CoenzymeQ10 Therapy for Patients with Primary Mitochondrial Diseases: Systematic Review

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Introduction

- CoenzymeQ10 (CoQ10) is an electron carrier in the electron transport chain which is part of the respiratory pathway
- CoQ10 supplementation is used for symptomatic benefit in primary mitochondrial disease
- No clear consensus regarding dosing and who would benefit from therapy
- Minimal reported side effects

Aims

- To identify current evidence for using CoQ10 in the literature
- Identify if there are any subtypes of mitochondrial disease that would benefit from CoQ10 therapy

Methods

- CENTRAL, EMBASE and Ovid were used for literature searches
- Search terms included "Ubiquinone", "Ubidecarenone", "Antioxidants", "Vitamins", "Coenzymes", 'Quinone", "Benzoquinone", "Mitochondrial Diseases", "Mitochondrial Myopathy", "Leber Hereditary Optic Neuropathy
- Study selection involved 2 stages
- Stage 1 – removal of duplicate papers, papers written in languages other than English and those that did not focus on primary mitochondrial disease
- Stage 2 – assessing sample size and bias, double blind trial, clear assessment of pre and post treatment with CoQ10

Results

Study Characteristics

- 66 papers initially from searches
- 5 papers following selection criteria
- 106 mitochondrial disease patients considered over the papers
- Trials from 1990 -2010
- Studied conducted in Europe, Taiwan and Canada
- Ages of patients = 16-82
- Mitochondrial disease subtypes included – MELAS, CPEO, LHON, NARP
- Studies used 1.2 ± 0.5 and 2mg/kg (3,4). Greatest daily dose was 600 mg twice daily (2)

Marker	Outcome
Lactate[1,2,3,4] (Measured in 4 studies)	Significant reduction following 15 minutes of endurance ergometry exercise, in two studies at either 1 minute or 5 minutes (2,3) No Significant difference 6-9 or 12-15 months post therapy in lactate levels post exercise tolerance (4) No significant change when patients exercised until subjective exhaustion(1)
Muscle Phosphocreatine[5] (Measured in one study)	Considered by one study No statistically significant increase in levels at 3 months and 6 months post treatment
Subjective Measurement of Fatigue	MELAS patients reported reduced fatigue when completing ADLs after 3 months of treatment (1)

Conclusion

- Most studies do not measure a baseline lactate
- No transferable finding between studies – differences in methodology and outcomes
- Youngest patient was 16 years old - hence more work needed for the paediatric population
- Potential benefit for MELAS patients but a larger sample size needed to assess
- Unclear if standard or weight based dosing is therapeutically beneficial

Future Works

- More standardised method of measuring outcomes (lactate levels at baseline and regularly post treatment)
- National register – currently no national data for the number of patients on CoQ10 treatment and when it was commenced in the diagnostic process
- Measurement of short term and long term outcomes (up to 12 months post treatment commencing)
- Larger pool of patients requiring cross-site networking
- Double Blind Cross-over trials would be recommended
- Standardisation on the therapeutic dose required

References

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