

# VISION SCIENCE AND EYE

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## Cultured Autologous Oral Mucosa Epithelial Cell Sheet (CAOMECS) for corneal epithelial regeneration

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**Statement of the Problem:** Corneal limbal stem-cell deficiency (LSCD) caused by ocular trauma or by eye disease leads to impaired corneal epithelial regeneration and conjunctivalization, neovascularization, which often results in significant vision impairment. Patients with bilateral or unilateral LSCD are currently treated with ex vivo cultured allogeneic or autologous transplant of limbal stem cells. Allogenic grafts require immunosuppression, and autologous grafts are associated with other risks. The purpose of this study is to use a carrier-free cultured autologous oral mucosal epithelial cell sheet (CAOMECS) graft as a therapeutic approach to improve the health and transparency of the corneal epithelium.

**Methodology & Theoretical Orientation:** Using a small biopsy from the buccal cheek, epithelial cells were isolated and cultured for two weeks on a temperature responsive surface (CellSeed Inc. Japan). CAOMECS was harvested and grafted onto the cornea of rabbits with experimentally induced LSCD.

**Findings:** Both rabbit and human CAOMECS grafts resulted to a multi stratified epithelium similar to corneal epithelium with basal cell positive for DeltaNp63 (a marker of progenitor stem cell). CAOMECS grafts had a healthy extra cellular matrix including balanced pro- and anti angiogenic factors and up-regulated levels of adhesion molecules necessary for the epithelial integrity. CAOMECS grafting onto corneas of rabbits with LSCD successfully re epithelized the ocular surface, reduced cornea vascularization and reduced fibrotic tissue re-growth. We also demonstrated that diseased corneas with LSCD showed little or no staining for adhesion molecules, while CAOMECS-grafted corneas showed normal expression of adhesion molecules and junctional complexes, which is indicative of a non-migratory behavior of cells in CAOMECS.

**Conclusion & Significance:** Carrier-free CAOMECS grafting improved the ocular surface in a rabbit model of LSCD. CAOMECS grafts renewed corneal epithelial cells, including basal cells positive for progenitor stem cells, acted as a barrier to conjunctivalization and neovascularization, and conferred anti-inflammatory as well as anti-fibrotic effects.

### Biography

Fawzia Bardag-Gorce has been studying ocular surface disease for the last six years, and has published and co authored six peer-reviewed publications in this field. She began her research on the treatment of limbal stem cell deficiency using Cultured Autologous Oral Mucosa Epithelial Cell Sheet (CAOMECS). During these six years, and under her supervision and guidance, her lab has successfully completed pre-clinical studies related to the efficacy and safety of CAOMECS cell-based therapy. She is currently directing a new study approved by the Institutional Research Board in which subjects are being recruited for the human oral mucosal epithelial cell sheet characterization. The long-term goal of this study is to regenerate corneal epithelium in patient with severe ocular surface diseases using autologous oral mucosa epithelial cell sheet grafts.

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