dedicated to enhancing patient outcomes or a supplement manufacturer striving to deliver top-tier products, Kaneka Ubiquinol® offers the scientific edge your clients need. Connect with us today to enhance your offerings and set a new standard in overall wellness.

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