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Alkylaminoquinones as Multifunctional Radical Quenchers

Mitochondrial diseases are a group of disorders associated with dysfunctional mitochondria, often caused by genetic mutations to mitochondrial DNA. Mitochondrial defects are damaging, particularly to tissues with high energy demands such as neural and muscle tissues. Energetic defects have been implicated in forms of movement disorders, cardiomyopathy, myopathy, blindness and deafness. Membrane-penetrating antioxidants are often prescribed but treatment options are limited. There have been extensive efforts to find alternative therapeutics with superior activities.

Researchers at the Biodesign Institute of Arizona State University have developed novel multifunctional radical quenchers (MRQs) for the treatment of mitochondrial disorders. These alkylaminoquinone-based MRQs have a redox center which undergoes in situ redox cycling. These MRQs blunt oxidative stress-induced mitochondrial degradation, maintain mitochondrial membrane potential and confer cytoprotection to cultured Friedreich's ataxia cells under oxidative stress and have better intrinsic chemical stability.

These new MRQs have increased antioxidant potential over a-tocopherol and idebenone, and show great promise in the development of advanced drugs to treat Friedreich's ataxia and other diseases associated with impaired mitochondrial function.

Potential Applications

- Therapeutic candidates for mitochondrial diseases such as:
  - Friedreich's ataxia
  - Leber's Hereditary Optic Neuropathy
  - Kearns-Sayre Syndrome
  - MELAS (Mitochondrial Encephalomyopathy with Lactic Acidosis and Strole-like Episodes)
  - Leigh's Syndrome
  - Diseases with significant mitochondrial component: PD, AD, Obesity, etc.

Benefits and Advantages

- Inhibition of lipid peroxidation and prevention of ROS production in cells depleted of glutathione (GSH)
- Greater antioxidant potential compared to a-tocopherol and idebenone
- Preservation of mitochondrial membrane potential

For more information about the inventor(s) and their research, please see Dr. Hecht's departmental webpage