
# Smooth Muscles

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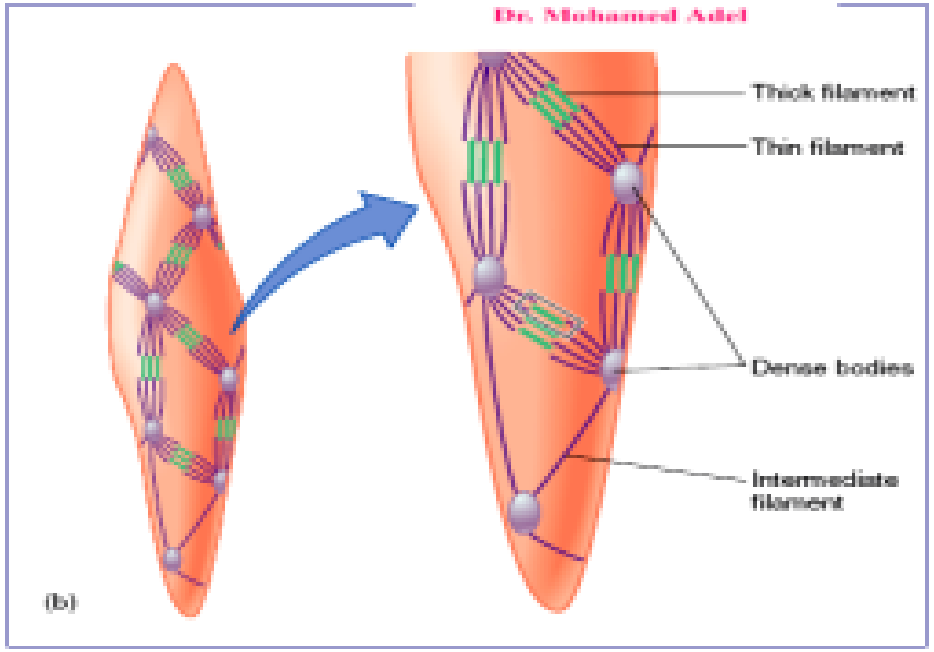
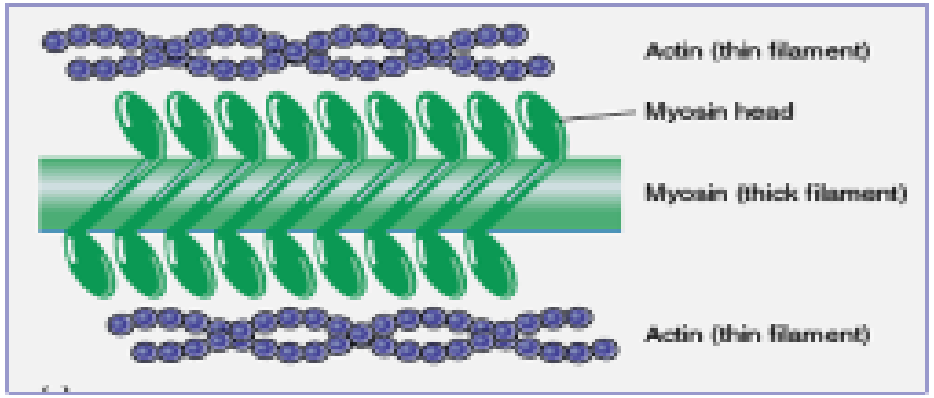
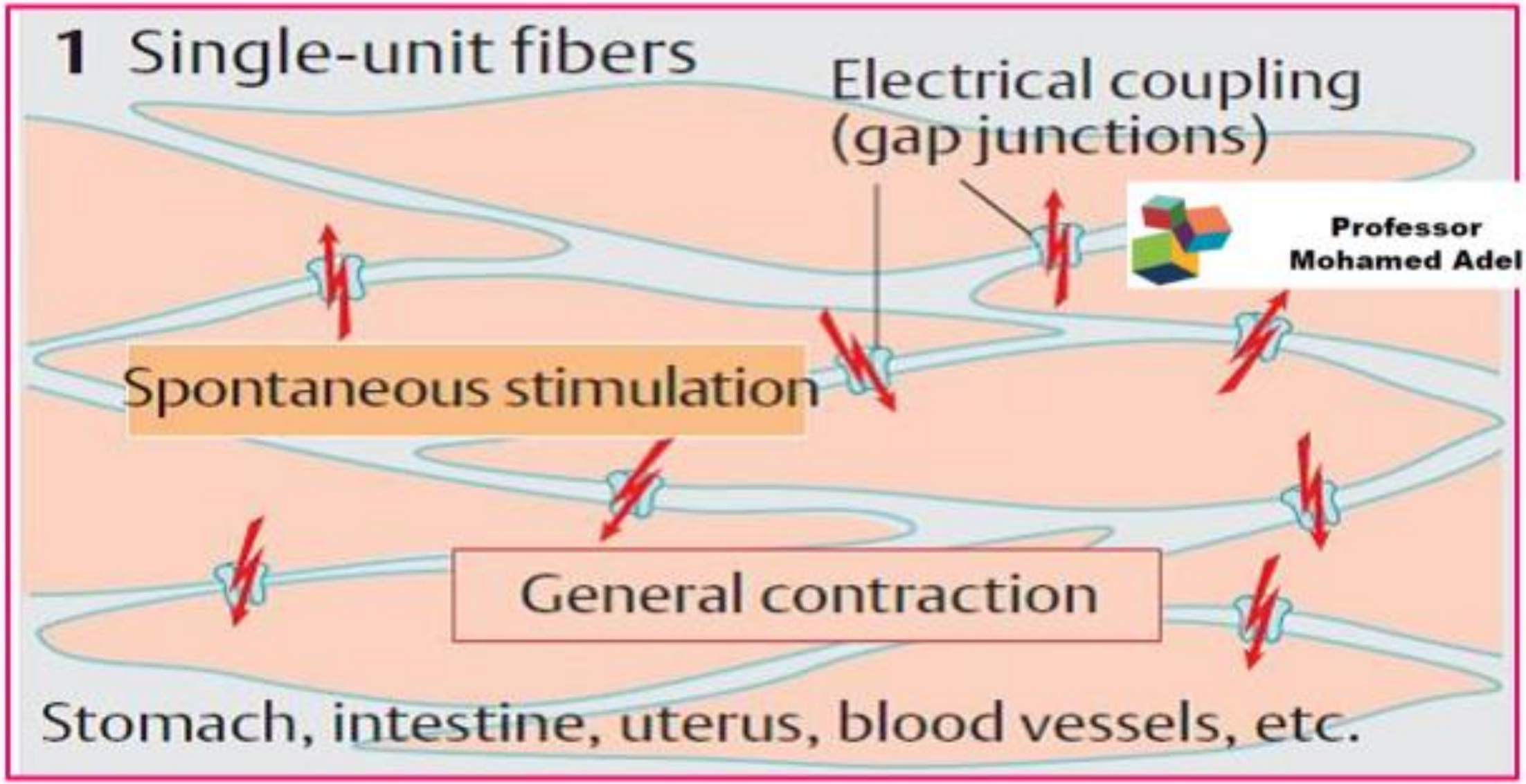
# Smooth Muscles


