SL08 (MS04-8) **MR Imaging at High Magnetic Fields—From MR Microscopy to Clinical Application: A Challenge to New Biological Information**

Masaya TAKAHASHI
Advanced Imaging Research Center/Radiology, University of Texas Southwestern Medical Center, TX, U.S.A.

Recent technical progress in noninvasive imaging techniques - notably magnetic resonance imaging (MRI) - in terms of improvement in achievable signal-to-noise ratio and spatial/temporal resolution, has been overcoming several fundamental difficulties. Subsequently, there is an increase in demand to have a better diagnostic tool with which to determine the mechanism, location and stage of the diseases. An important challenge is the development of more powerful, multi-variate methods for characterization of anatomical and functional changes, predicting individual outcome and responsiveness to particular therapies on the basis of clinical and laboratory characteristics.

More investigators have been applying higher magnetic field strengths (3 Tesla or higher) in research and clinical settings. Higher magnetic field strength is expected to afford higher spatial resolution and/or a decrease in the length of total scan time due to its higher signal intensity. Besides MR signal intensity, however, there are several factors which are magnetic field dependent, thus, the same set of imaging parameters at lower magnetic field strengths would provide differences in signal or contrast to noise ratios at 3T or higher. Therefore, an outcome of the combined effect of all these factors should be considered to estimate the change in usefulness at different magnetic fields.

We have during the past years been dedicated to the development of new acquisition and processing methods by means of MR, permitting quantitative characterization of the pathophysiological change. The objective of this lecture is to illustrate the practical scientific applications, focusing on MR imaging, of higher magnetic field strength. We will first discuss how MRI is unique in diverse imaging modalities such as X-ray based imaging, nuclear medicine and optical imaging. Second, we will review the advance MR imaging methods that are state-of-the-art at high magnetic field strength in which we hope one can take a hint in their expertise.