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Intracellular Osmolyte Distributions Assessed by ^{1}H and ^{23}Na Magnetic Resonance Microscopy SAMUEL GRANT, The Florida State University — Recently, Magnetic Resonance Microscopy (MRM) has been applied to the high resolution imaging and localized spectroscopy of isolated cells[1,2]. With resolutions <40 μm, these efforts have demonstrated the diverse intracellular environments that can be probed by proton MRM to provide insight into the compartmental diffusion and relaxation of intracellular water and metabolites. In this study, the intracellular distribution of the inorganic osmolyte sodium in isolated single neurons is assessed by MRM through the acquisition of three-dimensional (3D) microimages by direct observation of ^{23}Na. These efforts are made possible through (a) the use of a specially constructed, double-tuned Radio Frequency (RF) microcoil and (b) the application of a unique, ultra-widebore 21.1-T magnet. Results show an increased sodium signal in the nucleus of the L7 neuron of *aplysia Californica*. These ^{23}Na findings are compared with MR data that display a heterogeneous distribution of the organic osmolyte betaine, which appears to be localized at high concentrations to the cytoplasm. The link between the intracellular distributions of sodium and other osmolytes in this single neuron model may shed light on intracellular osmoregulatory processes, particularly in response to toxic or pathological perturbations. [1]S.C.Grant, *et al.*, Magn. Reson. Med. 2000. [2]S.C.Grant, *et al.,* Magn. Reson. Med. 2001.

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