Stem Cell-Derived Exosomes for the Treatment of Corneal Scarring

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SUMMARY

UCLA researchers in the Department of Ophthalmology have developed a novel method to heal corneal scarring using exosomes from immortalized corneal stem cells.

BACKGROUND

Corneal stromal scarring is the leading cause of corneal blindness, the second most common type of blindness globally. The current options to restore vision are corneal transplantation or treatment with corneal stromal stem cells (CSSC), which release exosomes – vesicles containing various cellular factors – that promote healing to reduce corneal scars. However, neither are easily accessible options. Corneal transplantations suffer from extreme shortage of transplantable cornea tissues. Donor-derived CSSCs have a limited life span and feature different scar-reducing efficiency. In addition to these disadvantages, donor-derived CSSCs often produce inconsistent numbers of exosomes of varying quality. A constant and consistent supply of CSSC-derived exosomes would revolutionize treatment of corneal scarring.

INNOVATION

Researchers at UCLA have developed immortalized CSSC lines that produce a constant supply of exosomes that can be added to the scar site. The exosomes from these immortalized CSSC lines were demonstrated to increase the capacity of wound repair, reduce the scar area, and decrease expression of scar-forming genes. These exosomes have consistently high healing efficiency and, because they come for immortalized cell lines, are readily available and scalable for production.

APPLICATIONS

- Non-surgical procedure to treat corneal scars
- Topical solution for emergency situations involving corneal injury
- Wound healing and scar prevention

ADVANTAGES

- Application of exosomes does not require a surgical procedure
- Consistent, high scar-healing capacity
- Constant supply
- Cost-efficient
- Scalable production

RELATED MATERIALS

- Pellegrini, Graziella, et al. "From discovery to approval of an advanced therapy medicinal product-containing stem cells, in the EU." Regenerative medicine 11.4 (2016): 407-420.
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- Chen, Yinyin, et al. “Identification of novel molecular markers through transcriptomic analysis in human fetal and adult corneal endothelial cells.” Hum Mol Genet 22.7 (2013): 1271-1279. doi: 10.1093/hmg/dds527
- Nakatsu, Martin, et al. “Human Limbal Mesenchymal Cells Support the Growth of Human Corneal Epithelial Stem/Progenitor Cells.” Invest. Ophthalmol. Vis. Sci. 55.10 (2014):6953-6959. doi: 10.1167/iovs.14-14999.

CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.

INVENTORS

- Deng, Sophie X.

OTHER INFORMATION

KEYWORDS

Corneal scarring, Corneal transplantation, Exosome, Stem cell, Immortal cell line

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Medical**
  - Disease: Ophthalmology and Optometry
  - Therapeutics

RELATED CASES

2017-838-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,257,266	03/25/2025	2017-838
European Patent Office	Published Application	3758756	01/06/2021	2017-838

Additional Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Xenobiotic-Free Culture System To Expand Human Limbal Stem Cells

UCLA Technology Development Group
10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095
https://tdg.ucla.edu
Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu