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SECTION 1: Coenzyme Q10 Overview

Introduction: Understanding the CoQ10 Market

Coenzyme Q10, or CoQ10, as it is most often called, occupies a unique and virtually unprecedented place in the story of dietary supplement ingredients. The antioxidant nutrient is the third most popular supplement in the North American market for three years running, just behind vitamin D and fish oil, according to a comprehensive study from ConsumerLab.com, surveying more than 11,000 dietary supplement users.¹ It likely has the opportunity to move up on that list as well as the potential to dominate other emerging supplement markets such as China, Japan and Brazil.

So what's so great about CoQ10? Stephen Sinatra, M.D., F.A.C.C., calls it "essential to the foundation of a healthy lifestyle, especially for the millions of men and women concerned about heart health. CoQ10 can—and should—be taken by nearly everyone."²

There is significant evidence to support that statement. Even before birth, CoQ10 is produced naturally in the body and is used in the cells to create usable energy. It does this by serving as a cofactor in the electron-transport chain, which is involved in the synthesis of adenosine triphosphate (ATP). During the ATP cycle, the body takes raw nutrients from food and refines them into fuel that is used by individual cells to function.³ Without CoQ10, the body has no ATP and therefore cannot generate energy. This has implications for all body systems from cardiovascular and brain function to hearing, vision and oral health. CoQ10 is also important for defending the cells from damage caused by free radicals in the body. It is also well known that CoQ10 production declines significantly with age and low levels of this nutrient are increasingly linked with diabetes, cancer and heart disease.

As a supplement ingredient, CoQ10 is basically without parallel in its function, evidence and safety. But this ingredient also has unique stature as one of few supplement ingredients that began as a pharmaceutical and carries a variety of distinctions

and challenges, from its highly technical production costs and requirements creating a high barrier to entry to its connection to statin drugs, which are now a globally recognized primary protocol for cardiovascular treatment.

This provides a well-defined and important audience for CoQ10 and the ingredient has definitely developed a loyal following among regular users who are well educated as to its benefits. Cardiologists are also key supporters, but only about half of these practitioners understand as much as they should or feel satisfied as to the level of proof of efficacy for CoQ10.

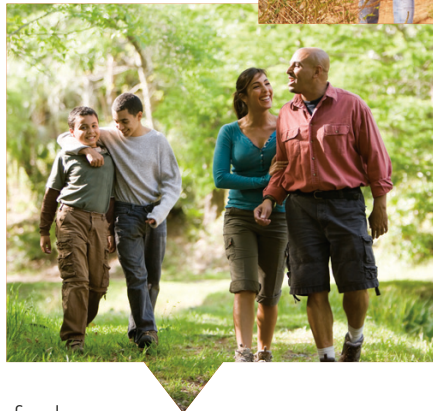
Though the CoQ10 industry has successfully addressed important supply chain and price issues over the last decade, which has created a more favorable overall climate, these factors have also slowed research and investment in CoQ10 technologies and could ultimately threaten quality if the segment does not find a way to better support sustainable industry expansion.

Ongoing internal industry disputes about bioavailability of certain forms may lead to negative consumer perceptions in addition to an overall lack of excitement about the category. Global market factors will also play a role in how CoQ10 is perceived and accepted in developing markets.

About this report

To understand where the CoQ10 market is going, it is important to know where CoQ10 has come from and the potential obstacles and opportunities it may face. That is the objective of this report sponsored by the CoQ10 Association.

This report provides in-depth analysis on the scope of the CoQ10 market, its history, forms, applications and market challenges, as well as an examination of the market's size, revenues, and forecasted growth. We also provide a breakdown of key suppliers, brands, and ongoing and competitive factors that will play a role in its future growth and development.



1.1: Production Overview

What is CoQ10 and how does it work?

CoQ10 is a fat-soluble nutrient produced naturally in the body and is used in cells to create usable energy. It is found in the membranes of many organelles, which are parts of the cell that support this function, such as the nucleus. The highest concentrations are found in the inner membrane of the energy producing mitochondrion. CoQ10 is fat soluble, so it is mobile in cellular membranes and plays a crucial role in the electron transport chain (ETC). In the inner mitochondrial membrane, electrons from NADH (nicotinamide adenine dinucleotide + hydrogen) and succinate pass through the ETC to oxygen which is reduced to water. The transfer of electrons through ETC results in the pumping of hydrogen ions across the membrane. This creates a proton gradient, which is used by ATP synthase (located on the membrane) to generate ATP. As such, CoQ10 serves as a mitochondrial electron carrier. Aside from vitamin K2, no other molecule can do this, so CoQ10 functions in every cell of the body to synthesize energy.

Given its role as an energy carrier, the CoQ10 molecule goes through the oxidation-reduction cycle, which contributes to its antioxidant nature.⁴

1.2: Production of CoQ10: Forms — Ubiquinone versus Ubiquinol

In the body, CoQ10 exists in either its oxidized form, ubiquinone, or in its reduced form, ubiquinol. The oxidized form of

Historical Perspective: CoQ10 — A key discovery

CoQ10 was discovered in 1957, relatively speaking, not that long ago, at the University of Wisconsin—Madison by Professor Frederick L. Crane and his colleagues at the Enzyme Institute. Here are some highlights of its history:

1958 —

Dr. Karl Folkers and coworkers at Merck reported on its chemical structure.

1961 —

British chemist Dr. Peter Mitchell proposed the electron transport chain (which includes CoQ10's vital role in moving protons).

1972 —

Gian Paolo Littaru and Karl Folkers separately demonstrate a deficiency of CoQ10 in human heart disease.

1978 —

Dr. Peter Mitchell receives Nobel Prize for Chemistry for his discovery on the role of CoQ10 in

CoQ10 (ubiquinone) is used in the body through its transformation into ubiquinol, and in the same way reduced CoQ10 (ubiquinol) becomes ubiquinone after it carries out its role in the body.⁵ Either form taken as a supplement can be used in the human body, which can convert the reduced ubiquinol to ubiquinone and vice versa. The conversion occurs to maintain a state of equilibrium between the two forms.

Both forms are available in supplement products. Ubiquinone, often called conventional CoQ10 is the most used form of the nutrient, in part because it was the only form available in products until 2007, when the other form, ubiquinol, became commercially available. At that time, manufacturers of ubiquinol claimed to have discovered a way to make the compound stable so it could be used as a food or nutritional supplement, using numerous delivery formats, such as softgels, CoQ10 molecules in water and lipid-based solutions. Some companies also claim a higher degree of bioavailability for ubiquinol. The result has led some consumers to believe that ubiquinone is an inferior form of CoQ10.⁶

This debate prompted a group of long-time CoQ10 researchers led by William V. Judy, Ph.D., to investigate and clarify the claims. The team found some claims to be based on scientific fact, while others were deemed to be aggressive and misleading marketing.

The key dispute is about absorption and bioavailability. According to the research team, it is true that the two forms have some differences:

- Ubiquinone, the oxidized form

of CoQ10, is stable, well researched and plays an essential role in energy production processes in the cells and no other known substance can replace its function.

- Ubiquinol, the reduced form, is an unstable form. In some supplement products it may be converted to ubiquinone in softgels, if it is accompanied by other antioxidants, like vitamin E. It plays an important role as a fat-soluble antioxidant. Marketing claims for its superior absorption range from 12% better to as much as 800% better. Dr. Judy's research team suggests that the latter claim is based on poor science, with comparisons that were not randomized or head-to-head.⁷

The two forms do have distinct functions in the body. They actually act as redox pairs with the ability to recycle each other as needed. This is important because ubiquinone is essential for life and the body cannot survive without the energy it provides, so its life-sustaining energy must be protected and maintained. This is where ubiquinol steps in to recycle and maintain ubiquinone stores, serving as a defense system with other antioxidants to also protect the body from free radicals, super-oxides and the effects of aging.⁸

Ultimately, both forms are of interest to researchers as there are still many questions to answer about how they func-

tion. While most experts consider both forms of value and interchangeable, there is some research to suggest ubiquinol may offer absorption advantages over conventional CoQ10,^{9,10,11} but again many of these studies are small and inconclusive. Some research also suggests that absorption is dependent upon age and overall health, and that the conversion process may become harder and less efficient with age, which is touted to provide some advantages for ubiquinol, especially for older users.¹²

the biological transfer of energy in the cells through the movement of electrons to the electron transport chain in the inner mitochondrial cell membranes and through the movement of hydrogen ions (protons) across the inner membranes of the mitochondria.

1980s —

see a steep rise in clinical trials due to availability of large quantities of pure CoQ10 and methods to measure plasma and blood CoQ10 concentrations. Leads to study of antioxidant role as a free radical scavenger (Lars Ernster) and relation of CoQ10 to various diseases including cardiovascular conditions and neurodegenerative disease.

1990s —

CoQ10 becomes a dietary supplement ingredient just prior to the passage of DSHEA, the Dietary Supplements Health and Education Act of 1994. Merck develops a CoQ10 statin combination product, but because of the

tion. While most experts consider both forms of value and interchangeable, there is some research to suggest ubiquinol may offer absorption advantages over conventional CoQ10,^{9,10,11} but again many of these studies are small and inconclusive. Some research also suggests that absorption is dependent upon age and overall health, and that the conversion process may become harder and less efficient with age, which is touted to provide some advantages for ubiquinol, especially for older users.¹²

That said, conventional ubiquinone has been well-studied for more than 50 years and has long been seen as a clinically valid, safe and trusted option by practicing cardiologists.¹³ Conventional CoQ10 currently still makes up the lion's share of CoQ10 sold in more than 90% of the market.¹⁴

Getting Enough CoQ10 — The Dosing Question

The debate over CoQ10 bioavailability is a subject of ongoing disagreement. It is obviously an important question. If the body is not absorbing CoQ10, the patient will not likely experience its potential benefits, which is overall a negative factor for the category, and may be a reason that research on the efficacy of CoQ10 is so variable.

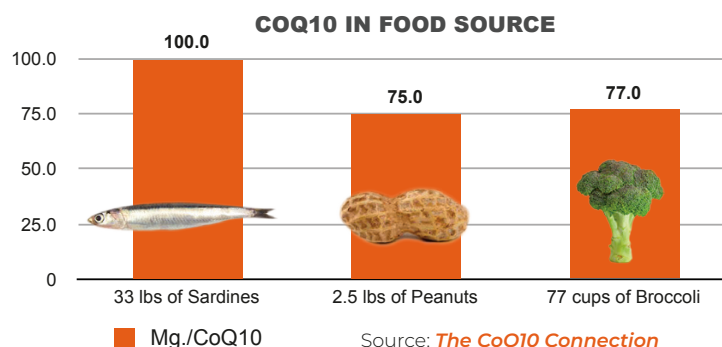
First of all, it is very difficult to get enough CoQ10 from diet alone. While it is readily available in foods like meat, poultry and fish, preparation of those foods can have an impact on how much CoQ10 is available after

it is cooked. Secondly, it is simply not possible to get enough CoQ10 from food to reach optimal doses of 30 to 100 mg daily for healthy people and even more difficult to reach therapeutic doses of 100 to 300 mg or more.

Addressing Dosage and Bioavailability

That leaves dietary supplements as the best option, but how much is enough? The consensus is that more CoQ10 is not necessarily better. Some research has suggested that the higher the single dose the less CoQ10 is absorbed and that smaller more frequent doses provide better absorption.

The key factor in experiencing the benefits of CoQ10, according to cardiologist Stephen Sinatra, M.D., an assistant clinical professor of medicine at the University of Connecticut School of Medicine, is to reach circulating blood levels of at least 2.5 µg/ml. In an article in *Holistic Primary Care* magazine, he noted the importance of measuring CoQ10 levels before supplementation and then 3 to 4 weeks later to assess how well it is being absorbed. "Once you know you have adequate blood level, then CoQ10 does its magic," he told the magazine. "At levels above the 2.5 µg/ml threshold offers therapeutic benefits for most patients, even those with heart disease. Below that level and the patient will see little impact. This may be one reason, he added,



Source: *The CoQ10 Connection*

that CoQ10 studies have been inconclusive.¹⁵

CoQ10 is inextricably linked to heart disease, with the severity of chronic heart failure and ischemic heart disease shown to be inversely correlated with

plasma CoQ10 levels, so the more severe the heart disease, the lower the level of plasma CoQ10, according to Dr. Judy. We now know that supplementation can improve heart health by two classifications as defined by the New York Heart Association (Class IV is considered severe cardiovascular disease; class III is moderately severe; class II is defined as minimal evidence of cardiovascular disease and class I is no evidence of the disease.) For some patients a dosage of at least 300 mg per day is required to push plasma CoQ10 level to the needed 3.0 mcg per milliliter in these more severe cases.¹⁶

Ultimately, bioavailability remains the big question mark. The problem is that CoQ10 is a large molecule with a crystalline structure that has difficulty passing through the intestinal wall to reach the blood stream. As a result, CoQ10 formulators have developed a variety of products to address its absorption including softgels, oils and nanoparticles. Solid forms, such as tablets, granules, oil suspensions and capsules tend not to be well absorbed.

The claim that ubiquinol is the superior form remains up for debate, although there are some smaller studies suggesting that patients who are not responding to ubiquinone might do better with ubiquinol.

price of CoQ10 the company decides not to produce it.

1995 — FDA tries to claim CoQ10 as a pharmaceutical ingredient and tried to prohibit its sale as a dietary supplement. FDA raids health food stores in Austin, Texas and seizes CoQ10 products. Due to DSHEA and consumer outreach this effort fails.

2000 — CoQ10 market reaches 40 metric tons

2002 — Dr. Julian Whitaker files an FDA citizen's petition urging people taking statin drugs to concomitantly consume CoQ10 at 100-200 mg daily.

2003 — Walmart, in reaction to the FDA petition

mol. But, if a patient is able to convert the oxidized form to the reduced form, the consensus is that both forms provide equivalent metabolic and antioxidant benefits.

The most important development on absorption is from CoQ10 brand Qunol® CoQ10, which used a tri-patented formulation, a solubilized form called Q-Gel®, which is 100% water and fat soluble. Studies have shown that the Q-Gel in Qunol is absorbed as much as three times better than regular CoQ10.¹⁷

Safety of CoQ10

CoQ10 is seen as a remarkably safe supplement ingredient, given that it is a substance that the body itself produces. Side effects in various studies have been minor in nature and in some cases no more prevalent than the rate of side effects reported in the placebo group.¹⁸

There have been no reports of significant adverse side effect of oral CoQ10 supplementation at doses as high as 1,200 mg/day for up to 16 months,¹⁹ and 600 mg for up to 30 months.²⁰

The CoQ10 Statin Connection

While CoQ10 certainly has many opportunities and challenges, one of the most distinct issues which has both positive and negative aspects is its connection to statin drugs. Statins are now one of the most popular cholesterol-lowering drugs prescribed by virtually 100% of cardiologists, according to a survey of cardiologists commissioned by the CoQ10 Association. According to the Centers for Disease Control and Prevention, between 2005 and 2012 more than 36%, or nearly 80 million Americans, were eligible for cholesterol-lowering medications or already taking one.

and raw material price decreases, begins selling a 100 mg softgel. (The average product dosage at the time was 10-30 mg). Ensuing demand prompts a 3-year shortage of CoQ10 supply.

2004 —

Research published by Pfizer indicates all statins lower CoQ10 levels in the body within 14 days of onset of treatment.

2006 —

Chinese suppliers enter the CoQ10 market reducing raw material prices.

2015 —

CoQ10 Association launched.

2018 —

CoQ10 market surpasses 800 metric tons, a 2000% increase since the year 2000.

Ironically, statin drugs are also detrimental to a chief ally in heart health, CoQ10. It is now understood that one of the side effects of statin use is that it diminishes production of CoQ10.²¹ This lowering of CoQ10 levels may be behind other side effects associated with statin use, such as myopathy, which causes muscle cramps and pain. Although definitive proof of this link has not yet been made, some studies suggest that because CoQ10 is important for energy production in muscles, the depletion may be a cause of the myopathy.

Statins may also be responsible for other CoQ10-related side effects in the body. These drugs work to reduce cholesterol formation in the liver by interfering with mevalonate production, through the inhibition of the enzyme HMG-CoA reductase. While this is effective for reducing high cholesterol, mevalonate is also a precursor to CoQ10, which causes CoQ10 depletion. This causes a 'Catch 22' for cardiovascular patients by compromising ATP production in the heart—the organ with the highest ATP needs.

Supplementation with high quality CoQ10 supplements is becoming a standard protocol in statin use, as 70% of cardiologists now say they recommend CoQ10 to their patients taking statins.²² Heart health is certainly the most recognized benefit of CoQ10 supplementation, with more CoQ10 users taking this supplement because of a doctor's recommendation than any

other supplement except astaxanthin, according to data from the recent Trust Transparency Consulting/CoQ10 Association Consumer Survey. But clearly there is still a gap, as the study noted that even now, 66% of statin users never take CoQ10.²³

That is a significant disconnect given the research supporting CoQ10's role in cardiovascular health—especially for statin users. A 2004 study, for example, looked at 42 patients diagnosed with coronary artery disease who had been tak-

ing statins for at least one month. One group received 300 mg of CoQ10 for 12 weeks and the other a placebo. The researchers monitored CoQ10 levels along with vitamin E, antioxidant enzymes, C-reactive protein (CRP) and other immune system markers. Subjects in the CoQ10 group demonstrated significantly higher CoQ10 levels as well as higher levels of vitamin E and antioxidant enzymes at week 12. This group also showed lower CRP (inflammation marker) levels. The study confirms the ability of CoQ10 supplements to maintain CoQ10 levels, heighten antioxidant activity and reduce inflammation.²⁴

More recent studies have considered the consistency of CoQ10 supplements in addressing statin-associated myopathy. A 2014 study examined statin patients who had reported mild-to-moderate muscle pain. In a double-blind, placebo-controlled, randomized study, 50 subjects were divided into two groups, with half receiving CoQ10 supplements of 50 mg twice daily for one month and the other half a placebo. While no change in pain was seen in the placebo group, pain severity scores and pain interference scores in the CoQ10 group dropped by 33% and 40% respectively. This led researchers to conclude that CoQ10 supplements of 50 mg twice daily could successfully reduce muscle pain for statin patients after one month.²⁵

Regulatory Status

Although regulation of dietary supplements varies from country to country, many of the challenges regarding safety, quality and efficacy are shared by all countries as the market for supplements becomes increasing global.²⁶

The common challenge is that there is no global consensus on how to define these supplement-type products or how to balance the need for consumer safety with information and access to these products. The following is a brief overview of various regulatory requirements in markets around the world relevant to CoQ10:

United States: Dietary supplements are governed under the Dietary Supplements Health and Education Act (DSHEA) of 1994, which is within the purview of the U.S. Food and Drug Administration. The act provides regulatory requirements and definitions, policies and

guidelines for dietary supplements including cGMPs. Products must not make claims to mitigate, treat or prevent any disease, but may make structure function claims that are limited to minor conditions, and the support of health and wellness.²⁷

When CoQ10 was first discovered, it was originally considered a pharmaceutical ingredient. It wasn't until the late 1980s and early 1990s that it became a dietary supplement ingredient. As such, in the United States, CoQ10 was sold and marketed into the dietary supplement market prior to the passage of DSHEA of 1994 and thus grandfathered in as a dietary ingredient under the Act. FDA did later try to return CoQ10 to its pharmaceutical status, but was unsuccessful in this attempt.

European Union: In the EU, food supplements are governed under novel food regulation (Regulation 9EC) No 258/97 of the European Parliament and the Council of 27, January 1997. The regulation applies to foods and food ingredients that have not been used for human consumption to a significant degree within the EU prior to May 1997. Among other things it applies to ingredients with a new or intentionally modified primary molecular structure, consists of or is isolated from microorganisms, fungi or algae; consists of or is isolated from plants or food ingredients isolated from animals; or to which have been applied a production process not currently used, where the process gives rise to significant changes in the composition or structure of the foods or food ingredients, which affect their nutritional value, metabolism or level of undesirable substances.²⁸

An update to the regulation of novel foods was passed in Nov. 2015 and took effect in January 2018. It provided a "simplified procedure for pre-market approval of novel food ingredients and introduced a simplified process for "traditional foods from third countries." The processing and evaluations would be centralized at the level of European Commission and EFSA (the European Food Safety Authority).

Under this law, CoQ10, which is isolated from food sources, is authorized in food supplements if the food source and the product process have been used in the EU prior to 1997. As

such, “before entering the European Market, any nutritional or physiological substance must be assessed in order to ensure that the ingredient and the production process do not fall under the European Novel Food Regulation. To assess the tradition of use of an ingredient or a process, the following should be considered: the nature of the extraction, the ration of extraction, the nature of the support and the solvent, food grade manufacturing process and level of the substance.”²⁹

There is no legal upper limit established by the European Union. Dosages of CoQ10 products are typically more restricted in the EU. Each member state has its own regulation regarding use of substances like CoQ10 in food supplements. Doses of 100 mg are generally acceptable, but several member states, including France, Belgium, Italy and Spain, do have maximum upper limit for CoQ10 of 200 mg/day.³⁰

Australia: Medicinal products containing ingredients such as herbs, vitamins, minerals, nutritional supplements, homeopathic and certain aromatherapy preparations are referred to as ‘complementary medicines’ and are regulated as medicines under the Therapeutic Goods Act 1989. A complementary medicine is defined in the Therapeutic Goods Regulations 1990 as a therapeutic good consisting principally of one or more designated active ingredients mentioned in Schedule 14 of the Regulations, each of which has a clearly established identity and traditional use. They include amino acids, such as CoQ10, essential oils, plant or herb material, homeopathic preparations and lipids, like essential fatty acids or phospholipids, among others.³¹

Australia uses a risk-based regulatory approach with a two-tiered system for the regulation of all medicines, including complementary medicines: Lower risk medicines can be listed on the Australian Register of Therapeutic Goods (ARTG); Higher risk medicines must be registered on the ARTG.

The Australian Regulatory Guidelines for Complementary Medicines (ARGCM) provides detail on the regulation of complementary medicines and assists sponsors to meet their legislative obligations.

Until fairly recently, CoQ10 was only available in Australia in the form of ubiquinone, but ubiquinol was recently approved by the TGA so both

forms are now marketed as supplemental options for coenzyme Q10.

Canada: Through the Natural Health Products Directorate, Health Canada assures that all Canadians have access to a wide range of natural health products that are safe, effective and of high quality. Under the Natural Health Products Regulations, which came into effect on January 1, 2004, natural health products (NHPs) in Canada are defined as:

- Vitamins and minerals
- Herbal remedies
- Homeopathic medicines
- Traditional medicines such as Traditional Chinese Medicines
- Probiotics
- Other products like amino acids and essential fatty acids

NHPs must be safe to use as over-the-counter products and do not need a prescription to be sold. Products needing a prescription are regulated as drugs under the Food and Drug Regulations.³²

The agency assesses all natural health products before they can be sold in Canada. It also ensures that NHPs are properly manufactured (without contamination or incorrect ingredients).

Japan: CoQ10 was formerly a drug for the treatment of cardiovascular disease and an OTC drug in Japan. But in 2001, it became an ingredient that could be used in foods and listed on the List of Non-Medicinal Ingredients. Since then many dietary supplement manufacturers started using CoQ10 as an ingredient for anti-oxidant, anti-fatigue, and beauty-from-within, etc. But those products are considered health foods and cannot feature structure-function claims on the product.

In 2015 Japan created a new claim system: Foods with Function Claims (FFC). A number of companies have submitted products for FFC containing ubiquinol CoQ10 with claims such as “Ubiquinol CoQ10 is reported as it helps easing the physical fatigue occurred from daily life” or “It is reported that ubiquinol CoQ10, which helps energy production in cells and eases the oxidative stress, has a function that reduces the temporary physical or mental stress occurred from daily life.”

Those products containing ubiquinol CoQ10 are mostly supplied by Kaneka. The company submitted a claim in the very early stage of the FFC system and it has been helping dietary supplement manufacturers to develop products using CoQ10 with an FFC claim.

1.3: U.S. CoQ10 Market Size and Revenue

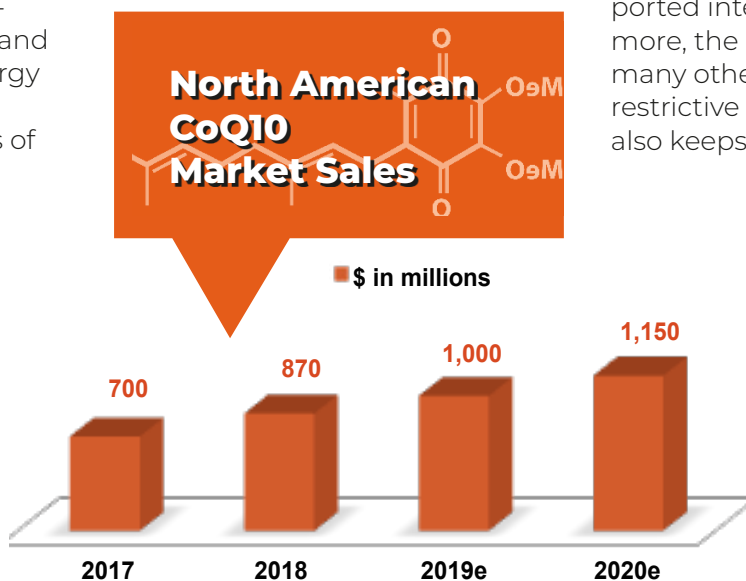
The global CoQ10 market is entering a period of robust growth and opportunity as it lies at the confluence of a number of important consumer and demographic trends, including the aging population, increasing knowledge and importance of health and wellness goals, energy starved adults and growing awareness of the importance of CoQ10's value and function. The market size and revenue valuations in this report provide a comprehensive and confident picture with numbers that are derived based on 18 years of market intelligence and information from major ingredient manufacturers. These predictions also consider dosing factors which the CoQ10 Association believes are extremely important. Final numbers and forecasts provided here are based on a proprietary trended algorithm.

