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Methylene Blue and Methylene Violet Analogs as Mitochondrial Therapeutic Agents

Mitochondrial dysfunction has been implicated in a number of diseases, including Alzheimer's disease (AD), movement disorders, diseases of the cardiovascular system, cancer, diabetes, blindness and deafness. Mitochondrial defects are damaging, particularly to tissues with high energy demands such as neural and muscle tissues. Membrane-penetrating antioxidants are often prescribed but treatment options are limited. Given the devastating effects of mitochondrial dysfunction, there have been extensive efforts to find alternative therapeutics for preserving mitochondrial function.

Researchers at the Biodesign Institute of Arizona State University have developed a suite of novel compounds for the treatment of mitochondrial disorders. These compounds are analogues of methylene blue and methylene violet and have been shown to blunt a number of the biochemical changes associated with mitochondrial dysfunction, without the cytotoxicity normally associated with the parent compounds. Further, these compounds were shown to be better antioxidants than the parent compounds.

These compounds represent a novel class of potential therapeutics for a variety of diseases associated with decreased 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 Stroke-like Episodes)
  - Leigh's Syndrome
  - Amyotrophic lateral sclerosis
  - Diseases with significant mitochondrial component: PD, AD, Obesity, Cancer

etc.

Benefits and Advantages

- Better antioxidants than the parent compounds
- Maintain cell viability under conditions of induced stress
- Efficient ROS scavengers
- Preserves mitochondrial membrane potential
- Augment ATP production
- Maintain NADH Oxidation in mitochondrial complexes
- Modulate SIRT3 activity
- Synthetic route of preparation which is more efficient than previously reported methods with higher yield and greater purity

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