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Spinal cord injury (SCI) results in permanent loss of motor and sensory function due to developmentally-related and injured-induced changes in the extrinsic microenvironment and intrinsic neuronal biochemistry that limit plasticity and axon regeneration.

The long term goal is to develop cationic, amphiphilic copolymers (poly (lactide-co-glycolide)-g-polyethylenimine, PgP) for combinatorial delivery of therapeutic nucleic acids (TNAs) and drugs targeting these different barriers. In a study, Gwak et al., evaluated the ability of PgP to deliver siRNA targeting RhoA, a critical signaling pathway activated by multiple extracellular inhibitors of Axon regeneration. After generation of rat compression SCI model, PgP/siRhoA polyplexes were locally injected into the lesion site. Relative to untreated injury only, PgP/siRhoA polyplexes significantly reduced RhoA mRNA and protein expression for up to 4 weeks post-injury. Histological analysis at 4 weeks post-injury showed that RhoA knockdown was accompanied by reduced apoptosis, cavity size, and astrogliosis and increased Axon regeneration within the lesion site. These studies demonstrate that PgP is an efficient non-viral delivery carrier for therapeutic siRhoA to the injured spinal cord and may be a promising platform for the development of combinatorial TNA/drug therapy [1)]

1)
Gwak SJ, Macks C, Jeong DU, Kindy M, Lynn M, Webb K, Lee JS. RhoA knockdown by cationic amphiphilic copolymer/siRhoA polyplexes enhances Axon regeneration in rat spinal cord injury model. Biomaterials. 2017 Jan 3;121:155-166. doi: 10.1016/j.biomaterials.2017.01.003. [Epub ahead of print] PubMed PMID: 28088077.