TABLE V

Measured cellular ADP content versus calculated free cytoplasmic ADP concentration and cytoplasmic phosphorylation state

The cytoplasmic free ADP concentration was calculated from the measured tissue components of the creatine kinase reaction in rat liver and rat muscle. The cytoplasmic free ADP concentration in rat liver was calculated from the measured components of the combined glyceraldehyde-3-P and glycerate-3-P reactions. The phosphorylation potential, $\Sigma ATP/\Sigma ADP \times \Sigma P_i$, was calculated using both the measured and calculated cytoplasmic ADP concentrations. The measured ATP and P_i concentrations were used in both calculations. ΔG_{ATP} hydrolysis was calculated from the equation

$$\Delta G_{ATP} = \Delta G^0_{ATP} + RT \ln \frac{[\Sigma ADP]\,[\Sigma P_i]}{[\Sigma ATP]}$$

using the calculated cytoplasmic free ADP concentration. The ΔG^0_{ATP} is, at 38°C, $I = 0.25$, and pH 7.2, −7.73 kcal/mol at free $[Mg^{2+}] = 10^{-3}$ M and −8.27 kcal/mol at free $[Mg^{2+}] = 0.15 \times 10^{-3}$ M. These values were obtained from K_{obs} values calculated from the K_{obs} at pH 7 and free $[Mg^{2+}] = 0$. The values in parentheses indicate number of observations.

	Red cell[a] (7)	Brain[b] (8)	Muscle[b] (6)	Liver[b] (9)
Measured [ΣADP] (μmol/ml cell H_2O)	0.248 ± 0.009	0.726 ± 0.018	0.926 ± 0.067	1.32 ± 0.05
Calculated free cytoplasmic [ΣADP] (μmol/ml cell H_2O)	0.248 ± 0.009	0.032 ± 0.001	0.037 ± 0.001	0.046 ± 0.003
Measured cell content of [ΣATP]/[ΣADP]-[ΣP_i] (M^{-1})	5700 ± 540	1320 ± 40	1090 ± 165	557 ± 46
Calculated free cytoplasmic [ΣATP]/[ΣADP]-[ΣP_i] (M^{-1})	5700 ± 540	30,000 ± 700	27,200 ± 1,240	16,300 ± 1,620
Calculated ΔG for ATP hydrolysis with free cytoplasmic [ΣADP] (kcal/mol at pH 7.2)	−13.65 ± 0.07	−14.08 ± 0.01	−14.03 ± 0.08	−13.69 ± 0.06

[a] Free $[Mg^{2+}] = 0.15$ mM.

[b] Free $[Mg^{2+}] = 1$ mM.