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THE DEPARTMENT OF MATHEMATICAL SCIENCES PROUDLY PRESENTS

COLLOQUIUM

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The Role of RdCVFL in a Mathematical Model of Photoreceptor Interactions

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Abstract

Recent experimental and mathematical work has shown the interdependence of the rod and cone photoreceptors with the retinal pigment epithelium in maintaining sight. Accelerated intake of glucose into the cones via the theoredoxin-like rod-derived cone viability factor (RdCVF) is needed as aerobic glycolysis is the primary source of energy production. Reactive oxidative species (ROS) result from the rod and cone metabolism and recent experimental work has shown that the long form of RdCVF (RdCVFL) helps mitigate the negative effects of ROS. In this work we investigate the role of RdCVFL in maintaining the health of the photoreceptors. The results of our mathematical model show the necessity of RdCVFL a nd also demonstrate additional stable modes that are present in this system. The sensitivity analysis shows the importance of glucose uptake, nutrient levels, and ROS mitigation in maintaining rod and cone health in light-damaged mouse models. Together, these suggests areas on which to focus treatment in order to prolong the photoreceptors, especially in situations where ROS is a contributing factor to their death such as retinitis pigmentosa. Having a more thorough understanding of rod and cone survival via RdCVF and RdCVFL in a non-diseased retina can help give insight into degenerative diseases such as Retinitis Pigmentosa. Thus, independent of RdCVFL, there is a critical amount of ROS that is predicted to result in the death of the photoreceptors.

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