Disruption of glucose transport to rods and cones shown to cause vision loss in retinitis pigmentosa

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Retinitis pigmentosa (RP) is a common hereditary eye disorder that leads to the gradual deterioration of rod cells causing reduced peripheral vision and night vision. Subsequent loss of cone photoreceptors cause the loss of high-resolution daylight and color vision.

Ophthalmology researchers at the University of Louisville have discovered the loss of vision in RP is the result of a disruption in the flow of nourishing glucose to the rods and cones. This disruption leads to the starvation of the photoreceptors.

In research published today in *Cell Reports*, the researchers, led by Douglas C. Dean, Ph.D., and Wei Wang, M.D., Ph.D., of the UofL Department of Ophthalmology and Visual Sciences, described metabolic changes that result in the reduced availability of glucose in the cells.

As research provides a better understanding of the progression of RP, this knowledge may lead to therapies that could slow or stop this process before the rods and cones are destroyed. In addition to the relevance for RP, the researchers discovered the failure in glucose metabolism in RP is similar to changes seen in lung cancer and may be useful in developing therapeutic targets for both diseases.

"Interestingly, these metabolic changes appear similar to those we also are investigating in other studies into lung cancer in the laboratory," Dean said. "Both lung cancer and neurons in the retina use glucose as a primary source for their metabolism. Attacking glucose utilization is a major strategy in fighting lung cancer. This unexpected connection in retinal and lung cancer metabolism has led us to link these seemingly unrelated systems to search for common drugs that target both lung cancer and retinal degeneration."

RP is an inherited disease in which the photoreceptor cells in the retina—rods and cones—deteriorate over time. Photoreceptors absorb

and convert light into electrical signals, which are sent through the optic nerve to the brain. Rods, located in the outer regions of the retina, allow peripheral and low-light vision. Cones, located mostly in the central part of the retina, allow perception of color and visual detail.

In RP, rods deteriorate first, causing the peripheral and low light vision loss typically associated with the disease. In later stages, the cones also deteriorate. Without cone function, RP patients lose the high-resolution daylight vision necessary for reading, facial recognition and driving. As a result, this stage of RP vision loss is more debilitating than the loss of nighttime or peripheral vision. RP affects 1 in 4,000 people globally.

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