North America, particularly the United States, is by far the largest market for CoQ10 in the world making up close to 85% of the market. This is largely due to the progressive regulatory framework in the United States under the

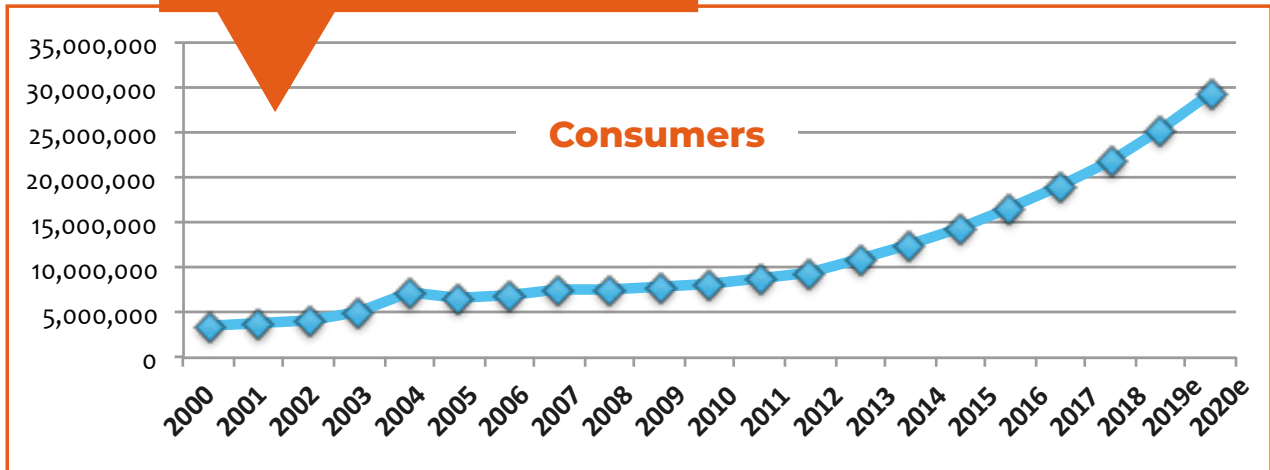
Dietary Supplements Health and Education Act (DSHEA), which has allowed for unprecedented development, marketing and access of dietary supplements, like those with CoQ10, as a subset of foods. These products are limited to oral intake, and cannot make specific disease claims, but rather those related to nutritional support. This system also allows for relatively high-dose products to be sold over the counter as supplements, especially in the very unique practitioner channel.

It is also important to note in considering the size of the North American CoQ10 market, that a portion of this market is exported internationally. Furthermore, the allowable dosages in many other countries are more restrictive than in the U.S., which also keeps a lower lid on market potential in these other regions.

The progressive nature of the North American market has led to its dominance in the CoQ10 space with both increasing numbers of consumers as well as higher dosage products, a phenomenon that is expected to increase exponentially in the coming years, as illustrated by the following charts. *(next page)*

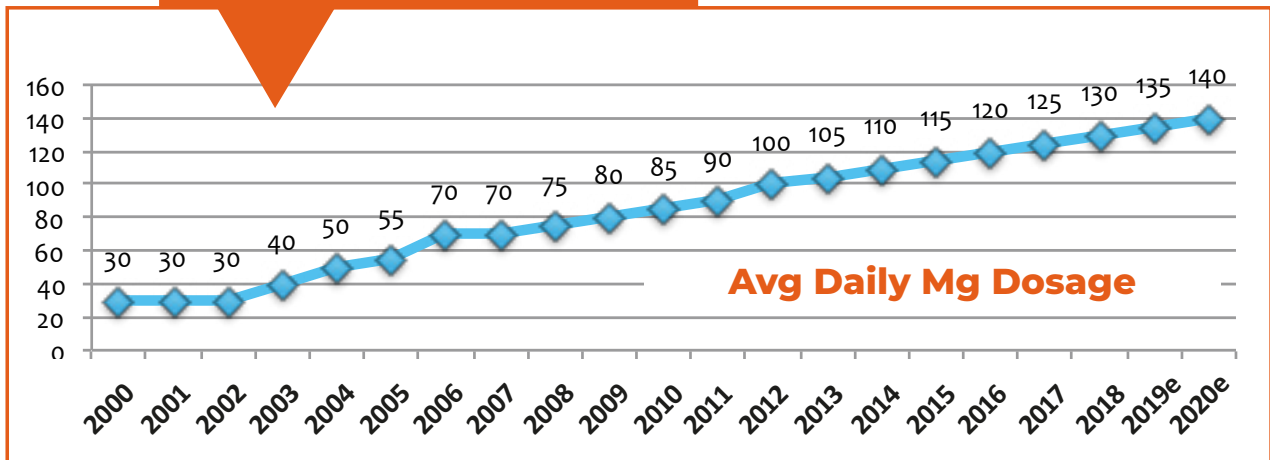


Increase of CoQ10 consumers in North America, 2000 to 2020



Source: CoQ10 Association

Average Daily Dosage Consumer by North American CoQ10 Consumer



Source: CoQ10 Association

1.4 Global CoQ10 Market Size and Revenue

The rest of the world, outside of North America, makes up approximately 15% of the global CoQ10 market. Overall global CoQ10 market growth is expected to be 24% in 2018 and 15% annually through 2020.

Global growth drivers

Despite a general economic slow-down worldwide, the outlook for the global CoQ10 market remains strong. And there is additional potential for growth both in North America as well as other regions.

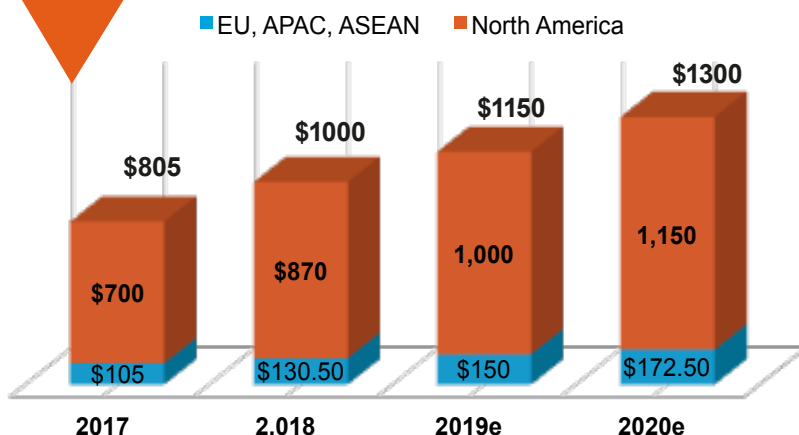
The Asia Pacific region will likely be the driver of some of this growth as it is predicted to reach \$243.4 million by 2020 with rising levels of consumer awareness bolstered by strong consumer demand in specific applications, such as cosmetics.³³

That said, Japan is one Asian market where strong growth is not a given. Even though there are more products registered under the recent Foods with Function Claims category and the real benefits of CoQ10 have been shown, the market itself is not growing rapidly, according to Japan-based Global Nutrition Group, Inc. (GNG)

Because the boom of CoQ10 no longer exists, according to GNG, many companies do not promote their products proactively. The Japanese market in 2017 was about 9.2 billion yen (approx. \$90 million) and the main sales channels are catalog/internet sales (40%), MLM (30%) and drugstore/pharmacy (20%).

Other categories may also help fuel CoQ10 growth in the global market. Increasing use of CoQ10 infused sunscreens and anti-aging creams are expected to help drive this revenue growth internationally. There is also the intriguing potential for usage of CoQ10 in pharmaceutical products, particularly for its CVD risk reduction potential, however, as the U.S. Food and Drug Administration (FDA) has not approved CoQ10 for use in this product category, this will likely temper growth potential to some degree.

Global CoQ10 Market Sales



1.5 CoQ10 Applications

Food/Dietary supplements: Commanding market share

Although CoQ10 began as a pharmaceutical ingredient, it has been sold primarily as a dietary supplement ingredient, especially in leading markets like the United States since the mid-1990s. This category continues to make up the most significant share of the overall global CoQ10 market. In this category, CoQ10 products are positioned for support of a healthy heart, to enhance energy, to boost antioxidant function, for anti-aging benefits, to improve cognitive health, to relieve the negative impacts of stress and to support oral health. There is also some positioning of CoQ10 products as an important supplement for statin users.

Pet/Companion products: CoQ10 for Fido

Paralleling trends in both the food and beverage and dietary supplements markets, these days what is perceived as good for humans also applies to their pets—especially dogs—dog owners by a factor of three to one purchase the majority of pet supplements. So the growing awareness of CoQ10 for energy, heart health and brain function in humans bodes well for CoQ10 pet supplements. Total sales of pet supplements

and nutraceutical treats have been booming, with sales in the U.S. up a healthy 8.2% in 2017 to reach an estimated \$2.65 billion, according to the State of the Industry: Pet and Animal Health Care Products in the U.S. from Sundale Research. This boom is expected to continue with sales totaling \$3.75 billion by 2022 on a CAGR of 7.2%. Top selling categories in the segment, according to the report include joint senior care products, skin and coat supplements, vitamins and minerals and digestive health products.

Trends driving the growth in the segment, according to the report, include a humanization of pets turning pet owners into pet parents and along with this a rising awareness of age and obesity related health factors for pets. Other drivers also mirror human concerns, which is leading to a more preventative approach to pet care and includes rising worry about food allergies and intolerances, a desire for natural pet products and use of pet supplements to support overall good health.³⁴

Medical Applications: Regulatory Complications and Orphan Drugs

While overall prevention-oriented product positionings are likely to continue to gain ground in the coming years, CoQ10's inherent benefits also make it well-suited for medical applications such as strengthening heart health and treating diseases like cancer and Huntington's Disease. Given that the World Health Organization predicts a continuing increase in cancer incidence through 2030, the potential for CoQ10 in these areas could be significant in many markets. However, CoQ10 treatments in pharmaceutical products have not yet been approved by FDA, so this will likely hamper the potential growth of this segment in the United States for the foreseeable future. That said,

growing evidence for CoQ10's benefits for brain function and eye health may provide enough incentive to overcome this stumbling block for some companies.

Orphan Drugs (pharmaceuticals that remain commercially undeveloped due to limited profitability potential) is an additional category that may be important for CoQ10. The FDA's Office of Orphan Products for Rare Diseases and Conditions was created to advance the evaluation and development of products, including drugs, biologics, devices and

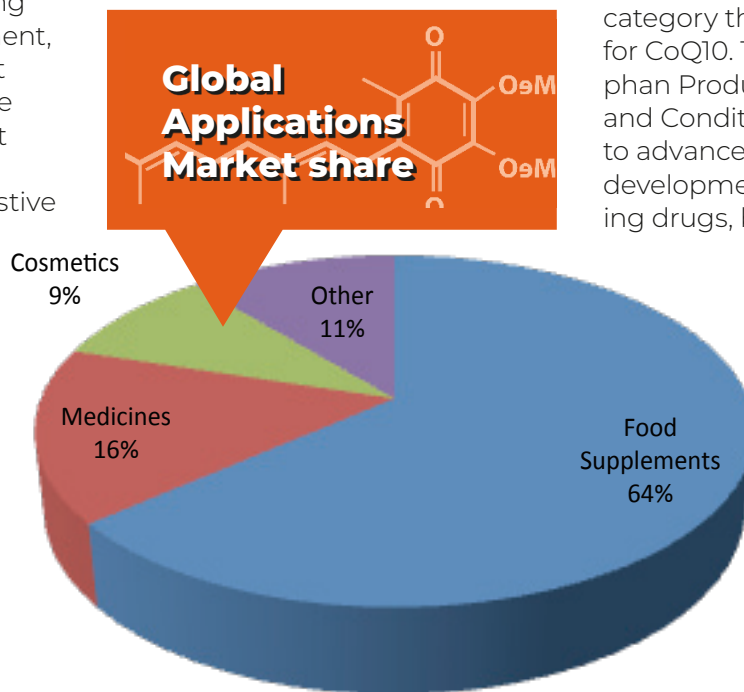
medical foods, which demonstrate promise for the diagnosis and treatment of rare diseases or conditions that affect fewer than 200,000 patients.³⁵

Because these markets need a different approach to clinical trials, manufacturing and market-

ing, they provide some advantage to product developers, such as a shorter process (less than five years) to move from Phase 2 clinical trials to market and have better odds of approval. They drive premium pricing, reduce the cost of sales and can produce ongoing revenue growth with chronic lifetime users and a first to market competitive advantages.³⁶

A number of dietary supplements have achieved Orphan Drug status, including COQ10. They include:

- Ubiquinol, Coenzyme Q10, ubiquinone developed by the Gel-Tec division of Tishcon Corporation in 2004 for treatment of pediatric congestive heart failure, mitochondrial cytopathies and Huntington's Disease.^{37,38}
- Coenzyme Q10 developed by Integrative Therapies for treatment of Huntington's Disease (2001) and CoenzymeQ10 and d-alpha-tocopherol for treatment of Ataxia in 2011.³⁹



- The European Medicines Agency (EMA) has designated ubiquinol in 2016 as an orphan drug for the treatment of primary coenzyme Q10 deficiency, a rare disease which produces muscular, nervous system and kidney disorders and can cause failure of other organs.⁴⁰

Though this category has seen some skepticism from product developers and investors in early years, it is proving to be a solid strategy for ingredients with appropriate credentials. While each of the conditions are unique, overall these rare diseases impact an estimated 25 million people in the United States and 30 million in Europe. Despite the high cost of research and uncertain ROI, a 2016 analysis of these products noted that companies with marketing authorization for Orphan drugs tend to be more profitable than those without.⁴¹

Cosmetics: Anti-aging and beyond

Cosmetics and skin care products are another bright spot for CoQ10, with continuing global demand for natural and organic products. The rapidly aging populations in countries including the United States, the UK, Japan, China, Russia and Asia Pacific, along with increasing incidence of diseases and ailments associated with aging, is prompting demand for nutricosmetics manufactured with enzymes like CoQ10, which offers antioxidant properties to provide biological energy for skin repair.⁴²

This personal care segment does not face the same regulatory hurdles in the U.S. as with supplements and medical products, so CoQ10 is now appearing in a variety of skin care products for anti-aging and sun protection. This growth and product innovation is predicted to continue with the increase of disposable incomes from a growing middle-class in emerging economies such as Brazil, China, India, and Mexico.

1.6 Key Studies: The benefits of CoQ10 for cardiovascular health

Three notable studies have shown the positive effect of CoQ10 on cardiovascular health. The most conclusive of the three is relatively recent. The 2014 Q-SYMBIO study involved 420 patients with moderate to severe heart failure and took place over a two-year time period. In this double-blind placebo controlled trial, the subjects were assigned CoQ10 supplementation (100 mg, three times daily) or placebo. Though there were few short-term changes noted, long-term benefits were abundant.

These included a significant reduction in incidence of major adverse cardiovascular events in the CoQ10 group. There was also a significant reduction in overall mortality, cardiovascular mortality and heart failure hospitalizations.⁴³ The researchers concluded that Coenzyme Q10 should be added to standard heart failure therapy.

An earlier meta-analysis which analyzed 13 of 120 potentially relevant studies, looked at CoQ10's effect on congestive heart failure (CHF). The analysis focused on primary indicators of CHF, namely ejection fraction (EF), and New York Heart Association (NYHA) functional classification in CHF patients. The analysis found significant improvement in EF for subjects receiving CoQ10 supplementation compared to control groups, with the researchers suggesting the positive effects were likely due to CoQ10's involvement in ATP synthesis in the heart muscle.⁴⁴

The third study underscored the connection between statins and lower CoQ10 levels noted earlier in this report,⁴⁵ but other research also supports use of CoQ10 for statin users. One study featured patients diagnosed with coronary artery disease who were being treated with statin therapy and had been taking statins for at least one month. Fifty-one subjects were assigned to one of two groups: Placebo or 300 mg of CoQ10 for 12 weeks. CoQ10 levels along with vitamin E, antioxidant enzymes, C-reactive protein (CRP) and other immune system markers were measured in the 42 subjects who completed the study.

The CoQ10 groups had significantly higher CoQ10 levels as well as significantly higher levels of vitamin E and antioxidant enzyme levels at week 12. This group also demonstrated lower CRP levels. The study suggested the ability of supplemented CoQ10 to maintain CoQ10 levels in the body, heighten the activity of other antioxidants and reduce inflammation in statin therapy.⁴⁶

In addition to heart-related health issues, CoQ10 has also been investigated for its effects on

cognitive health, sports performance, glycemic control and anti-aging affects through oral and topical supplementation.

Many questions have yet to be answered, such as the potential synergistic effects of CoQ10 with other nutrients. A 2016 study from researchers at Linköping University in Sweden found that combining CoQ10 with selenium, both of which are important for the management of cellular energy, can dramatically reduce cardiovascular mortality.⁴⁷

The small study revealed that this combination may be providing important lifesaving protection from cardiovascular disease. A 2018 follow up to this paper heralds an important finding for the future of CoQ10 usage. The Swedish researchers now suggest that the benefits of combining CoQ10 with selenium were still evident in subjects 12 years after supplementation ended.⁴⁸ Independent researchers are lauding these findings as having implications for epigenetic regulation and suggests this has the potential to reset drivers for disease and health.⁴⁹

SECTION 2: CoQ10 SUPPLY

Competition and the Growing Need for Transparency

2.1: CoQ10 Supply: A volatile landscape

Despite its stature as a well-researched and understood ingredient, CoQ10 has had a turbulent run with respect to its global supply chain. As it first entered the supplement market, CoQ10 supply was largely to almost exclusively dominated by Japanese companies. Companies operated in an opaque business environment, with shadow companies purporting to be CoQ10 producers, while in reality they were actually sourcing their CoQ10 from a single manufacturer. Eventually, Chinese suppliers entered the market in 2006, which relieved the shortage and drove down prices. “The good news is that CoQ10 became more affordable,” said Scott Steinfeld, executive director of the CoQ10 Association. “The bad news is that CoQ10 became a commodity ingredient and has really never recovered from that. When prices were controlled by the Japanese, there was a tremendous amount of science, but as it became a commodity ingredient, the incentive for new science

investment was largely eliminated.”

Current lower prices improving retail margins should help propel the market. However, the segment may need to find more solid footing to achieve its growth potential. With ingredient prices still on the lower side, suppliers remain less inclined to invest in research that helps to both support and expand the

market. Moreover, continued low pricing could further impact quality and supply, which may also have a detrimental effect, Steinfeld noted. “The CoQ10 Association encourages manufacturers to

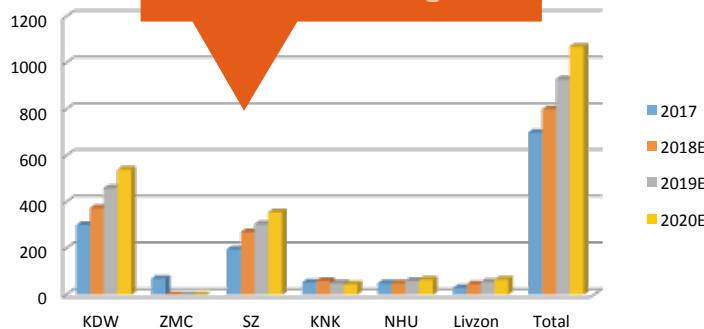
maintain their focus on quality, science and education and not strictly on pricing,” he said.

Still, today’s CoQ10 market is more stable and transparent than ever before, but the level of sourcing transparency is still well under what modern consumers deserve and far below what they will require going forward as they become more interested and savvy about the origins of supplement ingredients.

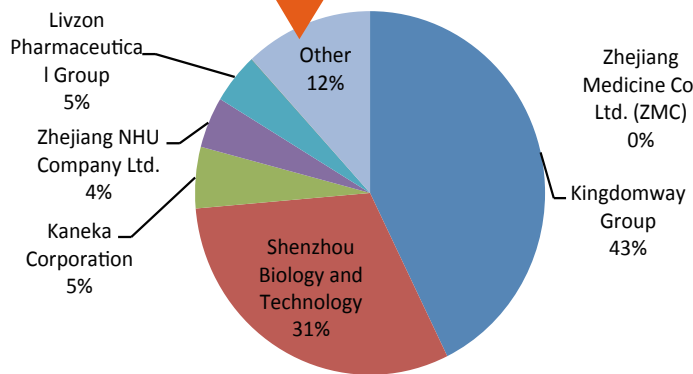
The CoQ10 production landscape remains very competitive for a

number of reasons, but chief among them is that there is a high barrier to entry for supplier manufacturers. CoQ10 production involves a

CoQ10 Supply Market in metric tons



Raw Material Suppliers Market Share 2018E



fermentation technology that has a number of steps subsequent to the fermentation process, and this allows for an economy of scale advantage. “The economy of scale for production has become very important since 2010,” said Steinfeld. “Ingredient manufacturers utilized their increased capacity to make it more difficult for newcomers to enter the segment. It really has no parallel in other ingredients,” he added. “One could argue that fish oil has certain opportunities in this respect, with the barriers to going out and accumulating fish still relatively low and the sustainability of raw material in a fish oil base highly abundant. But there are some sustainability issues going forward, so manufacturers do have some economy of scale issues, but not as much as with CoQ10.”

Despite the ever-present specter of adulteration and misidentification in the global dietary supplement supply chain, CoQ10 presents little concern on this score, according to Steinfeld. “CoQ10 is a single molecule that is bioidentical to what is produced in the body. A kilogram of raw material typically assays for 98% to 99% active CoQ10, so there is not room for adulteration. Most other ingredients will see greater variability.” CoQ10 also has a recognized USP monograph test for assay, which is strict and easy to understand, so it is easy for companies to verify what they are getting when they purchase CoQ10, he added.

2.2 Competitive Challenges and Trends

The Chinese entrance into the market opened up the supply chain, which allowed supply to catch up with demand and raw material prices to come down to support strong category growth, according to Steinfeld. “Per kilo Coq10 prices are now one tenth of what they were in 2000, while production is up twentyfold,” he said.

Chinese companies like Kingdomway Group and Shenzhou Bio are now the key suppliers in the global market providing over 90% of the CoQ10 raw material, with one manufacturer in the United States accounting for the remainder of global production.

Ubiquinone and ubiquinol

Kaneka Corporation is historically the key Japan-based CoQ10 manufacturer and has primarily built its current market on the supply of ubiquinol, the reduced form of CoQ10 which entered the market in 2006. The company has maintained a competitive strategy with the story that ubiquinol is a superior bio-identical form and thus offers better bioavailability, although this claim is not well substantiated with a strong body of human clinical trials. Many experts find that ubiquinone is far better studied. Nevertheless, the company has maintained traction in the market and is the only producer of CoQ10 in the

Mergers and Acquisitions

With the potential growth predicted for the CoQ10 market, many companies are consolidating or entering into strategic agreements to improve their positioning in the global market. Here is a list of recent key CoQ10 related M&A activity:

2010: Six key Chinese ingredient manufacturers, led by then leading Chinese Vitamin C manufacturer JSPC, joined together to purchase a small Freehold, New Jersey-based contract manufacturer, Inverness Medical, for \$63.4million. The organization was renamed International Vitamin Corporation and is referred to as IVC. Since this acquisition in 2010, the organization has acquired a West Coast manufacturer and the vitamin operations of Perrigo in 2016 making IVC the largest U.S. private label manufacturer.⁵⁰

2015: KDW made a strategic move in the CoQ10 space, when it purchased U.S based supplement brand Doctor’s Best, a leading internet seller of CoQ10. The deal created a vertical integration platform for the company and represents an aggressive strategy in the market. It also underscored a trend in which Chinese manufacturers acquire U.S. based brands and manufacturers to position those products as made in the USA as they are sold in China and other markets. This deal, and other KDW acquisitions, are notable because the company (KDW) was transparent about their actions as opposed to other similar acquisitions by Chinese companies where companies hid behind shell companies or opaque ownership structures.

2015: To shore up its position in the U.S. market, Kingdomway Group (KDW) acquired California-based health and wellness manufacturer Vitatech for RMB 1.1B. The deal was expected to improve the company's access to new supplement technologies and increase its competitiveness in the emerging global market.

2017: KDW purchased shares of Labrada Nutrition, a Houston, Texas-based sports nutrition company. In September 2017, KDW also invested in Texas-based sports nutrition brand ProSupps. While neither company currently offers CoQ10 products, the deals may leave KDW poised to capitalize on the potential of CoQ10 as an energy and performance ingredient. Along with the Doctor's Best deal it also gives KDW a strong position to meet growing demand for U.S. supplements in China.

2018: In another example of how Chinese companies are looking to bring U.S. supplement brands to their home market through strategic investment and acquisitions, Harbin Pharmaceutical Group (Hayao) announced a \$300 million investment in General Nutrition Centers (GNC), the global specialty retailer of health and supplement products, as well as a supplement manufacturer through its Nutra Manufacturing division. The deal makes Hayao the largest shareholder in GNC giving it a 40% stake. The partnership will focus on marketing, manufacturing, distribution and sale of GNC-branded products in China.⁵¹

In a similar deal, also early in 2018, Chinese-based dairy products and infant formula company, Feihe International acquired failing supplement retailer Vitamin World out of bankruptcy for \$28 million. Feihe's reach into 50,000 retail outlets in China will provide a platform for Vitamin World

United States, which gives it a competitive edge with American consumers who are concerned about quality of raw materials from China. An agreement between Shenzhou and Kaneka in 2017 placed Kaneka as a Shenzhou ubiquinone distributor and Shenzhou as the exclusive distributor for ubiquinol in China.

Zhejiang Medicine Co. (ZMC) was the first Chinese manufacturer to enter the market with CoQ10 as a raw material. ZMC formed ZMC-USA in 2006 and has been a relatively small player in the CoQ10 supply segment for many years. However, as of 2018, it is currently out of the CoQ10 market, although the company does say it will reenter the segment in coming years.

2.3 CoQ10 Manufacturing Sustainability

One reason for the high barrier of entry into CoQ10 production is that CoQ10 is a difficult ingredient to manufacture in large quantity because of the environmental issues associated with the process. Fermentation tanks achieve high temperatures requiring high-consumption and create large amounts of wastewater. Environmental laws have long been a limiting factor for CoQ10 manufacturers. Chinese CoQ10 manufacturers have managed this issue to some

extent, by creating manufacturing facilities in extremely rural areas. Shenzhou and Kingdomway have both created their manufacturing operations in the Inner Mongolia Province of China near Hohhot.

Many Chinese manufacturing concerns were shuttered or had operations curtailed in the months leading up to the 2008 Summer Olympics in Beijing. CoQ10 manufacturers were affected as well. Most recently, on June 21, 2018, the Tuoketuo County Committee and the local government instructed the Industrial Park Management Committee and the Environmental Protection Agency to jointly carry out an investigation of Shenzhou Biotechnology Co., and specifically look at odor control and water treatment. A correction plan was put in place through the summer. It is clear that the Chinese government is putting pressure on all manufacturers to become more environmentally responsible. As demand increases, it is certain that the cost of production will be impacted by these increasing environmental constraints.

2.4 Finished Brands in the U.S. Market

On the branded products end of the CoQ10 market, there is a similar story to that of CoQ10

ingredient manufacturers in that the concentration of market share is divided amongst relatively few top brands. More than half of CoQ10 finished product sales is concentrated among just a handful of brands, as shown here in the current brand rankings.

Obviously, Nature's Bounty and IVC are the leading players in the mass market, but this scenario also plays out similarly by channel, for example, with just a few key CoQ10 brands owning the space in natural. Natural Factors, Jarrow and NOW are good examples of leading brands in the natural health foods channel.

Following is a ranking of brands by their estimated CoQ10 volume:

- 1. NBTY**
- 2. International Vitamin Corp.**
- 3. Pharmavite**
- 4. GNC/Nutra**
- 5. Natural Factors**
- 6. Swanson Vitamins**
- 7. Tishcon Corp.**
- 8. NOW**
- 9. Vitamin Shoppe**
- 10. Softgel Technologies**
- 11. Jarrow Formulas**

It is expected that IVC will overtake NBTY as the largest CoQ10 ingredient purchaser in the near future. Pharmavite will continue to improve its position with the Nature Made® brand and the NOW brand continues to increase its CoQ10 market share. It is important to note that all of these leading CoQ10 finished product manufacturers have softgel manufacturing capabilities. More CoQ10 is sold in softgels than capsules.

