Hypothesis for a common basis for neuroprotection in glaucoma and Alzheimer's disease: anti-apoptosis by alpha-2-adrenergic receptor activation.


Source
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Abstract
Recent studies have suggested glaucomatous loss of retinal ganglion cells and their axons in Alzheimer's disease. Amyloid beta peptides and phosphorylated tau protein have been implicated in the selective regional neuronal loss and protein accumulations characteristic of Alzheimer's disease. Similar protein accumulations are not present on glaucomatous retinal ganglion cells. Neurons die in both Alzheimer's disease and glaucoma by apoptosis, although the signaling pathways for neuronal degradation appear to differ in the two diseases. Alzheimer's disease features a loss of locus ceruleus noradrenergic neurons, which send axon terminals to the brain regions suffering neuronal apoptosis and results in reductions in noradrenaline in those regions. Activation of alpha-2 adrenergic receptors reduces neuronal apoptosis, in part through a protein kinase B (Akt)-dependent signaling pathway. Loss of noradrenaline innervation facilitates neuronal apoptosis in Alzheimer's disease models and may act similarly in glaucoma. Alpha-2 adrenergic receptor agonists offer the potential to slow the neuronal loss in both diseases by compensating for lost noradrenaline innervation.

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