

Cellular and Molecular Imaging Based on MR Techniques

○Toshiro Inubushi, Ikuo Tooyama and Ryuzo Torii

(Biomed. MR Sci. Centr., Molec. Neurosci. Res. Centr., and Res. Centr. Animal Life Sci., Shiga Univ. Med. Sci.)

An application of NMR for biomedical area is most clearly embodied as MRI, an important diagnostic tool, where the information obtained by NMR is presented in a visualized image. However, the MRI outlines only the structure of internal organs and areas of lesions. The properties in cellular and molecular levels are not obtained with an MRI. Some elaborations have been devised to delineate the characters with an aid of cellular and molecular targeting and sensing agents, which lead to so-called Molecular Imaging (MI). One of the agents is paramagnetic nano-particles, which can be loaded into living cells. The tagged cells transplanted into a living system are visualized with the paramagnetic effect on MRI. Another example is an MR reporter with over-expressing ferritin, which also shows paramagnetic effect on MRI.

Clinical imaging in the future will not merely report on the success or failure of therapy several months after it has been initiated but will play a crucial role in detecting lesions based upon their molecular signatures, will characterize lesions in situ to aid in treatment decisions, and will help define successful therapeutic drug levels on an individual basis. The chemical aspect of NMR imaging technology presented in the talk shows examples of physiological probes and some example clinical-use paradigms for their implementation into practice. Treatment and screening approaches of number of cancers may benefit in the near future from these tools. In combination with newly emerged bioluminescence and fluorescence imaging techniques targeting specific molecule, an NMR technique in MI, in no doubt, continues to serve as a diagnostic imaging tool in biomedical field.