

Artemin augments survival and axon regeneration in axotomized retinal ganglion cells

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Artemin, a recently discovered member of the glial cell line-derived neurotrophic factor (GDNF) family, has neurotrophic effects on damaged neurons, including sympathetic neurons, dopamine neurons, and spiral ganglion neurons both in vivo and in vitro. However, its effects on retinal cells and its intracellular signaling remain relatively unexplored.

During development, expression of GFRa3, a specific receptor for artemin, is strong in the immature retina and gradually decreases during maturation, suggesting a possible role in the formation of retinal connections. Optic nerve damage in mature rats causes levels of GFRa3 mRNA to increase tenfold in the retina within 3 days.

GFRa3 mRNA levels continue to rise within the first week and then decline. Artemin, a specific ligand for GFRa3, has a neuroprotective effect on axotomized retinal ganglion cells (RGCs) in vivo and in vitro via activation of the extracellular signal-related kinase- and phosphoinositide 3-kinase-Akt signaling pathways.

Artemin also has a substantial effect on axon regeneration in RGCs both in vivo and in vitro, whereas other GDNF family members do not. Therefore, artemin/GFRa3, but not other GDNF family members, may be of value for optic nerve regeneration in mature mammals. © 2014 Wiley Periodicals, Inc.

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