

The Effects of Polymeric Coatings on the Antioxidative Abilities of ▶ Cerium Oxide Nanoparticles

By

Jacob Lex

Nanoceria

- ▶ Cerium Oxide Nanoparticles
- ▶ Known for antioxidant abilities
- ▶ Scavenges Reactive Oxygen Species (ROS)
 - ▶ Shifts between oxidation states
 - ▶ Haber-Wiess Reaction
- ▶ Polymeric coatings improve effectiveness
- ▶ Benefits:
 - ▶ Increased antioxidant abilities
 - ▶ Lower cytotoxicity
 - ▶ Possible treatment for degenerative diseases

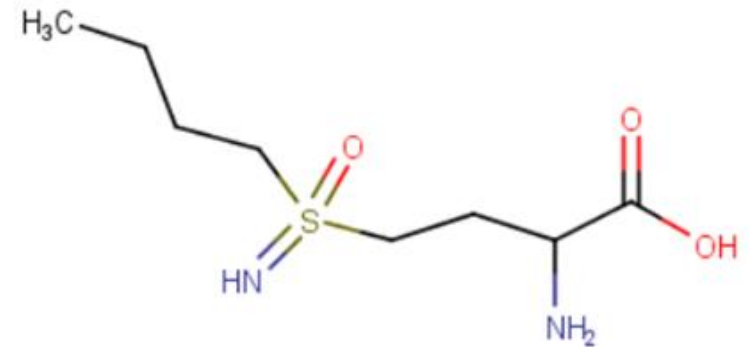


ROS

- ▶ Reactive Oxygen Species
 - ▶ Oxygens with unpaired e⁻
- ▶ Endangers cell
 - ▶ Cell damage
 - ▶ Cell death
- ▶ Linked to degenerative diseases

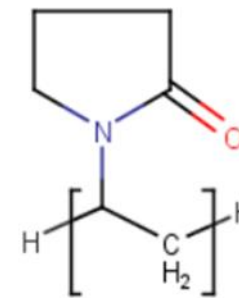
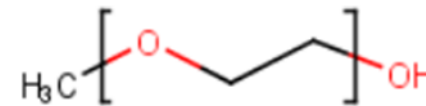
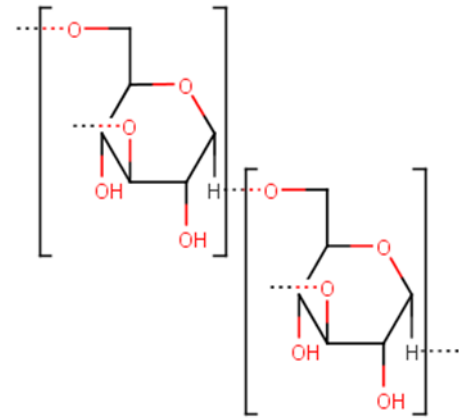
BSO

- ▶ Buthionine Sulfoximine
- ▶ Induces oxidative stress
- ▶ Depletes Glutathione (GSH) levels
 - ▶ GSH is the natural ROS defense
 - ▶ BSO inhibits the GSH synthesis
- ▶ Cells can no longer protect against oxidative stress

