

## A myosin II nanomachine mimicking the striated muscle

The contraction of striated muscle (skeletal and cardiac muscle) is generated by ATP-dependent interactions between the molecular motor myosin II and the actin filament. The myosin motors are mechanically coupled along the thick filament in a geometry not achievable by single-molecule experiments. We show that a synthetic one-dimensional nanomachine, comprising fewer than ten myosin II dimers purified from rabbit psoas, performs isometric and isotonic contractions at 2 mM ATP, delivering a maximum power of 5 aW. The results are explained with a kinetic model fitted to the performance of mammalian skeletal muscle, showing that the condition for the motor coordination that maximises the efficiency in striated muscle is a minimum of 32 myosin heads sharing a common mechanical ground. The nanomachine offers a powerful tool for investigating muscle contractile-protein physiology, pathology and pharmacology without the potentially disturbing effects of the cytoskeletal- and regulatory-protein environment.

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