Brands beyond retail

Positioning of leading brands has been largely focused on heart health, but a few companies are pushing the envelope and broadening the scope of CoQ10 and its benefits. One brand that will be interesting to watch is MitoQ Ltd. Developed in New Zealand, that brand was founded on the unique benefits of a specialty form of CoQ10. MitoQ used a different approach to bioavailability of CoQ10 by altering the base ubiquinone molecule. It says the ingredient uses an electrostatic penetration system that delivers anti-oxidant CoQ10

directly to the mitochondria, where it gets on with its job of eliminating free radicals, preventing oxidation and keeping skin and organs healthy. The company offers both supplements and skin care products and its messaging is decidedly about energy and is geared toward a younger audience by touting the concept in which use should begin from the age of 20, when anti-oxidant supplies start their decline. The MitoQ CoQ10 ingredient, however, does not currently have New Dietary Ingredient status, which is a point of contention for both manufacturers and brands.

Beyond the retail channel, the CoQ10 segment remains even more fragmented with few dominant brands and premium priced formulas. In the direct to consumers space, ProCaps Laboratories, founded by Andrew Lessman in 1979, does appear to be a prevalent brand focused on educating consumers through its HSN infomercials. It provides a strong educational component, but also sticks with price-value formulation.

In the practitioner segment, interestingly, there does not appear to be an especially dominant CoQ10 player. According to *Holistic Primary Care's* 2018 practitioner survey, leading practitioner brands have consistently been Pure Encapsulations, Metagenics, Thorne Research and Integrative Therapeutics, none of which have a leading presence in the CoQ10 market. For example, Pure Encapsulations has 10 CoQ10 SKUs out of 197 total cardiovascular support formulas. Perhaps one of the reasons that CoQ10 is not a significant segment for the practitioner channel is that cardiovascular disease has been relatively low on the list of health conditions that integrative practitioners say they address, well behind issues like immune support, GI complaints and chronic inflammation.⁵³

With its strong substantiation and potential demand, CoQ10 might seem an ideal fit for the MLM segment, but this category also lacks a commanding CoQ10 brand or prominent formula. This is likely due in part to the fact that MLM companies typically shy away from commodity ingredients. These companies may also harbor perceptions that the ingredient is too expensive, even with recent decreases in raw material price. The lingering high price perception is also a key reason why CoQ10 is not more commonly being used in foods. But this does represent a gap in the market and a potential opportunity for the right MLM companies willing to develop bold aggressive strategies for a well substantiated ingredient that should be part of many portfolios.

SECTION 3: CoQ10 SALES

Volume and Revenue by Condition

3.1 Cardio Health: Still pumping along for CoQ10

Heart disease is now the number one global cause of death, causing 17.3 million deaths annually, according to the American Heart Association.⁵⁴ It has long held that distinction in the United States, where the Centers for Disease Control estimates that 610,000 Americans, or one in four, die of heart disease annually.⁵⁵

So it is no real surprise that this category will experience continued growth for the foreseeable future.

Nutrition Business

Journal predicts that the heart health category will continue to “pump along” to reach \$3.2 billion by 2021, according to its 2018 estimates.⁵⁶ Growth of this category has been relatively modest between 2015 and 2017 averaging about at 4% annually, with heart health products occupying a relatively small slice of the U.S. supplements market at 6 percent.⁵⁷

Overall, though, this category looks bright for supplement products on the whole and CoQ10 specifically. Growing questions and concerns about the long-term use of cholesterol lowering drugs is opening the door and raising awareness among heart health patients as well as those looking to prevent cardiovascular disease with new solutions.

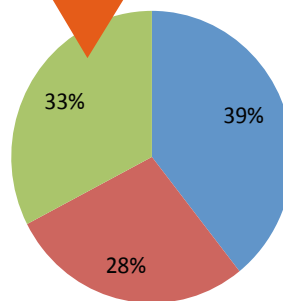
Heart Health products see their greatest sales

in the mass market channel, but together direct sales and natural channel sales make up more than half of the market and this is likely to increase the popularity and reporting of direct

sales increases. Currently CoQ10 products make up about 15.4% of the U.S. Heart Health condition specific marketplace,⁵⁸ which is down slightly from previous years' contribution, but still second to omega-3 fish oils. But heart health is also a category with many established contenders offering well-researched solutions, ranging from omega-3 fish oils, magnesium and plant sterols to new rising stars, such as vitamin K2 and probiotics, so the competition for a share of this pie is intense and rapidly changing.

CoQ10 products are expected to grow at a faster clip than the overall heart health category. However, if CoQ10's success is hitched to the statins 'wagon', the persistent questions about statins' long-term safety may present some challenges for the category. For now, however, the pharmaceutical industry seems to be stick-

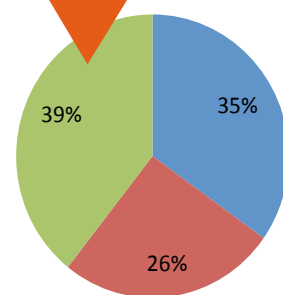
Heart Health Supplement Sales 2017
Market Share by Channel



■ Natural/Specialty Retail ■ Mass Market Retail ■ Direct-to-Consumer

Source: *Nutrition Business Journal 2018 estimates*

Healthy Aging Supplement Sales 2017
Market Share by Channel



■ Natural/Specialty Retail ■ Mass Market Retail ■ Direct to Consumer

Source: *Nutrition Business Journal 2018 estimates*

ing with its story of statins as a safe and reliable option for cholesterol lowering, and now even positioning these drugs as a long-term strategy for the prevention of heart disease.⁵⁹ This leaves CoQ10 with an ongoing strategy to communicate both its support for healthy heart function as well as its important role in addressing the deficiencies and side effects associated with statin use.

3.2 Anti-Aging: CoQ10 brings potential in skin health

The number of American's age 65 or older is predicted to more than double in the next 4 decades, so it's not surprising that conditions of aging are a hot topic.⁶⁰ This inevitable ticking of the clock increasingly has younger people concerned about the effects of aging and seeking solutions to forestall a range of concerns from wrinkles and bone loss to Alzheimer's Disease. All of this is good news for the supplements segment, which now offers anti-aging products based on emerging scientific advancements and new technologies. The market, according to *NBJ* 2018 estimates is expected to be nearing \$528 million this year and is predicted to reach nearly \$619 million by 2021.⁶¹

CoQ10 makes up the largest piece of the anti-aging condition-specific market in the United States holding close to 25% percent of this segment, according to *NBJ* data. Although it is most clearly tied to heart health, CoQ10 is known for a range of general healthy aging benefits, from supporting heart function and energy to reducing the risk of cancer and protecting the brain from oxidative damage that can come with age. But its share of this segment has also declined in the last decade with the emergence of newer products, such as glutathione, resveratrol, collagen and vitamin D. The category as a whole has no real standout ingredient with no specific product commanding long-term consumer interest. This may be because

there are claims challenges, limiting language towards maintaining a general tone referring to cellular or heart health or supporting youthful appearance of hair, skin and nails.

CoQ10 may see a boost in this category as awareness increases for its abilities to protect skin from both internal and external forces that effect its youthfulness. Internal factors such as cellular damage and hormonal balance can impact the skin,⁶² as well as external factors such as UV rays.⁶³

Sales of anti-aging products tend to be most concentrated in the mass market, but the direct sales channel is starting to emerge as the most popular channel for these products.

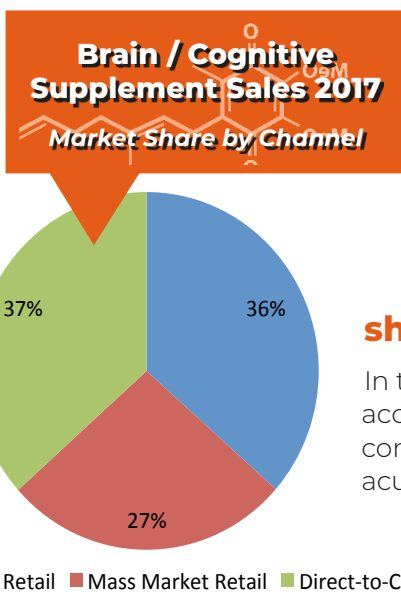
3.3 Cognitive Health: The search to stay sharp

In this fast-paced world of accelerating deadlines and constant distractions, mental acuity is the asset upon which we increasingly rely. Maintaining mental sharpness and cognitive function as we age may well rank as the most important

quest for maintaining quality of life with age. The Alzheimer's Association notes that 5.7 million American's are currently living with Alzheimer's and that number is expected to more than double by 2050.

This aging population, coupled with rising consumer demand has propelled the cognitive health segment to nearly \$912 million in 2018, according to *NBJ* 2018 estimates, and it could reach \$1.04 billion by 2021, with the category predicted to see healthy growth through 2021 at close to 8%.⁶⁴

On the research front, there is an emerging body of evidence to support the use of nutritional compounds such as omega-3s and magnesium for brain health benefits, and CoQ10 has seen increasing interest with new studies investigating its potential in prevention and treatment of cognitive impairment and Alzheimer's Disease.



Source: *Nutrition Business Journal* 2018 estimates

This is likely why supplement ingredients with substantial scientific evidence, such as CoQ10, vitamins D and B, as well as feverfew seem to be rising in this segment. But CoQ10 has plenty of room for growth in this segment, making up only about 2.5% of the cognitive/brain health market.⁶⁵

The emerging evidence has bolstered the category's potential, but the opportunity is also tempered by a restrictive and troubling regulatory environment. High profile lawsuits from the Federal Trade Commission (FTC), commentary from political leaders like former Senator Claire McCaskill (D-Mo.), and allegations of unsubstantiated claims, has cast a shadow over the segment that has created a cautionary environment for these products.

Supplement ingredients labeled as nootropics seem to be the reboot for the category, including ingredients as far ranging as omega-3s, Resveratrol, Phosphatidylserine, and Acetyl-L-Carnitine,

but this is also a segment where some problematic ingredients are currently flying under the regulatory spotlight and this may prompt a crackdown on the nootropics specifically as well as the category and tighten the claims environment even further.

Not surprisingly, mental acuity products tend to see the most sales from the direct sales channel, with sales in both mass market and natural retail outlets showing more sluggish sales figures.

SECTION 4.0: CoQ10 SUPPLIER MANUFACTURERS

Profiles and Analysis



Founded in 1997, **Xiamen Kingdomway Group Company (KDW)** in Xiamen, China is a leading

supplier of nutritional ingredients. KDW currently employs 1,000 people in four state-of-the-art production facilities in Xiamen, China and Huhhot, China. Kingdomway Nutrition Inc., based in Irvine, Calif., is a subsidiary of KDW and serves as its sales and marketing arm for the North American Market. KDW is a market leader in both quality and volume for the ingredients it

manufactures. The company provides Coenzyme Q10, microalgae DHA, ARA, vitamin A, vitamin D3 and Beta-Carotene. KDW serves major companies worldwide in diverse markets from the pharmaceutical segment to nutraceuticals, foods, cosmetics and feed. The Company was

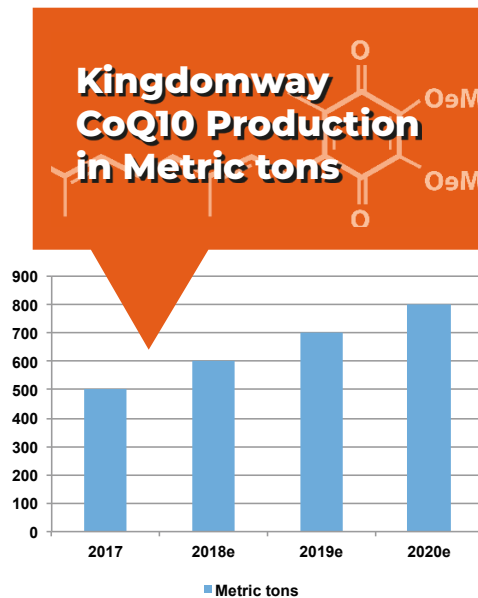
listed on the Shenzhen Stock Exchange in October 2011.

KDW has seen steady increases in sales revenue since 2014, reporting 2,064.8 million CNY for 2017, on net income of 474.1 million CNY and profits of 22.96%. 2018 started off well with first quarter revenues of 746.4 million CNY; Net income—338 million CNY and a profit margin of 45.29%, while second quarter saw revenues of 569.6 million CNY on net income of 152 million CNY and profits at 26.69%.

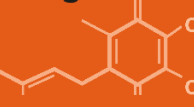
Kingdomway is clearly a leader in the CoQ10 space with an over 50% market share. The company scaled its production and launched its Co10 ingredient in 2006 and has since become arguably the largest supplier of this ingredient worldwide, having produced 500 metric tons in 2017, with this amount estimated to nearly double by 2020.

CoQ10 Production in Metric tons

Kingdomway's Coenzyme Q10 is produced with its own microorganism fermentation method and the production process adheres to FDA cGMP standards and meets HACCP guidelines as well as conforming to USP, EP, JP and CP standards. KDW received its USP certification in 2015.



Insights



To shore up its position in the U.S. market, the company acquired California-based health and wellness manufacturer Vitatech for RMB 1.1 billion in 2015. The deal was expected to improve the company's access to new supplement technologies and increase its competitiveness.

In a strategic move in the CoQ10 space, KDW purchased U.S.-based supplement brand, Doctor's Best, a leading internet seller of CoQ10, in 2016. The deal created a vertical

integration platform for the company and represents a more aggressive strategy in the market. It also underscores a trend in which Chinese manufacturers acquire U.S. based brands and manufacturers to position those products as made in the USA as they are sold in China and other markets. This deal, and other KDW acquisitions, are notable because the company (KDW) was transparent about their actions as opposed to other similar acquisitions by Chinese companies where firms hid behind shell companies or opaque ownership structures.

COQ10 Portfolio

Coenzyme Q10

Coenzyme Q10 powder CWS

Coenzyme Q10 Nano-emulsion

Specification

98%

10%, 20%, 40%

5%, 10%

Package

1kg/5kg/25 kg

5 kg

5kg

SWOT Analysis**Strengths**

- Leading player with exceptional vertical integration
- Global reach
- Kingdomway Nutrition, only U.S. based subsidiary primarily for CoQ10 sales and marketing
- Commitment to quality, health and wellness
- Strong quality credentials with USP, JP, EP and CP certifications
- Long history in nutraceutical ingredient manufacturing

Weaknesses

- China based leadership may lack understanding of CoQ10 channels in Western markets, especially the role of practitioners with Coq10 in the United States

Opportunities

- Growing global demand for CoQ10
- Growth in emerging markets like its home market of China, as well as Japan and Brazil
- Well-established in leading U.S. market and owner of strong CoQ10 brand Doctor's Best

Threats

- Current trade war with China
- Poor perceptions about Chinese ingredient quality

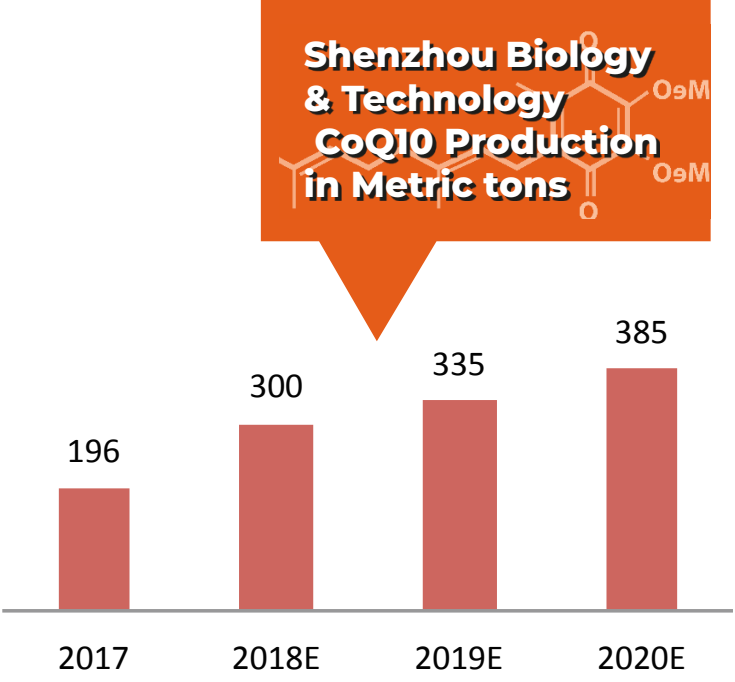
Shenzhou Biology & Technology Co., Ltd. (Shenzhou Bio) was invested in by CASC in 2006, with an office in Beijing, China. The manufacturing facility for Shenzhou Bio is located in Tuoketuo Industrial Park, Huhohote City, Inner Mongolia, covering an area of 200 acres, and has more than 550 employees.

In 2008, the company received a first-phase investment of RMB 550 million. Now Shenzhou possesses 5,000 M3 fermentation capacity, annual Coenzyme Q10 production of nearly 400 metric tons, annual glucoamylase of 12,000 tons and related facilities. At this same time, the company built an R&D center with advanced facilities and full functionality.

Shenzhou Bio takes great advantage of its environmental resources and especially has significant advantages in research and application of bio-fermentation technology. Through mutation breeding induced by space flight, further selection and regeneration, the company is able to cultivate stable and high-yielding strains. Shenzhou has taken great effort to become a major global supplier of Coenzyme Q10, which is its core business.

It is one of the largest CoQ10 manufacturers in the world, providing fermentation capacity of more 5,000MT, with 400 MT annual production capacity of CoQ10. Shenzhou has certificates for Kosher, Halal, ISO 900, and USP for Coenzyme Q10. Shenzhou sells CoQ10 locally and also exports

the raw material globally to the United States, Canada, Europe, Australia, New Zealand, and Japan



Insights

Shenzhou is second only to KDW in CoQ10 production and holds an estimated 34% of the global market for CoQ10 raw material. Shenzhou Bio expresses a commitment to fully utilize its technological superiority, talent advantages and product advantages to maintain its status as the leading high-tech enterprise in Coenzyme biotechnology and supply with excellent-quality biological medicines for the world.

SWOT Analysis

Strengths

- Solid scientific and technological strength leaves Shenzhou poised to be a major player in the field of bio-fermentation with advanced equipment and abundant techniques.
- Global reach and commitment to quality, health and wellness
- Strong quality credentials with USP, drug manufacturing capabilities, Kosher and Halal certifications
- Specializes in CoQ10

Weaknesses

- China based leadership may lack understanding of CoQ10 channels in Western markets, such as the role of practitioners to this category in the United States. With no vertical integration, the company has little perspective on consumer markets and insights

Opportunities

- Growing global demand for CoQ10
- Growth in emerging markets like its home market of China, as well as Japan and Brazil
- Create partnerships in emerging regions to achieve a consumer view of the global market

Threats

- Trade war between U.S. and China
- Poor perception of Chinese raw materials and manufacturing
- Concern over sustainability of fermentation technology and cost of environmental expectations



www.kanekanutrients.com

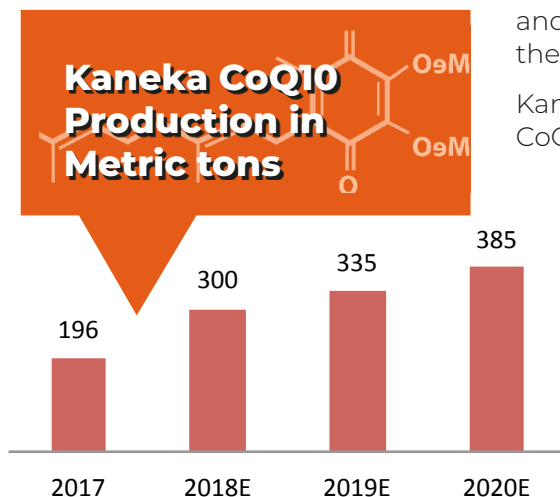
Headquartered in Osaka, Japan, **Kaneka Corporation** is a \$5.6 billion global producer of products including pharmaceutical intermediates, food supplements, and fine chemicals. It provides high quality nutritional ingredients for the global market in dietary supplements, nutraceuticals, cosmetics, and food and beverage.

The company has 30 consolidated subsidiaries in Japan and 16 subsidiaries outside of Japan and in the United States. One of those, Kanaka North American LLC, is the parent to Kaneka

Nutrients based in Pasadena, Texas. Kaneka Corporation was the first to commercialize CoQ10 35 years ago and first to manufacture ubiquinol in 2007. It is also the only manufacturer of ubiquinol globally and the only producer of CoQ10 in the United States.

Kaneka is a global supplier of CoQ10 and has been commercially producing it since 1977, when it began offering CoQ10 fermented from a proprietary strain of yeast, which the company says is bio-identical to the CoQ10 produced naturally in the human body. In 2007, Kaneka Nutrients launched a next generation of CoQ10, Kaneka Ubiquinol, which is the

only supplemental ubiquinol ingredient on the market. The company's products are supported by 30 years of manufacturing experience, safety and clinical studies.



Insights

Kaneka has attempted to distance itself from other suppliers in the relatively small CoQ10 market over the years. In 2010 it filed a lawsuit against unnamed Chinese CoQ10 suppliers and their European distributors for patent infringement as part of its "existing patent enforcement program to enforce its proprietary rights in those countries in which its patents relating to coenzyme Q10 are in force." The company was initially criticized for not being more specific in its suit. Kaneka eventually filed a patent infringe-

ment suit specifically against ZMC, which it ultimately lost in 2015.

Since its founding in 2004, Kaneka Nutrients has lost ground in the global CoQ10 market with the entrance of Chinese players, but it still dominates the Ubiquinol portion of the market which is estimated at about 10% of the total CoQ10 market. In an effort to diversify its portfolio to the functional food segment, Kaneka acquired a 34.8% share of Spanish biotech company AB-Biotics, a maker of lactic acid probiotic ingredients for dairy, supplements and functional foods and beverages. Kaneka recently launched a full line of probiotic ingredients as a result of this acquisition.

Products:

Kaneka Q10® is the only CoQ10 manufactured in the United States. It is fermented with pure natural yeast using a yeast-fermentation method.

Kaneka Ubiquinol™ is the reduced, active antioxidant form of Coenzyme Q10 that the company calls a next-generation CoQ10 ingredient. It is the same substance produced naturally in the body that has been converted for use in cellular energy production. Kaneka provides CoQ10 in its reduced form, which the company claims is more absorbable.

SWOT Analysis

Strengths

- Early to market—claims some market firsts
- Solid scientific substantiation
- Only U.S.-based manufacturer of CoQ10
- Strong, but controversial absorption story with ubiquinol product

Weaknesses

- Has lost ground in recent years to China-based suppliers
- Distanced from some U.S. market players due to patent lawsuits
- Less global focus
- Not diversified in supplements segment—completely reliant on CoQ10 segment, working to diversify with recent acquisition of AB-Biotics

Opportunities

- Strong position in U.S. market
- Trade war with China may work to Kaneka's advantage
- Because of its novel form, the company may be poised to capitalize on new compelling science that could change the category landscape

Threats

- Concern over sustainability of their process and cost of environmental expectations
- Global market could be affected by U.S. China trade war



Zhejiang NHU Company Ltd.

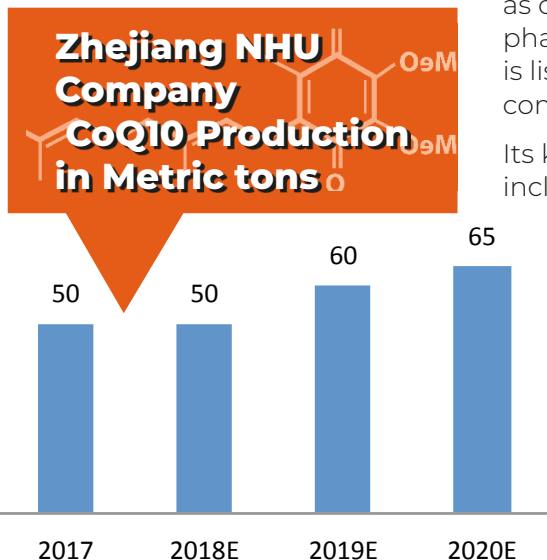
located in Zhejiang Province, China, was established in 1999. The fine chemicals manufacturer adheres to the philosophy of innovation, balance and sustainable development. It supplies ingredients for nutrition, flavor and fragrance, APIs, and polymers, among other segments, providing solutions in animal and human nutrition, medicine, as well as for environmental protection and engineering plastics.

Today, NHU has three production facilities—Zhejiang Xinchang, Zhejiang Shangyu and Shangdong Weifang, with more than 6,000 employees. NHU is recognized as one of China's top 100 pharmaceutical companies and is listed as one of China's top 100 companies overall.

Its key nutritional ingredients include vitamin E, vitamin D3, raspberry ketone, astaxanthin and Linalool. Its raw materials are used in many product segments from dairy, bakery, and fruit and vegetable juices to functional drinks and flavor ingredients.

Annual Revenues 2017: \$6.14 Billion

- Net income: \$1.7 billion
- 2017 sales growth: 32.8%



SWOT Analysis

Strengths

- Well diversified in the nutrition space
- Strongly recognized pharmaceutical company in China
- Experiencing modest growth in CoQ10 supply

Weaknesses

- Not a top supplier in CoQ10
- Manufacturing in China
- China based leadership may lack understanding of CoQ10 channels in Western markets, such as the role of practitioners to this category in the United States

Opportunities

- Potential growth of supplements, specifically Coq10, in home country of China
- Growth in other emerging markets, including Japan and Brazil
- Create partnerships in emerging markets to achieve a consumer view of the global market

Threats

- Global market could be affected by U.S. China trade war
- Poor perception of Chinese raw materials
- Concern over sustainability of fermentation technology and cost of environmental expectations



Livzon Pharmaceutical Group Inc., founded in 1985, is a comprehensive pharmaceutical enterprise integrating development and research, production and sales of pharmaceutical products. Livzon

www.kingdnarmsa.cn has nine GMP production plants located in Guangdong, Shanghai, Sichuan, Fujian, and three plantation bases for Chinese drug preparation production located in Shanxi, Gansu, and Yunan, China. The company employs more than 5,700 people.

Livzon Group Ningxia Fuxing Pharmaceutical Co., Ltd., is a wholly owned subsidiary of Livzon Pharmaceutical Group Co., Ltd., which was established and put into production in 2011. The subsidiary has more than 500 employees. As a reputed food additive manufacturer and R&D center of Livzon Group, the division features state-of-the-art facilities and advanced fermentation and extraction technologies, with all the production lines approved and certified by SFDA. Its main products, include Coenzyme Q10 (the company estimates it manufactures 200mt/year) and L-Phenylalanine (10,000mt/year), which are widely applied in the fields of

SWOT Analysis

Strengths

- Well-recognized pharmaceutical company in China
- Drug manufacturing capabilities may give the company an edge in pharmaceutical applications of CoQ10
- Specializes in CoQ10 and is expected to see substantial growth

Weaknesses

- Still relatively small compared to the largest CoQ10 suppliers, with little vertical integration and reach into Western markets
- China-based leadership may lack understanding of CoQ10 channels in Western markets, such as the role of practitioners to this category in the United States



pharmaceuticals, health care, and the food industry.

