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Corneal Wound Healing | Application Note

Corneal Wound Healing Using EpiCorneal

Objective

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 the aid of gentle vacuum application (biopsy punch wound). Chemical wounds were introduced by applying 0.5 µL of 1M NaOH for 15 minutes to the tissue surface. Wounded tissues were incubated in maintenance medium (COR-100-MM, Mattek) with or without Erlotinib (10 µM) for up to 5 days.

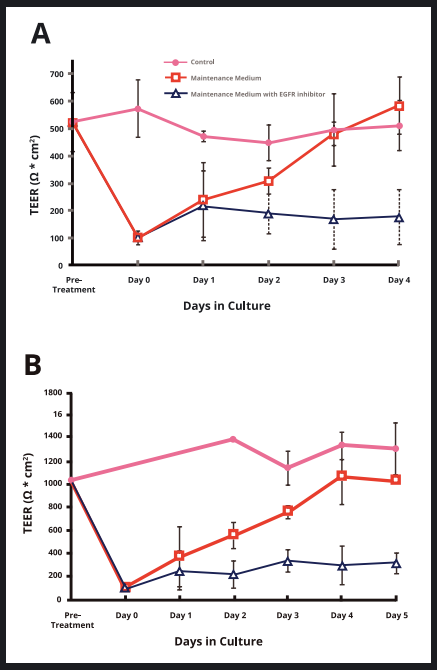

Figure 1. Recovery of the barrier properties of EpiCorneal tissues as assessed by transepithelial electrical resistance (TEER) after a: (A) scratch wound and (B) biopsy punch wound. Tissues were incubated in maintenance medium (COR-100-MM) alone or in the presence of EGFR Inhibitor (Erlotinib, 10 µM).

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 (Figure 1 & 2). The presence of 10 µM Erlotinib, EGFR inhibitor, inhibited wound healing of the EpiCorneal tissues. Expression of Cyclin D1 is observed right after tissue abrasion; up-regulation of Cyclin D1 was observed 48 hour post-abrasion (Figure 3).

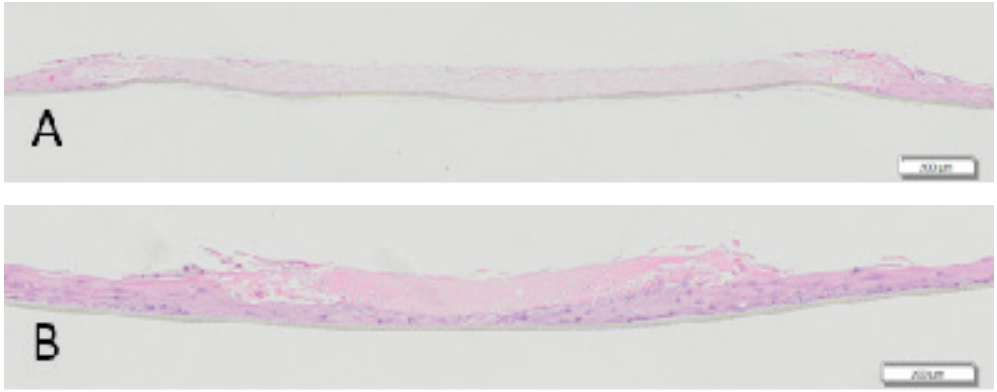

Figure 2. H&E cross-sections of EpiCorneal tissues in maintenance medium: (A) 30 min after and (B) 96 h after application of 0.5 µL of 1N NaOH.

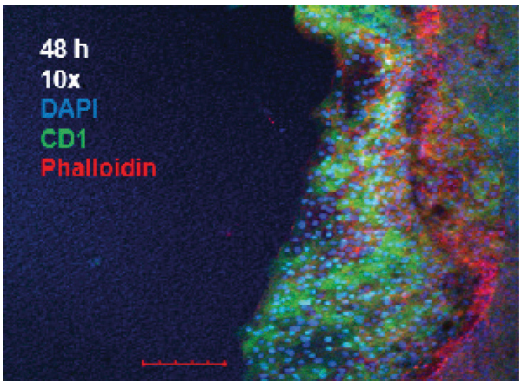

Figure 3. Immunofluorescent analysis. Cyclin D1 (CD1, green) expression in the leading edge of corneal epithelial cells during wound healing.

Conclusion

Corneal wound healing characteristics are achievable with the EpiCorneal tissue model, structurally and functionally, demonstrating its value as an vitro tool for the study and development of ophthalmic pharmaceuticals.