Published April 2, 2009 as 10.3174/ajnr.A1572

BOOK REVIEW

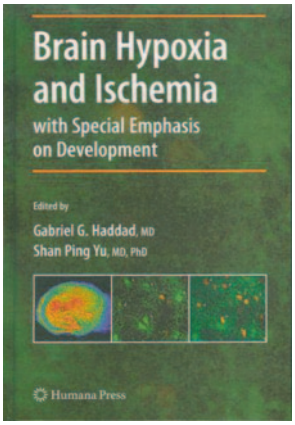
Brain Hypoxia and Ischemia

G.G. Haddad and S.P. Yu, eds. Totowa, NJ: Humana Press; 2009, 343 pages, 47 illustrations, $159.00.

The stated intent of this multi-authored volume is to provide a broad mechanistic foundation for understanding brain disorders attributable to oxygen dysregulation. The editors are highly accomplished investigators. Gabriel G. Haddad, MD, is a renowned specialist in pediatric respiratory medicine and is presently chair of pediatrics at the University of California San Diego and Rady Children's Hospital. His published contributions are in normal and disordered respiratory physiology, hypoxia-mediated cell death and its signaling pathways, the effects of hypoxia on developing organ systems, and physiologic influences on neuronal homeostasis. His co-editor, Shan Ping Yu, MD, PhD, is an accomplished electrophysiologist and cellular/molecular biologist at Emory University School of Medicine, interested in regulation of ion channels and membrane transporters under normal and pathologic conditions.

As the editors note in their Preface, the book is a product resulting "from many discussions and meetings that the editors have had . . . around mechanisms of cell death and cell survival under stressful conditions in the central nervous system"; some of the book's contributors were co-participants in a Society for Neuroscience symposium "several years ago" (year not specified). Although this ambiguous formulation obscures the details of the book's genesis, the volume bears a strong resemblance to typical "symposium proceedings" by virtue of its heavily multi-authored format (more than 30 contributing authors) coupled with a complete lack of thematic integration or cross-referencing among its 17 chapters.

The book's central focus is on cell death and survival mechanisms pertinent to brain hypoxia and ischemia. The volume is divided into 2 major sections. The first, dealing with ion channels, transporters, and excitotoxicity, consists of 7 chapters devoted variously to vulnerability to NMDA excitotoxicity during postnatal maturation, acid-sensing ion channels and glutamate receptor-independent neuronal injury, brain ischemia and neuronal excitability, Na/K-ATPase in central nervous system diseases, the role of water channels during oxygen deprivation and cell death, the roles of zinc and potassium in neuronal apoptosis, and mitochondrial ion channels. The subtitle of the volume's second section stresses reactive oxygen species and gene expression. Its 10 chapters deal with perinatal panencephalopathy in premature infants, intermittent hypoxia, brain stem sensitivity to hypoxia-ischemia, matrix metalloproteinases, oxidative stress, postnatal hypoxia and the developing brain, hypoxia-inducible factor 1, transcriptional responses, acute stroke therapy, and genes relevant to low-oxygen survival.



The reader who approaches this volume with a sharply defined interest in a specific chapter-topic will be rewarded by the degree of detail and the wealth of literature citations (though, in some chapters, it is difficult to find references more recent than the early 2000s). On the other hand, the reader in search of the "big picture" with tie-ins to clinical relevance will be highly disappointed. Many topic-areas potentially amenable to synthesis and integration are, rather, dealt with in a piecemeal fashion in multiple chapters (eg, the chapters on mitochondrial mechanisms and reactive oxygen species). The usefulness of this volume is further diminished by the fact that the extensive chapter bibliographies are organized in order of citation rather than alphabetically.

The abstracts at the start of each chapter are, for the most part, overly general and, therefore, useless; the dearth of critical chapter summaries or conclusions relegates this task to the reader's own devices. Another peculiarity of this volume is that color figure panels are not presented in the chapters themselves but, rather, are assembled in a central folio section; the black-and-white versions in the chapters contain the full explanatory legends, but their color duplicates in the centerfold often do not.

Certain chapters are considered more accessible than others to the basic science–oriented clinical investigator: the chapter on the emerging role of water channels in cell-volume regulation is an example of this. On the other hand, other chapters are so narrowly focused as to be of interest only to the subspecialist (eg, the chapter on mitochondrial ion channels). An extreme example is the chapter on transcriptional response to hypoxia in the developing brain (D. Zhou), which consists largely of extensive tabular listings of individual expressed genes and functional networks reprinted from the author's journal publication.

There is little rhyme or reason to the sequence of chapters. Thus, the clinically pertinent review of the ischemic penumbra (H. Yao) is followed by Dr. Haddad's chapter on Drosophila genetics in relationship to hypoxic injury.

Only a single chapter satisfies the clinician-investigator's requirement for comprehensive coverage, relevance to human disease, and accessible organization. This is Hannah Kinney and Joseph Volpe's superb chapter on perinatal panencephalopathy in premature infants. The question posed in the title, "Is It Due to Hypoxia-Ischemia?", is answered in the affirmative, albeit with caveats. David Gozal's chapter on intermittent hypoxia and neurologic function (eg, obstructive sleep apnea) is also comprehensive and well organized. The chapter on matrix metalloproteinases in cerebral hypoxia-ischemia (by Z. Gu, J. Cui, and S.A. Lipton) stands out for its lucid, step-by-step account of the authors' own studies to implicate S-nitrosylation and protein-thiol oxidation in the prodomain of matrix metalloproteinase-9 as a crucial pathophysiologic event implicated in cerebral hypoxia-ischemia as well as in neurodegenerative disorders.

Notwithstanding the editors' expressed hope that "neuroscientists, clinicians, and medical/graduate students will find this book useful for both basic research and clinical practice," the overall volume disappoints on several counts and cannot be recommended to the clinically oriented neuroscientist.

DOI 10.3174/ajnr.A1572