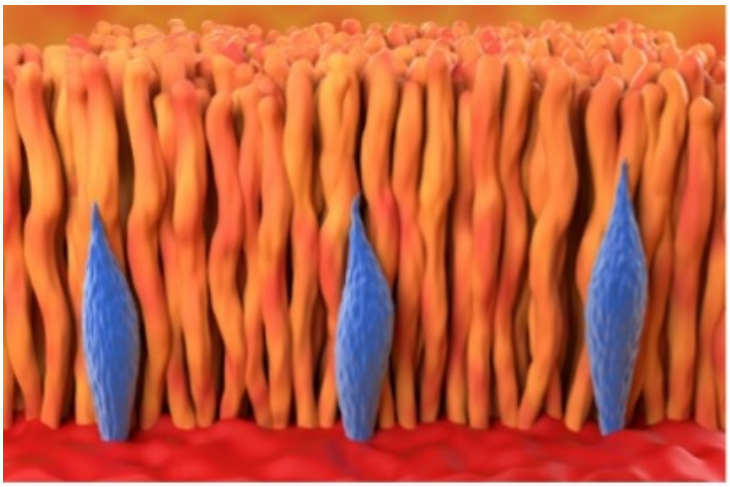
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Reprogramming Photoreceptor Metabolism to Enhance Survival and Prevent Vision Loss

TECHNOLOGY NUMBER: 7634



Technology ID
7634

Category
Therapeutics and Vaccines
Life Sciences

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OVERVIEW

Metabolic reprogramming for photoreceptor survival in retinal disorders

- Targets aerobic glycolysis for specificity and minimal off-target effects
- Treats retinal detachment, age-related macular degeneration, retinal degenerations

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MODALITY

Therapeutic intervention targeting metabolic pathways in photoreceptors; delivered via intraocular (local ocular) administration

INDICATION

Treatment and prevention of vision loss in retinal detachment, age-related macular degeneration, and other degenerative retinal disorders

PUBLICATIONS

"Photoreceptor metabolic reprogramming provides survival advantage in acute stress while causing chronic degeneration"

INTELLECTUAL PROPERTY

BACKGROUND

Photoreceptor cell death is the main cause of vision loss in numerous retinal disorders, yet the treatment options remain extremely limited. Photoreceptors require a high level of metabolic activity, relying heavily on aerobic glycolysis, a metabolic process commonly associated with cancerous tissues. This reliance on aerobic glycolysis is critical for the survival and function of photoreceptors, with manipulations in glucose availability and metabolism significantly impacting photoreceptor survival. PKM2, a key enzyme in aerobic glycolysis, is found within photoreceptors, and genetic modifications of PKM2 in rod photoreceptors have shown effects on their morphology. Current treatments inadequately address the metabolic needs of photoreceptors, so there is a need for therapies that can support photoreceptor metabolism.

INNOVATION

The proposed innovation suggests metabolic reprogramming of photoreceptors as a novel therapeutic approach for various retinal disorders. By focusing on PKM2, an enzyme crucial for aerobic glycolysis in photoreceptors, this method aims to enhance photoreceptor survival through precise metabolic interventions. The creation of a photoreceptor-specific in-vivo PKM2 conditional knockout mouse model demonstrated that removing PKM2 leads to significant changes in glucose metabolism gene expression, affecting retinal health. Under normal conditions, loss of PKM2 resulted in retinal degeneration; however, in situations of acute stress, such as retinal detachment, PKM2 knockout mice showed increased photoreceptor survival. This underlines the potential of enzymes involved in photoreceptor metabolism as promising therapeutic targets. Real-world applications include the treatment of retinal detachment, non-exudative age-related macular degeneration, and other retinal degenerations, leveraging the high specificity of aerobic glycolysis to minimize off-target effects and improve patient outcomes.