Livzon has obtained the food GMP, ISO 9001, ISO 14001, ISO 22000, HACCP, Kosher, and Halal certificates. Aimed at enhancing the health and quality of human life, the company is committed to the innovation and development of nutrition fortifiers, and looking forward to long-term success and win-win cooperation with all of its customers at home and abroad by offering high-quality products and services.

Opportunities

- Potential growth of supplements, specifically CoQ10, in home country of China
- Growth in other emerging markets, including Japan and Brazil
- Create partnerships in emerging markets to achieve a consumer view of the global markets

Threats

- Global market could be affected by U.S. / China trade war
- Poor perception of Chinese raw materials and quality procedures
- Concern over sustainability of this process and cost of environmental expectations



www.china-zmc.com.cn

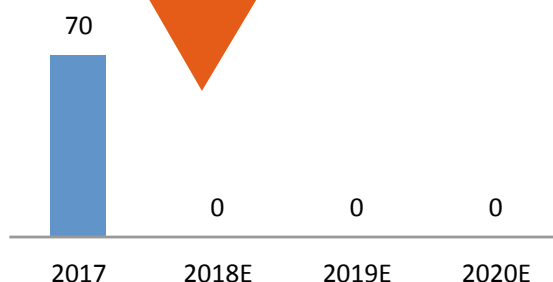
Zhejiang Medicine Company Ltd. (ZMC)

is a China-based pharmaceutical company established in 1997 and listed on the Shanghai Stock Exchange as of Oct. 1999.

ZMC specializes in large-scale production of fat-soluble vitamins, quasi-vitamins, quinolone antibiotics, anti-drug resistant antibiotics and other products. The corporation has formulated a range of dominant products through in depth and extensive studies.

The company has six subsidiaries Xinchang Pharmaceutical Factory, Vitamin Factory, Changhai Biological Company, Zhejiang Health Creation Biotechnology Co. Ltd., Zhejiang Health Creation Pharmaceutical CO., Ltd., and Shanghai Vital Health Management CO., Ltd.) as well as two R&D Units.

Zhejiang Medicine Co. (ZMC) CoQ10 Production in Metric tons



ZMC operates in North America as ZMC-USA with offices in The Woodlands, Texas.

The company was embroiled in a long patent infringement battle with competitor Kaneka, from which it emerged favorably in a 2012 ruling. (Kaneka’s complaint alleged that ZMC’s process for making coenzyme Q10 infringed on Kaneka’s patent.)

Insights

With revenues of \$21.35 million, ZMC has been a relatively small but steady player in the CoQ10 supply segment. It is currently out of the market as of 2018, but the company does say it will reenter the segment in coming years.

CoQ10 Products	Compendia/Certification	Package size	Application
CoQ10 98% Crystalloid	Japan Pharmacopoeia US Pharmacopoeia Pharmacopoeia of Europe	5 g/tin 10kg/carton 25 kg/drum	Soft capsules

SWOT Analysis

Strengths

- Strong global reputation/recognized as influential global pharma company
- Solid capital, technical strengths and advanced technology
- Well diversified

Weaknesses

- CoQ10 manufactured in China—a negative perception for U.S. market
- Has currently ceased production of CoQ10 but maintains it will reenter the market again

Opportunities

- Potential growth of CoQ10 market in China and other emerging markets, such as Japan and Brazil may provide opportunity for renewal of production

Threats

- Global market could be affected by U.S. China trade war
- Perceived exit from market based upon currently idled production



www.soft-gel.com

Soft Gel Technologies, Inc.®

(SGTI) provides contract manufacturing of soft gelatin capsules exclusively for the dietary supplement industry. For more than a decade, SGTI has specialized in

providing premium quality products in a soft-gelatin capsule delivery system. Based in Los Angeles, California, the company features state-of-the-art equipment, professional and well-trained personnel, and the capacity to meet high-volume demands as well as accommodate smaller jobs.

SGTI has access to a portfolio of unique ingredients from around the globe, with an international sales team to export its softgels throughout the world. It supports exclusive products through clinical studies, extensive marketing and educational efforts.

CoQ10 Portfolio:

- Exclusively from Soft Gel Technologies, CoQsol-CF® is a completely soluble, 100% crystal-free formulation clinically proven to provide superior bioavailability of CoQ10. CoQsol-CF® includes the following trio of

ingredients: CoQ10 to protect proteins, LDL (“bad”) cholesterol, and mitochondrial DNA from oxidative damage and support production of cellular energy, for healthy function of the heart and brain; d-Limonene extracted from the oil of citrus fruits, food-grade d-Limonene acts as a non-polar organic solvent that solubilizes CoQ10, without causing significant chemical interactions or degradation; and tocopherols, a form of vitamin E, to enhance the biological function of CoQ10, which in turn helps maintain the antioxidant state of vitamin E.

- CoQH-CF® softgels provide a stabilized and protected form of Kaneka Ubiquinol, the reduced form of CoQ10, for maximum utilization. It is a clinically-studied, targeted antioxidant solution for late middle-aged to elderly and individuals suffering from oxidative-stress conditions.
- CoQsol® is formulated with a blend of high-quality ingredients for superior absorption, containing CoQ10, natural mixed carotenoids, natural vitamin E (tocopherols), and rice bran oil. Backed by clinical research, CoQsol® increases CoQ10 levels almost three times higher than CoQ10 powder.

SWOT Analysis

Strengths

- Specialist in CoQ10 with a number of proprietary ingredients featuring some clinical backing and patent protection
- Creates unique high-value supplements and specializes in ingredients difficult to encapsulate and/or sensitive to work with
- Offers new nutrient technologies for enhanced bioavailability and functionality
- Several quality certifications including NPA GMP, NSF GMP registered and GMP registered for Sport, and Health Canada.

Weaknesses

- Proprietary ingredients are not well known or understood on the consumer end
- Competitive, low-margin contract manufacturing space

Opportunities

- Further leverage delivery technologies and proprietary ingredients in CoQ10 segment
- Showcase and promote strong proprietary technologies to thought leaders (practitioners) in CoQ10 space

Threats

- Global supplements market could be affected by U.S. China trade war
- Growing consumer awareness of supply chain and ingredient quality issues
- Ongoing regulatory concerns about supplement industry



J+D LABS

www.jdlabs.com

J+D Labs is a San Diego, Calif.-based custom nutraceutical manufacturer of softgels, capsules, tablets and powders with more than 25 years of experience. The company was founded in 1989 by husband and wife Kiran and Hema Majmudar, who combined their knowledge in chemistry, pharmacology and manufacturing. Today, J+D has grown to more than 300 employees, including pharmacists, microbiologists, administrative staff, skilled technicians, engineers and chemists—all working in a state-of-the-art, 135,000-square-foot facility to produce the high-quality dietary supplements. The company works to build long-term client partnerships, which has helped it earn the confidence of some of the nation's top retailers who consistently count on its superior quality, complex formulations at competitive prices.

The company was acquired in 2017 by Captek Softgel International, Inc. (CSI), a California-based contract manufacturer of custom dietary supplements. CSI is a portfolio company of Swander Pace Capital (SPC). The acquisition recognized J+D Labs as a category leader with more than 1,000 unique formulations and is a continuation of SPC's focus on investment

SWOT Analysis

Strengths

- Creates high-value custom supplements for a variety of U.S. retail customers
- Has several quality certifications including NSF GMP registered and GMP registered for Sport, USDA Organic, USP Verified and Health Canada. Full in-house analytical services and R&D
- Wide range of CoQ10 products with varying doses and non-GMO option
- Flexibility to work with large and small customers
- Consistent family-ownership

in industry leading vitamin, mineral and supplement companies.

The joined companies should lead to greater diversity of products and services in the channel by providing greater manufacturing capacity and comprehensive turnkey packaging, among other benefits.

J+D Labs offers customer softgel manufacturing in every size, shape and color, as well as a wide range of specialized tablets, capsules, dietary supplements and powders, including lozenges, chewables, enteric coating, color coated, multivitamins/minerals, botanicals, sustained release and powder blends. In addition to customer formulations, the company offers bulk stock products through its J+D NutraStock®. These bulk stock dietary supplements and nutraceutical products are carefully manufactured in its San Diego facility.

CoQ10 Portfolio:

- CoQ10: 10 mg, 50 mg, 100 mg, 200 mg, 400 mg, 600 mg, non-GMO, softgel
- CoQ10 30 mg (Ubiquinone), non-GMO, softgel
- CoQ10 30 mg and Omega-3 30 mg, softgel
- CoQ10 30 mg and L-Carnitine 250 mg, softgel, non-GMO
- CoQ10 60 mg and Red yeast Rice 600 mg, softgel, non-GMO

Weaknesses

- No proprietary CoQ10 ingredients
- Competitive, low-margin contract manufacturing space
- Mostly U.S. focus

Opportunities

- Global expansion
- Leverage availability of non-GMO CoQ10 products
- Develop novel delivery systems for CoQ10 products

Threats

- Global supplements market could be affected by U.S. China trade war
- Growing consumer awareness of supply chain and ingredient quality issues
- Ongoing regulatory concerns about supplement industry

SECTION 5.0: BRAND MANUFACTURERS

Profiles and Analysis

THE NATURE'S BOUNTY co.

www.naturesbounty.com

For more than 70 years, **The Nature's Bounty Company** (formerly **NBTY**) has been a leading brand in health and wellness products. The company is a vertically integrated manufacturer, marketer and retailer with global scope and a commitment to producing high-quality products through a range of well-known and trusted brands across a wide-value spectrum. Nature's Bounty has a strong presence in every major vitamin, mineral, herb, sport, active nutrition and supplement product category as well as a presence in multiple distribution channels. Its brands include Nature's Bounty®, Sundown Naturals®, Osteo-Bi-Flex®, Solgar®, MET-Rx®, Pure Protein®, Balance Bar®, Puritan's Pride and others.

Headquartered in Ronkonkoma, NY, the company employs 4,000 associates worldwide and has manufacturing, packaging, warehouse distribution, and administrative facilities throughout the United States and Canada. The company also maintains overseas offices in the United Kingdom, the Netherlands, Spain, South Africa and New Zealand.

Nature's Bounty was purchased by the Carlyle Group in 2010 and then in 2017, Kohlberg, Kravis Roberts (KKR) purchased a majority ownership stake, while the Carlyle Group maintained a minority share. In September 2017, the company named Paul Sturman, a 30-year veteran of consumer-driven business and a former Pfizer executive, president and CEO. Under Sturman's leadership, the company continues to be committed to supporting wellness through innovative products, which are easily available to consumers wherever they shop.

In February 2016, the company sold retailer Vitamin World, including its headquarters in Bohemia and 378 stores, to Manhattan-based private equity firm Centre Lane Partners LLC for \$25 million. It also began to shrink its contract manufacturing and private-label businesses,

although it said it would continue to make private-label products. Nature's Bounty has estimated annual revenues of \$3.3 billion.

Nature's Bounty is a clear leader by volume in branded CoQ10 products, utilizing an estimated 220 metric tons of CoQ10 in 2018, considerably more than any other player.

CoQ10 Portfolio: Nature's Bounty brands are sold primarily in mainstream food and drug stores, such as Walmart, Walgreens, CVS and Rite Aid.

- Nature's Bounty Co Q-10 products are positioned as clinically studied products for support of cardiovascular health and noted for statin users. Products are available in 100 mg, 200 mg and 400mg dosages with branded ingredients CardioQ10 and QSorb. The products are made with Rapid Release Softgels.
- CoQ10 Gummies contain Q-Sorb™ Coenzyme Q-10 for support of heart health and energy production.
- Dual Spectrum CoQ10 with Krill Oil is a premium formula that was created for those looking for the dual heart health benefits of both CoQ-10 and omega-3s in a convenient, one-per-day formula. Positioned to support heart health and healthy blood pressure levels already within a normal range, and as a great choice for statin medication users. Krill oil supplies important omega-3 fatty acids that help support and maintain the health of the cardiovascular system. A fat source, such as krill oil, can also play an important role in CoQ10 absorption.



Additional Nature's Bounty-owned brands:

Solgar is a legacy health and natural food store brand of premium vitamins and specialty formulas

launched in 1947. The company was acquired by Wyeth Pharmaceuticals in 1998 and then by NBTY in 2005 for \$115 million. The brand is sold primarily in natural products groceries and independent health food stores.

Solgar CoQ10 products contain Kaneka's branded ingredients Kaneka Q10™ (noted as a clinically researched form that is bioidentical to the CoQ10 produced by the body) and Kaneka QH™, ubiquinol made from KanekaQ10. The formulas are positioned for energy production, heart health and antioxidant support.

- Solgar Vegetarian CoQ10 in 60 mg, 120 mg and 200 mg dosages.
- Solgar MegaSorb CoQ10 in 100 mg, 200 mg, 400 mg and 600 mg dosages.
- Solgar Ubiquinol Reduced CoQ10 in 100 mg.



SiSU is a Canadian brand of supplement products founded 35 years ago and available in pharmacies, drug stores, grocery shops and health food stores. Its CoQ10 formulas include:

- CoQ10 softgels in 60 mg and 120 mg, offering antioxidant support for muscle and heart strength and anti-aging.
- CoQ10 vegetarian capsules in 100 mg and 120 mg with antioxidant support for muscle and heart strength and anti-aging.
- Ubiquinol QH, the active form of CoQ10, for increased energy and heart strength.

All products are vegan, non-GMO, gluten free, dairy free and soy free and approved under Health Canada standards.

Sundown Naturals brand vitamins are a long-time natural brand of vitamins and supplements sold online and in the mass, food and drug store channels. All products are non-GMO, gluten free and dairy/lactose free.



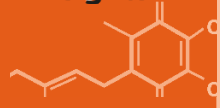
- Sundown Naturals CoQ10 comes in 100 mg, 200 mg and 400 mg dosages and are positioned for enhanced energy and support of heart health.
- Sundown Naturals CoQ10 Gummies offer 200 mg per serving with positioning for heart health and energy support.



Puritan's Pride is a value brand of vitamins first sold directly to consumers via catalogue and mail order. It is now primarily an online, discount brand. Its CoQ10 products include:

- Q-Sorb CoQ10 in 30 mg, 50 mg, 100 mg, 200 mg, 400 mg and 600 mg.
- Ubiquinol in 50 mg, 100 mg, and 200 mg.
- CoQ10 plus cinnamon, is a formula positioned for antioxidant support, heart health, oral health and stress relief.
- Ubiquinol 100 mg with omega-3 fish oils (400 mg) with Rapid-release capsules. Positioned to help reduce the risk of heart disease.
- CoQ10 and Red Yeast Rice for support of a healthy cardiovascular system, oral health and energy production.
- CoQ10 with Resveratrol and Grapeseed with Q-Sorb™ CoQ10, Resveratrol and Grapeseed dietary supplement positioned for triple-antioxidant support. It contains 100mg of grapeseed extract, 100mg of resveratrol, and 50mg of Q-Sorb™ Coenzyme Q-10 to support healthy aging.
- Coenzyme Q10 serum with CoQ10 to nourish and moisturize skin.
- Coenzyme Q10 crème with CoQ10 to nourish and moisturize skin

Insights



Nature's Bounty is overall the largest manufacturer and brand owner of CoQ10 products globally. It has a solid quality ingredient story and a strong omni-channel presence, making it well poised to weather potential changes in ingredient supply, consumer perceptions about transparency and evolving shopping habits.

SWOT Analysis

Strengths

- Large company with deep CPG business expertise
- Diverse brands with many value propositions
- Solid financing
- Omni-channel presence, with well-known brands in various channels
- Reach into multiple markets globally
- Updated branding and websites show commitment to e-commerce
- A variety of leading CoQ10 brands

Weaknesses

- Large company, with multiple brands and high profile ownership changes that may make some key supplement buyers skeptical of its transparency and quality commitment
- Many of its products are perceived to be at the lower end of the quality spectrum
- Late to develop an online presence so may not be as agile as other companies
- No practitioner exposure, so limited in higher dose applications

Opportunities

- Potential global growth of CoQ10 market
- Direct consumer engagement through social media and e-commerce sales can provide additional insights to retail channel brands

Threats

- Global market could be affected by U.S. China trade war
- Potential of consumer concern about use of GMO fermentation processes
- Growing consumer awareness of supply chain and ingredient quality issues
- Ongoing regulatory concerns about supplement industry



International Vitamin Corporation (IVC)

Headquartered in Irvine, Calif., IVC has been producing high quality dietary supplements for leading food, drug, mass and club retailers in the U.S for

more than 50 years. The company also produces nutritional, prescription, and OTC products for contract customers throughout the world. Its brands include Stresstabs, IronMan and Ferro-Sequels.

IVC's ability to deliver on innovation, quality and supply chain efficiency has enabled it to become one of the largest, and fastest growing private label nutritional supplement companies. It supplies private label vitamins and nutritional products for drug and food chains along with bulk vitamins, minerals and nutritional supplements for unaffiliated brand name distributors. The company has tableting and capsule facilities in Freehold, N.J. and a softgel facility in Irvington, N.J. More than half of the company's business is in vitamins and mineral products, and about a quarter of its business centers on specialty products like CoQ10.

IVC is one of the major users of CoQ10 raw material, second only to NBTY, and predicted to use 135 metric tons in 2018.

Acquisitions:

- **2013** – Contract manufacturer Adam Nutrition Inc., to provide a platform for product expansion.
- **2016** – All assets of Perrigo's vitamin, mineral and supplement business to strengthen IVC's leadership in U.S. mass, food and drug channels.
- **2016** – VC parent company acquires all assets of Brunel Healthcare Ltd., a UK based contract manufacturing and private label company, which exports products throughout EMEA region; and Biocare Ltd, with an extensive range of physician developed supplements for the practitioner channel. The acquisitions represent expanded delivery systems, capacity and territories for IVC.

SWOT Analysis

Strengths

- Offers wide range of contract manufacturing and private-label services, including tablets, softgels, and powder production.
- Its branded products are in niche categories and do not compete with contract manufacturing customers
- Global vertical integration to ensure quality and stability in supply chain and pricing
- Recent acquisitions will help expand capabilities, technologies and global reach
- Manufacturing facilities are compliant with U.S. Dietary Supplement cGMPs and U.S Drug cGMPs (Irvington facility)

Weaknesses

- No strong scientific support or information on CoQ10 products
- Small branded-products line and no branded ingredients in competitive contract manufacturing space
- Responsive rather than an innovative market player

Opportunities

- Leverage expertise to develop special and condition-specific products
- Leverage drug manufacturing abilities for cutting-edge product development

Threats

- Global supplements market could be affected by U.S. China trade war
- Growing consumer awareness of supply chain and ingredient quality issues
- Ongoing regulatory concerns about supplement industry and Country of Origin issue



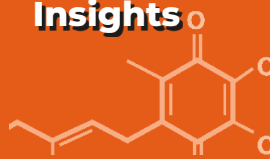
Swanson Health Products,
founded in 1969 by Leland

Swanson, Swanson Health Products was one of the early catalog mail order businesses in the dietary supplements segment offering quality nutritional supplements to American consumers at affordable prices. Swanson was an arthritis sufferer who wanted to share the products he himself found helpful with other consumers. The company has since become one of the largest privately held internet and mail order marketers in the space with global sales reach and distribution. Swanson now offers more than 20,000 products, with the majority of its business in vitamins, minerals and specialty supplements like CoQ10 and has sales estimated at more than \$300 million. The company features twenty of its own brands including Swanson Ultra, Swanson Superior Herbs and Swanson Fit.

CoQ10 Product portfolio: Swanson sells 39 CoQ10 SKUs under its Swanson, Swanson Ultra and Swanson Premium branded lines. The Swanson line is the value brand with Swanson Ultra and Swanson Premium priced as premium products.

- Swanson CoQ10 softgels to enhance cellular energy production and physical performance, support cardiovascular health, boost antioxidant activity, help maintain healthy blood sugar balance and promote neurological health; 50 mg, 60 mg, 100 mg, and 400 mg.
- Swanson CoQ10 capsules to enhance cellular energy production and physical performance, support cardiovascular health,
- boost antioxidant activity, help maintain healthy blood sugar balance and promote neurological health; 30m, 120 mg, 200 mg.
- Swanson Ubiquinol softgels to support cellular energy production, stamina and cardiovascular strength. It provides cardiovascular, cognitive, and metabolic health benefits in a bioavailable form of CoQ10 that is ready for immediate utilization; 50 mg and 100 mg.
- Swanson Premium CoQ10 capsules to promote healthy heart function and play a crucial role in ATP production. Easy-to-swallow, high absorption capsules; 10 mg and 30 mg.
- Swanson Ultra Ubiquinol pharmaceutical-quality, with the first stabilized, bio-identical CoQ10 supplemental form of ubiquinol to achieve higher elevations of circulating CoQ10 in the bloodstream with just a fraction of the dose. Promotes healthy heart function; 100 mg.
- Swanson Ultra Ubiquinol Maximum Strength to support cellular energy production, stamina and cardiovascular strength. It provides cardiovascular, cognitive, and metabolic health benefits from this bioavailable form of CoQ10 that is ready for immediate utilization; 200 mg.
- Swanson CoQ10 with Tocotrienols to enhance cellular energy production and physical performance, support cardiovascular health, boost antioxidant activity, help maintain healthy blood sugar balance and promote neurological health; 100 mg, 300 mg.

Insights



Swanson is a well-known and respected supplement seller in the direct sales channel, with a long history and well-established consumer trust and relationships. Given the long-term nature of the brand, its marketing and packaging are a bit dated in appearance. This is likely no problem for many of its customers who are older, but the company has done a good job of building its presence and value proposition to new consumers through social media. Recent campaigns suggest a direct approach to appeal to younger consumers.

- Swanson Enhanced PQQ with Ubiquinol is an energizing combination for body and mind to support normal cognitive function, cardiovascular health and blood sugar metabolism. Features Kaneka QH® enhanced bioactivity CoQ10.
- Swanson Wrinkle Cream with DMAE and CoQ10: a paraben-free, age-defying wrinkle cream featuring hydrating botanicals and soothing shea and cocoa butter.
- Swanson Ultra Red Yeast Rice and CoQ10-Traditional Formula is a potent combination for total-body health used in Chinese herbalism. Also features milk thistle and alpha lipoic acid, and CoQ10 to promote heart wellness.
- Swanson Ultra CoQ10 with Tocotrienols to support cardiovascular function, with 20 mg of full-spectrum tocotrienols in body-preferred form; 200 mg.
- Swanson Q-Gel Mega offers three times the absorption rate of conventional CoQ10. Fortified with 150 IU of vitamin E for enhanced antioxidant support; also supports cellular energy production, physical performance and cardiovascular health; 100 mg.
- Swanson Premium CoQ10 Cream keeps skin looking youthful and radiant with CoQ10, vitamins C and E plus chamomile and licorice extracts; Paraben free.
- Swanson Ultra Q-Gel Mega: A patented, hydrosoluble form of CoQ10 offers three times the absorption rate of conventional CoQ10, supports cardiovascular health and boosts antioxidant activity; 15mg, 30 mg, 60 mg, 200 mg.
- Swanson Ultra Maximum Strength CoQ10 with Tocotrienols is among the most potent CoQ10 supplements available. Supports heart health. Body-preferred form; 600 mg.



- Swanson Ultra Quinogel-Hydrosoluble Ubiquinol CoQ10: Water-soluble form of ubiquinol provides a highly bioavailable form of CoQ10 to support cellular energy production, stamina and cardiovascular strength, and enhance cardiovascular, cognitive, and metabolic health benefits; 100 mg, 500 mg.
 - Swanson Ultra CoQ10: Features super-potent standardized hawthorn extract to deliver broad-spectrum antioxidant nutrition. Also supports cellular energy production and cardiovascular function; Veg caps.
 - L-Glutathione with CoQ10L Pharmaceutical-grade Setria L-Glutathione with CoQ10 to support cellular and cardiovascular health. Vegetarian.
 - Carni Q-Gel Forte: Features the amino power of L-Carnitine fumarate, the hydrosoluble CoQ10 Q-Gel, and vitamins C and E to promote cardiovascular wellness with 30 mg CoQ10.
- Swanson Ultra Chew-Q Bioenhanced CoQ10: Maintains healthy heart function. Ideal for those who dislike swallowing pills. Sweetened with dental-friendly xylitol rather than sugar.
- Swanson Ultra CoQ10 softgels: Body-preferred form promotes cardiovascular wellness. Critical for cellular ATP production; 30 mg.
- Swanson Ultra CoQ10 capsules: Supports cardiovascular function and produces ATP in the body. Each capsule delivers 200 mg.
- Swanson Ultra Reserv-Q-Gel promotes healthy heart function by combining the power of antioxidant resveratrol with CoQ10 Q-Gel.

SWOT Analysis

Strengths

- Long history with established and loyal consumer base
- Offers product satisfaction and guarantees
- Growing international presence
- Private-label lines at several price points
- Strong appeal to broad range of consumers
- Successfully shifting business from mail order to online
- Wide variety of CoQ10 products at various dosages and prices

Weaknesses

- Packaging, website and marketing somewhat dated
- Customer base is older
- Lower price points demand higher volume

Opportunities

- Growing global market for higher dose opportunities
- Further engage younger consumers through product education and social media

Threats

- Growing competition in supplement space from both brick-and-mortar, omni-channel and online players
- Slowing of direct mail and catalogue sales
- Negative perception of online supplement retailers
- Proliferation of online only brands with younger consumer appeal
- Retailer liability for product quality and safety



www.gnc.com

Pittsburgh, Penn.-based **GNC (General Nutrition Centers) Holdings/ Nutra Contract Manufacturing** is

one of the oldest retailers of health and nutrition products in the United States. The company now has more than 8,000 retail outlets worldwide as well as a manufacturing and wholesale division. The company reported total revenues in 2017 of \$2.45 billion.

Though GNC has seen some slowing of its U.S. brick-and-mortar business in 2018, it is delivering meaningful growth in its e-commerce and international business consistent with its long-term growth objectives. The company plans to remain focused on its fundamental strengths and services as well as leveraging the strength of the GNC brand.

Revenues in the Manufacturing /Wholesale

segment, excluding intersegment sales, have been slowing, down \$4.0 million, or 7.2%, to \$52.0 million for the three months ended June 30, 2018 compared with \$56.0 million in the prior year quarter primarily due to a \$3.6 million decrease in third-party contract manufacturing sales. Intersegment sales increased \$9.2 million reflecting the company's increasing focus on proprietary products.

CoQ10 Portfolio: GNC retail stores carry a wide variety of CoQ10 products from all leading brands. In its private-label line, GNC offers 11 SKUs with a medium-to-high price range of \$17.99 to \$54.99:

- GNC CoQ10: Clinically shown to support heart health and replenish CoQ10 levels reduced by statin drug use. Also provides powerful cardiovascular antioxidant. Softgels in 50 mg, 100mg, 200 mg and 400 mg.
- GNC CoQ10 100 mg chews to support heart health and replenish CoQ10 levels reduced by statin drug use.

Insights

GNC was one of the key companies impacted by the 2015 NY AG lawsuit alleging product quality issues, but it also was one of the first companies to address the problem head on by spearheading a program to ensure better product testing.

GNC now seems poised to move forward with the 2018 Harbin Pharmaceutical Group (Hayoa) investment of \$300 million in GNC and its Nutra Manufacturing division. The deal makes Hayao the largest shareholder in GNC with a 40% stake. The partnership will focus on marketing, manufacturing, distribution and sale of GNC-branded products in China.⁶⁶

SWOT Analysis

Strengths

- Harbin Pharmaceutical Group transaction expected to close in 2018 leaving the company well poised to expand globally, and especially in China
- Broad product range across many brands
- Solid global presence
- Strong innovation and focus in sports nutrition

Weaknesses

- Private label line does not include a wide variety of CoQ10 products
- Innovation and focus has primarily been in sports nutrition segment

Opportunities

- Growth in international segment driven by China and GNC's franchise business
- Expand product lines to offer more appeal to consumer beyond sports enthusiasts
- CoQ10 combination formulas, especially those positioned for energy production and higher dose opportunities

Threats

- Growing competition in supplement space from both brick-and-mortar, omni-channel and online players
- Retailer liability for product quality and safety
- FDA warning letters regarding some of the edgier sports nutrition products could hurt its overall brand perception



Pharmavite LLC, is a dietary supplement

manufacturing company founded in 1971 by California pharmacist Barry Pressman. The Northridge, Calif.-based company manufactures mainstream supplement brands Nature Made®, SoyJoy Nutrition bars as well as providing contract manufacturing services. Pharmavite produces and distributes more than 120 dietary supplement products in the United States and more than 100 products to international markets such as Mexico, Japan, South Korea and Iran. The company is vertically integrated with 600,000-square-foot of onsite manufacturing, packing, distribution and research and development facilities. Pharmavite was acquired in 1988 by Otsuka Pharmaceutical Company, Ltd, a Japanese-based global healthcare company. The privately held company currently operates as a wholly owned subsidiary of Otsuka.

In 2014, Pharmavite expanded its footprint in the natural products and whole food supplements market with the acquisition of New Hampshire-based FoodState Inc., a manufacturer of whole-food supplement brands, MegaFood, a high quality natural channel brand, and Innate Response, a quality, whole food brand for the practitioner channel.

FoodState is recognized for high-quality products, strong brands in the natural and health practitioner channels and a transparent management strategy. Pharmavite noted that the acquisition brought together leading complementary companies, expanding Pharmavite in the natural and practitioner channels via FoodState's fast-growing brands, which align with Pharmavite's values of high quality and integrity and are well positioned for continued growth.

Insights

Pharmavite is arguably the number three player in the U.S. among CoQ10 products, purchasing an estimated 90 metric tons in 2018.

In July 2017, the company appointed accomplished consumer products executive Jeff Boutelle as CEO.

CoQ10 Portfolio:

Nature Made—is a value-based brand in mass, food and drug outlets that has been branded as the #1 Pharmacists recommended vitamin and supplement brand.



- CoQ10 Adult Gummies, 100 mcg/2gummies, offer support for heart function and cellular energy.
- Ubiquinol Liquid Soft gels, 100 mg per softgel, offers support for heart function and cellular energy.
- CoQ10 Liquid Soft gels, in 30 mg, 100 mg, 200 mg and 400 mg, all offering support for heart function, and cellular energy production. Also notes the importance for CoQ10 for statin users.

INNATE Response is a high quality, transparent and premium brand for the practitioner channel. Products are formulated in partnership with noted integrative physician Dr. Tieraona Low Dog, M.D.



- COQ10, 100 mg of ubiquinone per vegetarian capsule. Provides essential support for cellular energy production, with therapeutic dosing applications. Synergistically paired whole foods like apple, beet, broccoli, and spinach.
- Comprehensive Multi Powder with CoQ10 contains 200 mg arabinogalactan for immune support; 50 mg CoQ10 for cardiovascular support; Vitamin E as mixed tocopherols and tocotrienols; Features TRAACS™ minerals for validated chelation and optimal absorption and blended with FoodState Nutrient™ vitamins for enhanced digestibility and nutritional value.
- Comprehensive Multivitamin with CoQ10, contains 50 mg CoQ10 for cardiovascular support; Antioxidants - lutein, zeaxanthin, and astaxanthin; Vitamin E as mixed tocopherols and tocotrienols and features TRAACS® minerals for validated chelation and optimal absorption.

SWOT Analysis

Strengths

- Pharmavite is one of the largest supplement companies in the United States and considered a leader in mass market and private label
- Nature Made brand is well-known and noted as top pharmacist recommended brand in mass market stores
- FoodState and Innate Response acquisition gives Pharmavite an expanded presence in the natural and practitioner channels, as well as strong educational presence and whole food, clean label story. The latter channel is especially important given the implications of CoQ10 and statins for cardio health as well as energy and aging

Weaknesses

- Not considered a product innovator
- Weak consumer education strategy
- No CoQ10 SKUs in natural channel

Opportunities

- Capitalize on cross-channel strategy
- Bring whole food concept and transparency to Nature Made brand
- Utilize practitioner relationships to build awareness for consumer brands
- Formulate CoQ10 product for natural channel
- Leverage reputation with older consumers in other channels

Threats

- Strong competitors in mass market
- Aging mass market consumer
- Global and U.S. market could be affected by U.S. China trade war
- Perception of raw material ingredients from China



Science-Based Nutrition™

drbvitamins.com

Founded in 1990 by supplement industry veteran Ken Halvorsrude, San Clemente-Calif.,-based **Doctor's Best Inc.** manufactures and distributes

dietary supplements throughout the United States and internationally. Now owned by Kingdomway, Doctor's Best is known for its broad line of premium products that are scientifically based on sound research and manufactured using proven quality ingredients. The company offers more than 200 products, most of which are made with branded ingredients that are researched and tested to the highest quality standards. The company uses only cGMP certified manufacturing facilities and is committed to transparency through education and communication. It strives for clarity on the products it sells.

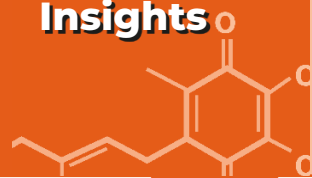
CoQ10 Portfolio:

- Doctor's Best High Absorption CoQ10: An easy-to-absorb form of CoQ10 that powers and protects the body's high-energy organs and systems – especially the heart and blood vessels. Formulated for bioavailability to re-

store decreased CoQ10 levels associated with aging, cardiovascular health and statin use. Available in softgels, veggie caps and veggie softgels; 100 mg, 200mg, 400 mg, 600mg.

- Doctor's Best High Absorption CoQ10 plus PQQ: contains pure Coenzyme Q10 and Pyrroloquinoline Quinone, which helps provide protection for the central nervous system and existing mitochondria, while promoting production of new mitochondria. This synergistic combination is positioned to support cellular energy, memory, recall, and focus. CoQ10 plus PQQ has been clinically shown to benefit attention span and information processing. BioPerine® black pepper extract is added to enhance absorption and bioavailability.
- Doctor's Best High Concentrate EPA Plus CoQ10 with KD-Pur (an omega-3 fatty acid) is positioned to enhance cardiovascular and cellular health. The high EPA levels of KD-Pür® support heart health and inhibit the enzyme that produces excessive omega-6 fatty acid. KD-Pür® EPA also balances fatty-acid ratio by protein. CoQ10 in combination with KD-Pür® helps reduce oxidative stress in the heart and supports endothelial function. BioPerine® enhances the absorption and bioavailability of CoQ10 and EPA in the bloodstream.

Insights



The Doctor's Best model is to sell products primarily through e-commerce and it works with a variety of online providers including Amazon.com, I-Herb, The Vitamin Shoppe, BodyBuilding.com, Vitacost and Swanson. The brand, though, is in natural grocery chains like Whole Foods Markets and Sprouts as well as being sold through independent health food retailers.

SWOT Analysis

Strengths

- Clearly positioned products and broadly diversified portfolio
- Solid portfolio of CoQ10 products with branded ingredients and strong absorption story
- Good science, cGMP and physician-based positioning
- Ownership by Kingdomway provides supply advantages and multichannel connections

Weaknesses

- Primary focus on e-commerce; with some negative perceptions of online brands
- Brand name not widely recognized, even in health food channel, where most health-educated consumers shop

Opportunities

- Potential global growth of CoQ10 market
- Ownership by Kingdomway may open the door to sale of Doctor's Best product globally and especially in China
- Versatility and adaptability of online retailing
- Strong brand positioning in the category for natural channel

Threats

- Global and U.S. market could be affected by U.S. China trade war
- Perception of raw material ingredients from China
- Ongoing regulatory concerns about supplement industry



jarrow.com

Los Angeles, Calif.,-based **Jarrow Formulas** is a formulator and supplier of nutritional supplements. The company was founded in 1977 by Jarrow Rogavin

and incorporated in 1988. Today it markets its products in the United States, Mexico, Canada and throughout the world. Jarrow Formulas' complete line of nutritional products includes vitamins, minerals, probiotics, standardized herbal concentrates, amino acids, enzymes and enteral nutrition products. The brand emphasizes quality, efficacy affordability and innovation. The majority of its business is in the natural specialty channel with minimal presence in mainstream grocery and some lesser-known online vitamin sellers. Sales of vitamin and mineral products make up close to half its business with specialty products making up the majority of the rest.

The company also operates a contract manufacturing arm called Jarrow Industries, Inc., which manufactures pharmaceutical preparations, specializing in vitamin, nutrient or hematinic preparations for human use. The company was founded in 2000 and is based in Santa Fe Springs, California. The company provides a full spectrum of services from formulation to encapsulation, tablet manufacturing, tablet coating and bottle and blister packaging of vitamins and nutritional supplement products for Jarrow Formulas and other private label customers.

CoQ10 portfolio:

- CoQ10 Veggie Caps, 200 mg, billed as an important antioxidant for ATP production, supporting heart and cardiovascular health, and energy and metabolism. Also enhances levels depleted by statin use. Natural Trans Configuration only.

- CoQ10 Capsules, 30 mg, 60 mg, 100 mg, 200 mg billed as an important antioxidant for ATP production, supporting heart and cardiovascular health, and energy and metabolism. Also enhances levels depleted by statin use. Natural Trans Configuration only. Pharmaceutical grade Kaneka Q10.
- Q Absorb CoQ10 softgels, 30 mg and 100 mg, high absorption CoQ10 for support of heart function and energy metabolism. Q-absorb® is a proliposome lipid-soluble delivery system that has been clinically shown in humans to increase CoQ10 levels 200% over baseline and at least 40% higher than dry capsules. Pharmaceutical grade Kaneka Q10.
- Ubiquinol QH +PQQ, (100 mg Ubiquinol and 10 mg Bio PQQ) combines the reduced, active, antioxidant form of CoQ10 which the company says is significantly better absorbed than ubiquinone—with PQQ, to promotes the production of new mitochondria. This combination supports both heart health and cognitive function.
- Ubiquinol QH Absorb, 100 mg and 200 mg, for support of heart and cardiovascular health and energy metabolism. Q-absorb® is a proliposome lipid-soluble delivery system that has been clinically shown in humans to increase CoQ10 levels 200% over baseline and at least 40% higher than dry capsules. Kaneka QH Ubiquinol.
- Red Yeast Rice with 100 mg of CoQ10 in 2 capsule serving. Complementary Red Yeast Rice + CoQ10 Formula for support of cardiovascular health.



Insights

The company is active in nutrition industry affairs, monitoring governmental regulatory issues. It focuses on marketing initiatives that are of value to independent retailers and vigorously promotes the rights of Americans to free access to dietary supplements. Jarrow Formulas also funds research studies on important nutritional products such as CoQ10, to ensure that customers receive the full biological value of these products. Its founder Jarrow Rogovin is a sometimes provocative individual with outspoken stances on industry issues and groups.

SWOT Analysis

Strengths

- Strong brand recognition
- Support of clinical research in CoQ10 area; wide variety of CoQ10 formulas and dosages
- Outspoken industry advocacy and legacy brand perception in natural channel
- Global brand presence
- Use of Kaneka CoQ10 may isolate Jarrow from trade issues and poor perception of Chinese sourced ingredients
- QH Absorp, Jarrow's proprietary enhanced stability formula has been shown in clinical studies to increase CoQ10 levels in subjects by 777% over baseline with 300 mg per day intake
- Vertically integrated with a contract manufacturing company

Weaknesses

- Branding is somewhat dated and has inconsistent focus
- Some non-GMO products but none in CoQ10 space

Opportunities

- More participation in the broader emerging categories of aging and energy
- Increase number of non-GMO product to include CoQ10
- Further global expansion of brand

Threats

- If science conclusively shows no difference between ubiquinol and ubiquinone
- Global and U.S. market could be affected by U.S. China trade war
- Perception of raw material ingredients from China
- Ongoing regulatory concerns about supplement industry



naturalfactors.com

Natural Factors is now one of the largest manufacturers of nutritional products in North America. Headquartered in Coquitlam, British Columbia, Canada, the family owned-supplement company was founded by

Jacob Gahler. His son Roland Gahler joined the company in 1972 and has carried on the family vision of adding modern technological improvements for greater reliability and efficacy of natural products. The company also has offices in Mississauga, Ontario and a U.S. sales and distribution center in Everett, Wash. In addition to its production facility in Coquitlam, it also has company-owned farms, production and extraction facilities in the Okanagan region of Canada.

In addition to its CoQ10 products, the company offers a variety of supplement products including amino acids, bee products, omegas, herbal and plant formulas, and probiotics in a variety of products for women, men, weight loss, joint health and various vitamin categories. The company farms allow for control of its supply chain and quick processing of botanical raw materials after harvesting. Natural Factors also operates its own laboratory and conducts clinical research, employing in house scientists in R&D, quality control and other technical departments to ensure quality, safety, purity and efficacy of products.

CoQ10 portfolio:

- Natural Factors PQQ-10 with Coenzyme Q10: PQQ is considered a novel cofactor with antioxidant and B vitamin-like activity that enhance the biosynthesis of nerve growth factor (NGF), a key protein involved in the growth and survival of neurons. PQQ and CoQ10 work together to promote antioxidant activity and mitochondrial health, and provide multifunctional support for cardiovascular health and neuroprotection. BioPQQ® is manufactured in Japan using a patented natural fermentation process. Natural Factors CoQ10 is naturally fermented, consisting only of the natural trans isomer identical to the body's own CoQ10.
- Natural Factors Coenzyme Q10 is blended in a base of rice bran oil for enhanced absorption. With "all-natural form" ubiquinone, the product is positioned to enhance cellular energy production and provide antioxidant support to scavenge free radicals throughout the body and support maintenance of normal heart function; 50 mg, 100 mg, 200 mg and 400 mg.
- Natural Factors Ubiquinol QH® Active CoQ10 is positioned as a powerful antioxidant that offers enhanced absorption and bioavailability especially for the aging body, when the ability to naturally produce ubiquinol may be diminished; 100 mg and 200 mg.

Insights



The company is a solid player in the U.S. specialty and natural channels, with a strong focus on customer education and practitioner endorsements for some product. Annual revenues are estimated at \$256 million. The company purchased an estimated 36 metric tons of CoQ10 in 2018.

SWOT Analysis

Strengths

- Vertical integration with company-owned production and extraction facilities, farms and distribution. This gives NF a strong transparency story and control over supply chain and ingredient price changes
- Broad, diversified portfolio
- Physician recommended brands
- Well-respected brand in both U.S. and Canada
- Makes a strong play to well-educated and older consumers

Weaknesses

- Must comply with both Canadian and U.S. regulatory requirements

- No physician endorsement for CoQ10 products
- Limited online presence and engagement

Opportunities

- Broaden social media effort to engage with younger consumers
- Leverage opportunities to create unique multi-ingredient products

Threats

- Global and U.S. market could be affected by U.S. China trade war
- Perception of raw material ingredients from China
- Consumer concern about cost, quality and absorption of CoQ10 products
- Ongoing regulatory concerns about supplement industry



nowfoods.com

NOW Foods is a family-owned, natural products legacy brand founded in 1968 by Elwood Richard, who first started a small chain of health food stores in the Chicago area called Health House, now known as Fruitful Yield. NOW company is currently celebrating its 50th Anniversary, boasting a broad inventory of more than 1,500 products, including nutritional supplements, health and beauty products, essential oils, sports nutrition, natural foods and pet health products. The company manufactures both its own brands as well as private label products. To expand globally, the company established NOW® International in 2000 and has extended the reach of the NOW® brand to more than 70 countries. The company is headquartered in Bloomington, Ill. where it maintains its primary manufacturing facility, but it also recently expanded into a 130,000-square-foot manufacturing and distribution center in Sparks, Nev.

CoQ10 Portfolio: All products are made with the natural, all-trans form of CoQ10 produced by fermentation. Products have a low-to-medium price point.

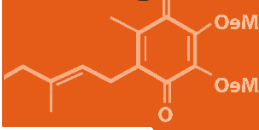
- NOW CoQ10 is positioned for cardiovascular health, cellular energy production and free radical scavenging. It contains 100 mg of CoQ10 and 30 IU of vitamin E; softgel format.
- NOW CoQ10 veg caps are positioned for cardiovascular health, cellular energy production and support of heart function; 150 mg and 200 mg Soy lecithin. Also comes in 30 mg veg caps, 60 mg veg caps, 200 mg veg caps
- CoQ10 200 mg Lozenges with vitamin E and lecithin for cardiovascular health and support of energy production.
- Maximum Strength CoQ10 600 mg softgels with vitamin E and lecithin are positioned for cardiovascular health and maintenance of a healthy nervous system.

- CoQ10 Liquid contains 100 mg, per teaspoon to support a healthy heart muscle and cellular energy production. Also contains coenzyme B vitamins, vitamin E, niacin and pantothenic acid. Sweetened with xylitol.
- CoQ10 Pure Powder for support of heart function and cellular energy production. 2 level scoops contain 50 mg.
- Ubiquinol Active Form CoQ10 100 mg, is positioned as highly bioavailable cardiovascular support. Contains Kaneka Ubiquinol. Also in 200 mg dose.
- Ubiquinol CoQH-CF with 50 mg of active form of CoQ10 from Kaneka. Positioned as superior bioavailability. Also features D-Limonene to naturally enhance its solubility and intestinal absorption to create a product with superior biological value.

Combination formulas include:

- CoQ10 100 mg with Hawthorne Berry veg capsules for cardiovascular health and cellular energy production.
- CoQ10 400 mg with vitamin E 30 IU and Sunflower lecithin 35 mg for support of energy production and cardiovascular health.
- CoQ10 50 mg with selenium 70mcg and vitamin E 30 IU for cardiovascular health and support of energy production.
- Krill and CoQ10 Softgels are positioned as a superior cardiovascular formula with Phospholipid omega-3 from krill. One softgel contains 50 mg of CoQ10.
- PQQ Energy is positioned as a free radical scavenger and to support mitochondrial function. Contains 30 mg of BioPQQ (Pyrroloquinoline) and 30 mg of CoQ10.
- Red Omega softgels with Red Yeast Rice and CoQ10 30 mg, with omega-3 fish oil. Positioned for cardiovascular support.

Insights



NOW's success in the U.S. has been driven by its steadfast commitment to the independent health food store channel viewing these retailers as important to the ongoing education of consumers about supplements and natural products. The company has worked in recent years to update its image and packaging. In 2015 it introduced new supplement packaging with a more modern look and feel, while retaining its signature orange and blue colors.

SWOT Analysis

Strengths

- Value-based brand that also serves as private label manufacturer for other stores: leading brand in CoQ10 products
- Award-winning, respected brand among independent health food stores; strong educational efforts for this retail segment
- Strong variety of CoQ10 products and combination formulas
- Growing global presence through NOW International distribution
- Well-recognized branding and packaging
- Family-owned company with strong industry leadership as well as support of employees through internal programs
- Focus on non-GMO products, one of the few in CoQ10 category

Weaknesses

- Large product portfolio position often places NOW Foods as a popular target for criticism from smaller players
- Wide presence in many channels places their perception as "big business" closer to GNC

Opportunities

- Take its message of quality, authenticity to mass channel
- Further leverage its non-GMO CoQ10 products and expand to all SKUs where possible
- New operational facilities will help national and global expansion

Threats

- Global and U.S. market could be affected by U.S. China trade war
- Perception of raw material ingredients from China



Tishcon Corp.
was founded
in Westbury,
New York by

Raj Chopra, Vipin Patel, and others in 1976 as a contract manufacturer of bulk products, mostly for mail order marketers and wholesalers. Over the years, the company has expanded to offer a full line of services from new product development to packaging and labeling. A second location in Salisbury, Maryland was established in 1984. Tishcon is the recognized leader in CoQ10 knowledge and production capability.

Current CEO Raj Chopra has an extensive background in various disciplines related to the nutraceutical, vitamin, and supplement industry and expertise in formulation, product development, nutrition research, and food technology. This range of experience has given the company a strong basis for expanding its product offerings. Tishcon offers its clients a complete menu of production options, including organic, vegan, kosher, herbal, all-natural, soy, non-GMO, halal and gluten-free.

Today, the Westbury facility is the home to softgel encapsulation, Research and Development laboratories and quality control testing labs. The Salisbury operation houses encapsulation and tableting operations, as well as all bottling, packaging and distribution. A satellite laboratory in Maryland handles QC testing during production.

CoQ10 Portfolio: Tishcon Corp. is one of the leaders in CoQ10 research, education and contract manufacturing. It can provide all of its products in bulk packs or labeled in consumer packages to company specifications.

- Q-Gel® CoQ10 is produced via the fermentation process using a 100% natural yeast food source. All CoQ10 is obtained either by 100% fermentation guaranteeing 100% Natural CoQ10 (the type used in Q-Gel®). Tishcon Corp's Q-Gel® CoQ10 is 100%

Hydrosoluble and Liposoluble (Duosoluble™). The 100% Hydrosoluble CoQ10 has been proven via several bioavailability studies in human subjects to be a highly bioavailable CoQ10 oral supplement. The products manufactured via the Biosolv® process were studied in patients with hypertension. Results of these studies proved conclusively the direct effect of the enhanced bioavailability of Q-Gel®.

- Mega Ubiquinol + Omega-3 fish oil: 100 mg of active CoQ10 and 100 mg of Omega-3 fish oil
- Derma Q-Gel Topical Delivery system to energize skin cells to support skin's natural functions; defend against the destructive and aging effects of free radicals; reduce damaging inflammation and moisturize. Comes in creams, Snipgels (single-serve formats often used in topical delivery), serums and concentrates.
- HydroQSorb® powder is bioavailability enhanced CoQ10 ideal for use in tablets, capsules, softgels, drink mixes, nutrition bars, beverages, and in cosmetics (topical use). Contains Gamma Cyclodextrin and CoenzymeQ10.
- Active Q Ubiquinol 50mg, the "active" antioxidant form of Coenzyme Q10.
- Chew Q Bioenhanced Coenzyme Q10 has a pleasant tasting, mildly sweet, natural orange flavor. Chew Q® is very stable through several freeze-thaw cycles.
- LiQSorb® Solution is ideal for use in beverages, liquid supplements, such as drops, syrups, etc., and in cosmetics (topical use). It is a bioavailability enhanced Coenzyme Q10 product, which has been shown in in-vitro cell culture studies to enhance intestinal permeability. CoQ10 particle size reduced to under 0.2 Microns (200nm)
- LiQH™ is soluble, stable ubiquinol ideal for use in liquid supplements, and in topical creams and lotions.

Insights

Tishcon is one of the leaders in CoQ10 science-based efficacy and innovation with three separate orphan drug designations for CoQ10 in the treatment of various rare diseases by the U.S. FDA. A Phase III trial of Tishcon's LiQ-NOL® in the treatment of mitochondrial diseases is currently underway at three U.S. centers and one center in Canada. This pilot trial is being funded by the Orphan Products Division of the U.S. Food and Drug Administration and the National Institutes of Health.

SWOT Analysis

Strengths

- Deep expertise in science-based product formulations
- Strong support of CoQ10 research
- Orphan Drug designation for CoQ10, giving their products unique positioning
- CoQ10 ingredients for multiple applications; Good positioning with CoQ10 Q Gel topical delivery

Weaknesses

- Proprietary ingredients are not well known or understood on the consumer end
- Passive marketing strategy

Opportunities

- Showcase and promote strong proprietary technologies to thought-leaders (practitioners) in CoQ10 space
- Develop a more aggressive marketing and product/category awareness approach

Threats

- Negative publicity around the efficacy of supplements
- Global and U.S. market could be affected by U.S. China trade war



www.qunol.com

Qunol is a leading CoQ10 brand focused on the mainstream channel, big box stores and a top seller on Amazon. Qunol is provided by the Quten Research Institute in Fairfield, N.J. The brand sells both liquid and softgel CoQ10 and turmeric products.

This specialized focus creates a strong quality story and the company claims to be 100% focused on absorption and works “tirelessly” to provide the best CoQ10 and turmeric products in the market.

The website, www.qunol.com provides a strong educational component for CoQ10. Qunol Liquid and Softgels are manufactured by high quality manufacturers specializing in CoQ10 production.

Qunol brand CoQ10 is positioned as a powerful antioxidant that can help support heart health and replenish CoQ10 that may be lost due to age and statin use. Supplementing with Qunol can help restore optimal levels of CoQ10 that the body needs to stay healthy. Qunol claims superior bioavailability and is purported to be the #1 Cardiologist Recommended (according to IQVIA ProVoice Survey) form of CoQ10.

Qunol is differentiated as a tri-patented formulation of a solubilized form called Q-Gel®, which is 100% water and fat soluble that provides superior absorption. The company touts studies that have shown that the Q-Gel in Qunol is absorbed as much as three times better than regular CoQ10.¹⁷



CoQ10 Portfolio: Qunol features seven CoQ10 SKUs. All are positioned to provide superior absorption and have a low-to-medium, competitive price value proposition.

