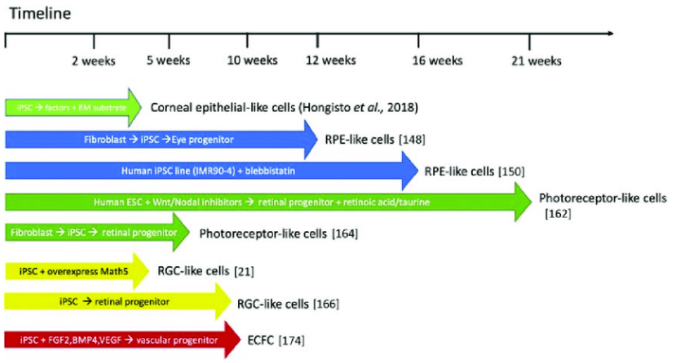
TEER ENABLES QUANTIFICATION OF OPHTHALMIC BARRIERS IN EYE-RELATED DISEASE AND IS CRITICAL FOR ASSESSING THE FUNCTION OF RPE CELL THERAPIES

TEER ENABLES QUALITY ASSESSMENT OF STEM CELL-DERIVED RPE CELLS, DEMONSTRATING FUNCTIONALITY FOR PRECLINICAL AND CLINICAL STUDIES

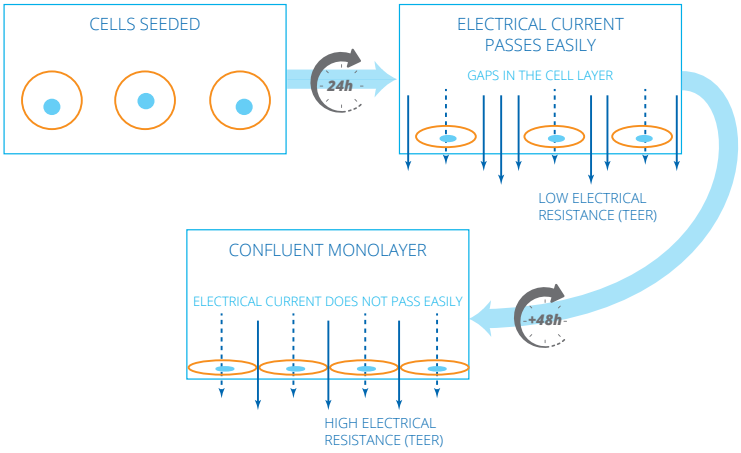
Cell therapy is a promising approach for retinal degenerative diseases, such as age-related macular degeneration (AMD), Stargardt's macular dystrophy (SMD), and retinitis pigmentosa (RP), and remains an active field of research and therapeutic development. The Retinal Pigment Epithelium (RPE) is known to be the key player in many ocular degenerative diseases, and due to the immune-privileged nature of the eye this has been a highly active and successful area of cell therapy development. Protocols have been established to differentiate RPE cells from both human embryonic stem cells (hESCs) and human induced pluripotent stem cells (iPSCs). These protocols commonly take over 12 weeks, so having a non-invasive, non-destructive method to monitor the functionality of these cells during development and validate functionality prior to clinical use is critical for researchers and clinicians. Surgical techniques to transplant RPE layers or inject RPE cell suspensions have been developed to enable both preclinical and clinical trials of RPE-derived cell therapies for patients to evaluate the safety and effectiveness of these therapies.

The RPE creates a monolayer of highly polarized cells which function to maintain the blood-retina barrier, to prove nutrients for the retina, and to prevent photo-oxidation by absorbing the excess light. Transepithelial electrical resistance (TEER) is a functional measurement widely used to measure the barrier integrity of the RPE and can confirm tight junction integrity. TEER has been shown to be reduced in RPE cells derived from patients with corneal diseases, diabetic retinopathy, and glaucoma with known corneal barrier, demonstrating compromised barrier function in these diseases.



2 Differentiation timeline of iPSC/ESC into retinal cells (RPE, photoreceptors, RGC, and ECFC). ECFC, endothelial colony-forming cell; ESC, embryonic stem cell; iPSC, Induced pluripotent stem cell; RPE, retinal pigment epithelium; RGC, retinal ganglion cell.

Figure is from Alexander V Ljubimov



In summary, the RPE of the eye is a unique site within the body that has well defined barriers, that when disrupted, can lead to ophthalmologic disease. TEER is an ideal measurement of barrier integrity for epithelial and endothelial cells and has become a standard tool for measuring the functionality of RPE cells, a promising target for regenerative medicine and cell therapy. WPI's EVOM™ technology is considered the gold standard to measure TEER values using an automatic or manual EVOM systems.

BENEFITS OF UTILIZING TEER TECHNOLOGY IN OPHTHALMOLOGY

- Simple, fast, and non-invasive method that does not affect your sample
- A critical measurement parameter to confirm the stem cell derived RPE cells are functional and can be effectively used to target damaged RPE layer in the eye
- Individual cellular doses can be screened with a threshold TEER value to ensure stem cells reached the desired differentiated and functional state (like, functional RPE cells) before using them for transplantation studies
- An efficient quality control and screening tool for cell therapy studies aiming to cure retinal degenerative diseases

WPI Offers Solutions for Your Ophthalmic Laboratory

1 VISUALIZE OCULAR TISSUES, CELLS & STRUCTURES

MICROSCOPY
Full line for visualizing ocular tissues, cells, and structures.

LIVE CELL IMAGING
Celloger®
Celloger® Pro
Celloger® Nano
Celloger® Stack

2 CELL ISOLATION & CELL CULTURE

CELL ISOLATION & CELL CULTURE
Surgical Instruments
Cell Counter - Coming soon!
FluoroDish™ Cell Culture Dishes

3 CELLULAR FUNCTIONAL ANALYSIS

TEER* MEASUREMENT
EVOM™ Auto
EVOM™ Manual

CELL VIABILITY ASSAY
Absorbance/Fluorescent Plate Reader

PERMEABILITY
Fluorescent Plate Reader
Immunostaining/ Immunofluorescence
Fluorescence Microscopy/ Celloger Pro

PROTEIN EXPRESSION/ LOCALIZATION (IMMUNO-STAINING)
Fluorescence Microscopy
Celloger Pro

4 PRE-CLINICAL MODELS

MICROINJECTION
UMP3 UltraMicroPump with NanoFil Gas-Tight Syringe and RPE or IO Kits

*TEER for functional analysis of cells, barrier integrity of healthy & diseased tissue, and quality control of cell therapy.

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TEER Technology Enables an Optimized *in vitro* Workflow for Drug Discovery

SynVivo, WPI. "TEER Technology Enables an Optimized in vitro Workflow for Drug Discovery." (2024).

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