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Regeneration of peripheral nervous system axons

MARK A. BISBY

in The Axon: Structure, Function and Pathophysiology

Published in print: 1995 Published Online: May 2009 Publisher: Oxford University Press
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Item type: chapter

This chapter focuses on regeneration in mammals. It begins with an overview of regeneration. It then discusses axon sprouting, axonal elongation, cell body reaction and regeneration, environment of the regenerating peripheral axon, and restoration of function.

Motoneurones: morphology, cytology, and topographical organization

Daniel Kernell

in The Motoneurone and its Muscle Fibres

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This chapter describes the morphology of individual gamma and (mainly) alpha motoneurones as well as the composition and localization of motoneuronal populations (pools) innervating different muscles and muscle portions. Within the ventral horn of the spinal cord, motoneuronal cell bodies for a given muscle lie within an elongated rostro-caudal ‘column’, and cells of different sizes and properties are generally intermingled. Each motoneurone has several dendrites, typically extending to distances of many cell body diameters in all directions. Reconstructions of dendritic trees are described and the relationships are analyzed between the dimensions of dendrites, sizes of cell bodies, and conduction velocities of motor axons. Furthermore, the possible relationships are discussed between various aspects of motoneuronal cytochemistry, morphological characteristics, and functional properties.

Large motoneurones seem to be more vulnerable than smaller ones in various kinds of disease (e.g., poliomyelitis).

The Axon

Stephen G. Waxman, Jeffery D. Kocsis, and Peter K. Stys (eds)

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The axon, which is interposed between the cell body and the synaptic terminals in most neurons, plays a crucial role in connecting neurons and acting as a conduit for the transmission of information between them. Axons have always been a favorite site for investigation in neuroscience. Axonology has moved ahead rapidly more recently. Molecular biology has provided new tools for studying the molecules that make up the axon and their associated glial cells. Increasingly powerful physiological techniques, together with immunocytochemical and immuno-ultrastructural methods, have facilitated a molecular dissection of the channels, exchangers, and pumps that are responsible for the functional properties of axons. The role of calcium in axonal function is now better understood and the complex dialogue between axons and glial cells that are associated with them now yield scrutiny. Such advances have applied not only to normal axons but also to their abnormal counterparts. Thus, the molecular and cellular events triggered by trauma, demyelination, and axonal injury in axons are being delineated, as the response of axons—and the cell bodies from which they originate—to injuries is studied in many laboratories. This book discusses, in close juxtaposition, various aspects of both normal and diseased axons. The book takes a multiauthored approach to this task.

Cranial Nerves

Jay A. Liveson and Dong M. Ma

in Laboratory Reference for Clinical Neurophysiology

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The trigeminal nerve (or fifth cranial nerve) contains both motor and sensory fibers. Primarily, however, it carries sensation from the skin of the face and forehead and from the mucous membranes of the mouth and nose. It is divided into three portions: the ophthalmic, maxillary, and mandibular. The cell bodies arise in the trigeminal ganglion located

in the middle fossa along the petrous bone. Fibers travel centrally to the pontine tegmentum, where they synapse with cells in the principal and spinal trigeminal nuclei, which extend from the pons to the upper cervical cord. The motor fibers originate from a nucleus occupying a column in the lateral tegmentum of the pons. These travel peripherally through the mandibular division of the nerve to innervate the masseter, temporalis, anterior digastric, mylohyoid, and muscles of mastication (medial and lateral pterygoids, tensores palati, and tympani).