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Biochemical and mechanical studies of the regenerating rat soleus muscles.

Rat soleus muscles were minced and orthotopically grafted. Six, 15, 30, and 60 days after the surgery their force-velocity constant was measured and their light chain pattern was evaluated by the O'Farrell technique.

At day 6, the muscles were not stimuable. At day 15, the muscles were directly (but not indirectly) stimuable; however their chaotic structure removed any meaning to force-velocity experiments. At day 30, the velocity constants evaluated using B, the exponential constant of Aubert's equation, (Aubert, 1956) for three experiments were 0.81, 0.99 and 0.50 (in muscle lengths per second). At day 60, their constants were 0.38 and 0.42 in two experiments. B was equal to 0.69 ± 0.07 (n=5) in control soleus muscle. In gastrocnemius rat muscle, a predominantly fast muscle, B was equal to 3.04, 3.14 and 3.19, in three experiments.

At day 6, the slow light chains typical of soleus muscles are absent; the fast. light chains of muscle are barely detectable, whilst fast light chains of non-muscle cells are present. At 15 days, muscle light chains of fast type are present, but none of the slow type variety. At day 30, there is a mixture of fast and slow muscle light chains, similar to that found in soleus muscles of the 12 day old rat (Fig 7, d of Whalen et al.) At day 60, the light chains are of the slow type variety. Embryonic light chains (Whalen et al, 1978) were found at days 6 and 15.

These experiments show that regenerating soleus muscles are mechanically slow, although their muscle light chains are of the fast type in the earlier stages of the regeneration. The regeneration recapitulates the normal growth of the muscle, including the presence of embryonic light chains.

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

Whalen R. G. Butler-Browne and F. Gros, J. Mol. Biol. 1978, **126**, 415-431.