

G. MARÉCHAL (') et G. BLEUKX. — **Le métabolisme de la phosphocréatine durant une contraction isométrique**  
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Translated from French.

## **The metabolism of phosphocreatine during an isometric contraction**

During an isometric contraction of the frog sartorius, phosphocreatine (PC) is hydrolyzed, and is not resynthesized if oxidations are prevented by placing the muscle in an oxygen-free medium, and if the glycolysis is stopped by the sodium monoiodoacetate. The amount of hydrolyzed PC depends on the total duration of tetanization and of the number of tetanus.

The rate of PC hydrolyzed during a tetanus of variable duration is 0.28  $\mu$ moles per gram of muscle and per second of tetanus at 2° C. for the sartorius of *Rana pipiens* (MARÉCHAL and MOMMAERTS, 1963), and  $0.46 \pm 0.016$   $\mu$ moles /g / sec (number of muscles on the basis of this estimate : 68) for *Rana temporaria* sartorius at 6° C. These two values are compatible if we assume that the rate of catabolism is the same in the two species of frogs, with a  $Q_{10}$  of 3.5.

Independently of the total duration of excitation, each tetanus hydrolyses an additional PC which depends on the number of tetani this *extrametabolism* is 0.33  $\mu$ mole /g per tetanus for *Rana pipiens* at 2° C. (MARÉCHAL and MOMMAERTS, 1963), and 0.84 moles g<sup>-1</sup> and tetanus for *Rana temporaria* at 6 C°; these results are compatible with a  $Q_{10}$  of 3.5 if their dispersion is taken into account. This extrametabolism originates in the work that the muscle must provide to develop tension, the heat of shortening associated with it, and especially the residual heat of maintenance occurring after the last stimulus (HILL, 1961). Another possible source of extrametabolism of the PC resides in the labile phase of the heat of retention,  $h_{AE}^{at}$  (AUBERT, 1956). According to observations of AUBERT (1963), the labile heat of maintenance is attenuated to the point of disappearing if the intervals between the tetani are too short. However, it is observed that the amount of PC hydrolyzed in a series of 6 tetani is slightly greater if the interval between tetani is 2 minutes ( $7.03 \pm 0.36$   $\mu$ mol. PC /g, n = 32) only if this interval is 5 sec. ( $6.51 \pm 0.36$  moles PC /g., n = 32).

It must be concluded either that the labile heat of maintenance hardly exists except for the first tetanus of the series, or that there is no hydrolysis of PC associated with the labile heat of maintenance  $h_A$ . Indeed, instead of the expected effect,

-3.5  $\mu$ moles/g. of PC there is a slight increase of + 0.5  $\mu$ mole /g, which can be explained by the slightly higher mean tension in the case of the short intervals (22.2 against 21.5 kg).

AUBERT, X. (1956). — *Le couplage énergétique de la contraction musculaire*.  
Ed. Arscia, Bruxelles.

AUBERT, X. et MARÉCHAL, G., (1963). — *Arch. internat. Physiol. Bioch.*,  
**71**, 32-33.

HILL, A. V. (1961). — *J. of Physiol.*, **159**, 518-545.

MARÉCHAL, G. & MOMMAERTS, W. F. H. M. (1963). — *Biochem. Biophys. Acta*,  
**70**, 53-67.