

# Successful transplantation of in vitro expanded human corneal endothelial precursors to corneal endothelial surface using a nanocomposite sheets

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## Abstract

### Background:

Though the transplantation of in vitro expanded human corneal endothelial precursors in animal models of endothelial damage by injecting into the anterior chamber has been reported, the practical difficulties of accomplishing such procedure in human patients have been a hurdle to clinical translation. Here we report the successful transplantation of in vitro expanded human corneal precursor cells to an animal eye using a transparent Nano-composite sheet and their engraftment.

### Materials & Methods:

Human Corneal endothelial cells (HCEC) were isolated from human cadaver eyes with informed consent and expanded in the lab using a sphere forming assay in a novel Thermoreversible Gelation Polymer (TGP) for 26 days. HCEC obtained by sphere forming assay were seeded in a novel Nano-composite sheet, which was made of PNIPA-NC gels by in-situ, free-radical polymerization of NIPA monomer in the presence of exfoliated clay (synthetic hectorite "Laponite XLG") uniformly dispersed in aqueous media. After a further seven days in vitro culture of HCEC in the Nano-composite sheet, cells were harvested and

transplanted on cadaver-bovine eyes (n=3). The cells were injected between the corneal endothelial layer and the Nano-composite sheet that had been placed prior to the injection in close proximity to the endothelial layer. After three hours, the transplanted Nano-composite sheets were removed from the bovine eyes and subjected to microscopic examination. The corneas were subjected to Histo-pathological studies along with controls.

### Results:

HCEC formed sphere like colonies in TGP which expressed relevant markers as confirmed by RT-PCR. Microscopic studies of the Nanosheets and histopathological studies of the cornea of the Bull's eye revealed that the HCEC got engrafted to the corneal endothelial layer of the bovine eyes with no remnant cells in the Nanosheet.

### Conclusion:

Transplantation of in vitro expanded donor human corneal endothelial cells using a transparent Nano-composite sheet was feasible in bovine eyes and the HCEC an engrafted within three hours of transplantation. Pilot human studies could be planned for utilization of this material and strategy.