Properties of Skeletal Muscle

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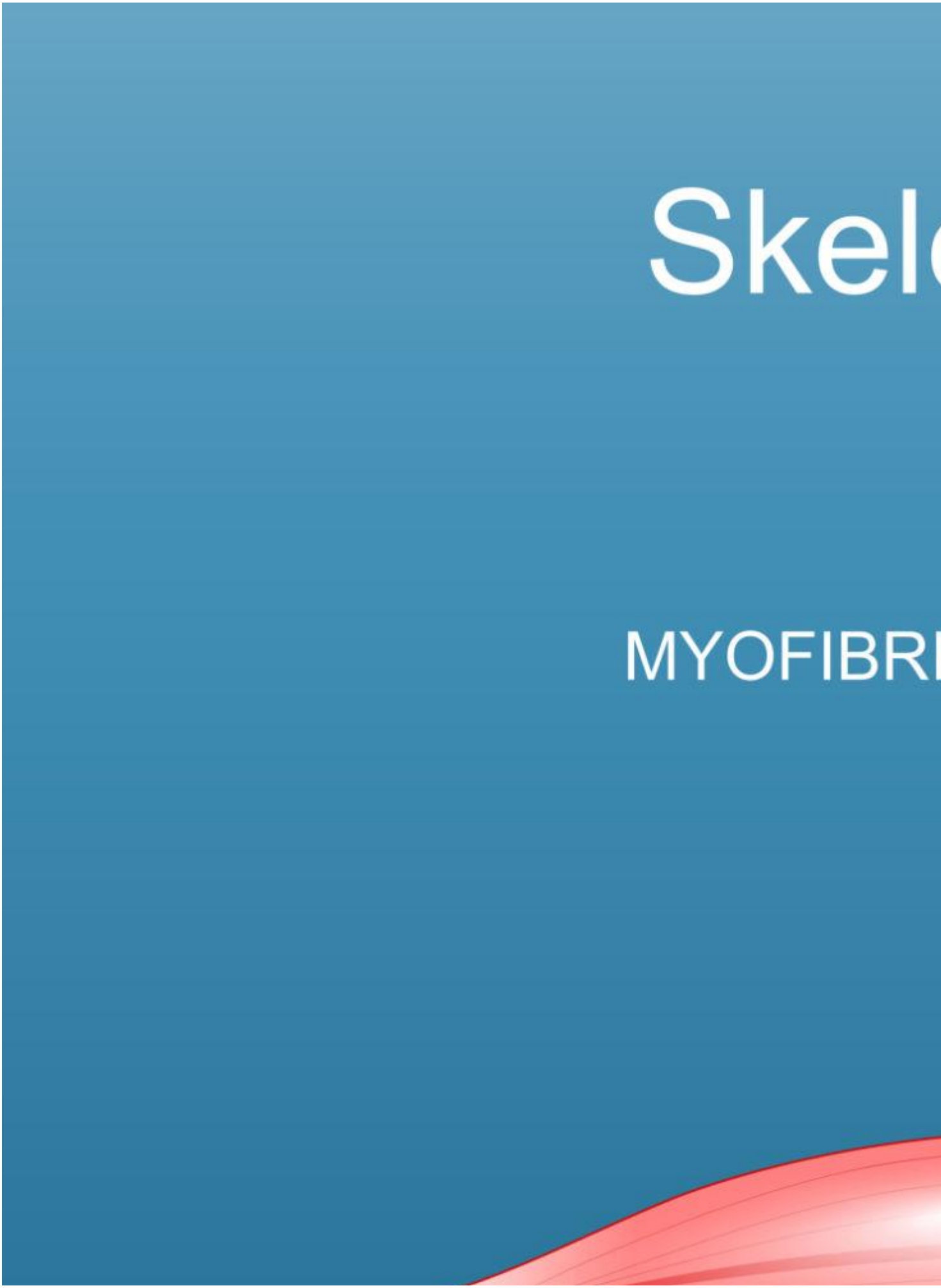
Introduction: Properties of Skeletal Muscle

