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Electron microscope observations on actomyosin and actin preparations from *Physarum polycephalum*, and on their interaction with heavy meromyosin subfragment I from muscle myosin

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Abstract

Actomyosin preparations made from the plasmodial slime mould *Physarum polycephalum* by the method of Hatano & Tazawa (1968) were examined by the negative staining technique. In 0.6M-KCl the preparations contained filaments 0.1 to 1.2 Î¼ long and about 50Ã…wide with attached material. In some cases the attached material resembled arrowheads, and occasionally these were connected to fine whiskers several hundredÃ…ngstrom units long, projecting out at a steep angle from the

several hundredÅ...ngstrom units long, projecting out at a steep angle from the filaments. Treatment with 0.5 to 5 mM-ATP released the attached material and produced unbranched, beaded filaments.

When heavy meromyosin subfragment I from muscle myosin was added to ATP-treated filaments on electron microscope grids, continuous arrowhead structures resulted. These were similar to but less regularly arranged than those formed from heavy meromyosin subfragment I and thin filaments from muscle or muscle actin. In all the cases examined, the direction of polarity was maintained along a given filament.

Repolymerized actin from *Physarum* consisted of long beaded filaments 40 to 50Ã... in diameter. These filaments also reacted with heavy meromyosin subfragment I or heavy meromyosin to form quite regular arrowhead structures. The axial periodicities in these â€œdecoratedâ€ filaments, and in those prepared from *Physarum* actomyosin, were similar to those characteristic of muscle actin.

The results provide evidence for conservation of at least part of the actin molecule during evolution. Several kinds of cytoplasmic streaming occur in a variety of plant and animal eukaryotic cells. In view of the present findings, it is proposed that muscle contraction may have evolved from a primitive form of cytoplasmic streaming.

Previous article

Next article

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