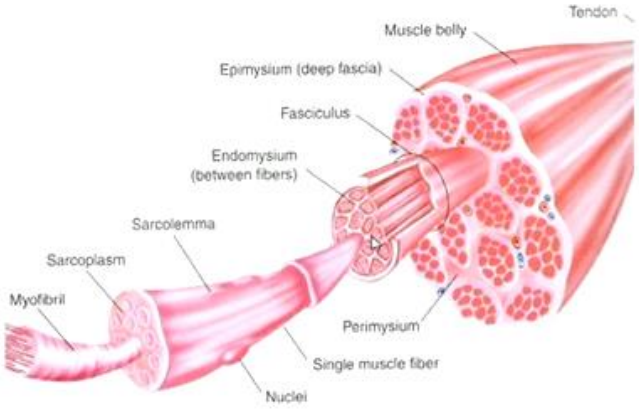
PHYS30005 Course Summary Notes

Table of Contents:

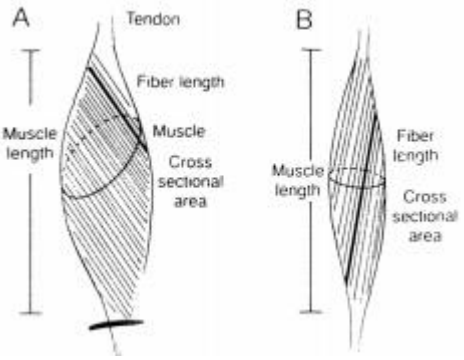
Lectures 1-11

<u>Muscle Structure</u>

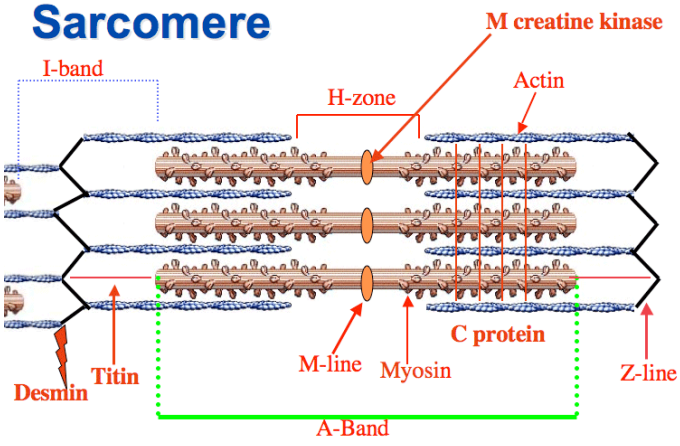


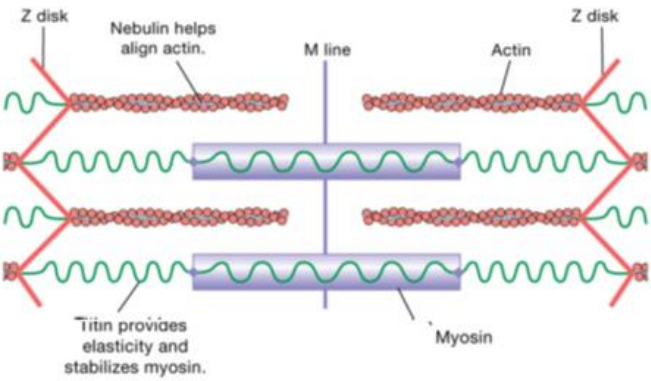
Muscle fibres (muscle cells)

- 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





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