- Not striated because they do not have sarcomeres
- Instead of Z lines, there are dense bodies to which actin filaments are attached
- There are gap junctions in-between muscle cells; thus acting as one unit (single unit smooth muscle).
- Sarcoplasmic reticulum is rudimentary
- Therefore, Excitation-Contraction Coupling depends mainly on Extracellular $Ca^{++}$




1 Single-unit fibers
Electrical coupling
(gap junctions)
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Spontaneous stimulation
General contraction
Stomach, intestine, uterus, blood vessels, etc.

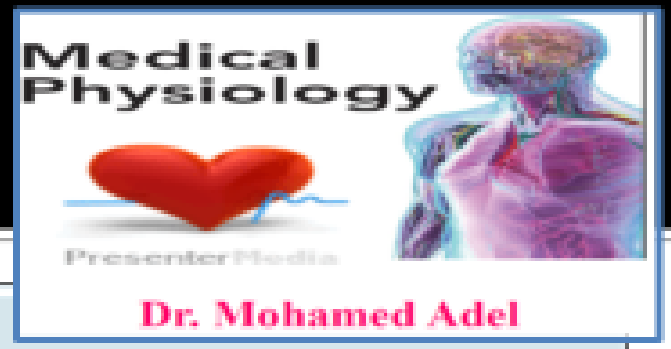
## Smooth Muscle;
## Excitation-Contraction Coupling

- Regulatory protein is Calmodulin.
- Ca-calmodulin complex activates Myosin Light Chain kinase enzyme (MLCK) which phosphorylates myosin heads activating myosin-actin binding.
- Relaxation occurs by dephosphorylation by phosphatase enzyme.

# Electric activity of smooth muscles

| | |
|---|---|
| ❑ Resting membrane potential (RMP): | = -50 mV |
| ❑ In most cases, the depolarizing phase of a smooth muscle action potential is caused by: | calcium influx (Not $Na^+$) through voltage-gated Ca++ channels or ligand-gated Ca Channels.   Dr. Mohamed Adel |
| ❑ Repolarization is caused by | K+ efflux, through several types of channels. |

# ❖Ca2+ channels:




**1) Voltage-activated Ca2+ channels**

- **Activated by spread of an action potential on the plasma membrane.**

**2) Chemically-activated sensitive Ca2+ channels**

- **Activated by binding of a chemical transmitter.**

| Skeletal Muscles | Smooth Muscles |
| --- | --- |
| **1) Appearance:** | |
| ❑Striated. | ❑No striations. |
| **2) Regulation:** | |
| ❑Nervous control | ❑ Nervous<br>❑Hormonal control |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## Skeletal Muscles

## Smooth Muscles

# 3) Action potential:

action potentials with plateaus occurs in the uterus and ureters

❑No plateau.

❑No plateau.

❑Upstroke due to inward $Na^+$ current.


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❑ Upstroke due to inward Ca+2 current

# Compare between Skeletal Muscles and Smooth Muscles

| | Skeletal Muscles | Smooth Muscles |
|---|---|---|
| **4) Source of Ca+2** | ❑ **SR:** via action potential on T tubules. | ❑ **SR.**<br>❑ **ECF:** via voltage gated Ca+2 channels |
| **5) Regulatory Proteins:** | ❑Troponin. | ❑Calmodulin. |
| **6) Speed of contraction:** | ❑Fast to slow. | ❑Very slow. |


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Thanks!