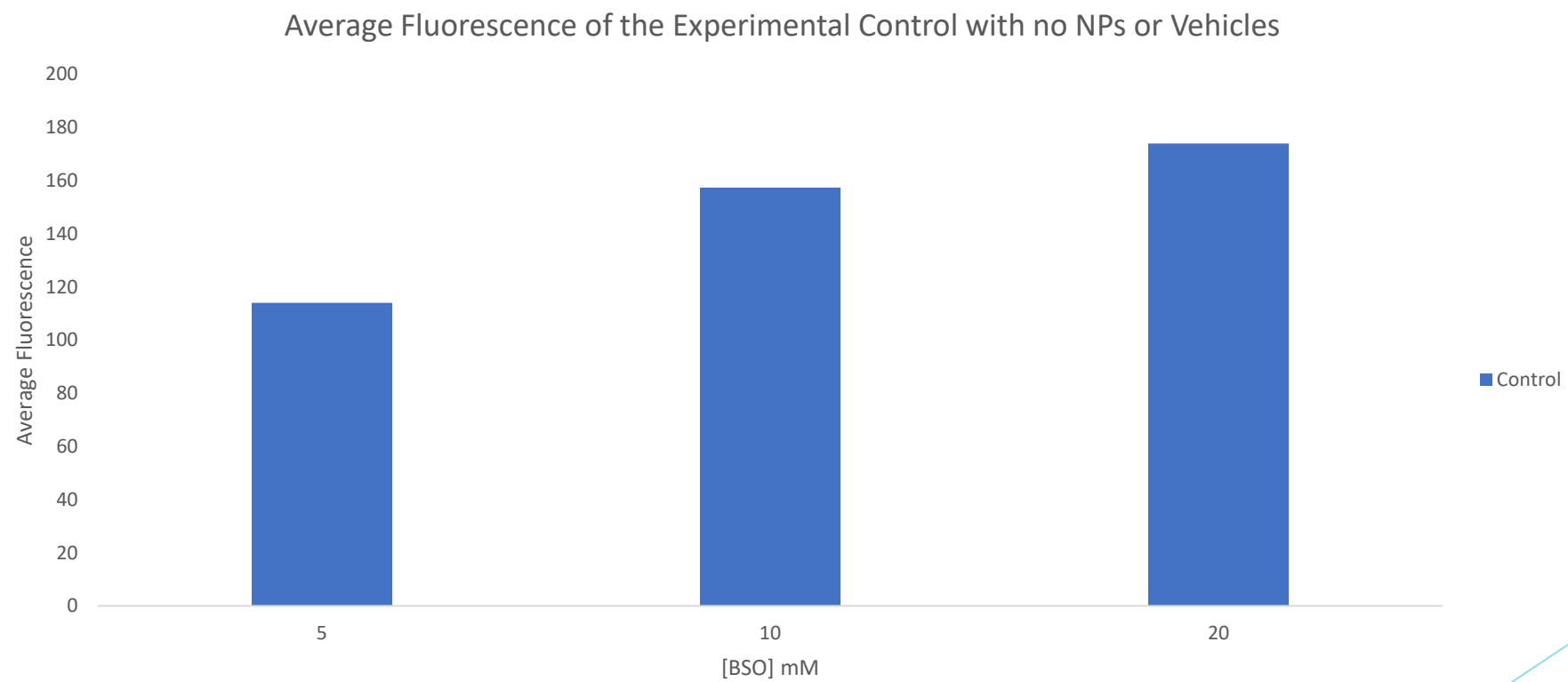


Method:

- ▶ Synthesize the nanoparticles
 - ▶ Dextran (DNC)
 - ▶ Polyethylene Glycol (PEG)
 - ▶ Polyvinylpyrrolidone (PVP)
- ▶ Culture and seed the cells
 - ▶ Mouse Fibroblast cells were used
- ▶ Treat cells with nanoparticles and vehicles
- ▶ Treat cells with BSO and DCFDA dye
- ▶ Test the ROS's effect using the microplate reader

