The Potential Role of Regenerative Medicine in Ophthalmology

Pfizer is investing resources and scientific know-how to develop stem-cell therapies for retinal diseases.

BY JENNIFER KREATSOULAS, PHD, SENIOR ASSOCIATE EDITOR

Pfizer, Inc. (New York, NY), launched the Pfizer Regenerative Medicine research unit in 2008 to lead investigative efforts in stem-cell therapies throughout the company. Building on Pfizer's experience in the field of regenerative medicine, this independent research organization aims to discover and develop a new generation of medicines for major medical needs across several therapeutic areas. Specific to ophthalmology, Pfizer Ophthlamics hopes to develop stem-cell therapies for patients with severe vision loss due to late-stage age-related macular degeneration (AMD) and other retinal diseases. Additionally, Pfizer's research unit is sampling stem cells in an effort to understand how retinal diseases progress.

WHY OPHTHALMOLOGY?

The field of ophthalmology represents an ideal opportunity to study regenerative medicine, David Eveleth, PhD, Vice President, Pfizer Ophthalmics, said in an interview with *Retina Today*.

"First, the eye does not require a large number of stem cells. Researchers can replace the retinal pigment epithelium under the entire fovea with a relatively small number of cells," Dr. Eveleth said. "Second, researchers believe there is a comparatively lower risk of stem-cell transplant rejection in the eye. Third, the eye allows for relatively easier monitoring over time. These elements make the eye a useful environment for applying the principles of regenerative medicine."

Historically, the majority of therapies available for ophthalmic use were originally developed for use in other medical disciplines, such as oncology or cardiovascular disease. Now ophthalmology is at the forefront of new technology that could shape the practice of medicine, Dr. Eveleth said.

Pfizer is partnering with academia and industry to understand new technologies and accelerate innovation in the area of retinal regenerative medicine.

COLLABORATORS

Pfizer is partnering with academia and industry to understand new technologies and accelerate innovation in the area of retinal regenerative medicine. Pfizer and its most recent partner, University College London (UCL), are examining how human embryonic stem cells differentiate into retinal pigment epithelium, with the goal of developing stem-cell–based therapies for wet and dry AMD. The collaboration marries the pioneering work of Pete Coffey, PhD, UCL Institute for Ophthalmology and Director of the London Project, and colleagues in the field of cell-based therapies with Pfizer's expertise in the design and delivery of therapeutics.

Under an agreement between the company and the University, Pfizer will provide funding to UCL to enable research into the development of stem-cell–based therapies for AMD and other retinal diseases. Pfizer's contributions will include expertise in the design and execution of clinical studies, interaction with global regula-

tors, and product manufacturing techniques.

Pfizer is also investing in EyeCyte, Inc., a company that is advancing stem-cell approaches developed at the Scripps Research Institute in La Jolla, CA. EyeCyte's regenerative medicine technologies are under development to treat acquired and inherited retinal diseases that include diabetic retinopathy, retinopathy of prematurity, retinal vascular occlusive disease, AMD, and retinitis pigmentosa.

LOOKING AHEAD

Pfizer officials realize that it will take time to develop a practical and effective stem-cell therapy in ophthalmology, as there are many scientific and clinical barriers that must be overcome, Dr. Eveleth said. "In order to achieve the best outcomes and minimize the risk of stem-cell transplant rejection, researchers are working to develop culture and differentiation protocols that produce the purest possible populations of stem cells," he explained. Such protocols are not yet established; however, researchers are making progress.

Industry and academic centers can now reliably produce retinal neural and RPE precursor cells from embryonic stem cells and induced pluripotent stem cells, Dr. Eveleth said. The ultimate goal, however, is true replacement, using these precursor cells to create functional replacements for retinal elements including photoreceptors or ganglion cells.

Dr. Eveleth admits that there is still much to learn about how and when these new cells integrate and grow, but he is confident that Pfizer will be a leader in developing stem-cell therapies for ophthalmology. "With the expertise of Pfizer's Regenerative Medicine group, the clinical and disease area knowledge of Pfizer Ophthalmics, the talents of our academic and industry partners, and the scientific know-how and resources of the world's largest biopharmaceutical company, we have the experience and the staying power required to develop practical applications of this exciting new science." ■

SHARE YOUR FEEDBACK

Would you like to comment on an author's article? Do you have an article topic to suggest? Do you wish to tell us how valuable *Retina Today* is to your practice? We would love to hear from you. Please e-mail us at letters@bmctoday.com with any comments or questions you have regarding this publication.