## Active metabolism of mouse papillary muscle

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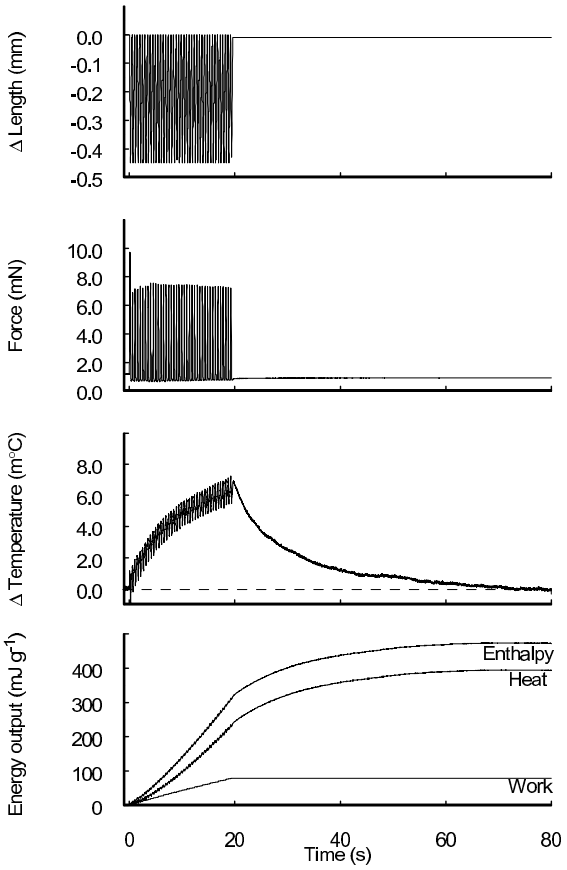
With the development of genetically modified mice, there is need for a cardiac muscle model for determining the physiological and functional consequences of the various genetic manipulations. There have been no measurements of energy use or work capacity of the isolated mouse papillary muscles and the aim of this study was to characterise the mechanical and energetic properties of these preparations.




Papillary muscles were dissected from the left ventricle of hearts from 6- to 12-week old male Swiss mice. The mice were rendered unconscious by inhalation of 80% $CO_2$-20% $O_2$ gas mixture and killed by cervical dislocation. All animal-handling procedures were approved by the Griffith University Animal Ethics Committee. Active metabolism of left ventricular papillary muscles was measured *in vitro* (27°C) using the myothermic technique (see Figure). Muscles were bathed in aerated (95% $O_2$-5% $CO_2$) Krebs solution with glucose provided as metabolic substrate.

The energy output of the mouse papillary muscles performing isometric contractions was measured at contraction frequencies 1 – 4 Hz. The mean absolute heat output was 6.8 ± 1.1 mJ $g^{-1}$ $twitch^{-1}$ (mean ± SEM; n = 11) at 1 Hz and decreased with increasing contraction frequency. Tension-independent heat, an index of metabolism primarily associated with calcium cycling, was also measured. The tension-independent heat accounted for 18.9 ± 2.6 % (n = 6) of the total metabolism. In a more realistic contraction protocol (Mellors & Barclay, 2001), designed to closely simulate the reported changes in muscle shortening (Semafuko & Bowie, 1975) work output and enthalpy output were measured and resulted in a maximum net mechanical efficiency of 17 % (n = 10).

The model is now well established and will be used to study energetic aspects of cardiac pathologies and heart-focussed genetic changes.

Mellors, L.J. & Barclay, C.J. (2001) *Journal of Experimental Biology* 204, 3765-3777.
Semafuko, W.E. & Bowie, W.C. (1975) *American Journal of Physiology* 228, 1800-1807.