Protection of Mammalian Cells Through the Inhibition of Reactive Oxygen Species Utilizing Cerium Oxide Nanoparticles

Timeline Of Exposure Of A Primary Retinal Neuron Culture To Treatment With Cerium Oxide Nanoparticles

A composition of ceria oxide nanoparticles and their biological applications for the protection of mammalian cells against reactive oxygen species, with additional specifications for the treatment of retinal neurons against light-induced degeneration.

Light-induced retinal degeneration and age-related macular degeneration (AMD) are two common medical conditions which lead to sight distortion and blindness. These conditions are often caused by harmful compounds known as reactive oxygen species (ROS). ROS are often generated as a byproduct of various cellular processes and/or during the retina’s exposure to UV radiation. ROS are extremely aggressive compounds which attack their surrounding tissue, causing irreversible damage over time. Currently, no satisfactory remedies to prevent the eventual outcome of blindness from these ROS exist, until now.

Technical Details

Cerium oxide nanoparticles show great potential to treat retinal degenerative conditions since studies have shown they protect neurons from apoptosis induced by hydrogen peroxide (an extremely harmful ROS) in tests on the cellular (in vitro) and whole organism (in vivo) levels. By breaking down these ROS, cerium oxide nanoparticles effectively extend the longevity of neurons and any other cells within the body which are plagued by the accumulation of these harmful chemical species.

Benefits

• The invention can potentially be used to treat virtually any disease caused by reactive oxygen species
• The therapeutics synthesis method is inexpensive and scalable to industrial quantities
• No other effective remedies exist for the prevention and treatment of light-induced retina degeneration

Applications

• Treatment of diseases:
  ◦ Age-related macular degeneration
  ◦ Light-induced retina degeneration
  ◦ Neuronal death in strokes
  ◦ Degenerative diseases such as Alzheimer’s, Parkinson’s and Huntington’s

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