DIGESTION AND ABSORPTION

MUSCLE

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- Most muscles of body are striated. These generally bring about voluntary movements under conscious control of brain and, hence, called voluntary muscles.
- Most of these are inserted at both ends upon bones in different parts of the body. Hence, these are also called skeletal muscles.
- Movements of limbs and the body solely depend upon these muscles. Hence these are also called somatic muscles.
- These are also called phasic type of muscles, because contraction in these is rapid but brief and fatigue occurs quickly.
- Each organised skeletal muscle in our body is made of a number of muscle bundles or fascicles held together by a common collagenous connective tissue layer called fascia. Each muscle bundle contains a number of muscle fibres.
- Each muscle fibre is lined by the plasma membrane called sarcolemma enclosing the sarcoplasm.
- Muscle fibre is a syncytium as the sarcoplasm contains many nuclei.
- The endoplasmic reticulum i.e. sarcoplasmic reticulum of the muscle fibre is the store house of calcium ions.

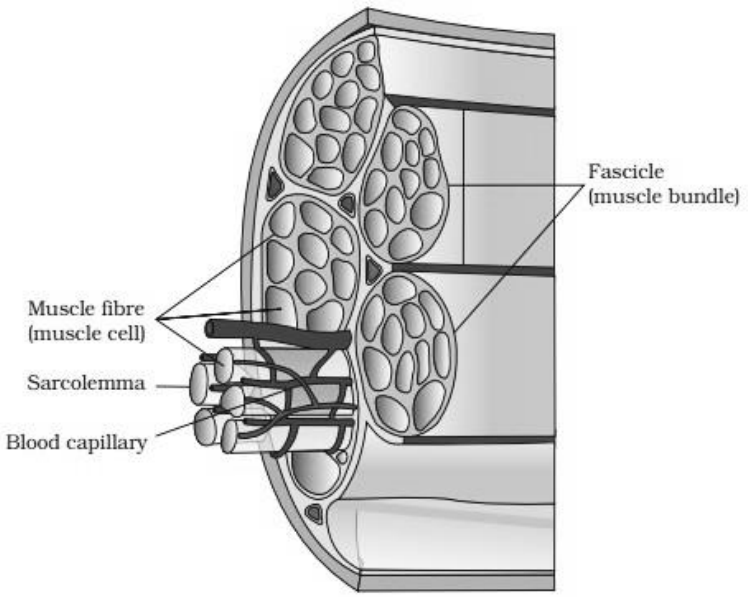

Fig. Diagrammatic cross sectional view of a muscle showing muscle bundles and muscle fibres

STRUCTURE OF CONTRACTILE PROTEINS:

A. Actin : Each actin filament is made up of the following components-

(a) F- actin: In each actin filament, two 'F' (filamentous) actins helically coiled around each other are present. Each 'F' actin is a polymer of monomeric 'G' (Globular) actions.

(b) Tropomyosin: Two filaments of another protein, tropomyosin also run close to the 'F' actins throughout its length.

(c) Troponin: It is a complex protein which is distributed at regular intervals on the tropomyosin. In the resting state, a subunit of troponin masks the active binding sites for myosin on the actin filaments.

B. Myosin: Each myosin (thick) filament is also a polymerised protein.

- Many monomeric proteins called Meromyosins constitute one thick filament.
- Each meromyosin has two important parts, a globular head with a short arm and a tail, the former being called the heavy meromyosin (HMM) and the latter, the light meromyosin (LMM).
- The HMM component, i.e.; the head and short arm projects outwards at regular distance and angle from each other from the surface of a polymerised myosin filament and is known as cross arm.
- The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin.

