



BCB/IGERT Thesis Seminar

Characterizing and influencing differentiation of retinal progenitor cells

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Abstract:

The vertebrate neural retina is a complex organ that is well suited for studying development of the central nervous system. Blinding degenerative retinal diseases including retinitis pigmentosa, macular degeneration and glaucoma are characterized by loss of retinal neurons. At this time there is no way to replace retinal cell loss due to disease or injury since differentiated retinal cells are unable to regenerate. As a potential approach for treating retinal injury, neural progenitor cells have been proposed as a unique source of transplantable cells to replace lost cells in the damaged retina.

Previous studies have transplanted a variety of neural stem cells to the eye in hopes of developing a therapy to replace retinal neurons lost to disease. Successful integration, survival and differentiation of the cell types have been variably successful. At the moment little is known about the fundamental biological differences between stem cell or progenitor cell types.

We have used proteomic profiling to begin to identify unique characteristics of retinal progenitor cells. Our results demonstrate that expanded retinal progenitor cells express higher levels of stress-response proteins compared to their brain-derived counterparts. Further, we have described the dynamic expression of stress-response proteins during in vivo retinal development. Finally, we have demonstrated that changing the oxidative environment by addition of the antioxidant vitamin E to retinal progenitor cells differentiated in vitro decrease expression of stress-response proteins and alter their differentiation. These studies are the first to describe the expression of stress-response proteins during in vitro and in vivo retinal cellular development. Our results demonstrate the importance of understanding the oxidative nature of a host environment and how differentiation of transplanted cells might be affected.