BOOK REVIEWS

NMR in Physiology and Biomedicine, Robert J. Gillies, Ph.D. ed., Academic Press, San Diego, California, 1994. 471 pp. $95.00

The editor of this book has brought together a distinguished group of internationally recognized experts to produce a thorough review of the use of nuclear magnetic resonance approaches to investigate biomedical problems. This book is written at a level accessible to most readers and should prove valuable to anyone interested in obtaining a state-of-the-art overview of biomedical NMR. This volume could easily serve as a textbook for a course on biomedical NMR in graduate school or medical school. I also highly recommend to anyone working in the field of biomedical NMR to read the outstanding global perspective offered by Robert Shulman in the foreword of the book. This book consists of 26 chapters. In Chapter 1, an introduction to NMR is presented, which includes the NMR phenomenon and basic principles of *in vivo* MRS and MRI techniques. Chapter 2 introduces basic imaging methods with an emphasis on diffusion, perfusion, and flow imaging. An overview of the use of MRI to evaluate tissue microcirculation and perfusion is presented in Chapter 3. Chapter 4 summarizes the current understanding of the processes that contribute to $1/T_1$ and $1/T_2$ at the molecular and anatomical levels, provides a perspective on features of chemical structure to guide MRI contrast agent development, and describes the concepts and principles of relaxation behavior of the water protons of tissue. Chapter 5 is devoted to the physiochemical principles that influence magnetopharmaceuticals. The applications of NMR microscopy to study tumors, kidney, and neurobiology through measurements of restricted diffusion and small metabolites is discussed in Chapter 6. The principles and mechanisms involved in magnetization transfer contrast (MTC) MRI are explored in Chapter 7 along with a discussion of the experimental difficulties associated with quantitative clinical MTC. Highlights of MTC applications which may have practical clinical utility are also presented. Chapter 8 discusses functional imaging of the brain by NMR and focuses primarily on the blood oxygenation level-dependent (BOLD) method used for functional brain mapping. The concepts and methods employed to obtain spatially localized *in vivo* MR spectra are included in Chapter 9. Chapter 10 provides a brief introduction into MR spectroscopic imaging and an overview of its applications emphasizing the brain. In Chapter 11, the methods and theory of diffusion spectroscopy is presented along with recent *in vivo* and *ex vivo* results. A review of the use of MRS for measuring tissue oxygenation from the ^{1}H signals of myoglobin is given in Chapter 12. An overview of the use of MRS and MRI for tracer measurements of blood flow is presented in Chapter 13. Chapter 14 surveys the use of MRS for obtaining the physiochemical composition of body fluids and tissue extracts. Chapter 15 demonstrates how molecular genetics, when combined with NMR, can be used to study enzymes *in vivo*. Chapter 16 reviews the use of fluorinated probes as indicators of for example, various cations, oxygen, and protein catabolism for *in vivo* NMR studies. A practical introduction is presented on the use of bioreactors in NMR research in Chapter 17. In Chapter 18, the application of NMR for studies of lymphocyte metabolism and mitogenesis is presented. Chapter 19 overviews the use of multinuclear MR for studying the blood flow, metabolism, and physiology of tumors. In Chapter 20, a review of work focused on the use of MRS and MRI for obtaining a better understanding of the development and treatment of breast cancer is presented. The use of ^{1}H NMR for metabolic and physiologic studies of the human brain is elucidated in Chapter 21. Chapter 22 overviews the use of NMR for studying the metabolism and physiology of the liver. The use of ^{31}P MRS for studying normal and diseased muscle during exercise is discussed in Chapter 23. In Chapter 24, an overview of the use of MRS for studying muscle bioenergetics is presented. Chapter 25 discusses the use of NMR to study myocardial energetics *in vitro* and *in vivo,* with an emphasis on *in vivo*. Chapter 26 focuses on the current status of ^{13}C NMR for metabolic studies of the heart. The first appendix lists the biologically relevant NMR active nuclei, including their physical characteristics and *in vivo* application. The final two appendices are very useful reference tables providing the ^{13}C and ^{31}P chemical shifts of biologically relevant metabolites. This thorough text reviews the recent field of *in vivo* biological magnetic resonance from methods to applications. Readers will find this book provides a solid introduction and overview of the topics covered with a replete bibliography following each chapter. This book should serve to facilitate the further advancement and development of biomedical NMR by compiling the many perspectives and knowledge offered by this diverse group of experts.

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