

Editorial

The molecular and cellular responses following CNS injury are, at present, not well understood. However, better knowledge of the genes and their distinctive programs of expression in lesioned and regenerating neurons and their companion glial cells as well as the regulation and function of the respective proteins that control cell degeneration and apoptosis, initiate axon regeneration and guidance, mediate cellular and matrix interactions, or inhibit spontaneous CNS repair is essential to develop rational therapeutic approaches leading to successful functional recovery.



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In this special issue of *Restorative Neurology and Neuroscience* leading groups in the field have contributed concise and focussed reviews that cover topical key issues in neurorepair. Five papers concentrate on molecular mechanisms and regulatory pathways including gene expression profiles in spontaneous peripheral nerve regeneration (Bosse, Küry, Müller), analysis of neuronal apoptosis and survival pathways (Weishaupt, Bähr), transcriptional regulation and signal transduction (Herdegen, Waetzig), mechanisms that regulate the molecular program for axon growth (Benowitz, Goldberg, Irwin), and interactions of neural cells with extracellular matrix molecules (Garwood, Rigato, Heck, Faissner).

A second group of papers is devoted to cellular and systems approaches exploring the role of astrocytes in CNS repair (Gates, Dunnett), cell type-specific differences in the intrinsic regenerative capabilities and plasticity of cerebellar Purkinje neurons (Rossi, Buffo, Strata) or adult olivary neurons (Strata, Buffo, Rossi).

Finally, therapeutic strategies to support axonal regeneration and/or functional restoration in traumatic optic nerve and spinal cord injury or neurodegenerative disease are the subject of four contributions, comprising attempts to overcome inhibitory mechanisms in optic nerve (Chierzi and Fawcett), neural cell transplantation to restore complex circuitries in the brain (Fricker-Gates, Lundberg, Dunnett), pharmacological suppression of regeneration-inhibiting scarring to promote extensive CNS-axon growth (Hermanns, Klapka, Müller) and implantation of olfactory ensheathing cells for successful structural and functional restoration following spinal cord injury (Ramón-Cueto, Santos-Benito). The contributions of this issue reflect the current excitement in molecular and cellular neuroregeneration research.

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