Measurement of unidirectional P(i)-->ATP flux in lamb myocardium *in vivo.*

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Unidirectional myocardial ATP synthesis, P(i)-->ATP flux, was studied in vivo using 31P magnetization transfer techniques in intact sheep hearts (n = 5) which were functioning aerobically. Myocardial oxygen consumption (MVO) expressed as mu moles of oxygen atoms/gm/min was estimated using linear regression analysis of data derived from sheep (n = 23), which had undergone continuous MVO measurement during graded stepups in epinephrine induced work loads. During the saturation transfer experiment, epinephrine, beginning at 1 microgram/kg per min was infused to achieve a higher steady-state work load and level of MVO. The unidirectional P(i)-->ATP flux was found to increase significantly ($P < 0.05$) during increases in rate pressure product and MVO. These data show that the unidirectional P(i)-->ATP flux is at least 3-times higher than the peak ATP synthesis rate, achieved through oxidative phosphorylation in these experiments, and more than a magnitude higher than the peak ATP synthesis rate through glycolysis. Therefore, forward P(i)-->ATP flux through glycolysis is the major contributor to the measured P(i)-->ATP flux and these ATP producing bidirectional glycolytic reactions are in a near equilibrium state. Furthermore, delta P(i)-->ATP/delta MVO, 2.70 +/- 0.29 (S.E.) elicited during epinephrine infusion is similar to classically derived P:O values, indicating that most of the change in unidirectional flux is due to oxidative phosphorylation and that minimal disturbance in the glycolytic near equilibrium occurs under these conditions.