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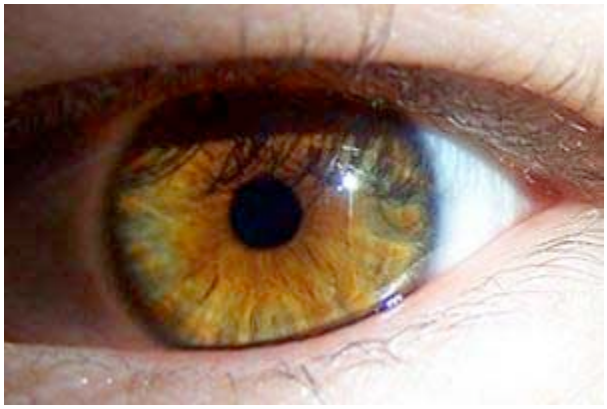
Stem cells bring new insights to future treatment of vision--and neural--disorders

By Katherine Harmon



BALTIMORE—Deep in the brain, buried in the hippocampus and subventricular zone, reside adult neural stem cells, cells that retain the ability to become other types of neural cells and could serve as possible treatments for ailments ranging from vision impairment to Parkinson's to spinal cord injuries. Doctors, scientists and patients, however, are understandably hesitant to go digging around for them, their location being "a great deterrent," Sally Temple, founder of the New York Neural Stem Cell Institute, said at the 2009 World Stem Cell Summit here on Wednesday.

Researchers, therefore, are anxious to uncover other, more accessible neural stem cell candidates. Temple and her team have turned their sights to the retinal pigment epithelium (RPE), a layer of tissue at the base of the retina that comes into being within 30 to 50 days of conception, before many other parts of the neural system differentiate. Cells from this area of the eye can be easily harvested from retinal fluid that is usually discarded during retinal surgery, she explained.

After culturing retinal pigment epithelium cells, her group was able to coax them into showing potential to become a host of different visual and other neural cells. The researchers also found, to their surprise, that in working with donated cadaver eyes, cells harvested from 99-year-old eyes had just as much plasticity as those from 22-year-old eyes. She asserts that they are similarly flexible because they have been "held in a dormant state," she said.

Aside from working to transform the retinal pigment epithelium cells into other neural incarnations, the group also expects them to be useful foils on which to model diseases in the lab and test drugs, Temple noted. If these cells are to become a viable treatment, however, years of research and trials remain ahead.

Others in the stem cell field are still waiting for the perfect cell to come along. Tina Guanting Qiu, the program leader of translational retinal stem cell research at Bristol University in the U.K., is hunting for a stem cell that her lab can turn into photoreceptor cells. Her goal is to find treatments for conditions, such as age-related macular degeneration and injury, in which photoreceptors have died off. Her team has had success using embryonic stem cells from rats, but those that have worked best came from nearly full-term rodent fetuses, a source obviously out of the question for human work.

Currently, gene therapy has been leading the charge in new treatments for vision disorders. However, the conditions for which there has been the most progress, including Leber congenital amaurosis (LCA), have relatively few sufferers. Aside from a small population base of potential beneficiaries, gene therapy is largely assumed to be most effective if administered during the early stages of a disease. Looking into the future, Qiu notes, stem cell treatment could be a good alternative for those who might have already missed the window for effective gene therapy.

Unlike some of her colleagues, who posture stem cell treatments in firm juxtaposition to gene therapy, Qiu looks forward to a future in which the two might be used together. She sees stem cells as a possible vehicle for gene delivery, "so you can get rid of the virus."

Even if stem cell research continues to show progress for improving vision or other neural disorders, a usable treatment would still be years, and likely decades, away. For Qiu though, the drive to find just the right cells comes from wanting to eventually be able to offer patients more options. At the moment, to treat many blinding conditions, she says, "we have nothing but laser cutting and burning."

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