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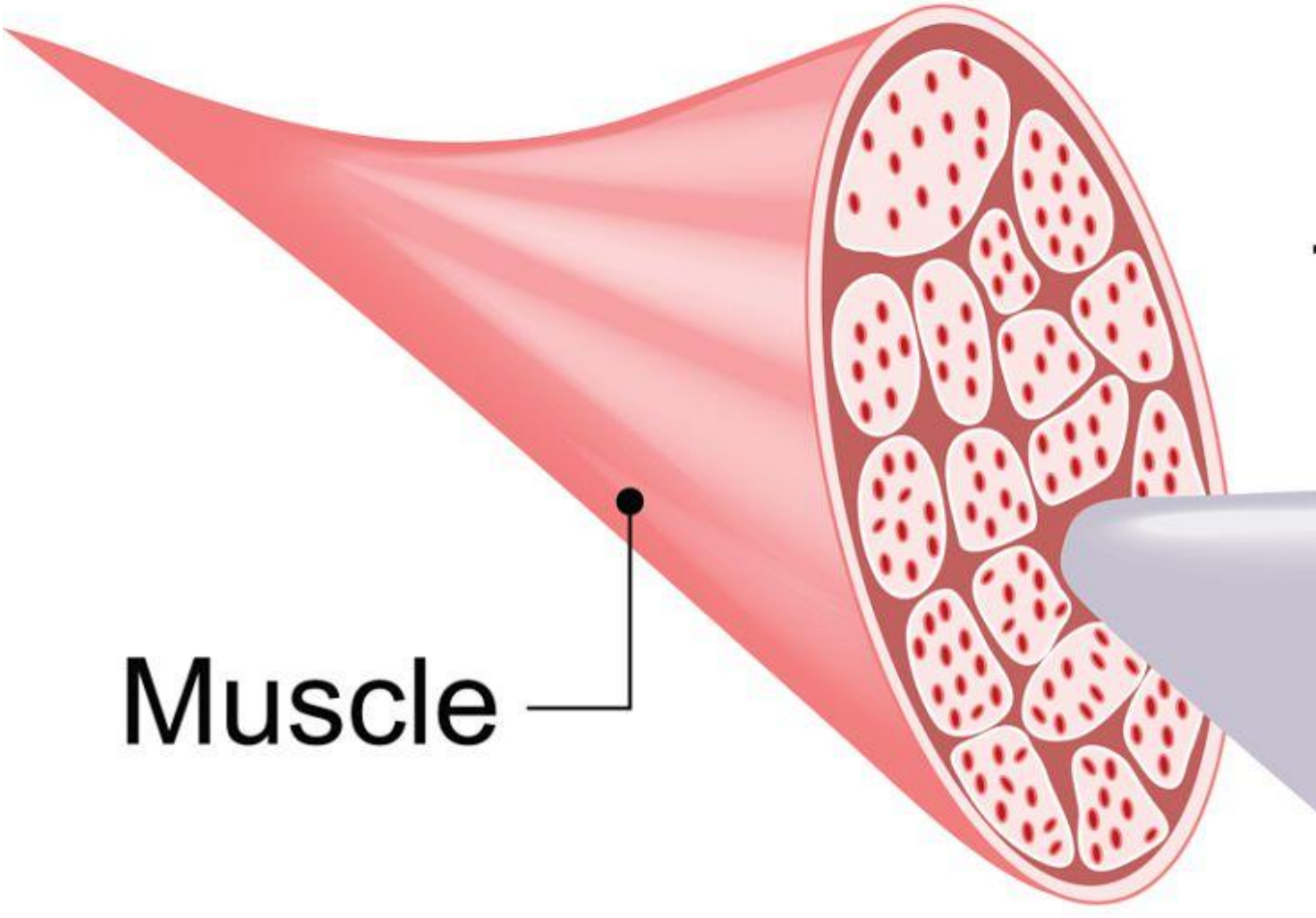
Contractility	
Excitability	

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• **Definition**
• Skeletal muscle possesses certain **physiological properties that enable it to respond to stimuli and produce movement**

• **Excitability (Irritability)**
• Excitability is the **ability of skeletal muscle fibres to respond to a stimulus by generating an action potential**
• This property allows the muscle to **react to nerve impulses from motor neurons**.

• **Contractility**
• Contractility is the **ability of muscle fibres to shorten and develop tension when stimulated**
• It is the fundamental property responsible for **movement of body parts**.

