

VISIONARY RESEARCH

ADULT STEM CELLS IN THE EYE HOLD PROMISE FOR MACULAR DEGENERATION

by TOM O'CONNOR

It starts as a dark spot, hardly noticeable in the center line of vision. But, almost like a black hole in space, it grows slowly, eating away the ability to see until only peripheral vision remains.

Macular degeneration is a thief of sight.

More than 10 million people in the United States have macular degeneration, the leading cause of severe vision loss among the elderly. And with huge numbers of baby boomers nearing retirement, low vision problems such as macular degeneration will no doubt reach a record high in the very near future.

Iqbal Ahmad, Ph.D., named one of UNMC's 2007 Distinguished Scientists, is determined to make a difference. A professor in the department of ophthalmology and visual sciences at UNMC, Dr. Ahmad is in a prime position to make a major impact on America's low vision problems.

Armed with a nearly \$1 million grant from the Lincy Foundation of Beverly Hills, Calif., as well as a \$200,000 gift from a Holdrege, Neb. couple, Dr. Ahmad is making serious progress in trying to find ways to stop progression of the disease.

His recent research has found that adult stem cells from rat retinas may hold the key to restoring sight in those with macular degeneration and other diseases.

Dr. Ahmad believes that by using adult stem cells, doctors may be able to regenerate photoreceptors or rescue degenerating photoreceptors, which are necessary for sight but are destroyed in macular degeneration.

"Once you have macular degeneration, your ability to recognize faces, read and drive is progressively compromised," Dr. Ahmad said. "Our goal is to use stem cells to discover new drugs and genes that will help slow down the degenerative process. If we can find a way to give people another 10 years of better vision, that would be a great improvement."

Dr. Ahmad's research team has observed that one particular type of adult stem cell in the eyes – known as Muller cells – are found throughout the adult retina. Muller cells are able to self-renew and have the potential to generate retinal neurons.



NORMAL VISION



AGE-RELATED MACULAR DEGENERATION

THE WORLD THROUGH MACULAR DEGENERATION. THESE PHOTOGRAPHS ILLUSTRATE HOW MACULAR DEGENERATION AFFECTS NORMAL EYESIGHT. PHOTOS COURTESY OF THE NATIONAL EYE INSTITUTE.

DR. IQBAL AHMAD IS RESEARCHING WAYS TO REGENERATE PHOTORECEPTORS WITH ADULT STEM CELLS FROM THE CORNEA, LEFT ON SCREEN, AND RETINA. A PHOTORECEPTOR, GENERATED IN THE LAB IS SHOWN ON THE RIGHT OF THE SCREEN.



"For some reason, these cells lay dormant and only become active when the retina is injured," he said. "The problem is, right now we don't know how specific injury activates Muller cells."

By inducing injury in the retina of lab rats, Dr. Ahmad said some of the activated Muller cells have become new photoreceptors, which is critical to a person's vision.

Another area of research being investigated by Dr. Ahmad's team is the possibility of isolating stem cells from adult cornea and trying to manipulate them into becoming retinal stem cells.

"It is known that two millimeters of tissue surrounding the cornea, where stem cells are located, can be removed without impacting eyesight," he said. "The cornea, brain and retina have the same embryonic origin."

Dr. Ahmad's research team recently published its findings in the journal Stem Cells, and has shared the findings at a number of national scientific conferences. Their findings demonstrated that corneal stem cells could be converted into photoreceptors, he said, which suggests that they also could be used for repairing retinal damage.

FUELING THE RESEARCH

Roy Pearson is a true visionary.

The 89-year-old Holdrege, Neb., man recognized the benefits of propane gas before it became established in Nebraska. He parlayed this niche into a successful business career spanning 47 years.

Today, the enterprising Pearson is applying his business acumen in another "visionary" effort. Diagnosed with macular degeneration soon after his retirement, Pearson and his wife, Mary, each donated \$100,000 of their retirement accounts to help fund the macular degeneration research being conducted by UNMC's Iqbal Ahmad, Ph.D.

Pearson, a retired Army Air Corps lieutenant colonel who served in World War II, is a longtime member of the UNMC Board of Counselors, a group of community and business leaders from across the state who advise the chancellor on health care issues of importance. He is well acquainted with the medical center and has great respect for its research work.

"With scientists like Dr. Ahmad, I believe UNMC is a place where real progress can be made in the fight against macular degeneration and other vision problems," he said.



ROY PEARSON, WHO SUFFERS FROM MACULAR DEGENERATION, AND HIS WIFE MARY HAVE BEEN GENEROUS SUPPORTERS OF DR. IQBAL AHMAD'S RESEARCH.

"This gives us hope that we may be able to manipulate these cells to treat retinal degeneration and restore sight," he said. "By using a person's own Muller adult stem cells, problems associated with immune rejection as well as the controversy surrounding the use of embryonic stem cells would be eliminated."

Dr. Ahmad's lab is currently studying signals that allow communication between cells. This has led to identification of proteins that are found to activate the stem cells. The next step is to research the efficacy and safety of using these proteins to manipulate stem cells into action and see if they regenerate and restore sight.

In the coming years, Dr. Ahmad hopes to move his research from animals to human clinical trials.

Although a cure could take several years, he is optimistic that a breakthrough in treatment of age-related macular degeneration is likely through multi-prong stem cell approaches. 