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Corneal injury: Expedited healing by alpha1-antitrypsin

Idan Farber[1]* and **Erez Tsumi**[2]
[1]Ben Gurion University, Israel
[2]Soroka Medical Center, Israel

Background: Corneal epithelial injuries, predominantly resulting from simple traumatic abrasions, can lead to visual complications, particularly when deeper and centrally located. Alpha1-antitrypsin (AAT) is a known serum anti-inflammatory and immune modulatory molecule elevated during inflammation. It has shown promise in accelerating human epithelial gap repair *in vitro* and in promoting wound healing in various *in vivo* models. Given the reparative properties of AAT, we aimed to explore its therapeutic efficacy in corneal injuries. Aim: To assess the impact of topical AAT treatment and dexamethasone (DEX) on corneal injury repair.

Methods: Corneal abrasions were induced in wild-type (WT) mice. The mice were divided into different treatment groups: WT receiving topical hAAT (7 microliters at a concentration of 4mg/ml), dexamethasone-treated mice, and control. Serial measurements of the abrasion area were taken over a period of 30 hours post-injury. Furthermore, histological examinations were conducted on the eye tissues, staining specifically for desmosomes. PCR was employed to evaluate the gene expression related to inflammation and desmosomes. A scratch assay was also executed on epithelial cells to gauge cellular migration.

Results: All groups achieved full wound closure by 48 hours post-wounding. Mice treated with hAAT exhibited a 3-fold faster healing rate compared to the untreated and dexamethasone-treated groups. DEX-treated mice displayed difficulty in closing the corneal injury relative to the control and hAAT groups. Histological studies revealed increased desmosomal gene expression after wound closure in the hAAT-treated group. PCR results indicated reduced inflammation and an early upsurge in epithelial migration and desmosomal gene expression in the hAAT-treated group. The scratch assay affirmed that hAAT treatment enhanced cellular migration.

Discussion: AAT presents a promising therapeutic potential in accelerating the repair of corneal abrasions, standing in stark contrast to the impediment observed with dexamethasone treatment. Further investigations are underway to comprehend the underlying mechanisms and to extend its applicability to other corneal conditions.