# PET and Molecular Imaging: State of the Art and Future Perspectives

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PET permits the mapping and measuring of the rate of physiologic, biochemical, and molecular processes. Therefore, PET has become essential for investigating basic chemical and functional processes in molecular biology.

PET plays an important role in molecular imaging and has been used in oncologic diagnosis and evaluation of therapeutic response. In addition, the precise characterization of brain and myocardial tissue enables risk stratification and treatment strategizing for various cerebral and myocardial diseases.

This book is a compilation of 20 invited lectures and 22 posters presented at the International Symposium for PET and Molecular Imaging in Sapporo, Japan, on November 1–3, 2003. The editors invited many specialists to that symposium, which was organized to exchange ideas, promote PET and molecular imaging technology, and extend experimental studies into clinical applications. More than 150 physicians and scientists attended to share their experiences with PET and molecular imaging. Many excellent ideas and valuable discussions were introduced.

This book is organized into invited lectures and posters and into neurology, oncology, and cardiology sections. The invited lectures in the neurology section relate to imaging of β-amyloid peptide plaques in Alzheimer's disease, PET in epilepsy, PET and SPECT in Parkinson's disease, $^{18}$F-FDG PET for dementia, PET for new drug development, and neuronal function in cerebral ischemia. Those in the oncology section deal with PET radiopharmaceuticals in oncology, $^{18}$F-FDG PET for radiation oncology, and methionine PET in oncology. Those in the cardiology section deal with PET and PET/CT in the diagnosis of atheromas, heart transplantation, the effect of altitude exposure on myocardial flow, adenosine-induced myocardial flow in $^{15}$O-water PET, sympathetic nerve imaging in heart failure or lethal arrhythmia, and quantitation of coronary endothelial function. Four papers included a panel discussion—on radiopharmaceuticals for molecular imaging, quantitation of biophysiologic parameters, radiopharmaceuticals for cancer imaging, and molecular imaging and cardiovascular imaging.

Poster topics in the neurology section relate to dopamine receptors and the pharmacokinetics of antipsychotics, neuronal integrity in brain injury, cerebral blood flow and oxygen metabolic rate, transcranial magnetic stimulation, cyclooxygenase-2 in depression and brain ischemia, oxygen extraction fraction in transient ischemia, and PET in quantification of drug effects.

Poster topics in the oncology section deal with brain tumor grading using $^{18}$F-FDG and methionine, $^{18}$F-FDG PET and methionine PET in brain tumors, methionine PET in differentiation of brain tumor and radiation necrosis, $^{18}$F-FDG PET for the detection of recurrent ovarian cancer, $^{18}$F-FDG PET in recurrent gynecologic cancer, $^{18}$F-FDG PET in malignant lymphoma, $^{18}$F-FDG PET and bone scanning for the detection of bone metastases, medical checkups using $^{18}$F-FDG PET, and determination of apoptotic tumor response using $^{99m}$Tc-annexin V. Poster topics in the cardiology section include myocardial flow in chronic myocardial infarction, coronary stenosis and risk factors, radioligands for β-adrenoreceptors, the effect of aldose reductase inhibitor on metaiodobenzylguanidine accumulation, myocardial oxidative metabolism, and ultra-high-energy collimators for $^{18}$F and $^{99m}$Tc studies.

The papers are fairly well written, with adequate tables and figures as well as updated references. These proceedings are helpful for understanding new or recent advances in PET technology, performing optimal measurements of tissue function, and choosing better strategies for patient management. I recommend this book to nuclear physicians and radiologists who want to better utilize PET and PET/CT in their practices. This book will also be useful for neurologists, oncologists, and cardiologists who benefit, or will benefit, from PET technology.

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