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Sonic hedgehog signaling promotes Müller glia reprogramming in regenerating zebra fish/mouse retina: Towards curing retinal diseases

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Visual impairment is one of the major problems faced by the world. Despite the fact that the notion of retina regeneration seems implausible, unlike humans, there are lower vertebrates such as teleost that have remarkable retina regeneration capabilities. Certain organisms serve as a great tool to study retinal regeneration, with zebrafish and postnatal chick being prominent examples. Zebrafish, due to their significant regenerative response and a retinal architecture that is similar to mammals, have emerged as the baseline model for studying regeneration. Upon retinal injury in zebrafish, Muller glia reprograms itself to a multipotent stem cell-like state, which then proliferates further and is capable to give rise to various retinal cell types. Although many molecular signaling pathways and transcription factors are known to play an important role during retina regeneration, one of the most important developmental signaling pathways, i.e., sonic hedgehog signaling pathway remains unexplored in this context. We report that expression of sonic hedgehog signaling components such as, Sonic hedgehog a (Shha), Patched1 (Ptch1) and Smoothened (Smo) in proliferating Müller glia is required for retina regeneration. We also show early expression of MMP9 is required for Shha protein expression, which in turn is required for the induction of pivotal genes like *ascl1a, lin28, zic2b* and *foxn4*. Moreover, we show that recombinant sonic hedgehog can induce the expression of crucial genes like *ascl1* and *lin28* in mouse retina. We believe that these novel findings pave the way to design new therapeutic techniques and mechanisms to treat retinal diseases in humans.

Biography

Simran Kaur is a Ph.D candidate at IISER, Mohali, India, where she works under the guidance of Dr. Rajesh Ramachandran. She obtained her Master's in Biotechnology (Hons.) from Panjab University, Chandigarh, India in 2011. Her Ph.D work focuses on investigating molecular mechanisms behind retina regeneration in Zebrafish. Some of her other works focuses on zebrafish model preparation techniques, and application of cell and molecular biology techniques. Her work is currently being published in two manuscripts both of which are under preparation..

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