Determination of Coenzyme Q10 in Over-the-Counter Dietary Supplements by High-Performance Liquid Chromatography with Ultraviolet Detection

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AIM
Products of coenzyme Q10 including the oxidized form of coenzyme Q10 (ubiquinone-10) and the reduced form of coenzyme Q10 (ubiquinol-10) are now among the most popular supplements in the US. Coenzyme Q10 has been purported as having therapeutic benefits for several diseases including heart failure, cardiovascular disease, hypertension, migraine headache, preeclampsia, neurodegenerative diseases, muscular dystrophy, digestive distress, inhibition of lipid peroxidation, and protection against renal ischemia and reperfusion injury. Several high-performance liquid chromatographic (HPLC) methods using ultraviolet (UV) detection have been previously described for measuring ubiquinone-10 in raw materials and dietary supplements. As ubiquinone-10 and ubiquinol-10 may co-exist, some pretreatments are necessitated to ensure all coenzyme Q10 is present in the fully oxidized state. Up to the present there is no HPLC-UV method has been reported for determining simultaneously ubiquinone-10 and ubiquinol-10. The aim of this project was to develop an analytical method for simultaneous determination of ubiquinone-10 and ubiquinol-10 contents in over-the-counter (OTC) dietary supplements.

RESULTS

A: Ubiquinol-10:

1. Weigh 10 mg of ubiquinol-10.
2. Dissolve ubiquinol-10 in 9 mL of ethanol.
3. Add 1 mL of water.
4. Add 100 mg of sodium dithionite.
5. Vortex-mixed for 2 min.
6. Incubated at room temperature in the dark for 60 min.
7. Filtered through a syringe filter.

B: Ubiquinone-10:

1. Prepare a standard solution of ubiquinone-10.
2. Inject a known volume of the standard solution into the HPLC system.
3. Measure the peak area or peak height of ubiquinone-10.

C: Stability of Ubiquinol-10:

1. Store the ubiquinol-10 at different temperatures.
2. Measure the peak area or peak height of ubiquinol-10 at different times.
3. Compare the stability of ubiquinol-10 at different temperatures.

DISCUSSION

1. Good linearity, accuracy, and repeatability were obtained for both ubiquinol-10 and ubiquinone-10.
2. No interference was observed from compounds such as vitamin E, β-carotene, idebenone, and ubiquinone-9.
3. Average recoveries of ubiquinol-10 and ubiquinone-10 were between 95 and 103%.
4. On prolonged standing at room temperature (>15-30 min), ubiquinol-10 oxidized and transformed into ubiquinone-10.
5. The oxidation of ubiquinol-10 was minimized by lowering the storage temperature.
6. The working standards are stable for several weeks when kept at -20°C.

CONCLUSIONS

An efficient and rapid method was developed for simultaneous determination of ubiquinol-10 and ubiquinone-10 in OTC dietary supplements. The method uses equipment commonly found in the typical analytical chemistry laboratory. The method has been proven to be linear, accurate, repeatable, and selective over intended dynamic ranges.

REFERENCES