

Therapeutic potential of cerium oxide nanoparticles for the treatment of sepsis induced cardiac dysfunction

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Severe sepsis is a medical emergency characterized by systemic inflammatory response syndrome that progresses to multi-organ dysfunction and death if left untreated. Sepsis is the leading cause of death in non-coronary intensive care units and ranks among the top ten causes of mortality in the United States. Current treatment for sepsis typically involves the use of antibiotics, fluid resuscitation, vasopressors, NSAIDs and mechanical ventilator support. Recent clinical trials using anti TNF- α antibodies, activated Protein C and antioxidants have been employed in animal models and have been shown to improve survivability by 30-40%. Although promising in animals, similar results in humans have yet to be realized. According to our knowledge, there is currently no FDA approved drug to treat severe sepsis suggesting an acute need for new therapeutic agent. Previous studies have shown that cerium oxide (CeO₂) nanoparticles exhibit anti-inflammatory, anti-bacterial and anti-oxidant activity. Herein we propose to examine the use of cerium oxide nanoparticles for the treatment of severe sepsis. Our preliminary data suggests that CeO₂ nanoparticles significantly improve survivability in Sprague Dawley rats with severe sepsis. Improvement in animal survivability was associated with normalization of body temperature and significantly decreased the levels of blood urea nitrogen along with major inflammatory proteins. Additional data also demonstrated that CeO₂ nanoparticles treatment decreased the expression of VCAM-1, a major marker for vascular dysfunction along with other proteins involved in inflammatory pathways in heart.

Biography

Nandini D.P.K Manne has earned his first doctoral degree in veterinary medicine from Sri Venkateswara Veterinary University, India. He is currently pursuing a doctoral degree in biomedical sciences at Marshall University while maintaining a strong focus on research and publishing articles in peer reviewed journals.

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