



## Nanotechnology Applications

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### Editorial Note

Nanotechnology refers to the techniques and methods used to study, design, and engineer materials on a molecular scale ranging from one to 100 nanometers. Nanotechnology research entails manipulating atoms and molecules with nanodevices in order to give them new properties and functions. Nanotechnology is sometimes referred to as nanomedicine or biomedical nanotechnology when discussed in the fields of biology and medicine. Nanomedicine in particular is the application of nanotechnology to medicine with the goal of restoring damaged tissue through drug delivery, tracking devices, nanoscale prosthetics, and gene therapy. Nanotechnology is sometimes referred to as nanomedicine or biomedical nanotechnology when discussed in the fields of biology and medicine. Nanomedicine in particular is the application of nanotechnology to medicine, with the goal of restoring damaged tissue through drug delivery, tracking devices or sensors, nanoscale prosthetics, and gene therapy. While protein based topical eye drops are a popular route of drug delivery they can be ineffective and cause systemic side effects as a result of bloodstream absorption. Disposable, nanoparticle laden contact lenses will improve treatment effectiveness while reducing systemic side effects. Researchers encapsulate proteins involved in wound healing in nanoparticles, which are then UV cross linked into hydrogel polyHEMA to create these contact lenses. Inorganic transparent nanoparticles and biopolymer nanoparticles are also included. The protein is released by a diffusion based mechanism and is tracked for 25 days. Hydrophilic proteins have been shown to be encapsulated in various forms of nanoparticles, and nanoparticle laden contact lenses are predicted to be considered a new mechanism of protein

(growth factor) drug delivery. This technology has the potential for widespread use. Though ARVO's research focuses on ocular drug delivery mechanisms it also looks into the role of nanotechnology in gene therapy. Maintaining corneal clarity and normal function requires a healthy corneal endothelium. Endothelial disease of the cornea is difficult to treat and often necessitates a corneal transplant. Researchers discovered that supplying therapeutic genes to corneal endothelial cells boosts their effectiveness. The role of gene therapy in various corneal diseases has also been investigated. The effectiveness of the GNPPEI vector in gene therapy is dependent on the existence of the corneal disease, according to these reports. Hazy corneas had comparable uptake to normal corneas 5% to 11% difference in gene expression but it was slightly lower than neovascularized corneas which had up to 31% transduction. Despite this, studies for corneal gene therapy show different efficacy based on corneal condition and toxicity based on vector type, they are promising. Using nanodevices to detect diseases is another hot subject in nanotechnology research. A 24 hour intraocular pressure sensing contact lens is one of the most important ocular nanodevices under research. Glaucoma treatment changed based on spikes and large diurnal IOP variations in a study that tracked the IOP of glaucoma patients over the course of 24 hours. This research along with others suggests that a 24 hour IOP sensor would be extremely beneficial. Researchers created a traditional contact lens with inorganic microstructures and microdevices in 2008, which can perform functions such as radio frequency power transmission to a contact lens and biosensing. Although there have been many recent developments in nanotechnology applied to the anterior segment, there have also been many research on nanotechnology and the posterior segment. Nanotechnology is an exciting field of study that has the potential to revolutionise disease detection, care, and management. To assist us in treating and controlling anterior segment disease, look for novel nanotech approaches through new instruments, exciting methods to alter disease course via gene therapy, and drug eluting devices.

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