Algae may be the solution to blindness

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(PhysOrg.com) -- The song about three blind mice may just be a song of the past according to new research presented by neuroscientist Alan Horsager from the Institute of Genetic Medicine at the University of Southern California with the report set to appear in *Molecular Therapy*. Using genes from algae injected into the retina, Horsager hopes this research will lead to a treatment for some forms of blindness.

Over 15 million people suffer from some form of blindness, with the most common conditions being retinitis pigmentosa (RP) and age-related macular degeneration (AMD). Both of these conditions are caused when the photoreceptors in the eye are damaged. The photoreceptors are responsible for transforming light entering the eye into electrical impulses, but when damaged, the brain is unable to receive this information.

Horsager's team is working with gene therapy and the gene responsible for making Channelrhodopsin-2 (ChR2) in algae. This photosensitive protein in the algae is what helps direct them toward a source of light.

The retina of the human eye is made up of three cellular layers. The first layer is the photoreceptors, which is what is damaged in people with RP and AMD. The second layer of the retina is made of bipolar cells which work to transmit information between the photoreceptors and the third layer, the ganglion. The ganglion is what then transmits light signals to the brain.

Horsager's plan is to use the bipolar cells and make them work as

photoreceptors as well. By injecting the algae gene into the bipolar cells, the idea is to have them produce the ChR2 and operate as a photoreceptor. With the bipolar cells able to sense light, they would then be able to transmit this information to the ganglion, which would then in turn transmit it to the brain.

The teams tested this on groups of mice and found that ten weeks after the injection of the genes, the bipolar cells were producing the ChR2 protein. They then put the mice in a maze of water with six possible paths with one having a ledge for the mice to get out of the water. Shining a light through the pass with the ledge, the gene-treated mice were able to find the path 2.5 times faster than the untreated blind mice.

The team is continuing its research and hopes to begin clinical trials in humans within the next two years.

More information: Doroudchi, M.M., Greenberg, K.P, Liu, J., Silka, K.A., Boyden, E.S., Lockridge, J.A., Arman, A.C., Janani, R., Boye, S.E., Boye, S.L., Gordon, G.M., Matteo, B.C., Sampath, A.P., Hauswirth, W.W., Horsager, A. "Virally-Delivered Channelrhodopsin-2 Safely and Effectively Restores Visual Function in Multiple Models of Blindness". (Accepted, *Molecular Therapy*).