Molecular Imaging in Oncology

O. Schober and B. Riemann, Eds.

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Molecular imaging is defined as the visualization, characterization, and quantification of biologic processes at the cellular and molecular levels in living organisms. Molecular imaging allows the study of cellular and molecular pathways and disease mechanisms in their own physiologically authentic environment so that the molecular abnormalities that form the basis of the disease can be revealed. The process of molecular imaging includes the identification of key biotargets and the design and preclinical evaluation of specific probes. A multitude of such innovative probes has already entered clinical diagnostics in oncology. The impact of molecular imaging on diagnostics, therapy, and follow-up in cancer patients has been increasing significantly. There is no doubt that in future the emphasis will be on multimodality imaging in which morphologic, functional, and metabolic imaging techniques are combined in a single clinical investigation that will optimize diagnostic processes.

Among the increasing number of publications comprising all fields of molecular imaging, this handbook focuses on the growing impact of molecular imaging in oncology and addresses topics ranging from basic research to clinical applications in the era of evidence-based medicine. The editors carefully selected experts in the different fields of molecular imaging to outline the major trends and challenges of molecular imaging in oncology, bridging the gap between basic research and clinical applications in a unique way. This book is organized into 4 parts with 14 chapters. Part I, with 5 chapters, is devoted to technology and probe design and examines CT, MR imaging, SPECT, 18F-labeled PET tracers, optical and optoacoustic imaging, and multifunctional MR imaging probes. Part II, with 4 chapters, discusses preclinical studies in detail, with particular attention on multimodality imaging such as PET/MR imaging. Part III, with 4 chapters, presents diverse clinical applications of molecular imaging in oncology. The final part, IV, deals with future challenges of multimodality imaging. The information is current, and the figures are clear and helpful.

Molecular imaging in oncology in the 21st century is not possible without close interdisciplinary and interfaculty collaborations, and this book highlights the potential reintegration of different disciplines. I highly recommend this book to nuclear physicians, radiologists, oncologists, chemists, physicists, mathematicians, and computer scientists.

E. Edmund Kim
University of California at Irvine
101 The City Dr. S.
Orange, CA 92868
E-mail: edmundek@uci.edu

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