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Abstract: The metabolism of acetate in the heart resembles fatty acid metabolism, which is altered in several diseases like ischemia, diabetes mellitus, and heart failure. A signal-to-noise ratio (SNR) optimized imaging framework for in vivo measurements of hyperpolarized [1-(13) C]acetate and its metabolic product [1-(13) C]acetylcarnitine (ALCAR) in rats at 3 Tesla (T) is presented in this work. A spectrospatial pulse was combined with IDEAL encoding to acquire well separated metabolic maps. The influence of dobutamine induced stress onto this metabolic system was investigated in spectra and in an imaging study. An increase of the ALCAR to acetate ratio with dobutamine induced stress was shown in slice selective spectra containing the rat hearts and skeletal muscles. Metabolic maps of acetate and ALCAR were acquired with an acceptable SNR. Quantification of the apparent conversion rate showed stable results in the heart in a time-window of 30 s. The effect of dobutamine on the signal intensities was shown to originate mainly from skeletal than cardiac muscles. The acetate activation was mapped with hyperpolarized [1-(13) C]acetate in a clinical 3T system. Quantitative measurement of the activity was possible in the heart, indicating that dobutamine induced stress does not
improve the ALCAR SNR in the heart.

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