

## **Developmental changes in ATP utilization during graded hypoxia and reoxygenation in the heart in vivo.**

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Myocardial ATP utilization and resynthesis during hypoxia and reoxygenation were studied in vivo as a function of maturation. Graded hypoxia was performed in newborn (NB; 4-10 days old, n = 6) and mature sheep (MAT; 30-60 days old, n = 6). Time-resolved <sup>31</sup>P-nuclear magnetic resonance was used to monitor myocardial phosphates throughout hypoxia and to monitor reoxygenation concomitant with rate of myocardial O<sub>2</sub> consumption (MVO<sub>2</sub>) measurement. Oxygen delivery and MVO<sub>2</sub> were constant in both groups throughout hypoxia, with substantial and similar increases in both parameters during reoxygenation. Hypoxic myocardial lactate release was similar in NB and MAT. Phosphocreatine (PCr), but not ATP, decreased in NB only during milder hypoxia. Rapid PCr and slower ATP depletion occurred with severe hypoxia, consistent with ATP utilization/synthesis imbalance. Depletion rates were higher in MAT. Creatine rephosphorylation rates, measures of mitochondrial function reported as percentage of predicted values, were similar. 34 +/- 12 in NB and 26 +/- 9% in mature lambs. In conclusion, 1) phosphorylation potential decreases in NB but not MAT in response to a decreasing oxygen gradient; 2) ATP utilization during hypoxia increases more in mature lambs; 3) anaerobic ATP production is not greater in NB; and 4) despite the greater energy imbalance imposed on MAT during hypoxia, mitochondrial function is similar to NB during reoxygenation.