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The antioxidant nanoceria ameliorates diabetic podocyte injury by decreasing high glucose-induced oxidative stress

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Objectives:

Podocyte injury, a major contributor to the pathogenesis of diabetic nephropathy, is caused at least in part by the excessive generation of reactive oxygen species. The use of antioxidants can benefit the control and prevention of diabetes side effects. Cerium oxide nanoparticles (nanoceria) exhibit superoxide dismutase and catalase mimetic activities. We investigated the effect of ceria nanoparticles in cultures of high glucose exposed human podocytes.

Methods:

In this experimental study, we divided human podocyte into these groups: i. cell treated with 5mM D- glucose (control), ii. cells treated with 20mM D-mannitol+5mM D glucose (osmotic control), iii. Cells treated with 25mM D glucose (high glucose) and iv. cell treated with 25mM D-glucose +nanoceria. MTT assay, ROS formation (ampelx red assay, DHE stain and DCF-DA), fibrosis marker genes (TGF- β , collagen IV, α -SMA and fibronectin) and apoptosis marker (caspase 4) were measured and analyzed statistically.

Results:

High glucose (25 mM) treatment increased oxidative stress and fibrosis markers in human podocytes. Nanoceria at a concentration of 10 μ g/ml significantly decreased the high glucose induced cytotoxicity, ROS formation and fibrosis markers.

Conclusions:

The antioxidant of nanoceria particles have the potential as a therapeutic medicine for preventing ROS-related hyperglycemia oxidative damage