# Multi-molecular imaging as a tool for the metallomics research

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In vivo molecular imaging techniques such as MRI, PET, and SPECT, are extensively used for the visualization of changes in the anatomy and function of various organs in several different disorders as well as in following abnormalities or treatment effects longitudinally. Multi- molecular imaging that we promote is a technology for examining the dynamics of a variety of molecular species with metal radio labeling such as genes and proteins existing in a living organism. Among the techniques of molecular imaging is positron emission tomography (PET), by which two gamma ray photons generated by annihilation are measured coincidently to quantify molecules and visualize their functionality in the body. On the basis of the principle of PET, however, PET can not detect and discriminate several positron emitter labeled molecular probes simultaneously. In contrast, our Gamma ray emission imaging (GREI) which developed from 1999 is intended to achieve simultaneous imaging of the gamma rays released from multiple radioisotopes. By use of a detector comprising a stack-strip semiconductor made from highly pure germanium crystals and a highly sensitive Compton camera enabling measurements of gamma rays over a wide range of 200 to 2500 keV, the dynamics of multiple kinds of biomolecules can be examined in one scan. Advantage of the use of the multiple probes and GREI resides in its ability to enable the visualization of several different pathophysiological and pathobiochemical changes such as tumor, cancer, inflammation, and ulcer. In 2003, the first images in the world of the three tracers were successfully obtained, which showed the different behavior in the living organism[1)]. In this paper, we will introduce our recent works and discuss the future of multi- molecular imaging in the field of metallomics.

1) S. Motomura et al.: *IEEE Trans. Nucl. Sci.* **54**, (2007) pp. 710-717.