

Water Soluble Ceria Nanoparticle-Embedded Contact Lens for the Protection of the Ocular Surface from Excessive Reactive Oxygen Species

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Increased level of reactive oxygen species (ROS) on the ocular surface can be cause of various eye diseases including dry eye syndrome and meibomian gland dysfunction. We developed water soluble ceria nanoparticles (CeNPs) for efficient elimination of excessive ROS and incorporated CeNPs into therapeutic contact lenses (CeNP-CLs) to replace eye drops which have disadvantages such as low bioavailability. Embedding of CeNPs in the matrix of contact lenses did not affect the physical properties of contact lenses including transparency and modulus. High ROS scavenging efficiency was observed in contact lens form without the release of CeNPs from the matrix of CeNP-CLs. By this ROS scavenging property of CeNP-CLs, the salvage effect of human conjunctival cells and human meibomian gland epithelial cells in high H₂O₂-containing media was confirmed. Wearing CeNP-CLs on the eyes of mice showed the reduction effect of corneal opacity after exposure of H₂O₂ on the eye. These results demonstrate the protective effect of CeNPs for high ROS on the ocular surface.