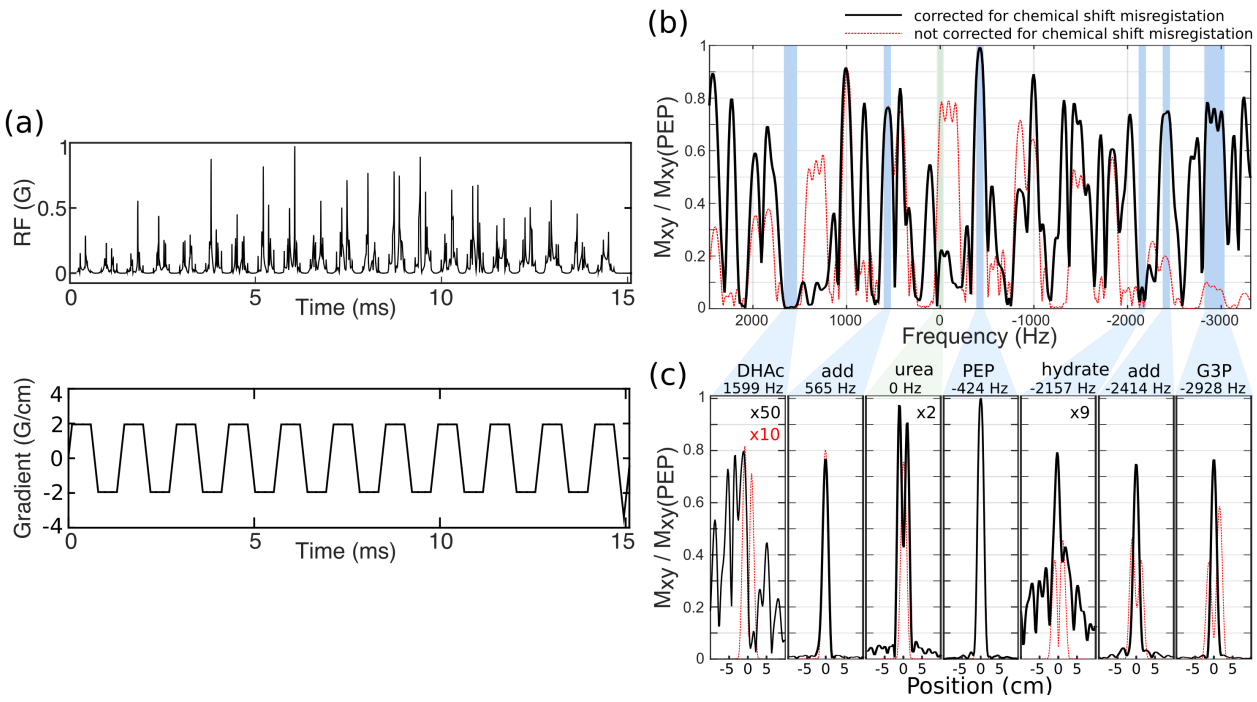
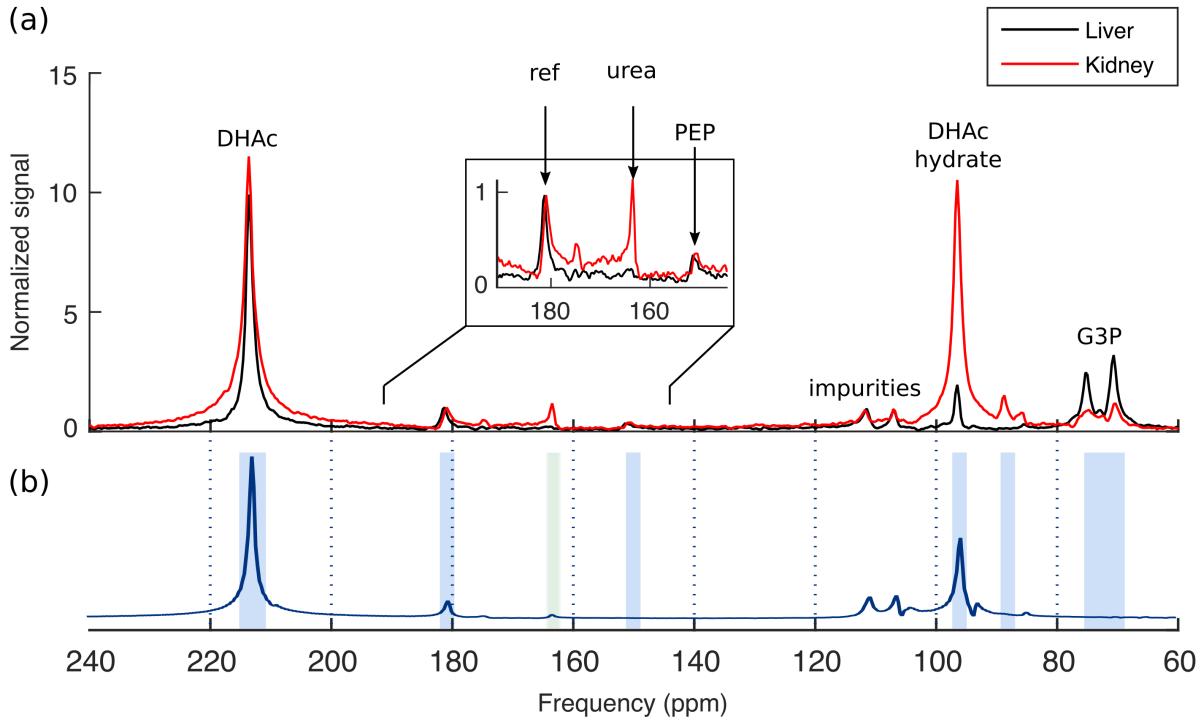


Supporting Figure S1. Spectral-spatial RF excitation pulse with independent flip angle control over six excitation bands. (a) RF and gradient waveforms. This 15.1ms pulse was designed for a 2-cm slab, with the following resonances and their corresponding bandwidths and flip angles: 213.0ppm ± 2ppm (DHAc), 0º; 180.8ppm ± 1ppm (additional resonance), 45º; 150.0ppm ± 1ppm (PEP), 67.5º; 96.0ppm ± 1ppm (DHAc hydrate), 0º; 88.0ppm ± 1ppm (additional resonance), 45º; and 72.0ppm ± 3ppm (G3P), 45º. (b) Spectral profile at the center of the slab (at 0 cm) and (b) spatial profile. The black curve displays the profiles of the RF designed with chemical shift misregistration correction (RF pulse shown in (a)), while the red curve characterizes the profiles. Urea was chosen as the center offset (0 Hz) envisioning the use of a urea phantom as a reference during in vivo experiments. Urea was not, however, one of the frequency bands controlled during the design of the experiment, which lead to a broader slice profile.



Supporting Figure S2. (a) ^{13}C-MRS of a 2-cm slab placed on the liver (black) and a 2-cm slab placed on the kidney (red) upon injection of hyperpolarized [2-^{13}C]DHAc into a fasted rat. Since the urea phantom was placed on the kidney slab only, no urea signal is observed in the liver slab. (b) ^{13}C-NMR of hyperpolarized [2-^{13}C]DHAc in solution showing confounded resonances not resulting from metabolism of DHAc. Shaded areas in blue highlight the spectral-spatial RF excitation frequency bands as shown in Figure S1. Shaded area in green shows the urea phantom resonance used to set the RF pulse offset (163.2ppm). Spectra in (a) and (b) were acquired every 3 s with the six-band RF pulse described in the text. Data shown is the sum of the first five spectra.