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Wallerian Degeneration in the Developing Mouse Visual System

Abstract

In the developing mouse visual system, retinal ganglion cell (RGC) axons, and their projections, initially overshoot their targets of the superior colliculus (SC) and the basal pons (BP) before branch extensions actually reach the target. As development progresses, branch elimination occurs to prune back the overshoot axons. However, the process of axonal degeneration in the pruned back axons is not. To determine whether Wallerian degeneration is the process that prunes back overshoot visual system axons, three methods were used. Measurements of the diameter of visual system axonal projections in the corticospinal tract (CST) found that mutant Wallerian slow mice (wld^s) had an increasing diameter up to p20, whereas wild type (wt) mice had a decrease in diameter after p15. Counting the number of RGCs in wld^s and wt mice found that there was roughly the same number of cells in each genotype. Calculating the area of optic nerve found that by p8 wld^s and wt mice have a similar area, yet p4 wld^s mice have an area equal to an assumed area of p0 wt mice. I conclude that Wallerian degeneration is the process whereby visual system overshoot axon projections get pruned back as characterized by the wld^s mice having a thicker diameter of axons in the CST, and RGCs dying but leaving their axons in the optic tract.