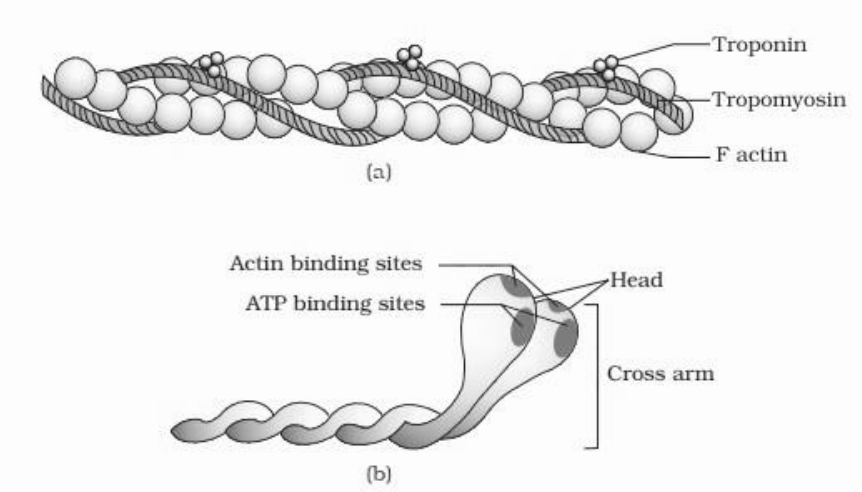

Fig. (a) An actin (thin) filament (b) Myosin monomer (Meromyosin)

Working of striated muscles:

- H.E. Huxley and A.F. Huxley in 1954 proposed a theory to explain the process of muscular contraction. This theory is known as 'sliding filament theory'.

- It was observed that when a fibril contracts:

(a) Its 'A' bands remain intact,

(b) 'I' bands progressively shorten and eventually disappear when the fibril has shortened to about 65% of its resting length.

(c) At this stage, 'H' zones also disappear because the actin filaments of both sides in each sarcomere reach, and may even overlap each other at the "M" line, and the 'Z' lines now touch the ends of myosin filaments.

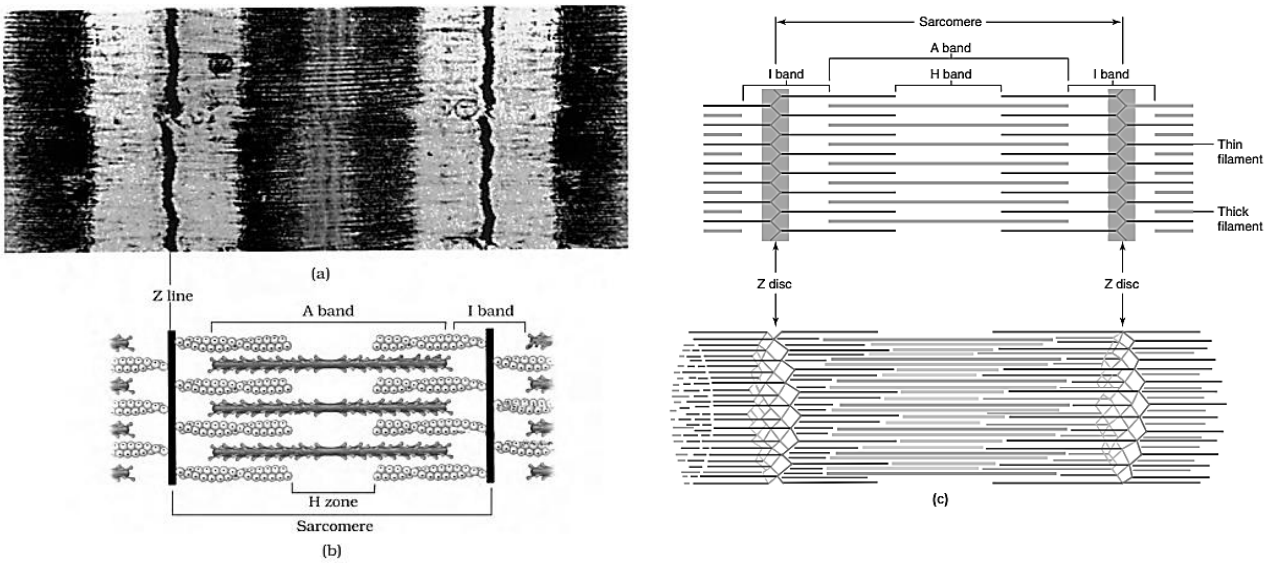

Fig. Diagrammatic representation of (a) Anatomy of a muscle fibre showing a sarcomere (b) a sarcomere (c) Arrangement of thick and thin filaments in a striated muscle fiber