

*Dr. Boles' experiences and practices*

**Coenzyme Q10:** Learn about an important nutrient that is often recommended and taken in patients with a variety of neurological and neurodevelopmental conditions.

**Overview:** Coenzyme Q10 (CoQ10) is an essential electron carrier in the respiratory chain, whereas almost all of the energy for the body is produced. It also functions as an antioxidant, which protects the body from damage caused by harmful molecules. Having been a mainstay of the “mitochondrial cocktail” for the treatment of mitochondrial disease for decades, many physicians now recommend CoQ10 supplementation for a variety of different medical conditions, including many neurological and neurodevelopmental conditions. Some people with these conditions have severe CoQ10 deficiency and substantial improvement occurs with CoQ10 supplementation. More frequently, CoQ10 levels are not deficient, yet supplementation results in clinical improvement via enhanced energy metabolism or driven by its antioxidant properties in ameliorating an underlying metabolic, redox, or mitochondrial condition. One study in children with autism reported that significant improvements were noted using CoQ10, including in communication and social skills as well as sleeping (see near the end of this article for details and references). CoQ10 is also sometimes recommended for treating a wide range of other conditions, especially heart disease and migraine, including cyclic vomiting. Given the above and its tolerability (side effects are rare and mild), many expert physicians recommend CoQ10 in their patients with a variety of neurological and neurodevelopmental conditions, especially in those with signs of mitochondrial dysfunction (see near the end of this article for details) and/or manifestations of migraine or chronic pain. CoQ10 is such an essential component of the mitochondrial cocktail that any mitochondrial-targeted approach is likely to fail unless sufficient CoQ10 is supplemented.

**What Form of CoQ10 is Best?** CoQ10 comes in two forms, ubiquinone, the oxidized form, and ubiquinol, the reduced form, which is the form comprising 80% of blood CoQ10. Both forms can be processed into the other by the body through either the loss or gain of electrons. Ubiquinone is the original and more clinically tested form, as well as the form that is in most dietary supplements. Many people claim that ubiquinol has better gut absorption and that a much lower dose is required. Ubiquinol likely has better penetration into brain, which is a good argument for the use of this form in the nutritional supplementation of individuals with autism and in any other condition involving the brain.

**What Are Good Sources of CoQ10?** Although CoQ10 is present in essentially all foods, the amounts are small and boosting CoQ10 levels is performed by dietary supplements. CoQ10 is not water soluble, and absorption from the intestines is difficult and highly dependent on the brand and form. There are many brands of CoQ10 on the market, yet in Dr. Boles' experience most of them are poorly absorbed, in that even extremely high doses do not lead to desired blood levels. In Dr. Boles' experience, Kaneka® and Tishcon® are the manufacturers that consistently produce excellent quality CoQ10. There are several brands that use CoQ10 from these manufacturers, so check the labels. If the label does not provide the manufacturer, it is unlikely to be one of these premium sources. The CoQ10 that these manufacturers produce is expensive, so brands that use their products want you to know that they buy the best quality material.

**Isn't CoQ10 in SpectrumNeeds®?** SpectrumNeeds® is the dietary supplement sold by NeuroNeeds® and primarily designed by Dr. Boles to act as a high-powered mitochondrial cocktail as well as providing neuroprotection and optimized micronutrition (e.g. a multivitamin). Yes, there is quite a lot of CoQ10 in that product. At recommended usage, there is 250 mg per day for children 20-40 kg (44-88 lbs) and 375 mg for adults over 60 kg (132+ lbs). However, it is all in the ubiquinone form since ubiquinol is not stable and bioavailable in a powder form. CoQ10 blood monitoring suggests that this amount is rarely enough, and Dr. Boles generally recommended additional CoQ10, usually ubiquinol, for his patients, whether or not they are taking SpectrumNeeds®. Additional CoQ10 may even be necessary for the full effects of SpectrumNeeds®.

**What CoQ10 Products Does Dr. Boles Recommend for His Patients?** The products that Dr. Boles generally recommends for his patients are shown and discussed in this section. These products were chosen based on Dr. Boles' experiences over time, and does not indicate the absence of other good products on the market. Check labels carefully, as there are many products that may seem to be the same.



NeuroNeeds® launched QNeeds® in May, 2019, which is a 100-mg softgel sourced from Kaneka® ubiquinol. Bioavailability is further enhanced by the addition of low dosing of natural ingredients, including alpha-lipoic acid, d-limonene, and capric and caprylic acids.

Dr. Boles is the Chief Medical and Scientific Officer of NeuroNeeds®, and the main designer of QNeeds®. With that stated, Dr. Boles believes that QNeeds® has advantages over other CoQ10 products on the market today, and he and his son personally take this product.

- Sourced from Kaneka® brand ubiquinol.
- Packaged in a small, very-easy-to-swallow softgel.
- Enhanced, state-of-the-art bioavailability in part due to additional natural ingredients, including alpha-lipoic acid, d-limonene, and capric and caprylic acids. Better bioavailability can mean lower dosing for the same blood level and clinical effect.
- Contains no soy or other common antigens.
- Retails at a good/reasonable price.

<https://neuroneeds.com>

However, no single CoQ10 product is perfect for everyone. People and families differ in terms of many aspects that impact on which CoQ10 product is right for them, including the availability of products in local retail stores, finances, and allergies/intolerance (e.g. many products contain soy). The ability to swallow capsules or presence of a feeding tube are other important considerations, and liquid products are often sought in those circumstances. However, CoQ10 itself has a taste many find disagreeable, and masking that flavor in a liquid product can be challenging. Also, brands vary in terms of capsule size, even for the same number of milligrams of CoQ10. Dr. Boles wishes to bring the following CoQ10 products to your attention.



