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Research Area:

Vision Research: The aim of the thesis was development of human corneal cell based scaffolds and tissue construct for corneal tissue engineering and explore various strategies to maximize and extend the long term preservation of corneas. The objectives were divided into two parts first part deals with corneal cells and tissue engineering, in which isolation, culture and characterization of three components of cornea i.e. limbal epithelial stem cells, stromal and endothelial cells were done and further natural and synthetic scaffolds were repopulated with these cells. The natural scaffold used in the study were decellularized corneal stroma which were decellularized by different methods and tissue construct was created using human corneal endothelial cells on decellularized stroma; the synthetic polymer used in the study was plasma treated poly-ε-caprolactone on which co-culture of limbal epithelial stem cells and mesenchymal stromal cells were also established as lamellar corneal tissue construct.

The second part of the thesis, “Improving Corneal Preservation Techniques” was focused on developing alternative methods for restoring corneal tissues structure and functions over prolonged period of time. Improvement in maximizing long term preservation techniques like in house preparation of intermediate storage media, glycerol preservation of cornea at optimum temperature and use of culture positive or septicemic cornea after sterilization (gamma sterilization) can increase availability of tissues for keratoplasty.

Publications:

1. Sharda Nara, Shibu Chameettachal, Swati Midha, **Himi Singh**, Radhika Tandon, Sujata Mohanty, Sourabh Ghosh. Strategies for faster detachment of corneal cell sheet using micropatterned thermoresponsive matrices. Journal of Materials Chemistry B (Manuscript accepted).
2. Sudip Sen, Shweta Sharma, Anand Gupta, Noopur Gupta, **Himi Singh**, Ajoy Roychoudhury, Sujata Mohanty, Tapas C Nag, Radihka Tandon. Molecular characterization of explant cultured human oral mucosal epithelial cells. **Invest Ophthalmol Vis Sci.** 2011 Dec 20; 52 (13):9548-54.