

《招待講演》

Molecular Imaging: The Future of Brain Nuclear Medicine

Masanori Ichise

Molecular Imaging Branch
National Institutes of Mental Health
USA

Nerve signals pass from one neuron to the next via the synapse. This process is a chemical event in which neurotransmitters, upon release from presynaptic nerve terminals into the synapse, act on postsynaptic receptor sites to produce either excitation or inhibition of the target neuron. This neurotransmission is then terminated when any excess neurotransmitters are removed from the synapse via reuptake sites (transporters) located on the membrane of presynaptic nerve terminals. Abnormalities of specific neurotransmission systems are implicated in various neuropsychiatric conditions including Parkinson's disease, Alzheimer's disease, depression, schizophrenia, etc.

With the advent of positron emission tomography (PET) and single photon emission computed tomography (SPECT) coupled with developments of neuroreceptor radioligands, it has become feasible to measure certain critical components of neurotransmission such as presynaptic transporters and postsynaptic receptors in living human brain. These imaging techniques provide clinically and experimentally significant information. In particular, the recent progress toward the development of iodinated and technetium-labeled neuroligands promises to make SPECT imaging of the dopaminergic, benzodiazepine, serotonergic and cholinergic systems a widely available clinical tool. For example, radioligands such as [^{123}I]FP-CIT and [^{123}I]IBZM for imaging of presynaptic dopamine transporters and postsynaptic dopamine D_2 receptors, respectively, are already clinically available in Europe and used for evaluation of patients with Parkinson's disease and other movement disorders. Recent developments of PET radioligands suited for imaging of serotonin transporters and serotonin (5-HT) receptors such as 5-HT $_{1A}$ and 5-HT $_{1A}$ receptor subtypes promise to unveil pathophysiological mechanisms of important neuropsychiatric conditions such as depression and obsessive compulsive disorder. The serotonin transporter, for example, is the primary target of the widely prescribed specific serotonin reuptake inhibitors for the treatment of depression as well as obsessive compulsive disorder. This presentation highlights these new trends in imaging of neuroreceptors, the emphasis being on the emerging clinical role of neuroreceptor SPECT imaging and the neuropsychiatric research use of neuroreceptor PET and SPECT imaging with new radioligands.