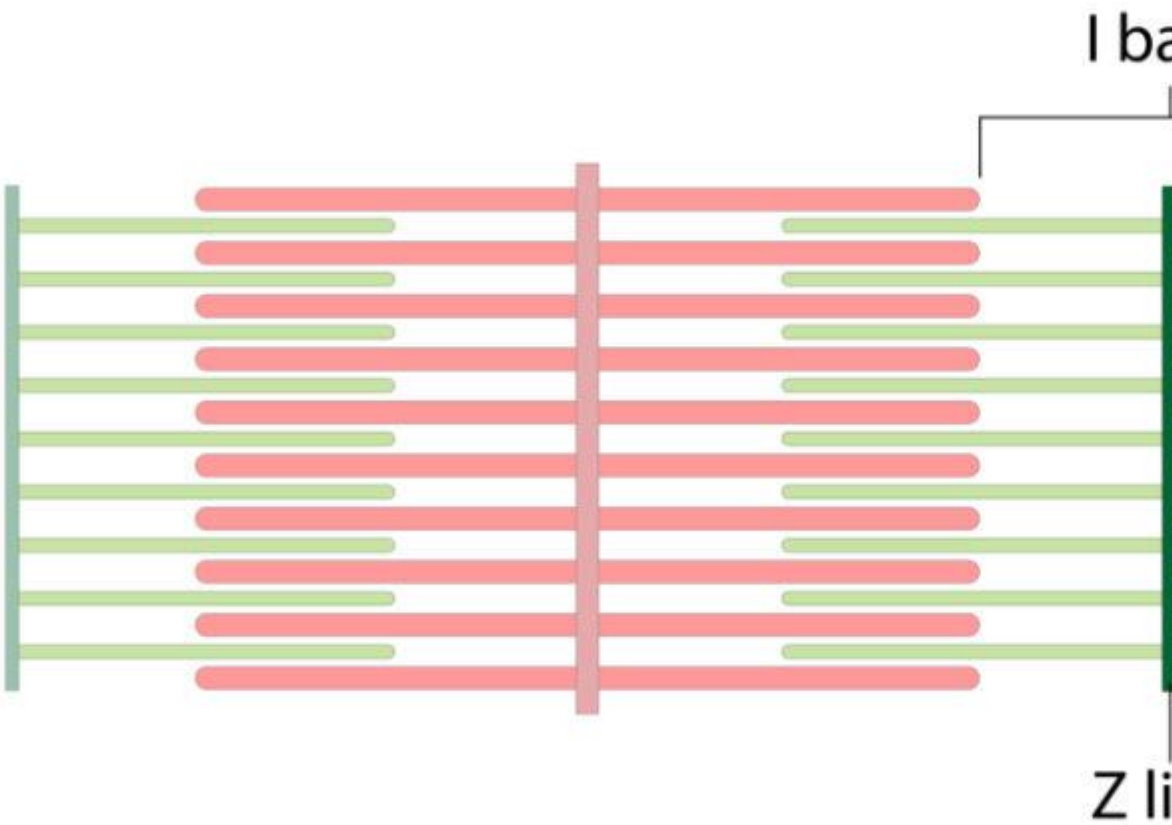
• **Extensibility**
• Extensibility is the **ability of muscle fibres to be stretched without damage**.
• This property allows muscles to **lengthen when acted upon by external forces**.

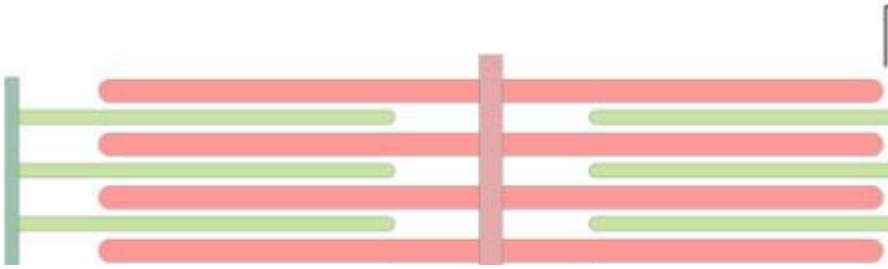
• **Elasticity**
• Elasticity is the **ability of muscle fibres to return to their original length after contraction or stretching**
• This property helps muscles **maintain tone and restore resting length after activity**.

• **Functional importance**
• These properties together allow skeletal muscles to **generate force, maintain posture, and produce voluntary movements of the body**.

