Molecular imaging for drug development and pathophysiology

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In vivo molecular imaging has become a key technology for drug development and pathophysiological science. We are mostly utilizing PET (Positron Emission Tomography) as a first-choice modality, because of its ultra-high sensitivity for molecules, adequate temporal and spatial resolution, and especially broad spectrum of target molecules. The present status for development of PET molecular probes, instrumentations including microPET, and the methods for quantitative analyses will be introduced with some examples.

In vivo molecular imaging could bring the high-quality information about:

1. Molecular diagnosis for living patients with symptoms
2. Closer approach for etiology and differential diagnosis
3. Direct follow-up of key molecules as disease markers
4. Pharmacokinetics/Pharmacodynamics in primates/human
5. Dose finding information for individuals, corresponding to SNP
6. Direct evidence for accumulation in non-target organs: Related to adverse effects
7. Drug effects with surrogate markers
8. Early decision of dropout substances (drug candidates)

In 2005, RIKEN and National Institute of Radiological Science were selected as the key centers for development of All-Japan research network to further promote mutual international and multi-disciplinary collaboration on *in vivo* molecular imaging. On this occasion, the concept and project themes will also be introduced.

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