

# **Recent Progresses in Magnetic Resonance Imaging and Applications to Medicine Ultra High Field MRI for Molecular Brain Imaging**

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Recent progress in magnetic resonance imaging and its applications to medicine and biology will be reviewed and discussed. Among the interesting topical areas, the ultrahigh field MRI of the whole body imaging system dedicated for the brain imaging will be highlighted and its applications to the molecular imaging in conjunction with the Positron Emission Tomography (PET), a forefront molecular imaging device, will be described.

Increased field strength in MRI and MR microscopy in the last two decades or so has accumulated a large amount of experiences in, both imaging as well as spectroscopic information retrieval, and made NMR and MRI as the most rewarding medically and biologically useful tools in the modern medicine and sciences.

With high field MRI, such as the 7.0T brain imager, one can be now able to visualize a micron size cortical laminae in-vivo hitherto unable to do with existing MRI systems. With these improved performances, together with increasing molecular imaging such as PET as well as more recently emerging nano-particle imaging, now it is possible to visualize quantitatively molecular mechanisms of genesis and cellular migrations in-vivo aiding gene therapy and post therapy monitoring with sensitivity and resolution unimagined for several years ago.

Another front of interests of ultrahigh field MRI is the functional brain imaging with markedly improved resolutions, both in spatial as well as temporal domain, and it suggests the possibility of imaging true oxygen consumption hitherto unable to observe and will further facilitate our understanding of BRAIN, the central focus on modern science.