Austen BioInnovation Institute in Akron (ABIA) Helps Researchers Realize Vision for Improving Glaucoma Surgery

Background

The sense of sight is one of the most important elements of the human experience. However, a variety of ocular diseases threaten the eye's ability to provide clear, reliable vision. Even worse, treatments for these conditions may result in complications such as blindness. This is especially true of glaucoma, a leading cause of blindness in the United States.

One of the major risk factors of glaucoma is elevated intraocular pressure (IOP) resulting from abnormalities in the drainage route of a clear fluid called aqueous humor. If pharmaceutical treatment for glaucoma is unsuccessful, surgery may be performed to create an additional drainage route that helps reduce pressure within the eye.

Shortly following surgery, however, the body's natural wound-healing ability kicks in. This process creates scar tissue that blocks the new drainage route and prevents the complete discharge of fluid. To prevent this outcome, surgeons commonly use anti-scarring treatments with antimetabolites to suppress the wound-healing process. However, these treatments cause widespread cell death and are potentially associated with severe and blinding complications.

Research

To help patients heal more effectively from glaucoma surgery and enjoy improved outcomes, a group of researchers combined their unique expertise in wound healing and pharmaceutical medicine to develop an innovative method of keeping the surgically created drainage route open without antimetabolites.

In 2009, Vijaykumar Sutariya, Ph.D., and Werner Geldenhuys, Ph.D., both from Northeast Ohio Medical University, and Summa Health System's Hiroshi Nakamura, M.D., Ph.D., accepted a grant from the ABIA to fund their wound-healing research. The ABIA is a collaborative organization focused on discovering, developing and commercializing biomaterial solutions.

"The ABIA recognized that a key strength of our project was its potential for commercialization," explained Sutariya. "Since its inception, the ABIA has been fostering innovation through product development. By funding projects that could become commercialized, the ABIA is helping patients with orthopaedic and wound-healing problems benefit from treatments and technologies faster than traditional research."

Over a period of 18 months, the team worked on developing and testing a method of applying a chemical gel to the patient's eye to enhance ocular wound responses after glaucoma filtration surgery. Unlike other delivery methods that may be toxic, the gel the team is working with has fewer side effects because it is nontoxic, biodegradable and does not irritate the tissue. Further, it adapts better to temperatures—making the application of the gel easier than traditional hydrogel. The development of this treatment method has the opportunity to supplant other techniques due to its mild interactions with the body.

Results

Through extensive biomedical testing, the controlled gel delivery system was proven to delay the wound-healing process for 20 days in a rabbit model of glaucoma surgery. Currently, the researchers are in the process of developing a license agreement with some pharmaceutical companies interested in using the ocular gel-based delivery system. They are also presenting their findings in publications and at biomedical conferences.

According to Nakamura, the success of the project may also lead to future developments and additional funding. He said, “Our research has provided us with abundant scientific evidence that may be applied to patients undergoing treatment for other vision-threatening disorders across the nation. We plan to use our findings to obtain future grants from foundations and institutions such as the National Institutes of Health and the National Science Foundation—efforts that will help us make additional scientific progress in ocular medicine.”

In addition to helping patients improve their vision, the project also has the potential to stimulate the local economy. “Wherever there’s biotechnology business, there’s an increase in local revenues,” explained Geldenhuys. “Once this new technology is brought to market, the ABIA will use it to foster biotechnology business opportunities in Northeast Ohio and give back to the community.”

About the ABIA

The ABIA is a collaborative organization focused on discovering, developing and commercializing biomaterial solutions for patients with orthopaedic and wound-healing problems. It was launched in 2008 to accelerate innovation and develop a nationally distinct economic engine that will transform the Akron community through the creation of 2,100 jobs and new medical device and life science-related companies. An exceptional collaboration of Akron Children’s Hospital, Akron General Health System, Northeast Ohio Medical University, Summa Health System, The University of Akron and The John S. and James L. Knight Foundation, the ABIA is focused on patient-centered innovation and commercialization at the intersection of biomaterials and medicine.