Innovations
UNIVERSITY OF COLORADO
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Two Layer Retinal Tissue Transplant for Age-Related Macular Degeneration

Problem
No treatment for many retinal degenerative diseases

Technology Overview
First two-layer retinal tissue containing photo-receptors and RPE

IP Status
- PCT application pending
- Available for licensing or co-development

Value Proposition
- Light-sensitive photoreceptors
- Replication of normal retinal cellular organization
- 2-layer retinal transplant

Market Attractions
- Tissue regeneration
- Potential to "cure blindness"

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Problem: Retinal degenerative diseases are caused by the dysfunction and death of photoreceptor cells and can lead to irreversible vision loss or complete blindness. One of the most prevalent retinal degenerative disease is age-related macular degeneration (AMD), affecting about 15 million people in the US and 170 million people worldwide. There is currently no effective treatment for retinal degeneration. However, in recent years, stem cell-derived tissues have become a promising source of therapeutic strategies for the treatment of retinal degenerative diseases.

Technical Solution and Key Value Propositions:

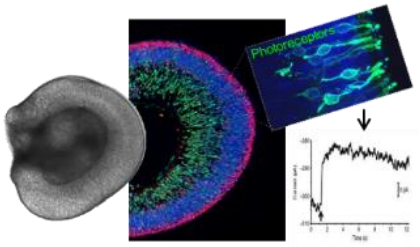

Figure 1. *hiPSCs form 3D retinas containing characteristic layers that recreate native cellular organization. Photoreceptors achieve advanced differentiation, including light response.*

A University of Colorado research group led by Dr. Maria Valeria Canto-Soler has developed a new technique to produce a dual layer retinal tissue transplant derived from human induced pluripotent stem cells (hiPSC) containing a layer of photoreceptor cells and an underlying layer of retina pigmented epithelial (RPE) cells. Together, the photoreceptor and RPE layers recreate the cellular organization and functional processes of the human retina. This dual-layer implant is the first to use technology that generates stem cell-derived human retinal tissue with functional light-sensitive photoreceptors (Figure 1).

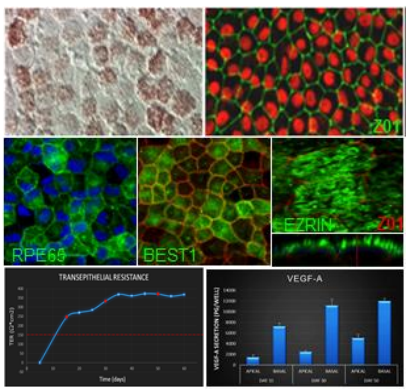

Figure 2. *Generation of highly mature functional RPE*

The new technology also allows the generation of highly mature functional RPE tissue that shows the characteristic pigmented cobblestone pattern, is polarized and expresses functional proteins of mature RPE tissue, achieves physiological trans-epithelial resistance and shows polarized release of bioactive molecules (Figure 2).

Key Documents and Sources:

1. Stem cell-derived cell cultures, stem cell-derived three-dimensional tissue products, and methods of making and using the same. PCT patent application pending.

2. Generation of three-dimensional retinal tissue with functional photoreceptors from human iPSCs. Zhong et al., 2014. Nat Commun.

3. Three-dimensional automated reporter quantification (3D-ARQ) technology enables quantitative screening in retinal organoids. Vergara et al., 2017. Development.