USANA HEALTH SCIENCES

CLINICAL RESEARCH BULLETIN

Bioavailability of Ubiquinone versus Ubiquinol

BRIAN DIXON* PHD, TONI MCKINNON* RN, CCRP, ERIK SCHNEIDER*, MARK BROWN* PHD, TIM WOOD* PHD, JOHN CUOMO* PHD

** USANA Health Sciences, Inc. Salt Lake City, Utah, USA.*

Coenzyme Q is a member of the ubiquinone family of compounds. All animals, including humans, can synthesize ubiquinones, and hence it cannot be considered an essential vitamin. Coenzyme Q moieties are fat-soluble molecules consisting of a benzoquinone "head" and a variable length isoprene "tail" anywhere from one to 12 isoprene (5-carbon) units long. The coenzyme Q species found in humans, ubidecaquinone or coenzyme Q 10 (CoQ10), consists of 10 isoprene units (a total of 50 carbon atoms). Coenzyme Q10 is found in virtually all cell membranes and lipoproteins.[1] The ability of the benzoquinone head group of CoQ10 to accept and donate electrons is a critical feature in its biochemical functions involved in energy production and as an antioxidant.[1] Its ability to quench free radicals in lipid compartments of the cell and in circulation helps to maintain the structural integrity and stability of all cellular membranes and help protect lipoproteins from oxidative damage. CoQ10 supplementation has been recognized as having therapeutic benefits for several diseases including heart failure, ischemic heart disease, and degenerative neurological diseases.[2-4] But because CoQ10 is a lipid-soluble nutrient, its bioavailability can be limited.[5]

USANA uses a proprietary solubilization and delivery system in its current CoQuinone 30 and 100 products, which is highly effective in promoting optimal CoQ10 absorption. In fact, we have previously shown that our formulation has superior bioavailability to other commercially prepared available products.[6] However, competitors have recently released an alternative form of CoQ10, ubiquinol (the reduced form of CoQ10) to the market place with claims of increased bioavailability over ubiquinone (the form used in USANA products). In this study we specifically evaluated plasma levels of circulating CoQ0 (both ubiquinone and ubiquinol) at baseline, four (4), six (6), and eight (8) hours following a 300 mg dose of either USANA's CoQuinone 100 or the equivalent dose of the leading competitor's ubiquinol product.

Materials and Methods

This study followed a randomized, prospective, single-blind crossover design involving four (4) healthy volunteers. Regular intake of all dietary supplements

Recommended Citation: Dixon B, McKinnon T, Schneider E, Brown M, Wood T, Cuomo J. Bioavailability of Ubiquinone versus Ubiquinol. 2011. USANA Clinical Research Bulletin, USANA Health Sciences, Inc. SLC, UT.

containing CoQ10 was discontinued six days prior to the start of the study. Each subject took a 300 mg dose of ubiquinone or ubiquinol in random order on two separate study days. The products were taken at the start of the day alongside a standardized meal (plain bagel and cream cheese) after completing a 12 hour overnight fast. Blood samples were taken at baseline (prior to supplementation) and again at 4, 6 and 8 hours after supplementation. Subjects were fed the same standard meal for lunch, and they were allowed unlimited water over the course of the day. No additional food or beverages were allowed until after the final blood collection. All blood samples were analyzed using standard methods for determining circulating concentrations of CoQ10 (both ubiquinone and ubiquinol) via HPLC coupled to UV detection. Recovery efficiency was determined using an internal standard (coenzymeQ9). Data are expressed as the total CoQ10 present and expressed as micrograms/ mL. After a six day washout, all subjects were tested again using the same methods employed for the first study day.

Results

A significant time-dependent appearance of both forms of CoQ10 was seen ($p<0.0001$) in plasma, but no difference between ubiquinone and ubiquinol (Figure 1A). Moreover, when the total area under the curve was calculated for both forms, results showed no significant differences (Figure B). Taken together, these results clearly show that there is no difference in absorption as measured by the plasma appearance of CoQ10 between USANA's CoQuinone 100 and the leading Competitor's ubiquinol product.

Discussion

This study was undertaken to help clarify current discrepancies in the marketplace regarding which form of CoQ10 is the most bioavailable. Our results clearly indicate no differences between the two forms. Thus, claims of increased bioavailability utilizing ubiquinol formulations should be viewed critically. Furthermore, based on our previous Clinical Bulletin, the single most important factor in determining the bioavailability of CoQ10 is the carrier formulation; i.e., powder versus oil/lipid delivery systems.[6] Therefore, to ensure you are getting the most out of your CoQ10 supplement, be sure to choose a formulation utilizing oil/ lipid systems such as those found in USANA's CoQuinone product line.

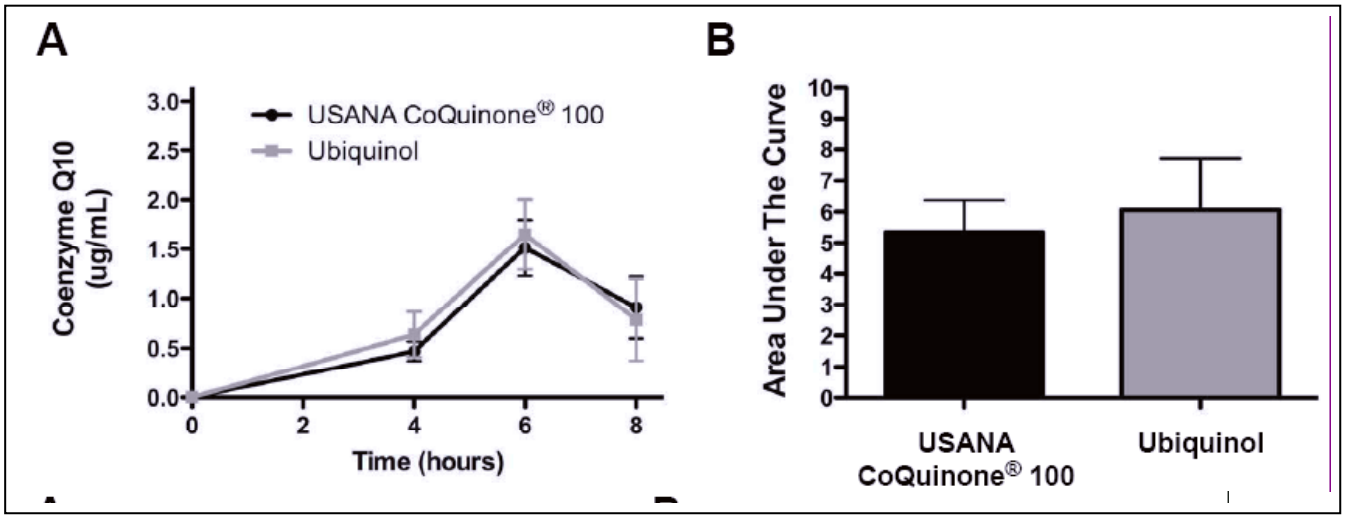

Figure 1. Bioavailability of USANA's CoQuinone 100 coenzyme Q10 product versus a leading competitors ubiquinol product. A. Net plasma appearance (baseline subtracted) of the various forms of CoQ10 over-time. Results show a significant time-dependent appearance of CoQ10 ($p<0.0001$) but no significant difference between USANA's CoQuinone100 or the leading competitors ubiquinol product. B. Total area under the curve was calculated from Figure 1A. Results again show no significant difference ($p=0.71$) between USANA's CoQuinone 100 or the leading competitors ubiquinol product.

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