The Role of Transforming Growth Factorβ (TGF-β)-activated Kinase 1 (TAK1) in Retinal Development

Ira Altaras[1], Sarika Tiwari[1,2], and Teri Belecky-Adams[1,2]
[1]Department of Biology, Indiana University-Purdue University Indianapolis; [2]Center for Regenerative Biology and Medicine, Indiana University-Purdue University Indianapolis

Purpose: The formation of the retina is dependent on multiple transcription factors being expressed in the correct time and place. Transforming growth factor-β-activated kinase1 (TAK1), a serine threonine kinase, has been increasingly associated with regulation of proliferation, differentiation and apoptosis of many cell types both within and outside of the central nervous system. However, little is known about its role in development of the retina. Previous results from our lab have indicated that TAK1 is expressed throughout the developing retina; however activated TAK1 is found predominantly in the dividing progenitors of the early developing chick retina. Retinas injected with TAK1 inhibitor appeared to have an increase in progenitor population and a decrease in differentiating retinal ganglion cells. The present study evaluated the potential role of TAK1 in inducing apoptosis in the developing chick retina. Methods: Embryonic day 3(E3) chick retina were injected with vehicle and 1.0 µM or 2.0 µM concentration (5Z)-7-Oxozeaenol, an irreversible inhibitor of TAK1. 24 hours post inhibition the tissue was harvested. Immunohistochemistry (IHC) was performed to analyze the levels of cleaved caspase 3 expression, a protein activated during apoptosis. Nuclei stained with DAPI were used to quantify the number of cells expressing the caspase3. Lipopolysaccharide (LPS) treated adult, postnatal 30 (P30), mouse retina was used as a positive control for our IHC. Results: No difference in the level of cleaved (activated) caspase 3 immunolabel was found in vehicle-, 1.0 and 2.0 µM inhibitor-injected retinas. Conclusion: Lack of cleaved caspase 3 immunolabel in TAK1-inhibited retinas indicates that TAK1 may not be playing any role in inducing cell death through apoptosis in the developing chick retina used in our study. These preliminary results suggest further research should be done to better understand its role in retinal development.

Mentors: Teri Belecky-Adams and Sarika Tiwari, Center for Regenerative Biology and Medicine, IUPUI, Department of Biology, IUPUI