TWO KINDS OF FILAMENTS IN THE SMOOTH MUSCLE CELLS IN THE ADDUCTOR OF A PECTEN, CHLAMYS NOBILIS.

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The opaque portion of the adductor of a pecten was investigated ultrastructurally. The portion contained smooth muscle cells which are composed of thick(myosin) and yhin(actin) filaments. It is well known that thick filaments in molluscan smooth muscle cells are composed of a paramyosin core and myosin molecules coarted the core. The core shows a regular periodicity.

Thick filaments in the pecten adductor were classified into two kinds, thinner and thicker, according to the statistical analysis of their diameter accumulated from cross sections. They were correspondingly classified into two kinds, shorter and longer, according to the statistical analysis of their length from isolated native filaments. These thick filaments were consequently classified into two kinds; thinner and shorter filaments(about 26.5nm in diameter and 7.5μm in length), and thicker and longer ones(about 42.0nm in diameter and 13.0μm in length).

A regular periodicity appeared on the surface of each kind of filaments, when coarted myosin was removed from the surface. Intervals of the periodicity were similar in each kind of filament. It is still obscure whether paramyosin molecules are differnt each other in the two kinds of thick filaments, or not.

EXCHANGEABILITY OF F-ACTIN-BOUND NUCLEOTIDE IN THE SLIDING MOVEMENT.

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It has been shown that F-actins can change their conformations. A typical conformation is the rigid form, in which nucleotides are firmly bound, and the other is the flexible form that feasibly exchange the bound-nucleotides. To study of the structural change in actin during the sliding movement, the exchangeability of the actin-bound nucleotide was investigated in an *in vitro* system.

F-actin containing ^{3}H-ADP was prepared from rabbit muscle, and the released ^{3}H-ADP was measured at 30°C. In a nitrocellulose-coated microchamber with heavy meromyosin(HMM), the rate of exchange of F-actin-bound nucleotide was similar in the conditions of either sliding(with 1m*M* ATP) or rigor(with 1m*M* ADP). In the case of HMM treated with *N,N'-p*-phenylenedimaleimide(*p*PDM), which showed no ATPase activity and weak affinity for F-actins, F-actins were non-motile, but the rate of exchange of the bound-^{3}H-ADP was almost the same again. In the presence of both of the *p*PDM-treated HMM and the untreated-HMM,the sliding of the F-actins were hindered and slowed, and the rate of the nucleotide-exchange was greatly enhanced. These data suggest that the load or tension may transform the actin structure and facilitate the exchange of the bound nucleotide.

RESIDUAL FORCE ENHANCEMENT AFTER STRETCH IN FROG SINGLE MUSCLE FIBRES.

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Stretch of active muscle at a slow velocity causes force to increase above the isometric level and this force is composed of, at least, two component forces, high and quickly decaying one and low and long lasting one; the latter being called the residual force enhancement after stretch. More than one mechanisms are known to be involved in the former high force enhancement early after stretch (Sugi and Tsuchiya, 1988; Amemiya et al. 1988) but the mechanism of the latter is not well known and investigated in the present study. A living single skeletal muscle, tibialis anterior, of the frog was stretched during tetanus in the low temperature (2-3 C). The residual force above isometric force 4 or 5s after stretch was constant irrespective of stretch velocity and change of velocity during stretch if the stretch amplitude was constant. The residual force was higher at longer sarcomere length in the range between 2.0-3.0um. The ratio of residual force to isometric force was very much constant at low and high temperature. Hypertonicity by 98mM sucrose had no effects on this ratio of the residual force. The possibility that the passive elastic element parallel to cross-bridges was involved in this phenomenon was discussed.

The Properties of Scallop and Rabbit Striated Muscle Thin Filaments.

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In vertebrate striated muscles, the actin-myosin interaction is regulated by troponin-tropomyosin system dependent system dependent on the Ca^{2+} concentration. In contrast, Ca^{2+} regulation of molluscan actomyosin ATPase is known to be associated with the myosin molecule and myosin-linked system had been regarded as essential.

Recently, we have detected troponin-like proteims in the striated muscle of scallop.

In the present study, we prepared thin filaments from scallop striated muscle and rabbit skeletal muscle. When scallop thin filaments were added to scallop myosin, the Mg^{2+}-APTase activity was more deeply inhibited in the presence of 10^{-7}M Ca^{2+} and further activated in the presence of 10^{-4}M Ca^{2+} as compared that of actomyosin reconstituted of scallop and actin. When rabbit skeletal thin filaments were added to scallop myosin, the Mg^{2+}-ATPase activity was slightly inhibited in the presence of 10^{-7}MCa^{2+} as compared with that of scallop thin filaments. we concluded the properties of scallop thin filaments were similar to that of vertebrate skeletal troponin I.