- Qunol Ultra CoQ10 supports healthy heart function and plays a vital role in helping maintenance of healthy blood pressure levels. 100 mg.
- Qunol Mega CoQ10 contains CoQ10 that has already been converted to its antioxidant form, Ubiquinol – the form that fights excess free radicals and can help protect the body’s cells from damage. 100 mg
- Qunol Liquid CoQ10 is a safe and natural way to support heart health and maintain healthy blood pressure levels. 100 mg per serving. 200.3 oz/30.4 oz
- Qunol Plus Ubiquinol + Omega-3 contains the active form of CoQ10 to provide powerful antioxidant protection for heart health. 200 mg
- Qunol Extra Strength Ubiquinol, contains the active form of CoQ10 which has been shown to improve oxygen utilization and energy production in heart muscle cells and can help statin users to maintain optimum Ubiquinol levels. 200 mg
- Qunol Ubiquinol contains the active form of CoQ10 which has been shown to improve oxygen utilization and energy production in heart muscle cells and can help statin users to maintain optimum Ubiquinol levels. 100 mg



The patented Q-Gel form is thought to be an important development in CoQ10 absorption. The brand seems prepared to make the most of this and supports Qunol with a heavy advertising budget which appears to reach out to a mixture of mature mainstream consumers and well-educated audiences that would have some awareness of CoQ10. It also creates partnerships with healthcare professionals to educate the public and provide CoQ10 to patients.

SWOT Analysis

Strengths

- Strong and focused story on superior absorption with patented Q-Gel that is water and fat soluble
- Specializes in CoQ10 and absorption technology
- Strong support of CoQ10 education: Partners with healthcare professionals to educate the public and provide CoQ10 to patients
- Well-funded, aggressive TV ad campaign touting Cardiologist recommended form

Weaknesses

- Provides almost no information on manufacturing processes, scientific standard and quality
- No real face of the company

Opportunities

- Sponsor and promote further absorption, bioavailability research
- Promote CoQ10's additional benefits, such as energy, to a younger audience
- Promote work with healthcare professionals
- Develop a more premium product positioning, or professional line

Threats

- Ongoing regulatory concerns about supplement industry
- Negative publicity around the efficacy of supplements
- Global and U.S. market could be affected by U.S. China trade war



THE VITAMIN SHOPPE

www.vitaminshoppe.com

stores and on its website, the company carries a comprehensive retail assortment including: vitamins, minerals, specialty supplements, herbs, sports nutrition, homeopathic remedies, green living products, and beauty aids. In addition to offering products from approximately 700 national brands, the Vitamin Shoppe also carries products under The Vitamin Shoppe®, BodyTech®, True Athlete®, MyTritition®, plnt®, ProBioCare®, and Next Step® brands. The Vitamin Shoppe conducts business through more than 775 company-operated retail stores under The Vitamin Shoppe and Super Supplements retail banners, and through its website. Total revenues for 2017 were \$1.178 billion.

The company has struggled in recent years with stalled revenues, smaller margins and reduced comp store sales that led to a 57% decline in stock prices. Vitamin Shoppe has admittedly been in reinvention mode with the departure of top executives such as its CEO Colin Watts and EVP/CFO Brenda Galgano in May 2018. The company has since noted improved financial results attributable to growth of its digital

The Vitamin Shoppe

is an omni-channel, specialty retailer of nutritional products based in Secaucus, New Jersey. In its

commerce and better grocery margins, customer acquisitions and comp sales. Sharon Leite, formerly of Godiva Chocolatier, has taken over as CEO.

CoQ10 Portfolio: In addition to offering most of the leading CoQ10 brands, The Vitamin Shoppe also offers 29 CoQ10 SKUs in its Vitamin Shoppe brand. Price proposition is medium to high ranging from \$10.99 for CoQ10 100 mg 30 softgels to \$89.99 for Ubiquinol CoQ10 200 mg 120 softgels.



- Vitamin Shoppe CoQ10 softgels: for support of cardiovascular health, cellular health and antioxidant support. Beneficial for those taking statin drugs; 50 mg, 100 mg, 200mg, and 400 mg.
- Vitamin Shoppe Ubiquinol CoQ10: for support of cardiovascular health, cellular health, and energy production. Beneficial for those taking statin drugs; 50mg, 100 mg, 200 mg, 400 mg.
- Vitamin Shoppe CoQ10 Capsules: for support of cardiovascular health, cellular health and energy production. Beneficial for those taking statins drugs; 30 mg, 60 mg, 100 mg, 200 mg.
- CoQ10 Plus Vitamin E softgels: for cardiovascular, health, cellular health and energy production; 100 mg.

Insights



As part of its turnaround strategy, Vitamin Shoppe is focusing on retail fundamentals and initiating new partnerships and strategies to expand its global reach. It partnered with Macy's China LTD to bring its broad product assortment to Chinese consumers by offering a mix of its private brand products as well as select third-party brands via Alibaba's online shopping platform- Tmall Global. The goal is to deliver products to the Chinese consumer in less than two weeks, enabling the partnership to be one of the quickest suppliers of vitamins, minerals and supplements from the United States to China.

The company also introduced a new online consumer packaged goods (CPG) platform, RangeMe, which provides a streamlined process that will allow The Vitamin Shoppe's category managers to be introduced to innovative products and brands that accommodate the evolving requirements of customers, easily meet and foster relationships with vendors, and provide them with access to thousands of new products from around the world.

SWOT Analysis

Strengths

- Long history and comprehensive product range
- Trusted name among well-educated supplement users
- Turn around strategies are now showing some results and improvements across key metrics such as comp sales, customer acquisitions and margins

Weaknesses

- Flat sales and market pressure
- Vulnerability of a public company
- Narrow CoQ10 offering in its private label brands

Opportunities

- Leverage its new partnerships to create a stronger foothold in growing international markets like China
- Utilize new CPG platform to create efficiencies in supply chain and provide better service to retail customers

Threats

- Competitive and fragmented market with new and strong players in both brick and mortar and online sales
- Sales growth is still lagging behind overall supplement market

SECTION 6:

Consumer Awareness and Sentiment

In an effort to better understand the consumer landscape around supplements generally and CoQ10 specifically, The CoQ10 Association in partnership with Trust Transparency Center, conducted a comprehensive survey of supplement users in May of 2018. The study surveyed adult consumers from the age of 18 to 75+, with no more than 10% over the age of 66. The cohort was a fairly even mix of men and women, with a diverse balance of incomes and ethnicity.

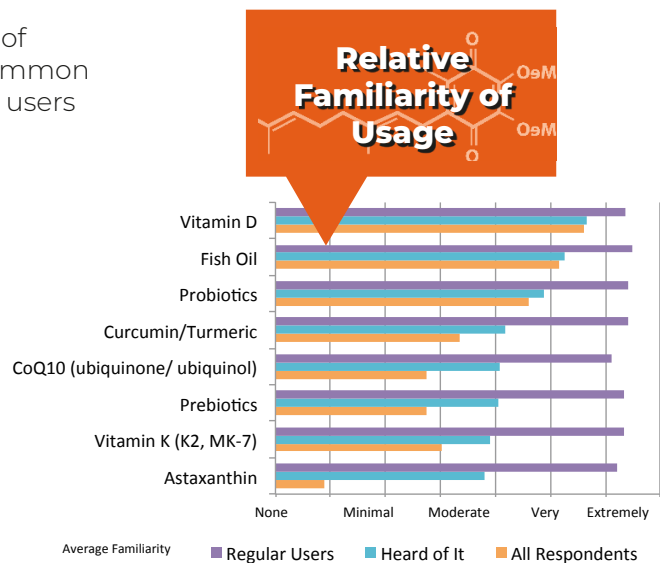
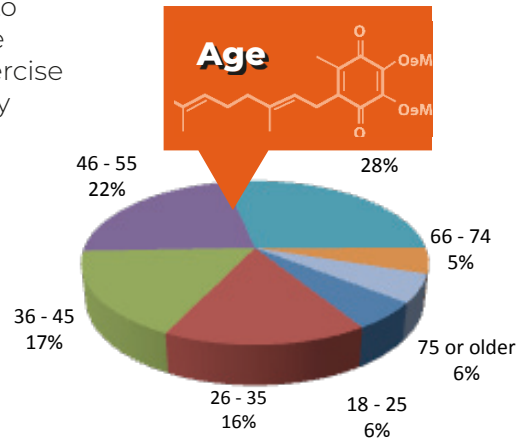
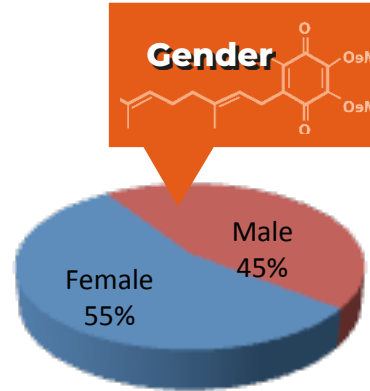
Defining supplement users

The majority of users had some kind of health issue and are looking for supplements to help them better manage their health. These consumers tend to have good eating and lifestyle habits and a proactive approach to their health. More than half say they exercise at least 30 minutes three times a week. They typically purchase a wide range of supplements, most especially multivitamins, but also single vitamins like vitamins B, C, D, minerals like calcium, and specialty nutrients like fish oil, but they are not particularly brand loyal.

One thing that is increasingly clear from the study is that knowledge plus familiarity breeds usage. Regular users of a particular supplement are generally confident in their knowledge about that supplement even if they don't know everything they could or should.

The study compared awareness and knowledge of supplements with usage for CoQ10 and other common supplements. The findings suggest that regular users can serve as important examples of how education and experience produces loyal customers. As shown in the chart (at right), even small segments of usage such as astaxanthin can have a steadfast, educated customer base that is willing to spend money to receive the health benefit.

Perceived effectiveness and or trust in that efficacy, however, remain important for all types of supplements. A large number of general supplement users have lingering questions or concerns about the efficacy of various supplements. But this can clearly be addressed with consumer education. Vitamin D, for example, underscores how



Source: [Trust Transparency Consulting Consumer Survey May 2018](#)

quickly a strong consumer education campaign can quickly elevate consumer understanding of a supplement and its perceived effectiveness.

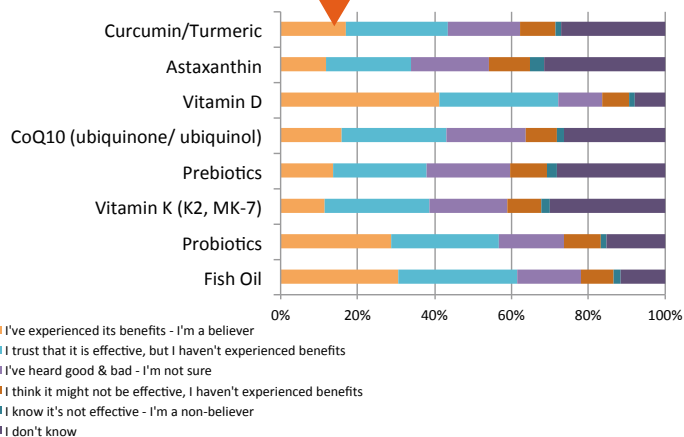
Regular users tend to be far more convinced of supplement efficacy, (and in truth more likely to have actually experienced a noticeable difference). So it is increasingly important that consumers are not only educated about how a supplement works, but also about the required dosage to experience the health benefit. Interestingly, CoQ10 falls somewhat in the middle of the road regarding this effect relative to other ingredients. Though more than 20% believe CoQ10 is effective, a surprisingly low number of 16% say they are a believer who has experienced its benefits. This is well below the number of believers for vitamin D, probiotics and fish oil and is certainly a relatively small percent given the conclusive scientific evidence that exists for CoQ10 and the fact that use of CoQ10 is supported by a significant number of physicians and cardiologists.

When it comes to perceived efficacy, CoQ10 does rank relatively high among both regular users and those who have heard of it, but again at the middle of the field rather than at the top where such a scientifically validated and medically accepted supplement should be.

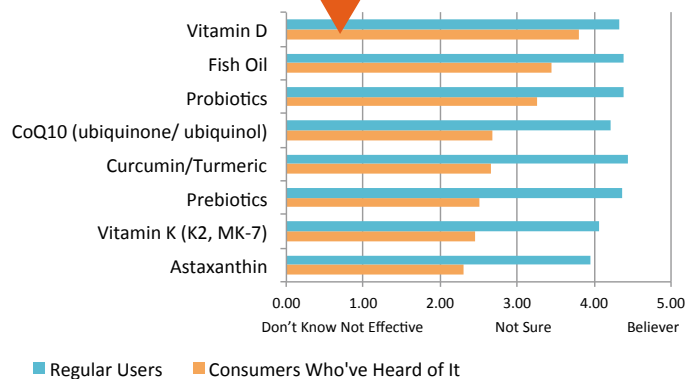
Dosage may be one of the reasons for this—an effective dosage is critical to experience CoQ10’s benefit. But in general, there is a significant segment of supplement users that aren’t paying attention to dosages. Regular users are significantly more familiar with required dosages. As such, this is an important aspect of any consumer education program to help consumers be informed when choosing supplement products.

The CoQ10 Consumer

Overall usage of CoQ10 remains relatively low, with 26% of supplement users using CoQ10 at some level. But consumers of CoQ10 tend to be regular users. Like overall supplement consumers, regular CoQ10 users tend to make healthy choices with regard to their diet and lifestyle.



Source: **Trust Transparency Consulting Consumer Survey May 2018**

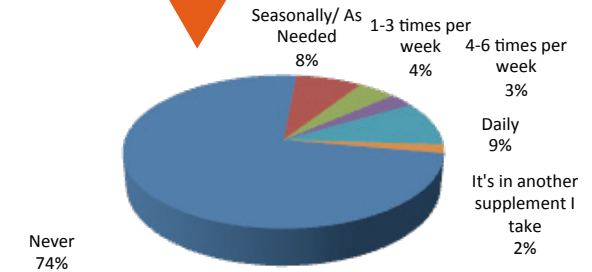


Source: **Trust Transparency Consulting Consumer Survey May 2018**

Moreover, they are a bit more likely than overall supplement users to be proactive about their health, taking steps to lower their risk of certain health issues. They are also more well-read about health and wellness and just slightly more likely to practice a regular exercise regimen.

Regular Users vs. Irregular Users		
Men	55%	44%
56+	44%	27%
-46	39%	53%
Higher Income >\$70K	66%	55%
Less ethnically diverse (white, not Hispanic)	53%	50%

Consumer Usage of CoQ10



Source: Trust Transparency Consulting Consumer Survey May 2018

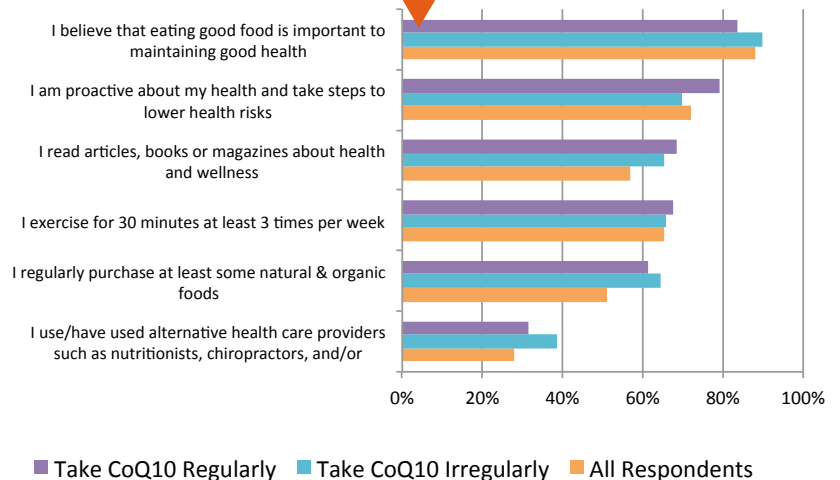
But there are still plenty of consumers who need to know more about CoQ10. While regular users are extremely familiar with CoQ10 and its usage, irregular users need more education and fully one in three supplement users have never heard of CoQ10. This is one of the category opportunities.

CoQ10 users at all levels are spending more on CoQ10 products than consumers spend on many other supplements. The average monthly spend for a regular user is \$19, which is about 50% more than irregular users spend (which is actually below average, relative to all supplements considered in this survey).

Regular users are believers

Half of regular users say they have experienced the benefits of CoQ10, which is typical for regular users of any supplement. What's more, few consumers have a truly negative opinion on CoQ10, but many still don't know much about it or have heard conflicting information.

CoQ10 User Characteristics



Source: Trust Transparency Consulting Consumer Survey May 2018

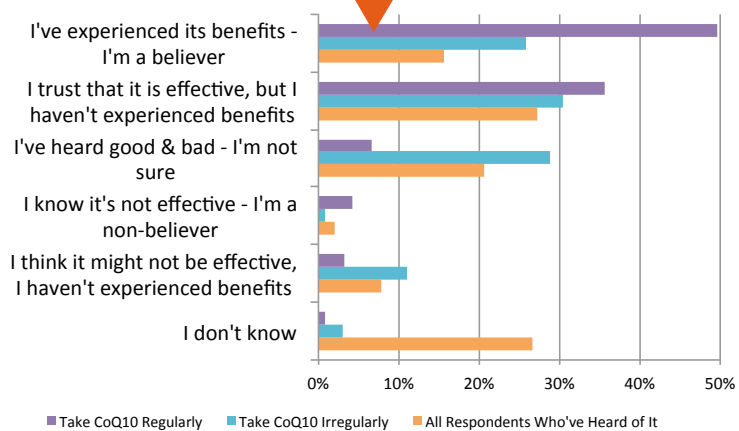
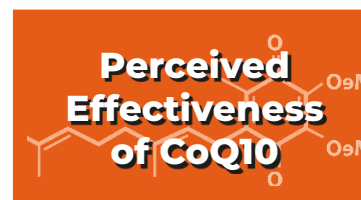
Understanding of the benefits

Heart Health is clearly the most recognized benefit for CoQ10 supplementation, but that noted, half of supplement users who have heard of CoQ10 say they are unfamiliar with its benefits. About one third of users say that their doctor recommended CoQ10, suggesting that physicians are still not as strong a source of recommendation as they might be. Generally speaking, CoQ10 is ahead of the curve in physician acceptance and endorsement as compared to other supplements, but given that there is still a real gap between awareness and strong confidence in efficacy, the CoQ10 segment does have a ways to go toward improving consumer education and acceptance.

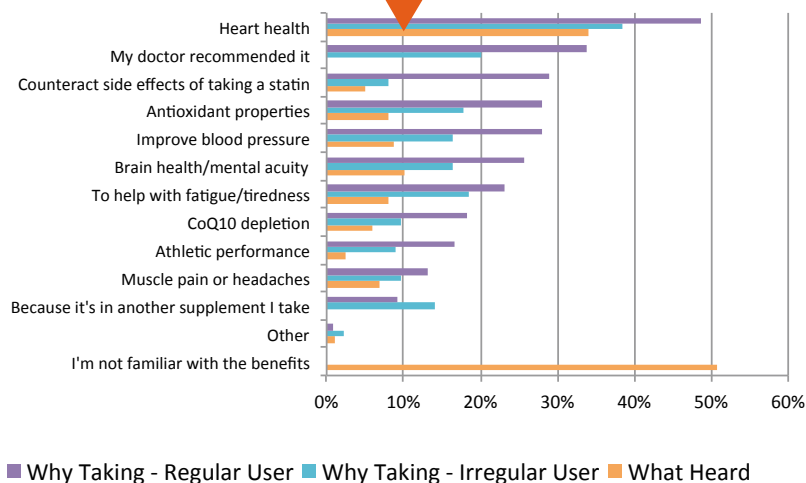
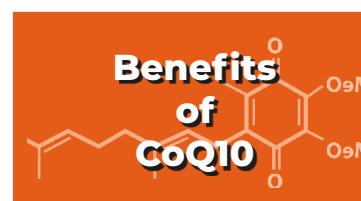
When it comes to the CoQ10 products that survey respondents purchase, again regular users are typically more informed about dosage and form. Regular users are certainly more knowledgeable about what dosage to take, with 51 mg to 100 mg the most popular. Overall knowledge about dosage is fairly strong compared to other supplements. Interestingly, a significant number of all users do look for a product with at least 100 mg of CoQ10. Irregular users are more likely to look for products that combine CoQ10 with other supplements. Generally most users are not sophisticated enough to search for ubiquinol versus ubiquinone. This divide is due at least in part because of mixed science and industry messaging about absorption and bioavailability of the two CoQ10 forms. A more cohesive segment-wide approach to messaging might bridge this education gap for consumers

Use of statins is a key factor

Heart health issues and statin use are clear drivers of CoQ10 usage, with 44% of regular users saying they take a statin and 22% noting statin use in the past. Of all CoQ10 users at any level, 33% take a statin, while 18% have done so in the past. But this is still relatively low, considering that 27% of statin users have never even heard of CoQ10, while 66% of these respondents say they never take CoQ10 and only 21% of statin users are regular CoQ10 users. Perhaps even more stunning is that 96% of current and past statin users who do not currently take CoQ10 have never had it recommended by their doctor. As noted above, a more unified industry approach targeted specifically to physicians and cardiologists might help address these important disconnects.



Source: Trust Transparency Consulting Consumer Survey May 2018



Source: Trust Transparency Consulting Consumer Survey May 2018

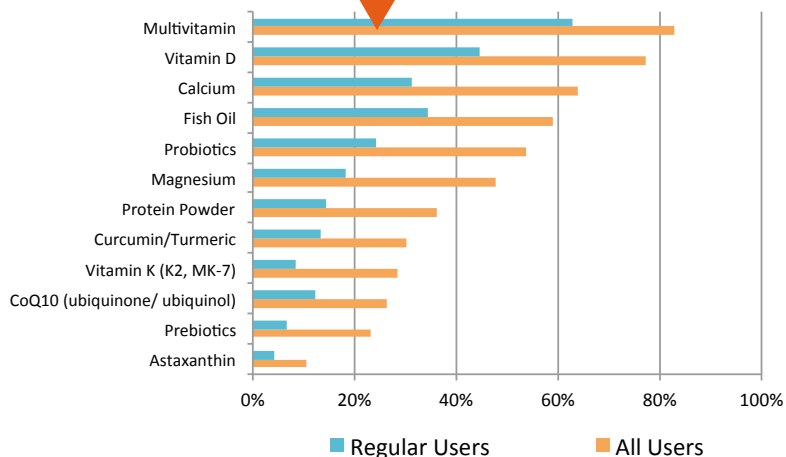
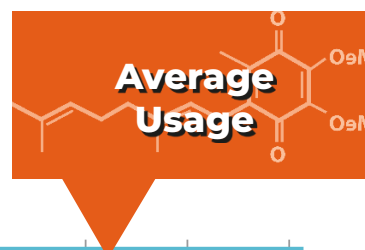
6.1: Related Ingredients and Category Analysis

Related ingredient Analysis: The Rising Potential of CoQ10

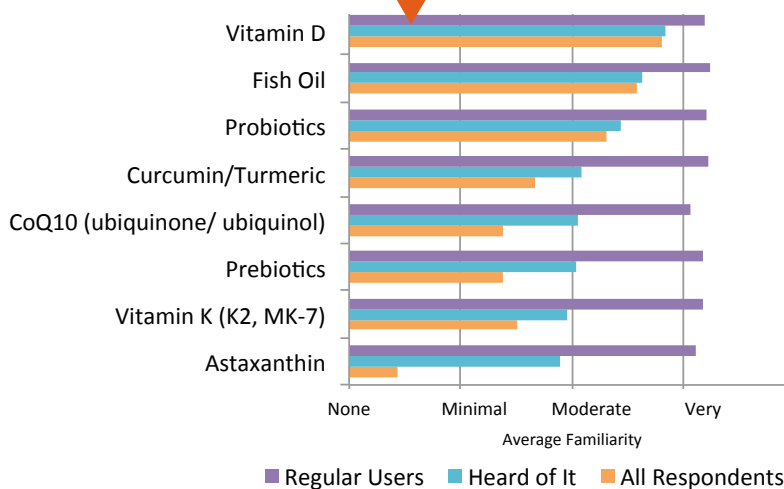
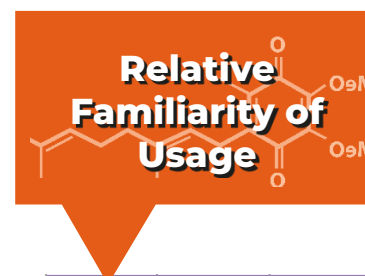
When it comes to overall supplement usage, multivitamins continue to be the most popular supplement choice, but vitamin D has taken the market by storm in the last decade, with growing awareness of both its importance for calcium absorption, gut health and rising concerns about deficiencies. Average usage of CoQ10 is now at just more than one in 10 consumers, due to its close association with heart health and aging. But this has the potential to change with the aging of the global population as well its emerging evidence of its benefits for anti-aging affects, energy enhancement and support of brain health.

CoQ10 ranks among the top most used supplements as well as those with the most understanding of the benefits they offer. But like most of these top nutrients, regular users tend to cite the most knowledge about the benefits these nutritional compounds offer, even if they don't know everything they could or should. Among this group, however, CoQ10 ranks surprisingly low in overall awareness, well behind top contenders like vitamin D and fish oil and even slightly behind vitamin K, a relative newcomer in the heart health space (see chart at right), which first came to the attention of researchers in 2004 when Dutch scientists noted that K-dependent proteins inhibited vascular calcification.⁶⁷

Regarding perceived efficacy, CoQ10 ranks a bit higher, with more than 40% of respondents in the recent survey noting a positive perception, with consumers having either experienced its affects or trusting that it is efficacious. This is a relatively strong showing given that many supplement users still indicate questions or concerns regarding the effectiveness of numerous supplement products. Vitamin D has the highest rating in this respect, and also demonstrates how quickly and effectively a strong consumer education campaign can elevate consumer understanding of a nutrient.



Source: Trust Transparency Consulting Consumer Survey May 2018

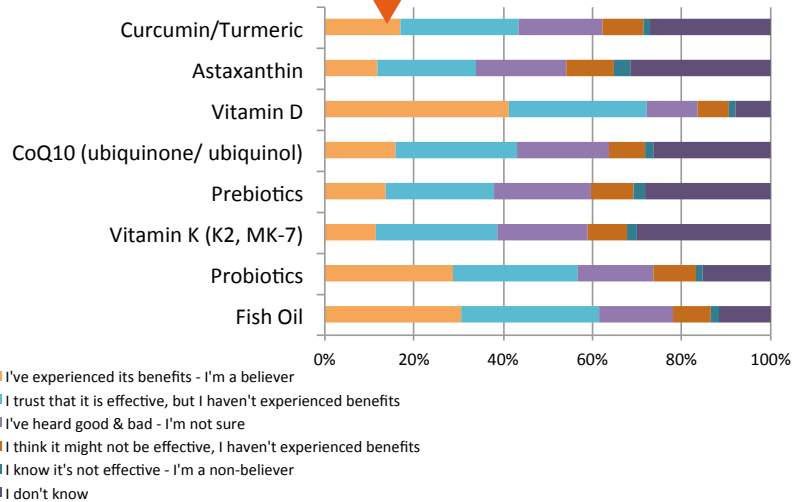


Source: Trust Transparency Consulting Consumer Survey May 2018

As indicated previously, regular users do tend to be more convinced of a supplement's efficacy. This is likely tied to knowledge of dosages required to experience an expected benefit. Though a significant number of supplement users pay little attention to dosages, regular users are significantly more likely to indicate familiarity with dosages. This underscores the need for better education regarding effective dosages. In the case of CoQ10 more than 20% of all users are unsure of an efficacious dosage and more than 10 percent of regular CoQ10 users also say this.

