Corneal Wound Healing Using the Epicorneal Tissue Model

Objectives
To investigate corneal wound healing using the EpiCorneal in vitro human 3D tissue model.

Methods
Tissues were equilibrated for 1 hour and abrasion wounds were introduced by: (a) gently scraping the tissue surface with a P100 pipette tip (scratch wound), or (b) gently applying a 2 mm biopsy punch and carefully removing the cut-out tissue fragment with an aid of gentle vacuum application (biopsy punch wound). Chemical wounds were introduced by applying 0.5 µl of 1M NaOH for 15 min to the tissue surface. Wounded tissues were incubated in the Maintenance medium (COR-100-MM, MatTek) with or without Erlotinib (10 µM) for up to 5 days.

Results
Incubation of the wounded tissues in the growth factor-containing maintenance medium (COR-100-MM) resulted in complete tissue recovery in 3-4 days. The presence of 10 µM Erlotinib, EGFR inhibitor, inhibited wound healing of the EpiCorneal tissues. No or little expression of Cyclin D1 is observed right after tissue abrasion; upregulation of Cyclin D1 was observed 24 hr post-abrasion.

Conclusion
The EpiCorneal tissue model structurally and functionally reproduces corneal wound healing and will provide a comprehensive means to study and develop ophthalmic pharmaceuticals.