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P. POILVACHE, Y. BOUTSEN et G. MARÉCHAL
(Laboratoire de Physiologie Générale des Muscles, UCL 5540, B-1200 Bruxelles).

La régénération du muscle gastrocnémien chez des rats hyperthyroïdiens

Translated from French

P. POILVACHE, Y. BOUTSEN and G. MARÉCHAL

(Laboratory of General Physiology of Muscles, UCL 5540, B-1200 Brussels).

Regeneration of the gastrocnemius muscle in hyperthyroid rats

Hyperthyroidism induces in the muscle an increase in the percentage of fast fibers (Ianuzzo et al., 1980). We investigated whether hyperthyroidism exerted an analogous effect on the regenerating gastrocnemius muscle.

We induced hyperthyroidism in a group of male Wistar rats of approximately 80 g by administering 2 μg T3 / g in the drink. A second group was not treated and served as a control. After three weeks of treatment, rats from both groups were operated on to stimulate regeneration. We excise the gastrocnemius, cut it into small pieces with fine scissors and replace in situ the mince thus obtained.

After 30 days of regeneration, during which the treatment is maintained, we proceed to the mechanical experiments. We dissected out the regenerate, preserving its innervation and vascularization. We attach the distal tendon of the regenerate to an ergometer. We stimulate the regenerate, first by nerve, then by electrodes placed directly on the muscle. We proceed thus to two successive sequences of 18 tetanus, long of 0.85 to 0.25 sec, and spaced of 4 min. During

each tetanus, after 0.2 sec, the regenerate is shortened by 1.1 mm at constant speed. The rate of shortening varies in 9 steps from 0.3 mm / sec to 39.3 mm / sec, then the sequence is repeated in reverse. The regenerate is then taken for biochemical analyzes.

The force-velocity curve expresses the relationship between the force exerted by the muscle during a constant velocity shortening and the rate at which this shortening occurs. The force-velocity relation can be analyzed in two exponentials, which suggests that the first exponential, of small velocity constant, expresses the force-velocity relationship of the slow fibers and the second one, of high velocity constant, that of the fast fibers. In this hypothesis, the analysis of the force-velocity relation makes it possible to evaluate not only the velocity constants of the slow and fast fibers, but also their respective contribution to the maximum isometric force.

The strength-to-velocity relationship is identical for treated and untreated rat regenerates, and does not change significantly in direct stimulation and indirect stimulation. Biochemical analyzes (proteins, creatine, CPK, aldolase, LDH, PFK, ICDH) show no significant difference between the two groups of regenerates. We conclude that the excess of T3 has no effect on the first 30 days of muscle regeneration, and this despite the fact that on the thirtieth day the difference between fast muscle regenerators and slow muscle regeneration is already very advanced and that the muscle fibers, which are in the process of neoformation, should be at this moment the most apt to modify their phenotype.

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