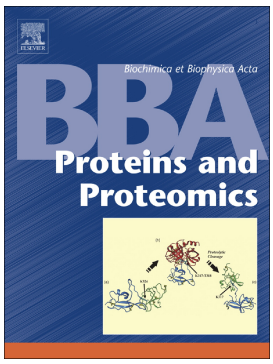

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Inorganic polyphosphate hydrolysis catalyzed by skeletal muscular actomyosin complexes is uncoupled with motility

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Abstract

Hydrolysis of the triphosphate moiety of ATP, catalyzed by myosin, induces alterations in the affinity of the myosin heads for actin filaments via conformational changes, thereby causing motility of the actomyosin complexes. To elucidate the contribution of the triphosphate group attached to adenosine, we examined the enzymatic activity of heavy meromyosin (HMM) with actin filaments for inorganic tripolyphosphate (3PP) using a Malachite green method and evaluated using fluorescence microscopy the effects of 3PP on actin filament motility on HMM-coated glass slides. In the presence of $MgCl_2$, HMM hydrolyzed 3PP at a maximum rate of 0.016 s^{-1} HMM^{-1}, which was four times lower than the hydrolysis rate of ATP. Tetrapolyphosphate (4PP) was hydrolyzed at a rate similar to that of 3PP hydrolysis. The hydrolysis rates of 3PP and 4PP were enhanced by roughly 10-fold in the presence of actin filaments. In motility assays, the presence of polyphosphates did not lead to the sliding movement of actin filaments. Moreover, in the presence of ATP at low concentrations, the sliding velocity of actin filaments decreased as the concentration