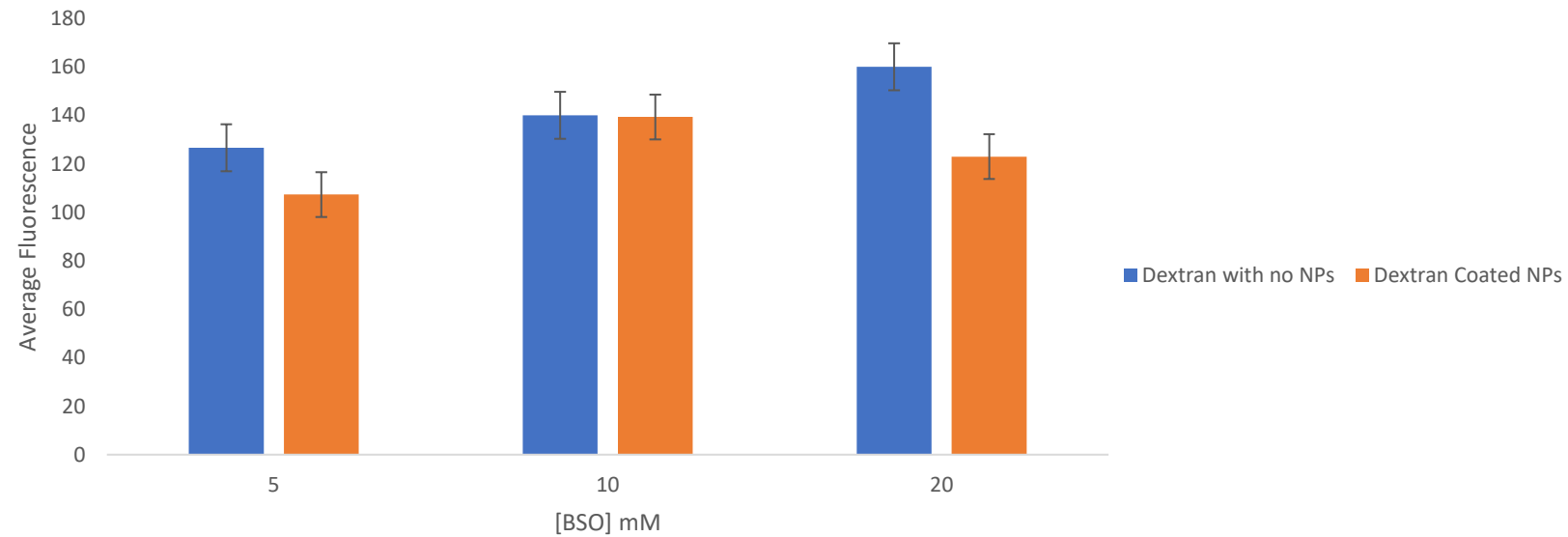


Results: Control



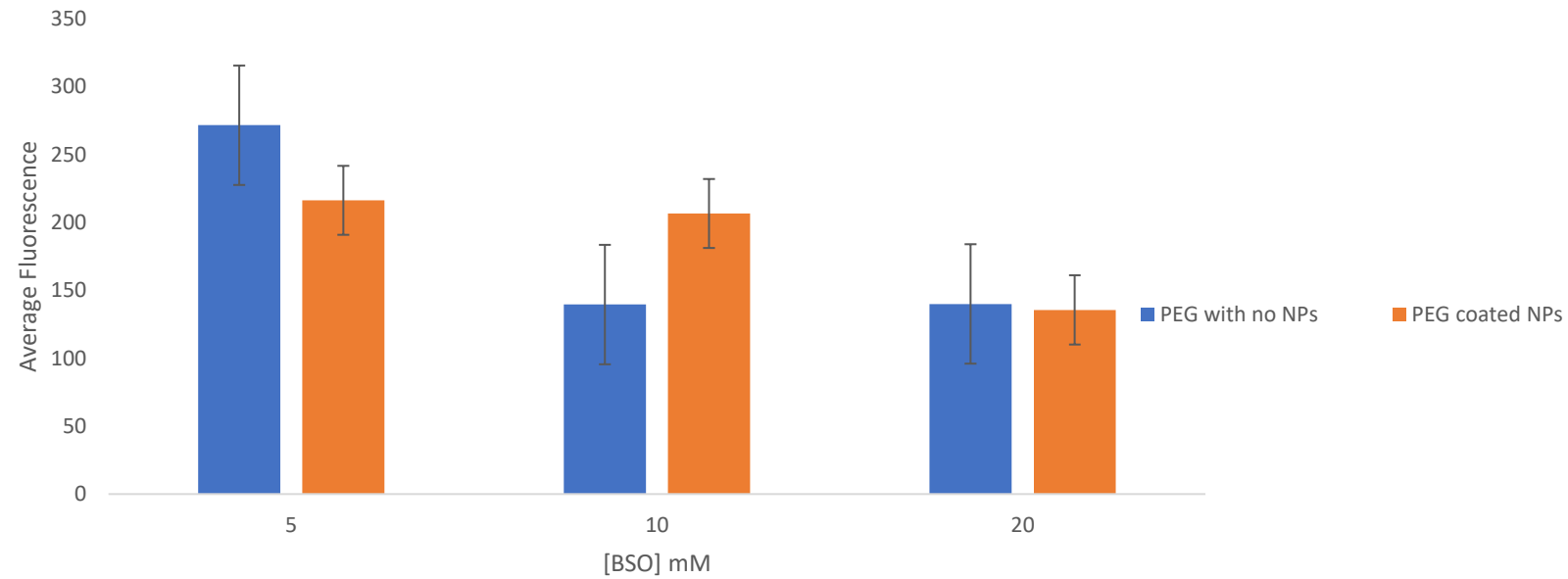
Results: DXN Coating vs ROS

Average Fluorescence of Dextran Nanoparticles vs. ROS



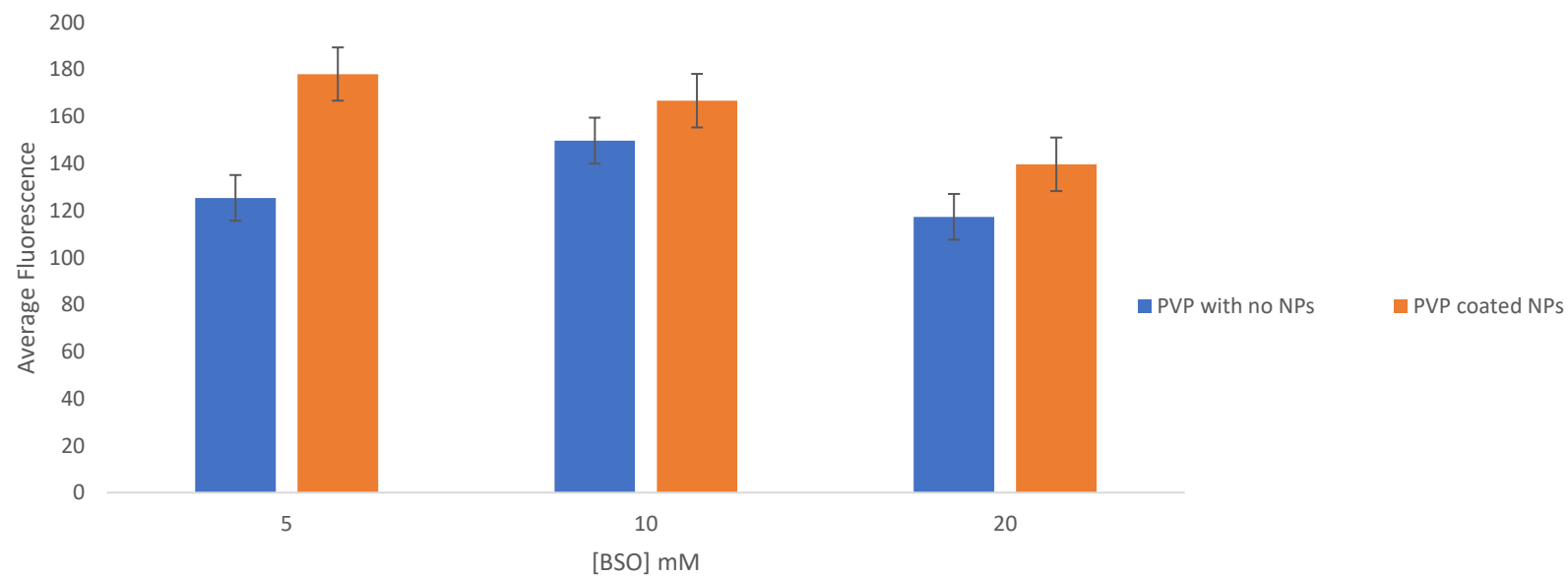
Results: PEG Coating vs ROS

Average Fluorescence of PEG coated Nanoparticles vs. ROS



Results: PVP Coating vs ROS

Average Fluorescence of PVP Coated Nanoparticles vs. ROS



Acknowledgements:

I would like to thank Dr. Gravelle for serving as my research advisor, Dr. Bethke for assisting with the ROS testing, and the Saint Vincent Chemistry Department