
# Photoreceptor Scaffold for In Vitro Modeling and Transplantation Therapy

**INVENTORS • Zhenqiang Ma, Yei Hwan Jung, Michael Phillips, David Gamm, Shaoqin Gong**

WARF: P160094US01

View U.S. Patent Application Publication No. US-2017-0226459 in PDF format.

**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing cell culture scaffold systems that could help patients with blinding disorders of the outer retina.**

## OVERVIEW

Photoreceptors are specialized cells that capture and convert light into signals that can be processed by the retina and visual centers of the brain. Supportive cells called the retinal pigment epithelium (RPE) grow adjacent to the photoreceptors and are critical to their health and function. All blinding disorders of the outer retina involve dysfunction and eventual degeneration of the photoreceptors, either alone (e.g., retinitis pigmentosa) or involving the RPE (e.g., age-related macular degeneration or AMD).

Currently, these patients have limited treatment options. One broadly applicable strategy would be to replace photoreceptors (alone or in combination with RPE). To date the only approved pluripotent stem cell-based clinical trials underway in humans involve transplantation of RPE cells alone (via bolus injection or on planar scaffolds). While representing an important advance, transplanting RPE alone will not rescue vision in advanced disease when photoreceptors have been lost. Furthermore, existing technologies cannot recapitulate the precise spatial orientation and polarization of photoreceptors required for proper function.

## THE INVENTION

Using state-of-the-art microfabrication techniques, UW–Madison researchers have developed microstructured scaffold systems that can guide the growth of photoreceptor cells and mimic polarized outer retinal tissue. The scaffolds also may be used for transplantation of organized photoreceptor tissue with or without RPE.

Transplantation of photoreceptor-seeded scaffolds may improve grafted cell retention, survival, integration and functional visual rescue as compared to simple bolus injections. By recapitulating *in vivo* outer retinal architecture, these uniquely fabricated scaffolds also can be used for *in vitro* developmental and disease studies as well as drug screening.

The microfabrication process for scaffold production is fully compatible with numerous

## THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.

biomaterials, including biodegradable and non-biodegradable materials, thus allowing the scaffolds to be tailored to both *in vitro* and *in vivo* applications. The scaffolds feature biocompatible support layers (e.g., PDMS film) patterned with an array of unique through-holes having a curvilinear cell receiver and cell guide channels. The structure enables photoreceptors to be grown in a polarized orientation that mimics their development *in vivo*.

## APPLICATIONS

- Photoreceptor scaffold systems for cell culturing, transplantation, developmental modeling, disease modeling and drug screening

## KEY BENEFITS

- Enables formation of organized, multicellular constructs
- Mimics *in vivo* cellular structure and development
- Potential new treatment for patients with limited options
- Offers an alternative to simple bolus injection

## STAGE OF DEVELOPMENT

The researchers continue to optimize a design combining the photoreceptor and RPE scaffold structures.

## ADDITIONAL INFORMATION

**Tech Fields**
Drug Discovery - Disease models
Micro & Nanotech - Micromachining

## CONTACT INFORMATION

For current licensing status, please contact Andy DeTienne at adetienne@warf.org or 608-960-9857.