Functionalized Nanoceria Composition For Ophthalmic Treatment

Advantages
• Efficient (effectively delivers higher therapeutic doses which would otherwise be lost to eye drainage)
• Traceable (fluorescent tags allow for the treatments to be tracked throughout the body to ensure delivery to targeted area)
• Powerful Antioxidant (utilizing the nontoxic nanoceria construct provides addition antioxidant properties to the treatment)

Invention
The invention is a nanoparticle composition which can be utilized for the delivery of ophthalmic (visual pathway) drug treatments via an eye drop method, more specifically incorporating drugs targeted at glaucoma treatments. Additionally the nanoparticles are fluorescently tagged for tracking and efficiency studies of the treatment within the patient.

Background
Millions of Americans are diagnosed with an ocular disease every year, one of the most rampant being glaucoma. This debilitating disease, which most often leads to blindness, is caused by a buildup of carbon dioxide (CO2) resulting in an increased pressure within the ocular cavity. The buildup of CO2 is facilitated by the aberrant behavior of an enzyme named human carbonic anhydrase II. By utilizing drugs which inhibit this enzyme, glaucoma treatments can help to alleviate the pressure and save the patient’s eyesight.

Treatment for ocular diseases with current medicinal eye drops is an inefficient mode of therapy because of the eye’s ability to quickly drain away fluids resulting in only 1-3% of the dosage actually penetrating through the cornea and reaching its target. A far more efficient method of drug transport was thus created by attaching the desired drug components to a ceria nanoparticle.

Application
The nanoparticle architecture can be utilized to deliver and track a wide range of drugs directly into the eye for a variety of ocular diseases. The technology was originally designed to deliver drugs such as human carbonic anhydrase II inhibitors for the more efficient treatment of glaucoma, but is not limited to such.

Lead Inventor
Sudipta Seal, Ph.D.