

## Talk-23

### Structural basis for regulatory mechanism of muscle contraction: Role of filament lattice in auto-oscillation of sarcomeres

Katsuhiko Sato  
Tohoku University

#### Abstract

The contractile system of striated muscle usually takes either contraction or relaxation state, which is regulated by the concentration of free  $\text{Ca}^{2+}$ . On the other hand, we found that under the conditions intermediate between contraction and relaxation, the auto-oscillation of sarcomeres (named SPOC) occurs (Okamura, N. and Ishiwata, S., 1988. *J. Muscle Res. Cell Motil.* 9, 111-119). During SPOC, each sarcomere repeats the cycle of slow shortening and rapid lengthening periodically under constant micromolar  $[\text{Ca}^{2+}]$  (Ca-SPOC) or in the presence of high concentration of MgADP and the absence of  $\text{Ca}^{2+}$  (ADP-SPOC). Many experimental results on the characteristics (e.g., period and amplitude of oscillation of sarcomere length) of SPOC have been obtained under various conditions (various concentrations of free  $\text{Ca}^{2+}$ , MgADP and inorganic phosphate, pH and temperature). However, the molecular mechanism of SPOC is not yet clearly understood. Recently, we observed that the width of sarcomeres, which corresponds to the lattice spacing between the thick and thin filaments, also oscillates during SPOC. It was found that the subtle change (less than nm) in the lattice spacing is responsible for the SPOC to occur. Based on these experimental findings, we constructed a simple two-state model to explain the SPOC phenomena, where the lateral force balance in addition to conventional longitudinal force balance was newly taken into account.