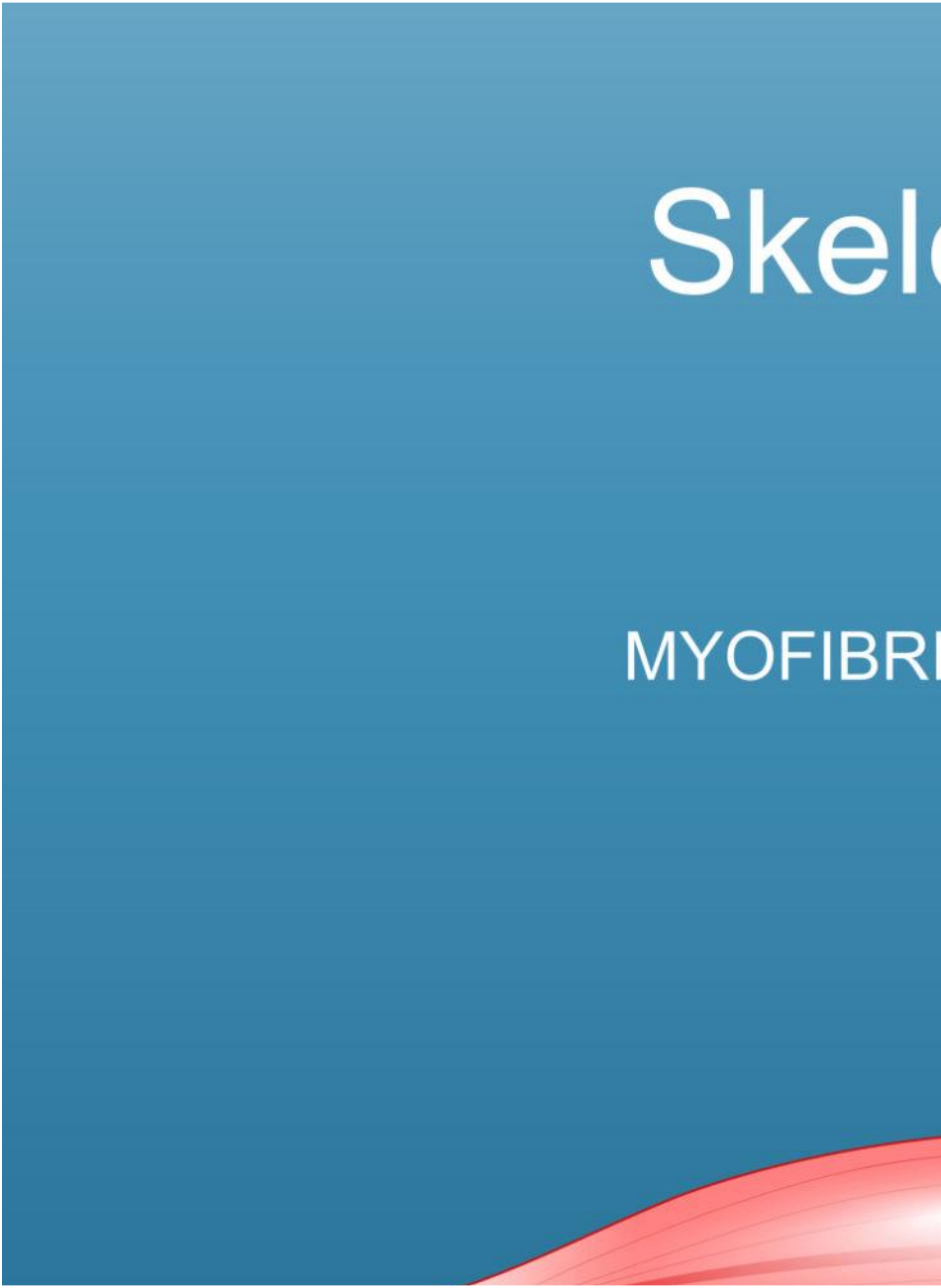
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Contraction of Skeletal Muscle





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• **Definition**

• Contraction of skeletal muscle refers to the **process by which muscle fibres develop tension and shorten in response to stimulation**.

• **Initiation of contraction**

• Contraction begins with a **nerve impulse reaching the neuromuscular junction**, resulting in **release of acetylcholine**.

• **Generation of muscle action potential**

• Acetylcholine binds to receptors on the muscle membrane, producing **depolarization and generation of a muscle action potential**.

• **Spread of electrical impulse**

• The action potential spreads along the **sarcolemma and through the transverse (T) tubules**.

• **Release of calcium ions**

• The electrical signal triggers **release of Ca²? from the sarcoplasmic reticulum**.

• **Interaction of contractile proteins**

• Calcium binds to **troponin**, causing movement of **tropomyosin and exposure of actin binding sites**.

• Myosin heads bind to actin forming **cross bridges**, resulting in **sliding of filaments and shortening of the sarcomere**.

• **Energy requirement**

• The process requires **ATP**, which provides energy for **cross-bridge cycling and calcium transport**.

• **Outcome of contraction**

• The repeated interaction of actin and myosin filaments leads to **shortening of muscle fibres and generation of force**, producing **movement of the skeleton**.

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