Physiological study of ascidian tail muscle

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Ascidians are the closest living relatives of vertebrates. Therefore, this animal is expected to provide us valuable knowledge concerning vertebrate evolution. The tadpole larvae share a basic body plan with vertebrates. However, the tail striated muscles are not fused and have no the transverse tubular system unlike vertebrate skeletal muscles. To know physiological property of ascidian tail muscle, we used a transgenic ascidian, *Ciona intestinalis,* expressing a cameleon fluorescent Ca^{2+} indicator in the larval muscle.

Pharmacological study suggested that the character of the acetylcholine receptor evoking Ciona muscle contraction is different from that of vertebrate skeletal muscle and rather similar to that of the neuronal type.

Ciona muscle is comprised of 18 cells on each side. These muscle cells fire synchronously although neuro-muscular junction exists only on most anterior cell. This suggested that the excitation signal transfer through GAP junction as vertebrate cardiac muscle.

The excitation –contraction (E-C) coupling of vertebrate skeletal muscle is a direct coupling between DHPR and Ryanodine receptor without entry of Ca^{2+} from the extracellular. Our experimental result, however, demonstrated that the contraction of Ciona muscle needed the Ca^{2+} influx, which is same as vertebrate cardiac muscle.