

PHYS30005 Course Summary Notes

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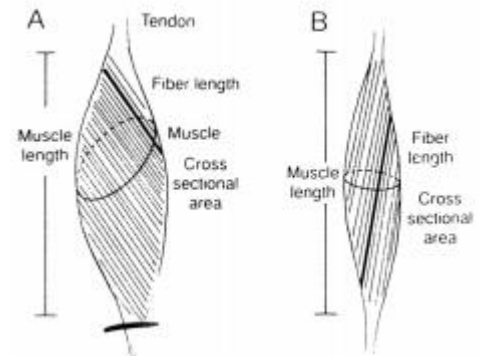
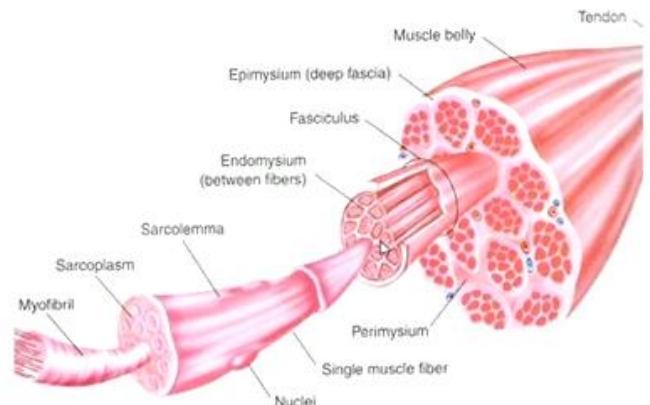
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Lectures 1-11

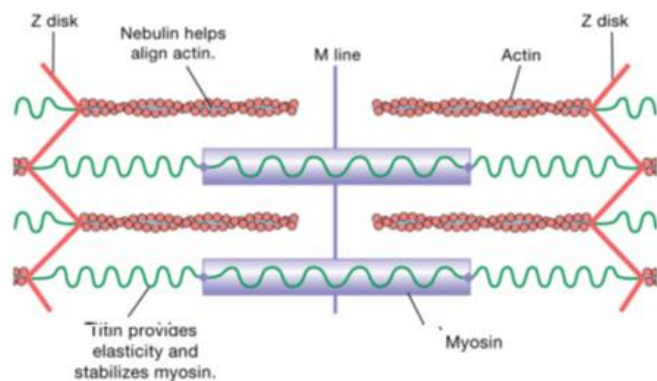
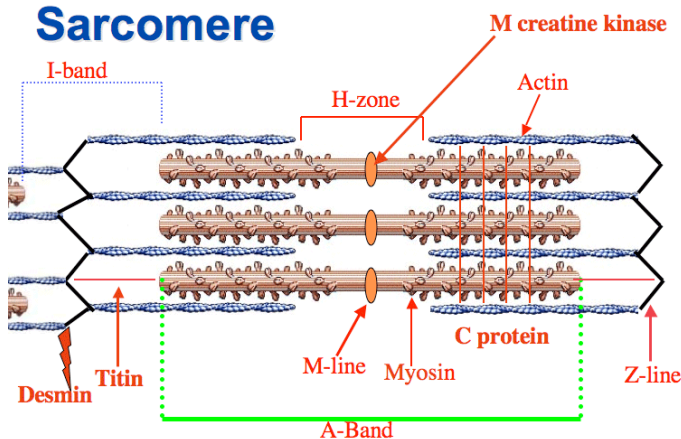
Muscle Structure

Muscle fibres (muscle cells)

- Sarcomeres (individual contractile units) sit in the sarcoplasm (the cytoplasm of muscle cells)
- Lines of sarcomeres make up myofibrils
- Surrounded by sarcolemma (the muscle cell membrane)
- Nuclei
 - Multi-nucleated
 - Nuclei at the periphery
- Fibre length – rarely the same as muscle length due to muscle architecture
 - 'Pennation' (angling of fibres) enables more muscle fibres to insert on the same tendon, thus generating increased force
 - Force is proportional to the cross-sectional area of the muscle
- Key cytoskeletal (structural) proteins
 - Dystrophin
 - Connects the cytoskeleton to the extracellular matrix
 - Anchors the cell to the surrounding architecture and allows linear contraction
 - Deficiencies in this protein cause DMD (Duchenne's muscular dystrophy)
 - Leads to instability of the sarcolemma and the sarcomere causing muscle atrophy
 - Sarcoglycans
 - Dystrophin-associated glycoprotein complex
 - Proteins of the nuclear envelope: emerin and lamin A



Sarcomere



Key parts of sarcomere

- Titin – elastic protein form Z-line to myosin that keeps it centred
- Nebulin – protein designed to provide scaffold to align actin
- Actin – helix molecule that is pulled towards the M-line during contraction
- Z-disks – anchor points at each end of the sarcomere
- I-band – distance between myosin molecules
 - I and H bands disappears in maximum contraction

Movement generation

- ACh neurotransmitter acting on nicotinic receptors (ligand-gated ion channels) on the motor end plate