MR Microscopy

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The contrast mechanism employed for differentiating structures in micron-scale samples is of great interest especially when is combined with high-resolution MRI and an adequate SNR. In this study, phase contrast together with the SWI technique were performed for imaging living glial tumor cell clusters using 500 µm diameter surface microcoil developed by Bruker Switzerland. The MnCl2 property to function as a T1 contrast agent enabled a closer examination of cell physiology with MRI. Specifically the temporal changes of MnCl2 uptake, retention and release time within and from individual clusters were assessed. The optimal MnCl2 concentration for improved MR signal enhancement was determined while keeping the cellular viability unaffected. The presented results demonstrate the possibilities to reveal structural and functional observation of living glioblastoma human-derived cells. This was achieved through the combination of highly sensitive microcoils, high magnetic field, and methods designed to maximize CNR. The presented approach may provide a powerful multimodal tool that merges structural and functional information of sub-milimeter biological samples. References:
Baxan N, et al. Magn Reson Med, published online

Figure 1: A. a) Optical micrograph of clusters morphology, 10 fold magnification; b) gradient echo magnitude image; c) high-pass filtered phase image. B. a) Optical micrograph of clusters morphology; Typical T1-weighted images acquired after MnCl2 exposure at 0.3 mM (resolution 12 x 16 x 80 µm3, Tscan=4 min 39 s) in coronal (b) and (c) sagittal view; The orientation of the coil with respect to the main magnetic field B0 and the slice positioning is illustrated in d.