The scientific evidence is fairly conclusive that a dosage of at least 200 mg is important for improving CoQ10 levels for most patients. A comprehensive education campaign on CoQ10 dosage could help move the needle on these factors.

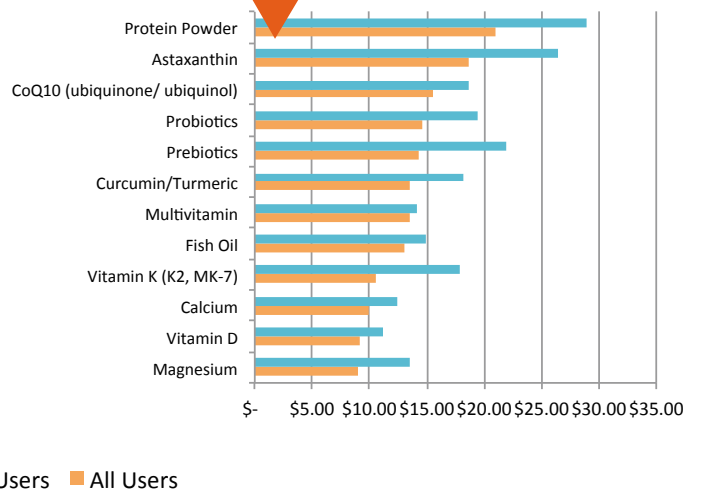
Perceived Effectiveness



Source: Trust Transparency Consulting Consumer Survey May 2018

The chart (at right) on spending is interesting given that most regular users do spend more on their supplements compared to average users. Protein powder generates the highest average monthly spend of nearly \$30 for regular users. Some regular users also splurge on premium versions of certain supplements such as astaxanthin and prebiotics. Interestingly, the variance in spending among CoQ10 users is not as large as in these other categories. It is not clear why this is so, but may have to do with most users having at least some guidance from a health care practitioner or physician.

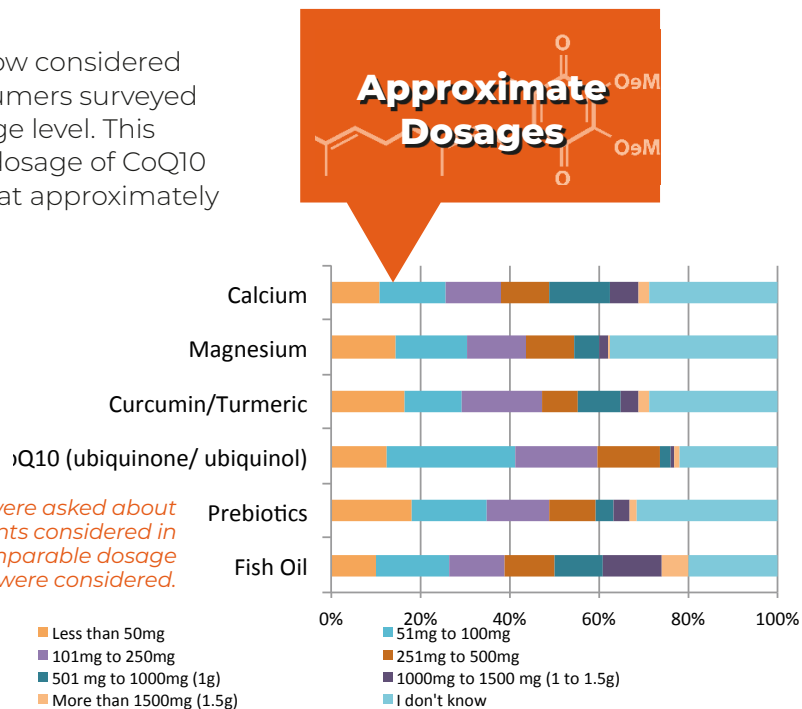
Average Monthly Spend of Users



Source: Trust Transparency Consulting Consumer Survey May 2018

For CoQ10, the optimal daily dosage is now considered to be 200 mg, but less than 20% of consumers surveyed noted this range as an appropriate dosage level. This does tend to be higher than the typical dosage of CoQ10 in the market, which generally averages at approximately 100 mg, especially among mainstream brands. That said, there are OTC CoQ10 products especially among premium and professional brands that go as high as 600 mg, with 200 mg a fairly typical dose.

For comparison purposes, supplement users were asked about relative dosage level for several of the supplements considered in this study. Only supplements with relatively comparable dosage formats were considered.



Source: **Trust Transparency Consulting Consumer Survey May 2018**

6.2 Related Category Analysis

CoQ10 and Heart Health: Still pumping along

For the past few decades, heart health has been the most important health issue for consumers, with cardiovascular related deaths now ranked as the leading cause of death for both men and women globally.⁶⁸

Not surprisingly, this has prompted the development of many drugs as well as dietary supplements to address these health issues. The supplement category has many vetted options, including calcium, magnesium, vitamin K2 and niacin, which makes for healthy competition. But CoQ10 occupies a unique and important place in this category. Not only is there exceptionally strong evidence on the benefits of CoQ10 for the heart, but its importance for statin users is critical and will gain in relevance as more and more cardiologists understand the connection between the two. Although the use of statins has seen some recent controversy, at least in

the United States, the medical establishment seems to be doubling down on these drugs so their usage is expected to continue to increase.

The number of cardiovascular related deaths is expected to increase globally reaching 23.6 million by 2030, according to the AHA. This growth will be driven by incidence in Eastern Europe and Latin American, in countries such as the Russian Federation, Ukraine, Hungary, Cuba, Brazil, Czech Republic, Argentina and Mexico, where especially for men, heart health morbidity is on the rise. In the United States, heart disease-related death, while still high, has been dropping off, particularly since 2001. Most of this decline is due to increasing use of medical therapies in treating patients as well as lifestyle changes for those at risk.

Given that an estimated 85.6 million people in the U.S. are currently living with cardiovascular diseases, including heart attack, stroke, high blood pressure and chest pain, it is likely that such treatments and science-backed prevention protocols, including CoQ10, will maintain strong interest for the foreseeable future.⁶⁹

The Rise of Cognitive Health Concerns — But no magic bullets

Given the increasing life expectancy of people around the world, other health issues are surfacing and driving consumer interest in preventive health maintenance strategies. With worry about heart health past its peak, the new top health concern for consumers in most developed nations is maintaining cognitive health as they age.

Cognitive health is now considered a major factor in maintaining quality of life for older adults and preserving their independence.⁷⁰ The concern is justified with nearly 6 million people now living with Alzheimer's Disease and more than 35 million worldwide noting some form of dementia.⁷¹

Though this category is expected to grow exponentially, there are several nutritional heavy hitters with a strong or growing perception and some scientific evidence targeting this area, including omega -3s from both fish and plant sources, herbs like ginkgo biloba, trace minerals such as selenium and even multivitamins. Probiotics also have the potential to impact this space as new research links microbiome health with brain function. This means that CoQ10 will face significant competition in the brain health category, where it is currently not well known.

As such, developing science will therefore be critical. While omega-3 DHA and EPA are the undisputed leaders in this category, as yet there are still many questions about how these substances impact brain function and cognitive decline let alone neurological disorders like Alzheimer's disease. For the foreseeable future, most supplements formulas for brain health will be hampered by a difficult and complex claims and regulatory environment.

Boomers to Millennials: Hanging on to youth

A more general approach to anti-aging may be a much more practical strategy for CoQ10 ingredient positioning, given the solid and emerging science on CoQ10 for anti-aging affects, like fighting oxidative stress and

supporting energy production and healthy skin. CoQ10 is already a leading supplement in this category, by a significant margin. However, its growth in the segment has leveled off for the past few years. Overall, it is a category where many nutrients hold a relatively small share.

CoQ10 may have an edge in this category given its support for energy production which targets a largely energy-starved and stressed adult population in most Western countries. While this positioning is overall less common currently for CoQ10 products, it is a message that will likely continue to resonate for consumers in many age groups.

Younger consumers, especially millennials, many of whom are already reaching their mid 30s, may be a key audience for this category as they look to stave off early signs of aging. These consumers are more knowledgeable about prevention strategies than their parents, and they are already looking for ways to look and feel younger.

Still, a strong scientific story, even for topical products, will continue to be important for CoQ10 to maintain its position in this category—an industry wide consumer education effort on behalf of CoQ10 wouldn't hurt either. Creating believers of young consumers could fill the pipeline of future customers for CoQ10's other health benefits as they grow older.

SECTION 7:

Marketing Strategy Analysis, Distributors and Traders

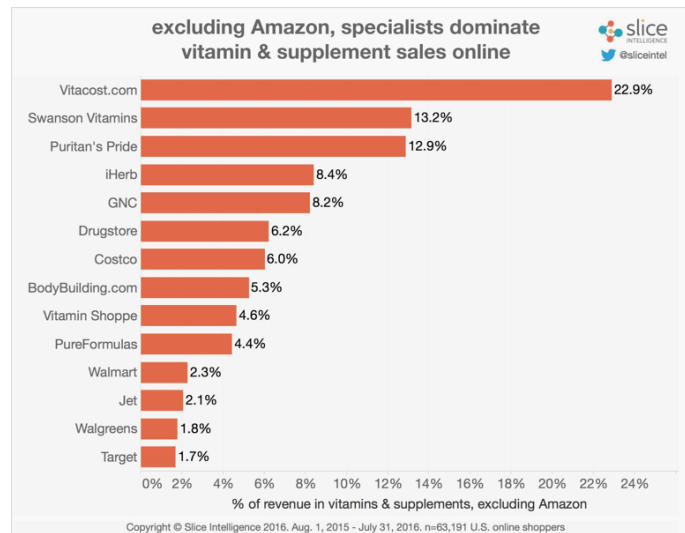
7.1 Channel Analysis

Direct to Consumer: The changing global e-commerce landscape

Overall, the direct sales channel, which now largely encompasses selling directly to consumers online via e-commerce, but also includes direct to consumers sales via television and radio, such as QVC and the home shopping network (HSN), is considered one of the most controversial channels in the dietary supplements space for a number of reasons. Even in the early years of the channel, which were dominated by telephone sales, email solicitations and direct mail catalogues and brochures, the category, which we now call e-commerce and/or DTC, has been criticized for its lack of accountability and absence of best practices for product efficacy, pricing, consumer privacy, and data collection. Perhaps most worrisome, the online platform has become a haven for product discounting as well as providing cover for some of the industry's most questionable players. However, the channel has become increasingly popular among consumers, especially with the more recent development of online sales and product reviews, which has made it easy and

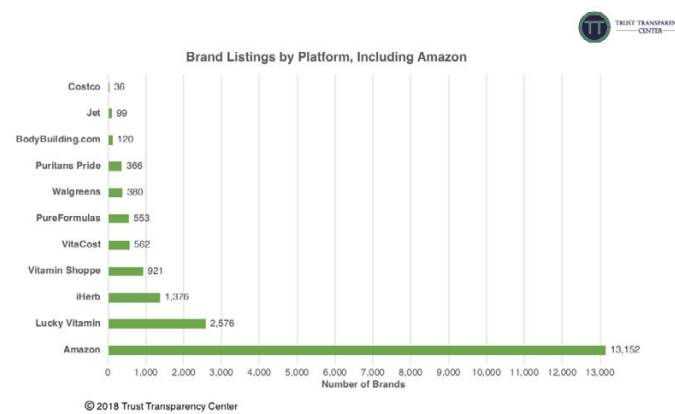
convenient to research products and brands and shop for the best price from the comfort of home. In the last two decades, this method of shopping has seen exponential growth in the sale of all kinds of consumer goods and now wields enormous economic power on a

global basis. This is largely due to the rising influence of Amazon. Originally established as a bookseller in 1994, the company now has undisputed global economic impact. As recently as April 2018, the Dow Jones Industrial Average dropped almost 500 points and almost 3.5% on the concern about the impact a trade war with China would have on Amazon.



The Amazon Effect

Amazon's influence on the supplement industry has become even more important as the market giant gobbles up share of supplement sales at an unprecedented rate seemingly without constraint. A recent report from Slice Intelligence indicates the vitamin and supplement category is outpacing other e-commerce categories. This same Slice report indicates U.S. vitamin and supplement e-commerce sales grew 40% in 2016 and at a 12 percent faster rate than the general e-commerce market. According to a 2017 Slice Intelligence survey of U.S. shoppers,



Amazon accounts for 77% of all U.S. vitamin and supplement sales made online. The remainder of sales in the vitamin and supplement e-commerce segment is almost entirely divided by vitamin and supplement specialized sellers such as Vitacost, Swanson, Puritan's Pride and iHerb. The two largest brick-and-mortar vitamin and supplement retailers, GNC and Vitamin Shoppe, combined receive approximately 2.3% of the total e-commerce market in their category, further underscoring the emergence and impact of the Amazon effect.

Another aspect of the Amazon effect is the product offering that providers carry and the vetting process they use. Platforms that have an extensive vetting process, logically, offer fewer brands, while those with a wide range of brands tend to provide less vetting. Amazon is the demonstrated leader in market offerings with over 14,000 brands. The range of brands being carried among those that promote multiple brands is 36 to 13,152.

One of the key complaints about e-commerce sellers in general and Amazon specifically is the vetting process to ensure that product offerings are safe and adhere to required quality standards including GMP requirements and meeting ingredient label claim.

Most online platforms have a fairly general process and/or terms and conditions as requirements for its vendors. These generally include:

1. **Name of the dietary supplement**
2. **The net quantity or amount of the dietary supplement**
3. **Nutrition labeling**
4. **The ingredient list**
5. **The name and place of business of the manufacturer, packer, or distributor**

Additionally, Amazon specifies the following:

"According to our Terms & Conditions, which are valid for all third-party sellers selling on Amazon, it is not allowed to offer products that are violating legal provisions. If we get notified about specific products, we will immediately review and, if confirmed, remove items as well as approach our sellers to secure compliance with our T&Cs."

Included on the Terms and Conditions included on the Seller Central Page is a listing of 23 prohibited listing categories and a list of banned products and ingredients numbering 1,391. Product names on the list include a 'hall of shame' of FDA blocked ingredients and products including Ephedra, steroids and Sibutramine.

It is fairly clear that online sellers, like Amazon, have some vetting criteria but it is inconsistent and completely reactive to some undefined impetus from the marketplace. A responsible vetting process should be both proactive and well defined, one that recognizes that supplements are not simply another category of 'widget'.

Given Amazon's growing impact across the U.S. market, it is unlikely this effect will diminish any time soon, but it is important that industry, including those in the CoQ10 segment, continue to monitor the impact on the industry.

Ultimately, the overall impact of e-commerce on the dietary supplements category is not fully known and may be under-reported. According to data from *Nutrition Business Journal's* 2017 Supplement Business Report online sales continued to see strong growth in 2017 jumping from 10.8% of total market sales for dietary supplements to 14%, but other estimates place this figure at nearer to 15% of total supplement sales or even higher.

The e-commerce segment of the CoQ10 market is the fastest growing supplement retail sector, mimicking the course of the entire dietary supplement market. The CoQ10 Association looked specifically at Amazon and independently tested 100 of the top brands sold on Amazon. In total, Amazon listed 1,036 CoQ10 brands representing 4,518 SKUs. Of the 100 brands tested, 66 tested below label claim with an average assay of 84% of label claim. Some brands tested 'zero' active ingredient. The CoQ10 Association is currently notifying each of the brands that tested below assay with the intent to assist with improving the overall quality of the category offering.

Brand		Current Sales Rank	Reviews
1. Nature Made	200mg sg	20	415
2. Doctor's Best	100mg sg	87	2,817
3. Qunol	100mg sg	150	1,667
4. Jarrow QH	100mg sg	506	1,251
5. Smarty Pants Masters 50s+ Gum		562	87
6. Puritan's Pride	100mg sg	2,028	239
7. Life Extension QH	100mg sg	2,094	379
8. VitaFusion	200mg Gum	2,404	486
9. aSquared	400mg Caps	2,499	458
10. Nature's Wonder	200mg sg	2,361	5
(Total Vit & Supps)			

Unfortunately, not all of these 10 products tested to label claim. The CoQ10 Association will be contacting those companies that did not pass label assay to work to correct the shortcomings in an effort to improve the category.

The Retail Channel: Mass and Natural Markets for the educated consumer

Brick-and-mortar retailers have long been the mainstay of the supplements business. This began with independent health food stores, specialty retailers and natural markets, which catered to strongly educated early adopters of the supplements, health and nutrition lifestyle, in the 70s and 80s. Then in the mid to late 90s, mainstream supermarkets and big box stores saw the potential of the burgeoning space and introduced offerings that contained more than just vitamins and minerals. Now, sales in both natural and specialty retail and the mass market make up more than 80% of the total supplement market sales, according to *NBJ* data. However, that picture is starting to shift again at least slightly with slowing growth in 2017 in both retail segments, to 3.8% down from 5.3% in the former and to 3.3% down from 5.8% in mass.

Industry experts say the slowing growth does not portend a serious turnaround in supplement sales, but rather indicates a more cyclical business trend in which consumers are shopping for supplements using a variety of platforms.

For CoQ10 specifically, sales in the natural channel were generally flat and saw the elimination of a number of SKUs. As noted earlier in this report, only a handful of brands make up a majority of the sales. There are about 483 SKUs in the channel, but no particularly dominant brands, with only about two dozen brands that have significant share. Natural Factors, NOW and Jarrow are the most prominent CoQ10 players in this category.

One of the problems for CoQ10 in this channel is that there is not much in the way of new developments. "The problem is CoQ10 is not new and it's not as exciting as it was 10 years or so ago" noted Alan Lewis, director of special projects for Natural Grocers (Vitamin Cottage) Natural Food Markets. Lewis predicts that CoQ10 would benefit from being studied as a part of a more comprehensive protocol, similar to what is being done with CBD. "Co Q10 needs to be properly ensconced as a critical element and part of a more comprehensive approach, but the industry hasn't really caught up to this yet."

Multi-level Marketing: Personalized selling

Multi-level marketing (MLM) companies or those that practice a direct-selling model using independent sales representatives have long been an important channel for dietary supplements, which have often needed a well-educated and evangelical sales force. It is still a booming business with global sales of \$189.6 billion in 2017, up 1.6%, according to data from the World Federation of Direct Selling Associations. The top markets for this model includes the United States, China, Korea, Germany, Japan and Brazil and the segment is predicted to see expanding opportunities in both advanced and developing economies.⁷²

The United States alone accounts for \$34.9 billion in sales in 2017 and is home to some of the most prominent MLM companies that are also key players in the dietary supplements market, including the Natural Health Trends Corporation, Shaklee, Amway, Herbalife, Nature's Sunshine, 4Life, Nu Skin Enterprises, and USANA Health Sciences.

While there are still some concerns that the MLM model may suffer at the expense of emerging digital platforms, the segment has shown fairly strong resilience. A 2017 article on the challenges facing this direct sales model noted that the question of whether these companies will emerge in the digital age will depend on how well they can capitalize on their ability to reach out to new audiences. These companies have an inherently social model with the potential to uniquely serve a marketplace in need of trust, reliability, and a strong network; these are certainly critical features of a competitive edge. But, the article argued that to fully leverage this affinity, MLM companies must invest in marketing to both their independent

representatives as well as the end consumer.⁷³ This means aggressively identifying and then targeting new groups – in new and unique ways. There is currently no company acting as an obvious lead in the MLM category. Whether that gap is filled by an existing company or a new to market company operating in either the ‘aging’ or ‘energy’ space remains to be seen.

Practitioner Channel: Key influencers

The practitioner channel in the United States has long been an appealing option for supplement brands. It offers fewer competitors, the possibility of a premium price point, and key potential to position a brand with strong clinical science as a science-based brand. At the same time, it requires a high degree of quality assurance and adherence to good manufacturing practices and regulatory constraints to attract a consumer base that tends to have more significant health issues and a more skeptical outlook about supplements.

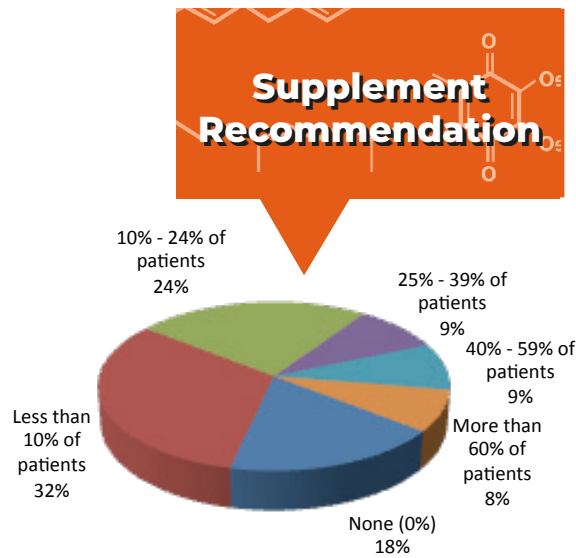
It is also generally a very fragmented landscape. While there is a broad and growing swath of practitioners who might potentially use supplements in the U.S., understanding and targeting the right type of practitioner is an important part of the approach to this channel. Physicians, for example, are concerned about stepping outside the medical boundaries of conventional, Western allopathic medical paradigms and many also have a well-established and ingrained bias against supplement and nutritional protocols.⁷⁴

Beyond physicians, there is growing consumer interest in alternative protocols as well as personalized medicine, which is prompting the rise of holistic practitioners ranging from chiropractors to naturopathic physicians and more recently non-physician health practitioners like nutritionists and dietitians. These practitioners are more receptive to supplement

use, but have many additional challenges, such as the time-intensive nature of their patient dealings and the fact their services are not covered under insurance plans, requiring the patient to pay for them out of pocket.

Although the channel is relatively small, it is a fiercely competitive space in which stakeholder companies must invest a lot in high-quality research, while also dealing with ongoing restrictions under DSHEA to communicate effective product messaging and an overall lingering perception that supplements still aren't regulated.

Despite all these challenges, it is a channel that seems tailor-made for CoQ10 products that have strong substantiation and a solid safety record. While this channel does have strong potential for CoQ10, it has been a tough nut for brands to crack open.



Source: CoQ10 Association Cardiologist Survey 2015

Moving MDs forward on the continuum

Given the strong clinically proven association of CoQ10 and heart health as well as the links between statin use and CoQ10 depletion, medical doctors--cardiologists, specifically--should be some of the greatest proponents of CoQ10 use. But there remains a significant gap between the 100% of cardiologists who prescribe statin drugs and the 50% of these practitioners who are concerned about CoQ10 depletion. This statistic was noted in the 2015 survey of cardiologists, conducted by the CoQ10 Association, and three years later the needle has not moved very much, according to CoQ10 Association executive director Scott Steinfeld. The reason for this, he explained, is that there is just not enough information being presented on a public scale to move awareness forward. “There is little eminent, recent research to create news, so cardiologists who believed and understood the concept then, still understand it now, but it just hasn’t changed much. Nevertheless, consumer awareness has increased due to the internet, which is doing far more to educate consumers than physicians,” Steinfeld said. There is, he added, “a strong

understanding of the potential of CoQ10, but they still want more proof.”

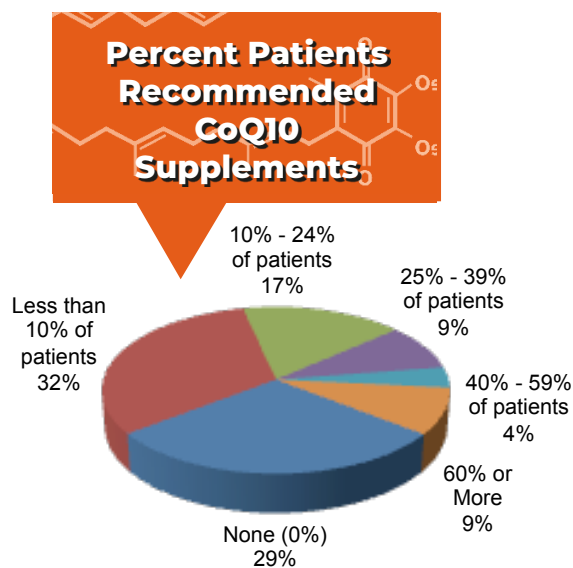
It should be noted that a recent study published in the *Journal of the American Heart Association*, Oct. 2018, concluded that CoQ10 supplementation ameliorated statin-associated muscle symptoms, implying that CoQ10 supplementation may be a complementary approach to manage statin-induced myopathy,⁷⁵ which may help prompt AHA support.

Meanwhile, the CoQ10 Association 2015 survey of 100 cardiologists in active medical practice with more than 25 patients monthly does provide some key insights to these issues. Here are some of the key findings:

Though it may be that the movement is slow, there is movement. According to this survey, a majority of cardiologists do understand the

51% of cardiologists do understand the statin/CoQ10 relationship, almost as many are either not aware of CoQ10 depletion or don't see it as a problem. Interestingly, cardiologists who have been in practice less than 10 years are more likely to be aware of these depletion issues. They are also prescribing statins at a much higher level, with 73% of these cardiologists recommending statins to more than 60% of their patients. (They were also more likely to recommend a higher initial dosage.) Another interesting dichotomy is that, despite being less likely to be aware of CoQ10 depletion issues, doctors who have been practicing medicine longer, tend to recommend CoQ10 at a higher rate as well.

And regardless of actual awareness, there is strong interest among these practitioners, with 22% of cardiologists who said they are actively looking to learn more about CoQ10 supplements, especially those younger doctors. Even among the cardiologists who are aware of CoQ10 depletion issues, 61% recognize that they could know more about the nutrient. Of those who are not aware of these issues, 29% are also actively looking for more information.



connection between statin use and CoQ10 depletion. And it is encouraging that CoQ10 is the most likely supplement to be recommended by cardiologists, with 45% of those surveyed listing CoQ10 unprompted as a supplement they recommend.

That noted, cardiologists are only recommending supplements to a relatively small percentage of their patients, and while some are convinced of CoQ10's benefits, many are still unconvinced that it really helps.

So, there is still plenty of work to do. Although

“ I will frequently offer CoQ10 to patients in whom I may be worried about side effects or in patients who are worried about myalgias.”

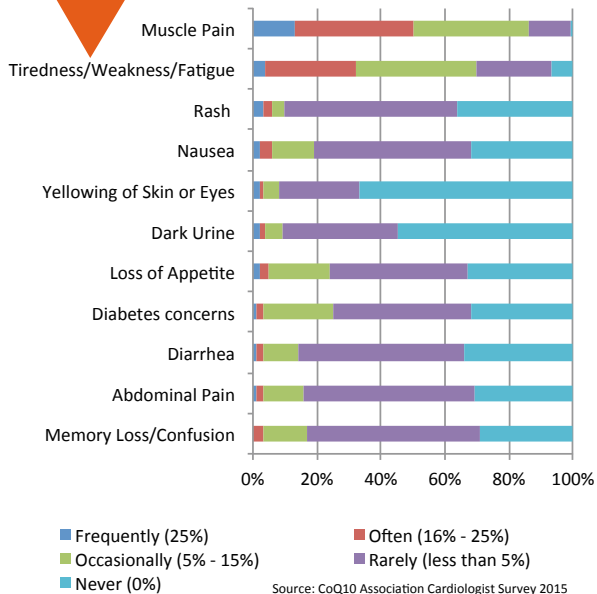
—Cardiologist, Pennsylvania

Addressing the gap

There are potential opportunities for brands to address this cardiologist gap by helping them understand the association between the side effects of statins and CoQ10 depletion. Patients are discussing their side effects from statins with their cardiologists and many are experiencing these problems.

