

Early Axonal Regeneration: Repression by Schwann Cells and a Protease

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Abstract

We have proposed that mature Schwann cells and an extracellular protease repress the sprouting response of axons. To test this hypothesis, we destroyed all cells by freezing a short span of the rat sciatic nerve or inhibited proteases with subperineurial injections of aprotinin, and a crush was made to induce the sprouting response. In unconditioned or in vehicle-injected nerves, axons began to elongate at a constant rate after a delay of about 1 day. The freezing of the nerve distal to the crush obliterated the delay, but the rate of elongation did not change. A similar pattern was observed when the nerve segment was conditioned with aprotinin for 2 days prior to the crush. These effects were abolished when a short untreated segment was left between crush and conditioned region of the nerve. The electron microscopy of the nerve and the immuno-localization of the growth-associated protein (GAP-43) were consistent with the enhanced regrowth observed in conditioned nerves. Our findings support the notion that Schwann cells repress the onset of regeneration and that a local protease is involved.