World Academy of Science, Engineering and Technology
International Journal of Medical and Health Sciences
Vol:18, No:08, 2024

Smart Coating for Enhanced Corneal Healing via Delivering Progranulin

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Abstract : The cornea serves as a vital protective barrier for the eye; however, it is prone to injury and damage that can disrupt corneal epithelium and nerves, triggering inflammation. Therefore, understanding the biological effects and molecular mechanisms involved in corneal wound healing and identifying drugs targeting these pathways is crucial for researchers in this field. This study aimed to investigate the therapeutic potential of progranulin (PGRN) in treating corneal injuries. Our findings demonstrated that PGRN significantly enhanced corneal wound repair by accelerating corneal re-epithelialization and re-innervation. In vitro experiments with cultured epithelial cells and trigeminal ganglion cells further revealed that PGRN stimulated corneal epithelial cell proliferation and promoted axon growth in trigeminal ganglion cells. Through RNA-sequencing (RNA-seq) analysis and other experimental techniques, we discovered that PGRN exerted its healing effects by modulating the Wnt signaling pathway, which played a critical role in repairing epithelial cells and promoting axon regeneration in trigeminal neurons. Importantly, our study highlighted the anti-inflammatory properties of PGRN by inhibiting the NF-κB signaling pathway, leading to decreased infiltration of macrophages. In conclusion, our findings underscored the potential of PGRN in facilitating corneal wound healing by promoting corneal epithelial cell proliferation, trigeminal ganglion cell axon regeneration, and suppressing ocular inflammation. These results suggest that PGRN could potentially expedite the healing process and improve visual outcomes in patients with corneal injuries.

Keywords : cornea, wound healing, progranulin, corneal epithelial cells, trigeminal ganglion cells
Conference Title : ICOCD 2024 : International Conference on Ophthalmology and Corneal Disorders
Conference Location : Tokyo, Japan
Conference Dates : August 15-16, 2024