

Energy balance-sheet during an isometric tetanus at different lengths in isolated striated muscle.

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The energy produced by a muscle during an isometric tetanus at the mean body length (l_0) occurs in two phases: during the first few seconds, the energy is produced at a faster rate than can be accounted for by known chemical reactions. After 6 to 8 s, the rate is paralleled by corresponding phosphorylcreatine (PC) hydrolysis (Curtin & Woledge, 1978). Aubert & Gilbert (1978) have shown that at lengths around l_0 the maximum heat production occurs at a length substantially smaller than that for maximum tension. This dissociation could have biased energy balance-sheet studies, since they imply analyses of separate muscles for thermal and chemical measurements.

In order to detect such an interference, frog Sartorius muscles were analyzed during 12 s isometric tetani at two different lengths around l_0 selected in such a way as to yield different heat to tension ratios. It was found that unexplained energy liberation occurs during the first 6 s as previously reported. At $1.1 l_0$, the energy output during the next 6 s of tetanus is balanced by PC hydrolysis. At $0.85 l_0$, however, the initial unexplained energy is accounted for by a subsequent excess PC hydrolysis.

These results suggest the existence of a length dependent energy store which buffers the energy transfer between PC hydrolysis and the tension and heat generating sites.

Curtin, N. & Woledge, R. (1978). *Physiol. Rev.*, **58**, 690-761.

Gilbert, S. & Aubert, X. (1978). *Proc. internat. Biophys. Congr.*, VI, 307A.

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