Specifically, half of cardiologists reported that muscle pain was a problem for close to one in six of their patients and one third of these doctors say fatigue is a problem for 16% of their patients. They also note they are looking for solutions to help raise patient compliance to statin use.

Statin Side Effects



To manage side effects, cardiologists are most likely to lower statin dosage or discontinue use when patients experience side effects from these drugs. They only occasionally recommend dietary supplements. Of those doing so, 61% listed CoQ10 (unaided) as something they would recommend. Of those recommending CoQ10 supplementation, 78% are doing so because of statin side effects.

Healthcare Gridlock

As Americans show increasing interest in more proactive health measures, they are indicating they want medical doctors who can provide holistic and functional care,⁷⁶ however, according to *Holistic Primary Care*, the number of integrative physicians still falls far short of this demand.

Most supplement brands targeting this channel have built their business model around established practice models such as DCs, NDs and other alternative practitioners. But new types of health influencers are on the rise and are predicted to have increasing influence, which could offer new opportunities for supplements including CoQ10.

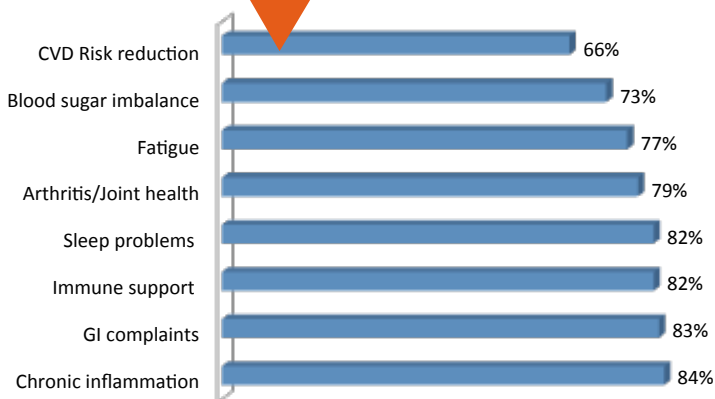
These practitioners do dispense supplement products for a wide range of health conditions from chronic inflammation to cognition.⁷⁷

While the reduction of CVD risk is relatively low on the list, two thirds of alternative physicians say they recommend supplements in this category.

One of the chief challenges for brands in the practitioner channel is distribution (many practitioners are not set up to sell and ship supplements they prescribed to patients) and this has led to a broad range of practitioner brands available through online sellers like Amazon and I-Herb, which not only sell products at a lower than suggested price, but also allows patients to bypass ongoing practitioner supervision by purchasing products directly online. Particular in the CoQ10 space, this can be problematic with regard to dosage and patient compliance which might also impact efficacy and results.

While many brands and practitioners are trying to reign in this problem through specialized practitioner-line distributors and MAP monitoring, many brands are still for sale online through unauthorized vendors.

Conditions for which Practitioners recommend supplements



Source: *Holistic Primary Care* 2016

7.2 Market Positioning

Overall most CoQ10 products, regardless of whether they contain ubiquinone or ubiquinol, are positioned generally for support of heart health, with some brands also noting enhanced cellular and mitochondrial function, energy enhancement and ATP production. Many brands do distinguish their product positioning based on dosage and these strategies do get much more varied in combination formulas with CoQ10 plus compounds such as PQQ, Red Yeast Rice or Tocotrienols.

Pricing strategy for CoQ10 is also widely varying depending on dosage, delivery format, added value ingredients and, of course, number of servings/pill per container. As a general rule, most brands offer products across a value spectrum:

On the whole, mass market and natural and specialty brands tend to be in the low-to-medium price range, although most natural and specialty brands tend to stay more in the medium-price range overall. Practitioner brands, even those sold online, tend to remain in the high-price range and many are more than \$2.00 per pill count. A few of these brands also occasionally dip into the medium-price range, especially online.

This breaks down fairly predictably in that higher value mass and specialty retail brands tend to target a broader audience with less deep knowledge



Low price point brands at below \$.25 per pill count



Medium price point at \$.26 to \$.75 per pill count



High price point at \$.76 or higher per pill count.

about the science, efficacy, dosage and quality benchmarks noted in higher priced brands.

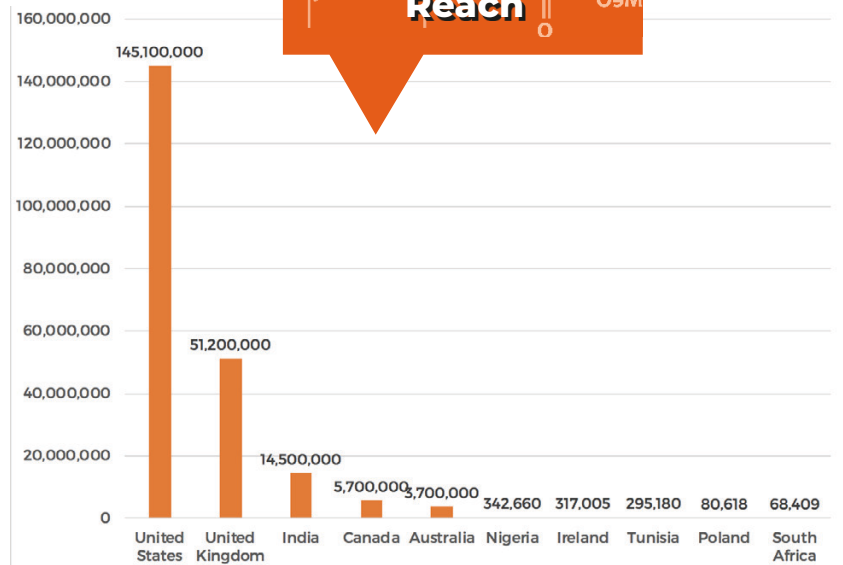
7.3 CoQ10 and the Media

For better or for worse, the media plays an important role in the awareness of nutritional ingredients and acceptance of their benefits among the public. Despite strong clinical evidence and unique acceptance among physicians and cardiologists, CoQ10 is no exception.

To understand how CoQ10's perception is driven by media reports, the CoQ10 Association analyzes media exposure of CoQ10 on a quarterly basis, with a focus on both traditional and social media and with an emphasis on consumer-reaching media outlets to discern trending topics, potential reach and tone of the reports as well as key influencers. Following is some of the most recent insights from media coverage of CoQ10 in 2018.

Given that the United States is by far the largest market for CoQ10 products, it is not surprising to find that media reports here reach almost triple the number of consumers compared to the next most prominent market in the United Kingdom.

Top 10 Countries by Reach



Source: Meltwater CoQ10 Q2 2018 Media Insight Report

Overall, the tone of most media reports was neutral to positive



Positive 44%



Neutral 55%



Negative 1%

The good news is that, while heart health issues are still predictably common in CoQ10 coverage, trending topics are expanding beyond this to other potential benefits of CoQ10. The most prevalent topics include:

- **CoQ10 and statins (recommendations that statin users take CoQ10)**
- **Heart disease prevention**
- **Supplements for energy**
- **Anti-aging supplements**
- **Supplements for athletes**

One of the most influential articles during this quarter was a CBS News piece entitled “22 popular supplements: What works and what doesn’t?” The article ranked a number of supplement ingredients from Aconite to Yohimbe (including fish oils and probiotics) with a thumbs up or a thumbs down and a short description. The article prompted peak reach for the quarter of more than 50 million consumers. CoQ10 received a thumbs up and was described as follows:

“Although proof is lacking, evidence suggests that CoQ10 (a vitamin-like compound also known as ubiquinone) can help prevent migraine, slow progression of Parkinson’s disease, ease effects of muscular dystrophy, and possibly lower blood pressure. Preliminary evidence suggests that it might also reduce the muscle aches that cholesterol-lowering statin drugs can cause, but there’s not yet enough research to recommend it for that purpose. Because CoQ10 can lower blood pressure, speak with your doctor before taking it if you take blood pressure medication.”

Another key article published in *Forbes* on May 31, 2018, entitled “Do alternative medicines for Alzheimer’s really work? Does anything?” prompted another peak with reach to approximately 40 million people. CoQ10 was prominently featured in the article and coverage is relatively positive:

“Research on CoQ10—though findings are mixed—has shown to improve symptoms of congestive heart failure, reduce blood pressure and when combined with other nutrients, might aid recovery in people who’ve had bypass and heart valve surgeries, according to Mayo Clinic. Studies have also shown some benefit of high doses in people in the early stages of Parkinson’s disease and those with Statin-induced myopathy. And some research suggests that CoQ10 might decrease the frequency of migraines and could improve physical performance.”

With regard to Alzheimer’s this article continues:

“Still the Alzheimer’s Association reports that the compound has not been studied for its effectiveness in treating Alzheimer’s. A synthetic version of this compound, called idebenone, was tested for Alzheimer’s disease but did not show any benefit. Little is known about what dosage of coenzyme Q10 is considered safe, and there could be harmful effects if too much is taken, the organization states.”

Recent key influencers and experts also indicate a growing scope of coverage on CoQ10 on topics ranging from energy and longevity to skin health. These influencers include Dr. Jewel Gamadia, a celebrity beauty acupuncturist; Kelly LeVeque, holistic nutritionist, wellness expert and celebrity health coach; Steven Masley, MD, author of *The Better Brain Solution*; Sandy Skotnicki, a Toronto dermatologist and skin allergy expert; and Dr. Chauncey Crandall, author of the newsletter “Dr. Crandall’s Heart Health Report.” As chief of the cardiac transplant program at the renowned Palm Beach Cardiovascular Clinic, Crandall is a notable advocate. In the article “Why Statins Cause Muscle Fatigue,” Crandall says:

“CoQ10 helps replenish the cell’s mitochondria, which is why I recommend that my patients taking statins also take 200 to 400 mg of this supplement daily.”

What is noticeably missing from this coverage is the lack of news about breaking research. It is also interesting to note that the most influential articles contain the least information about CoQ10. This coverage also clearly indicates a strong opportunity for both investment in new research as well as a joint and cohesive effort on the part of the CoQ10 segment to take messaging to a deeper level.

SECTION 8: MARKET EFFECT FACTORS ANALYSIS

Technology, Global Economic Factors and R&D

Although CoQ10 is one of the most well-studied supplement ingredients, the story and news on CoQ10 is relatively old. Coupled with the fact that new research and CoQ10-related technology has stalled in the last decade, CoQ10 is not generating as much news and media attention as it arguably should, given its efficacy and the prevalence of heart disease and statin use.

This is especially true with practitioners who are the key influencers and eager to learn more, according to the CoQ10 Association's Steinfeld. As noted earlier about 45% of cardiologists are recommending CoQ10 and especially younger doctors are eager to learn more about its benefits, Steinfeld noted. "There is no question but that the future of CoQ10 lies in the hands of practitioners."

Steinfeld believes the key in CoQ10 reaching its potential also lies with manufacturers working in synergy to further the science and education needed to support the ingredient. Suppliers have done amazing work in recent years maintaining product quality while also reducing cost, but ultimately this will have diminishing returns if there is not a concerted and ongoing effort to support research and consumer education, he added. "But both brand owners and suppliers need to reinvest in CoQ10 science and education because there remains many questions yet to be answered about how this ingredient can help the body."

Supply Chain Challenges: The tariff effect

On the positive side, CoQ10 is not generating much negative news associated with adulteration or poor efficacy that is currently plaguing many other ingredient categories. It would be ideal though if suppliers in particular can come together and support new entrants and technology as well as avoid patent litigation that has divided the supply segment in recent years.

For the present, the wild card for the global CoQ10 market is President Trump's recent trade tariffs which may add undue pressure to the CoQ10 supply since its primary source of raw material supply is from China. If the objective for the tariffs is to create new American jobs,

Steinfeld said, singling out ingredients like CoQ10 that have no alternative supply won't make that happen. "The U.S. market is the largest market for CoQ10 by a significant margin and many jobs here are tied to it. The tariffs won't help them."

The CoQ10 Association has taken measures to address the tariff situation. There are two possible United States Tariff Codes that have been historically used to import ubiquinone. One is tariff code, HTS Heading #29146200 Coenzyme Q10 (ubidecarenone [INN]CoQ10) which was on the first tariff list only. Another tariff code, (HTS Heading #2914990 Quinones nesoi Coenzyme Q10 (ubidecarenone [INN] CoQ10) is on the third list set at a 10% tariff, but this list has been threatened to increase to 25%. The association filed three appeals with the U.S. Tariff Department asking for their removal of the primary CoQ10 tariff codes from the lists. The appeals provide some background on the CoQ10 market and made the following points for consideration:

- **CoQ10 as a raw material ingredient is almost completely manufactured in China and approximately 800,000 kgs are currently imported annually at an approximate value of \$160 million.**
- **Chinese CoQ10 manufacturing began in 2006 and has contributed to both the capacity and affordability of the ingredient.**
- **There are approximately 16 million US consumers of CoQ10 representing almost \$800 million of retail product manufactured entirely in the United States and sold.**
- **CoQ10 is a raw material ingredient from China that is manufactured into finished dosage form in the United States contributing to over 300 significant United States CoQ10 brands. This United States production of Chinese manufactured ingredient creates significant job opportunities and significant health benefits for United States consumers.**

- **The economic impact of a 10% ad valorem tariff from a strictly retail perspective would be an estimated \$16 million realized from the tariff. This would translate to a \$54 million increased cost to the American consumer.**
- **Based upon forecasts, the retail impact of a 10% ad valorem tariff on US consumers would exceed \$100 million annually by 2020.**
- **The impact of the proposed tariff will add additional retail cost of this important ingredient, CoQ10, which would provide risk that some consumers could not afford the increase and lose access to the ingredient.**
- **A potential loss of jobs should companies that have a high dependence on the ingredient, CoQ10, cease to offer the product.**
- **There is not an ability for any United States producers to economically compete with the manufacturing economies of scale the Chinese have developed.**
- **One United States CoQ10 manufacturing facility was created in Pasadena, Texas in 2006 with a maximum capacity of about 10% of the current total market demand. That plant signed an agreement in 2017 with a Chinese manufacturer to purchase and distribute Chinese manufactured CoQ10 raw material. The cost of production at the United States facility is estimated to be double the cost of production in China, so a 10% tariff would not serve any purpose to support United States production.**
- **CoQ10 is not part of the Made in China by 2025 Strategic Initiative.**

As a result of these appeals, both CoQ10 codes were removed from the proposed lists asking for 25% tariffs. Because of the immensity of the third list, originally set at 10%, the task has been exponentially more difficult. The association hopes that this will be resolved and that it will provide a degree of stability for the market.

While this is a positive step, the trade issues do precipitate additional concerns. By October 2018, trade issues have so far been confined to raw material and bulk goods, Steinfeld noted, but a

larger concern now as the trade issues escalate is the disruption to overall business relationships in the broader dietary supplement segment between the U.S and China. "These issues may impact the industry whether we are on the tariff list or not," he said.

Moreover, if a trade war escalates, the perception in China of U.S. made goods, which currently have a strong "halo" among Chinese consumers, may be diminished, Steinfeld noted. "The Chinese have been very patient so far, but at some point that may end. This could be a significant factor for any companies working to enter the Chinese market."

Supporting R&D and the impacts of broader nutrition advances

Even if the CoQ10 space is considered somewhat staid, there are some exciting new stories to tell, like the recent follow-up study from Sweden regarding the lasting effects of CoQ10 and selenium. What's more, a surge in pharmaceutical applications may also be an important factor in driving demand for CoQ10 in the near term. As evidence reveals the potential of therapeutic doses of CoQ10 for specific diseases, such as Parkinson's Disease as well as other heart applications, CoQ10 will continue to be an important option in the supplement space. But more companies may have to invest in additional research and perhaps step into new regulatory categories such as orphan drugs.

The CoQ10 segment may also need to be prepared for broader advances in nutrition science, according to Martha Carlin, founder and CEO of The Biocollective, which is working to sharpen the focus on ingredient technology and restoring the microbiome's internal pharmacy through advanced modeling analysis and the market's first function-driven probiotic formulations. The company has developed a metabolic modeling computation engine that can look at a supplement in the microbiome and see how it works and what downstream metabolites are affected, Carlin explained.

Carlin's research is specifically relevant to CoQ10 in several ways. First CoQ10 is synthesized in the gut by bacteria and fungi through the Shikimate pathway, which is the same pathway targeted by glyphosate (a broad spectrum systemic herbicide and crop desiccant routinely

used in conventional agriculture) which proceeds the production of CoQ10. “Our bodies are supposed to be making CoQ10, but this low grade chronic exposure to glyphosate in the food supply is a destructive force in the microbiome. It breaks the pathways so lots of downstream metabolites don’t get made the way they used to in the body,” she said.

Carlin’s model can also test the efficacy of certain products in the body. “With an ingredient like CoQ10, which is often sold alone, there are ways using this model where we can see how other ingredients might improve its efficacy.”

“I think these findings can possibly really strengthen the position of CoQ10,” Carlin added. For one thing, she said, if this Shikimate pathway is broken by the food supply, as people begin to understand that and have tools to evaluate what’s going on in their gut it could be important. “Most humans can make CoQ10 but don’t realize that vitamins, hormones, enzymes and neurotransmitters are all made in our bioreactor. Until the food supply is fixed, that could be an upside for CoQ10.”

SECTION 9: CONCLUSION

Rewriting the CoQ10 Narrative

As has been noted throughout this report, the market size of the CoQ10 space is significantly larger than often estimated and has even more significance given CoQ10's potential from the global demographic shift toward an older population and the corresponding health needs of these aging consumers. People worldwide are looking for solutions to address the top health issues of age, which includes cardiovascular health as well as newly emerging issues of overall anti-aging and cognitive health, the latter of which is now seen as the most important factor for addressing quality of life and independence with age.

CoQ10 is well poised to reach this promising future, but is an ingredient in need of a new story that better communicates its proven benefits and sweeping potential for consumers of all ages. To do this, more investment is needed on all fronts and a cohesive industry approach will be important.

The question is not whether this is necessary, but how to achieve these goals, especially given the advances of personalized medicine and the potential encroachment of the pharmaceutical industry as more evidence supports nutritional protocols and supplementation.

The Future is Here

Advances made through efforts like that of the Biocollective are likely to usher in a new era for the overall supplement industry, within the next decade and perhaps even in the next five years. These types of advances will create better and more effective personalized products and make it much more difficult for the supplement industry to rely on the one-size-fits all approach that has served it for so long. "People will be looking at their gut several times a year and the supplements they are taking," Carlin said.

But at the same time, consumers are a long way from understanding metabolic pathways, Carlin said, and it is currently difficult to use the breakdown of these pathways as a selling or

educational tool. But, she noted, that as missing gut bacteria is tied more closely to synthesis of various nutrients, this is a concept that many people can grasp.

The growing relevance of the microbiome may also bring back an old foe to the supplement space and CoQ10 specifically. "Supplements are ahead of the curve in addressing the gut," Carlin said, "so pharmaceutical companies may start pushing back and making it harder for supplement companies to own the microbiome space. I think we should all be paying attention to FDA policy especially on the probiotics side. Probiotics have the potential to enhance health and explode supplement sales but it also has the potential to shine a light on low quality products." It is not outside the realm of possibility, she said, that we will see a requirement from FDA for genetic certification verifying the genomic make up of probiotics strains to ensure that products have been tested and contain what they say.

And if we see the rise of such technology, few supplements if any, including CoQ10, would be exempt.

The Time for CoQ10 is Now

CoQ10 has long been a proven ally for the cardiovascular system, as well as reducing the destructive side-effects of statins. But as the global market nears \$1 billion over the next two years, CoQ10's potential has hardly been realized.

Heart disease continues to be a top health issue worldwide. A recent study from Health Focus International noted that more than half of consumers surveyed continue to be concerned about cardiovascular health. Heart health will remain top of mind for consumers well into the future, predicted CoQ10 Association's Steinford. "A statement in the journal *Circulation* noted that most children between the ages of two and 19 do not meet American Heart Association classifications of ideal childhood cardiovascular health.⁷⁸ As these deficiencies in heart health

continue to get more attention, we will see more emphasis on supplementation,” he said.

Moreover, the science continues to further validate the ways in which CoQ10 impacts cellular and energy function in the body. CoQ10 is now understood to have important benefits for endurance athletes with increased needs for cellular energy and, more generally, for aging adults whose CoQ10 levels may naturally decrease with age. In addition, as the science improves, general awareness of the health benefits of antioxidants including, but not limited to CoQ10 (such as glutathione, vitamin D, melatonin, resveratrol and pterostilbene, and phenols), this should help boost consumer knowledge and interest.

There are also numerous other conditions where CoQ10 is seeing interest and these may offer emerging potential as more research is performed. For example, supplementing with CoQ10 can help those who suffer from migraines by reducing the number of attacks, according to a study reported in *Cephalalgia, the Journal of the International Headache Society*.⁷⁹ In addition, previous studies suggest that migraines may be caused in part by energy production that could presumably be improved with CoQ10 supplementation.⁸⁰

Chronic fatigue syndrome (CFS) is another area of potential for CoQ10. CoQ10 is a powerful antioxidant which can facilitate cellular respiration within the body. Supplementation has been found to reduce symptoms of fatigue in CFS patients as it helps to restore cellular function and reduce oxidation, which is often heightened during times of stress.⁸¹

In women’s health, CoQ10 also may play a role as new research suggests that women with polycystic ovary syndrome randomly assigned to 8 weeks of coenzyme Q10 plus vitamin E supplementation experienced an improvement in glycemic and anthropometric measures versus women assigned to either supplement alone.⁸²

Even diet trends like veganism may provide an increase in interest in CoQ10. Because a vegan diet limits intake of many foods, vegans need to be aware of potential nutritional deficiencies

as a result and should in particular ask their physician about how to get enough nutrients like long-chain omegas and CoQ10.

Ultimately, the story of CoQ10 will continue to resonate for consumers worldwide, from seniors seeking to stay active, manage their aging heart and maintain cognitive function to health-savvy young adults looking to boost energy, sports performance and minimize the internal and external effects of aging. Coupled with the intriguing new discoveries of a potential role for CoQ10 in other disorders such as Parkinson’s and Huntington’s Diseases, the overall potential for CoQ10 is potentially unprecedented. Dr. Sinatra’s prediction may in fact be spot on—“CoQ10 is foundational to a healthy lifestyle and almost everyone should be taking it.”

North America is expected to continue to be the leading regional market for CoQ10, with the strongest demand coming from the United States. Western Europe is likely to remain the second largest market for the foreseeable future, while Asia Pacific is predicted to be the fastest growing region with strong demand in China and potentially India as well, although these markets may be somewhat limited due to a lack of expendable income and understanding and awareness of CoQ10.

“The combined reality of heart disease along with the prominence of other health issues associated with CoQ10, should be driving this investment,” concludes Steinfeld. “Along with consumer’s proactive efforts to prolong their quality of life to an unprecedented age, these factors will continue to prompt growing demand for supplementation with CoQ10.”

However, growth of the awareness of CoQ10’s benefits is still holding this ingredient back. CoQ10 is a billion dollar story of which many people remain unaware. Even with the strong clinically proven association of CoQ10 and heart health as well as the links between statin use, almost half of cardiologists remain unaware and as many as 66% of statin users do not take CoQ10. General awareness of CoQ10 is even lower with average familiarity ranking in the minimal range.

This is due at least in part to the fact that the

internet, rather than any kind of comprehensive industry marketing approach, has played the most significant role in developing consumer awareness. The internet literally unlocks thousands of studies that support CoQ10. Consumers are generating their own interest and that is helping to drive demand.

While awareness has increased, the segment would benefit from additional investment in science and a cohesive message. There has not been recent important, game-changing science to drive further growth. While there are many reasons for this, the regulatory model in which dietary supplement ingredients exist in the United States, despite its positives, does provide some ongoing difficulties. Because dietary ingredients are part of a separate regulatory framework, the playing field, even for ingredients with strong substantiation is stacked against them. CoQ10 is a case in point. In the 2014 Q-Simbio study, CoQ10 showed a statistically significant 43 percent relative reduction of major adverse cardiovascular events.

One could argue that CoQ10 provided better outcomes than the pharmaceutical drug Entresto in the well-funded Paradigm-HF study published in *The New England Journal of Medicine* that same year.⁸³ While no one is suggesting that dietary supplements should replace pharmaceuticals, it is also not possible in this regulatory environment for representatives

of CoQ10 to enter a physicians' office to educate them on the potential benefits of CoQ10 as a safe, effective, low cost adjunct therapy for patients with moderate to severe chronic heart failure. The outcome of the Q-Simbio trial garnered no attention from the American Heart Association, although the American College of Cardiology did comment on CoQ10's possibilities with further industry supported science.

The pharmaceutical industry continues to dominate our health care system globally, while the dietary supplement industry has continually decreased spending on category building science and scientific education. It is time for all levels of the dietary supplement supply chain to resume development of science to further support the benefits of its ingredients like CoQ10.

In addition to continued investment in new scientific discoveries about CoQ10, industry stakeholders also need to develop a comprehensive and consistent story to help educate consumers about the real-world importance of CoQ10, along with the clinical evidence to support these benefits and to clear up the confusion about bioavailability and dosing. A joint industry approach that considers top motivators for supplement purchasers—such as a prominent media story, advice from family and friends, and/or witnessing the health decline of a loved one—is long overdue.

About the CoQ10 Association

The CoQ10 Association was founded with a mission to increase public awareness of CoQ10's surprising whole health benefits and expand manufacturer understanding of the solid science, supporting both well-known and newfound benefits. From public outreach and education events to industry member notifications regarding breakthrough science and market news, the CoQ10 Association is, at heart, a communication strategy liaison, engaging stakeholders, the medical community, consumers, academia, media, and government and regulatory groups, to promote exponential growth for CoQ10.

For more information
visit www.coq10association.org

Appendix

Additional resources (articles and studies)

[When a supplement out performs a drug](#)

[The effect of coenzyme Q10 on morbidity and mortality in chronic heart failure: results from Q-SYMBIO: a randomized double-blind trial. *JACC Heart Fail* Dec. 2014](#)

[Without greater transparency, CoQ10 won't meet its potential](#)

[Coenzyme Q10 Monograph:](#) Method of Action descriptions and condition-specific review of existing science

["The CoQ10 Connection: The Secret Nutrient for Optimal Health,"](#) authored by Stephen Sinatra, MD FACC.

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