#### Qunol®

- Sourced from Tishcon® brand ubiquinol.
- Lower price than many competitor's products.



#### Solace Nutrition®

- Cyto-Q® MAX is a concentrated, unflavored, liquid ubiquinol product, appropriate for tube feedings.
- Cyto-Q® is a diluted, flavored, liquid ubiquinol product, appropriate for oral usage.



#### Trader Joe's®

- Sourced from Kaneka® brand ubiquinol.
- Smaller capsule size than many competitor's products.
- Lower price than many competitor's products.

**How Much CoQ10 Is Recommended?** Dr. Boles doses CoQ10 based on blood levels, adjusting the dose until the blood level is between 4.0 and 7.0 mg/L, which is substantially above the normal range. The following are Dr. Boles' general recommendations for starting dosages:

- If on SpectrumNeeds® (on top of the ubiquinone provided by SpectrumNeeds®):
  - Children ages 5-12 years: Ubiquinol 200 mg twice daily for (400 mg per day)
  - Adolescents through adults: Ubiquinol 300 mg twice daily (600 mg per day)
- If NOT on SpectrumNeeds®:
  - Children ages 5-12 years: Ubiquinol 300 mg twice daily for (600 mg per day)
  - Adolescents through adults: Ubiquinol 400 mg twice daily (800 mg per day)

Twice a day dosing is usually recommended, although those with significant GI disease and difficulty with absorption may wish to give smaller amounts more frequently.

As with everything, start low and work up to the desired dosing, and do not start two products at the same time. As always, consult your physician. In particular, dosing for infants to preschool children is more difficult, and should be provided by your physician.

**Side Effects:** A minority of individuals have sleep difficulty if CoQ10 is provided at bedtime, which generally responds to moving the dose earlier. Other side effects noted are very rare and minor. An “energized”, more-active behavior is not uncommon on CoQ10, and can sometimes lead to misbehavior. However, most children get into trouble, from time to time, and ill children can be disincentivized from misbehaving for lack of the energy.

**The Caveats:** The information herein are Dr. Boles' general practice considerations, which may or may not apply to any individual. More information is available on the NeuroNeeds.com website, including some of the literature that supports these suggestions (<https://neuroneeds.com/index.php/active-ingredients/37-coenzyme-q10-also-known-as-coq10-vitamin-q-or-ubidecarenone-including-the-varieties-of-ubiquinone-and-ubiquinol>). However, these suggestions are based also in large part on empirical clinical observation (what seems to work in Dr. Boles' practice). Not all of the side effects and nuances are provided in the above summary. Note, that dosing information is provided per dose, with twice daily administration.

**The Details Regarding Its Use in Autism:** The role of CoQ10 in the treatment of autism is not well studied. One open label study was conducted with 100 mg of the ubiquinol form of CoQ10 in 24 children with autism ranging from age 3 to 6 years. Significant improvements were noted in communication skills, playing with friends, sleeping, and food acceptance with CoQ10 plasma levels above 2.2 mg/L (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3953391/pdf/OMCL2014-798957.pdf>). The use of CoQ10 in autism is mostly driven by its electron transport properties in the respiratory chain, as well as in its antioxidant properties in ameliorating an underlying defect on reactive oxygen species (ROS or redox) metabolism or mitochondrial dysfunction. Several lines of evidence support the notion that some children with autism have abnormal redox metabolism (this topic is reviewed in <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4910649/pdf/cmped-10-2016-043.pdf>), including abnormal glutathione metabolism. Oxidative damage to proteins has been documented in the brain and other tissues in autism. Redox abnormalities have been linked to mitochondrial dysfunction in children with autism, and mitochondrial dysfunction is one of the most prevalent metabolic disorders in autism. Biomarkers suggestive of mitochondrial dysfunction are identified in 30-80% of children with autism, while about 5-10% meet strict criteria for a diagnosis of classical mitochondrial disease. In support of this high prevalence of mitochondrial dysfunction in autism, are two studies that found lower than normal electron transport chain function in immune cells from 80% of the children with autism examined

(<https://www.ncbi.nlm.nih.gov/pubmed/?term=21119085>;  
<https://www.ncbi.nlm.nih.gov/pubmed/?term=24753527>).

**How Do I know If My Child Has Mitochondrial Dysfunction?** Some of the signs that a given individual with autism, or any neurological or neurodevelopmental condition, is more likely to have abnormal redox metabolism and/or mitochondrial dysfunction are the presence of chronic pain, increased fatigue on the day following unusual exertion, severe gastrointestinal disease, dysautonomia, or a history of regression (including any loss of abilities, whether transient or persistent). This list is incomplete, and you may want to consult with your physician. Laboratory testing can also help, especially genetic testing (<https://cnnh.org/cnnh-services/neurogenomics-program>).

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*Disclosure: Dr. Boles is the Chief Medical & Scientific Officer for NeuroNeeds LLC, the start-up company that makes SpectrumNeeds® and QNeeds®. As such, he may receive financial compensation based upon by efforts and/or the success of the company. However, he receives no appreciable additional compensation based of if you buy this product. You are under no obligation to purchase this or any product, whether recommended by Dr. Boles or another health care provider. As always, it is recommended that you contact your physician regarding SpectrumNeeds®, QNeeds®, and all other changes to disease management.*