

cardiac physiology  
[created by Paul Young 09/10/07]

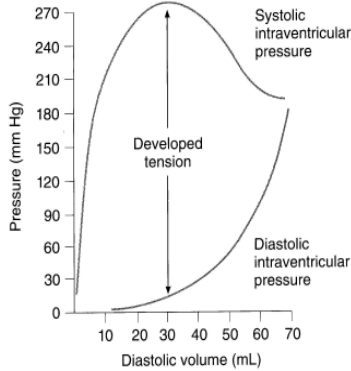
**mechanical properties**

- contraction begins just after depolarisation & lasts one & a half times as long as skeletal  
- calcium entry via dihydropyridine receptors triggers calcium release from the SR

compared to skeletal

- cardiac muscle is slow & has relatively low ATPase activity (fibres are dependent on oxygen)  
- two isoforms of MHCs (alpha predominates in atria; beta predominates in ventricles)

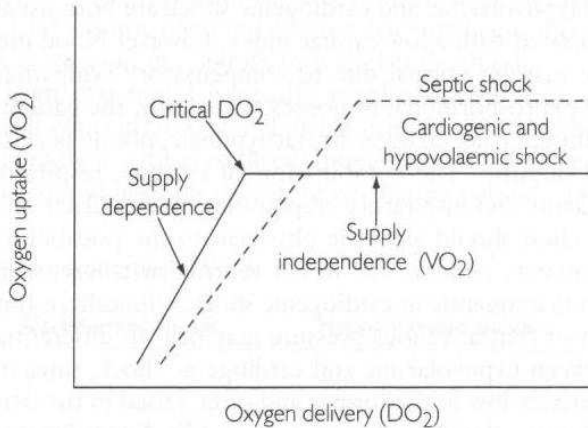
isoforms



length-tension relationships

**metabolism**

under basal conditions:  
- 35% of caloric needs come from carbohydrate  
- 5% from ketones & amino acids  
- 60% from fat



supply dependency

**morphology**

general

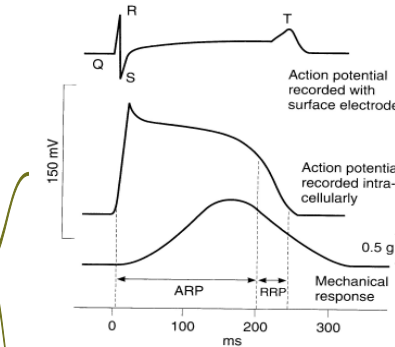
have intercalated discs where one fibre abuts another & membranes of both fibres parallel each other through an extensive series of folds (provide a strong unit between fibres so that pull is transmitted)

along sides of fibres next to discs, cell membranes fuse forming gap junctions allowing spread of conduction

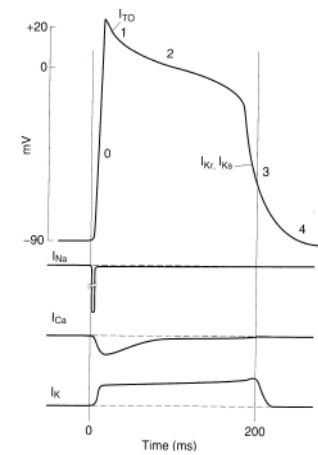
key features

1. branching cells
2. single central nucleus
3. visible striations
4. intercalated discs
5. T-tubules are located Z-lines rather than A-I junction

**electrical properties**



phase 0 is depolarisation  
phase 1 is initial repolarisation  
phase 2 is plateau  
phase 3 is late repolarisation  
phase 4 is baseline



**Voltage-gated channels**

- Na<sup>+</sup>
- T Ca<sup>2+</sup>
- L Ca<sup>2+</sup>
- K<sup>+</sup>

Inward rectifying  
Delayed rectifying  
Transient outward

**Ligand-gated K<sup>+</sup> channels**

- Ca<sup>2+</sup>-activated
- Na<sup>+</sup>-activated
- ATP-sensitive
- Acetylcholine-activated
- Arachidonic acid-activated