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In vivo cardiac ^{31}P MRS in a mouse model of heart failure

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Objective: To investigate myocardial energy status in a mouse model of heart failure using *in vivo* ^{31}P magnetic resonance spectroscopy (MRS).

Methods: Male C57BL/6 mice underwent thoracic aortic constriction (TAC) surgery, inducing pressure-overload cardiomyopathy, and were measured seven weeks after surgery ($n = 5$). Healthy wild-type mice served as controls ($n = 4$). Cardiac cine ^1H MR images were made for reference purposes and to quantify left ventricular (LV) function. Cardiac ^{31}P MR spectra were measured from a ~6 mm cubic voxel enclosing the end-diastolic LV myocardium using ECG triggered, respiratory gated 3D Image-Selected *In vivo* Spectroscopy (ISIS).

Results: LV end-diastolic volume and LV mass normalized to body weight were higher in TAC mice compared to controls (91.7 ± 19.0 versus 61.8 ± 6.0 μL and 4.4 ± 0.6 versus 3.1 ± 0.2 mg/g, $P < 0.01$), whereas LV ejection fraction was reduced in TAC mice (45.4 ± 20.0 versus 64.4 ± 5.2 %, $P < 0.05$). Myocardial phosphocreatine-to-ATP ratio was lower in TAC mice when compared to healthy controls (0.8 ± 0.2 versus 1.2 ± 0.2 , $P < 0.05$).

Conclusion: Decreased EF in TAC mice is accompanied by decreased phosphocreatine-to-ATP ratio, indicating a disturbed energy homeostasis in this mouse model of heart failure. ***This research was funded by a VIDI grant from the Netherlands Organisation for Scientific Research (NWO).***