# The Muscle Sarcomere in Mechanical Stress Sensing: Links to Muscle Protein Turnover Control


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Abstract:

Heart and skeletal muscles adapt rapidly to increases in workload, and inversely to mechanical unloading. In striated muscle sarcomeres, mechanics and signalling appear tightly interdependent, but the exact contributions of the various sarcomeric cytoskeleton proteins to mechanical stress handling or signalling are only just emerging. Recent work has led to insight into the interactions, structure, and mechanical stability of sarcomeric protein complexes that fulfil both structural and signalling roles in the adaptation of muscle to mechanical strain. In particular, the Z-disk and M-band are emerging as local hubs for the integration of mechanical signals with pathways controlling muscle protein turnover and muscle gene expression. The M-band emerges as a yet enigmatic integrator of mechanical, protein kinase and GTPase signals that seem to control the activity of the ubiquitin-proteasomal (UPS), autophagy-lysosomal and calpain protease degradation pathways. Recent progress is beginning to shed light on the contribution of adaptor and scaffold proteins like SQSTM1 and nbr1 in mechanically modulated remodeling of the sarcomere. Disruption of M-band mechanics is likely to play a major role in several myopathies by disrupting the mechanical stability of the sarcomere as well as its mechanosignalling functions.


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