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Animal Models of Acute Neurological Injuries

J. Chen, Z.C. Xu, X.-M. Xu, and J.H. Zhang, eds. Humana Press; 2009, 498 pages, 206 illustrations, \$169.00.

The book entitled *Animal Models of Acute Neurological Injuries* edited by Jun Chen, Zao C. Xu, Xiao-Ming Xu, and John H. Zhang is a comprehensive publication focusing on experimental models that can be used to reproduce, in a controlled setting, several types of acute neurologic injuries. In the last 30 years, many laboratories have developed animal models of neurologic disorders that have helped the research community investigate injury pathomechanisms as well as test new therapies that can potentially be translated into the clinic. In this regard, emphasis has been recently placed on the reproducibility and clinical significance of preclinical models and quantitative outcome measures. In this book, the editors have provided detailed discussions on numerous models of acute neurologic injury, including established models of cerebral ischemia, hemorrhage, and brain and spinal cord trauma.

The book is divided into 4 major logical sections, which provide important information and teaching value to the reader. In the initial part, for example, issues regarding animal care and general surgical procedures are reviewed. It is critical that proper steps be used to limit pain and discomfort to the animals during the surgical preparations. Thus, appropriate animal protocols, anesthesia, surgical procedures, brain monitoring, and veterinary care methods are emphasized. In the second section of the book, animal models of cerebral ischemia are summarized, including global and focal models. Transient global ischemia models are routinely used to simulate the cerebral insults that occur in patients with cardiac arrest. In addition to large multiple-vessel occlusion models, asphyxial cardiac arrest methods are also discussed. In contrast to global ischemia, focal ischemia models are helpful for investigating injury mechanisms associated with stroke. Thus, models that use clip occlusion of major vessels are described. Most recently, suture and thromboembolic models that can be used to test thrombolytic agents have been developed and are adequately reviewed in this publication. Because of the devastating consequences of neonatal hypoxia-ischemia, models

replicating this clinical condition have also been developed in young animals to investigate injury mechanisms and test new therapies.

In part 3 of the book, models of cerebral hemorrhage are reviewed. Subarachnoid hemorrhage can be produced in a variety of animal species and replicates some of the vascular events seen in patients with this devastating insult. When blood leaks into the brain parenchyma, cere-

bral vasospasm commonly occurs. Thus, animal models of cerebral vasospasm, including the use of blood injections and the intraparenchymal placement of blood clots, are described. Currently, there are limited treatments for vasospasm; therefore, these models are important as we attempt to discover new therapies for these neurologic injuries. Finally, methods of producing reproducible intracerebral hemorrhage are also reviewed, including the direct intraparenchymal injections of blood or bacterial collagenase into several animal species.

In the last section, experimental models of traumatic central nervous system injury are reviewed. Three chapters describe different traumatic brain injury models, including the fluid percussion, controlled cortical impact, and the Marmarou weight drop model. These models produce various degrees of histologic damage consisting of contusion formation, selective vulnerability of specific neuronal groups, and axonal pathology. Thus, available trauma models replicate both the focal and diffuse nature of traumatic brain injury. Spinal cord injury is another important research area in which reproducible animal models have been developed. During the last several years, new models have been added to the field that allow the generation of contusive or laceration injury at both thoracic and cervical levels. To make use of genetic models, both ischemic and traumatic models adapted to mice produce reproducible damage and long-term behavior deficits. Spinal cord and peripheral nerve transection models that are used to assess the potential for axonal regeneration are also an important component of the spinal cord injury field. Finally, demyelinating models that replicate some of the consequences of traumatic injury and other disorders have also been developed.

This publication is relevant to neuroradiologists interested in understanding some of the preclinical models that may assist researchers in developing new therapies for clinical disorders. Many of the consequences of the animal models can be evaluated by using neuroradiologic approaches, including MR imaging and CT. Micro-positron-emission tomography procedures have also been developed, which allow the brain and spinal cords of the injured animals to be evaluated by using radioactive tracers. The content of this book should, therefore, be an invaluable resource to anyone starting out in the neuroinjury field or to experienced individuals who require an update in terms of animal modeling. Images in each chapter are of excellent quality, and the legends provide a clear understanding of the major points being emphasized. Few books have provided such a comprehensive evaluation of animal models of neurologic injury. Thus, this publication is unique in that it provides critical information regarding animal care, surgical steps for producing the preclinical models, and postinjury management. References for each chapter are comprehensive and are selected from peer-reviewed journal articles. I recommend this book to a wide range of investigators in the field of neurologic injuries, including students, basic scientists, and clinicians. I think anyone in the field of experimental or clinical neurologic disorders will find this book to be extremely helpful, in addition to an important teaching guide for junior investigators.

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