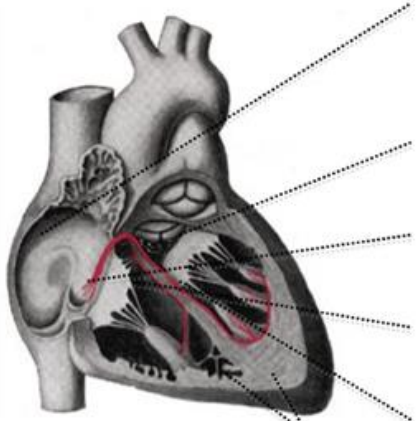
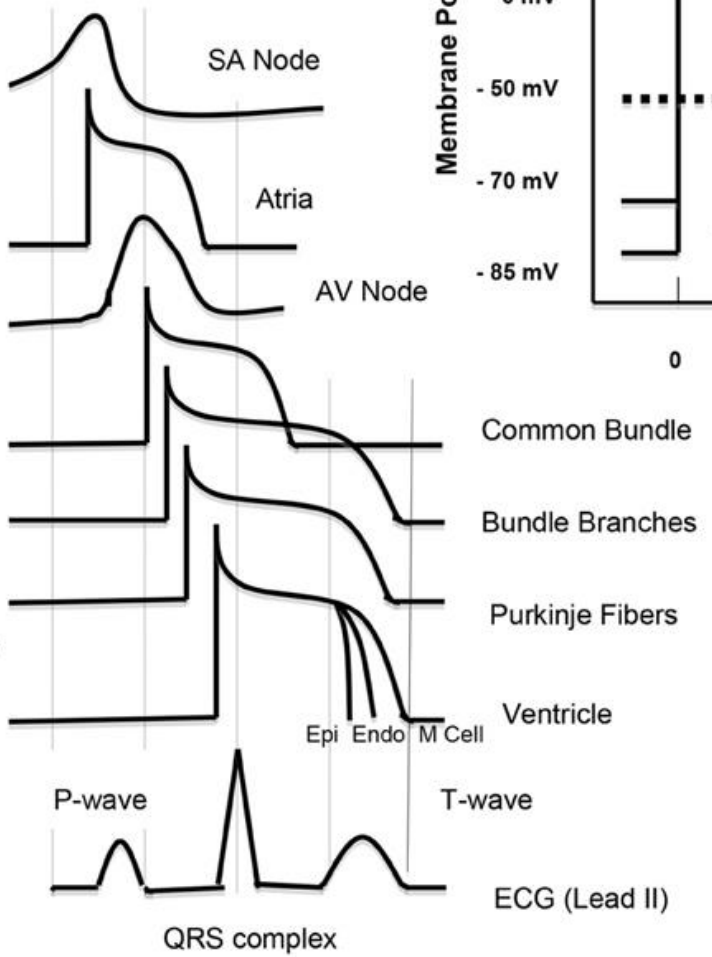
Myocardial protection during cardiac surgery and heart transplantation

Effect of hyperkalemic solution on myocardium : Cardioplegia

Hyperkalemia affects the cardiac transmembrane action potentials differently leading to abnormal electrical heterogeneities



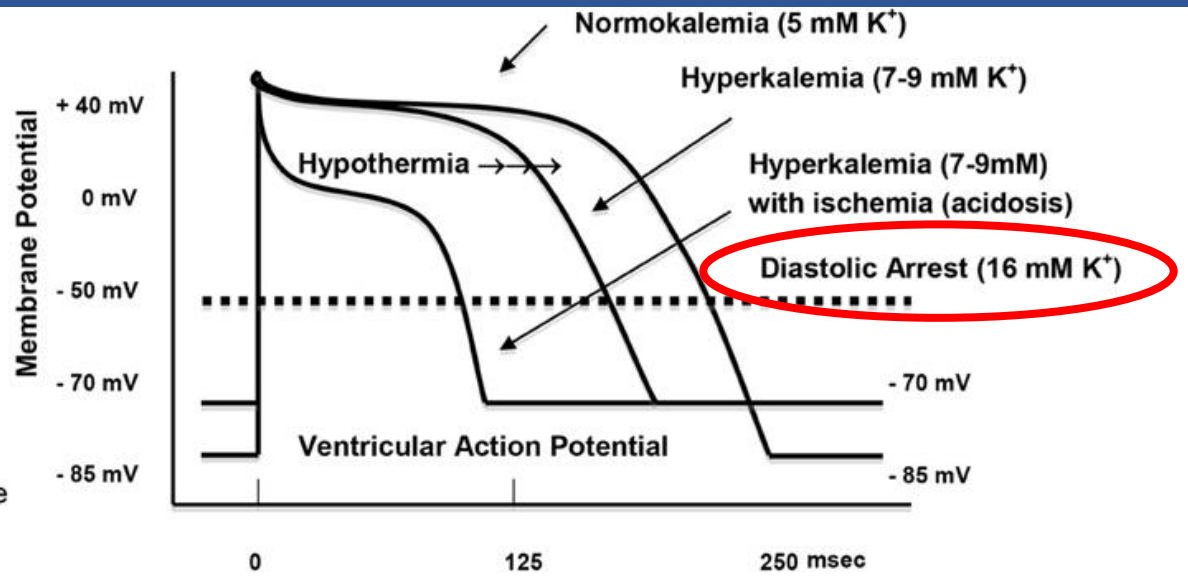


Scale of K^+ Sensitivity

Highest

- Atria
- Ventricular cells
- AV Bundle
- SA Node (inter-atrial tracts)

Lowest



Hyperkalemia (7-9 mM K^+)

- Depolarizes diastolic membrane potential.
- ↓ Na^+ fast channel availability.
- ↓ Excitability and conduction velocity.
- ↓ P-wave height and prolongation.
- ↑ QRS interval, QT shortening.
- ↓ Action potential duration (APD).
- Greater↓APD in the epi- vs. endocardium at the base and greater ↓APD endo- vs. epi at the apex.
- Tall T-waves. ↑ arrhythmogenicity.

Hyperkalemia with ischemia (acidosis pH < 7)

- Increase maximum upstroke velocity (not shown).
- Conduction becomes progressively impaired
- Major reductions in APD. ↑Disparate repolarisations

Hypothermia

- ↑ Diastolic Depolarization
- ↑Action Potential Duration (prolongs plateau)

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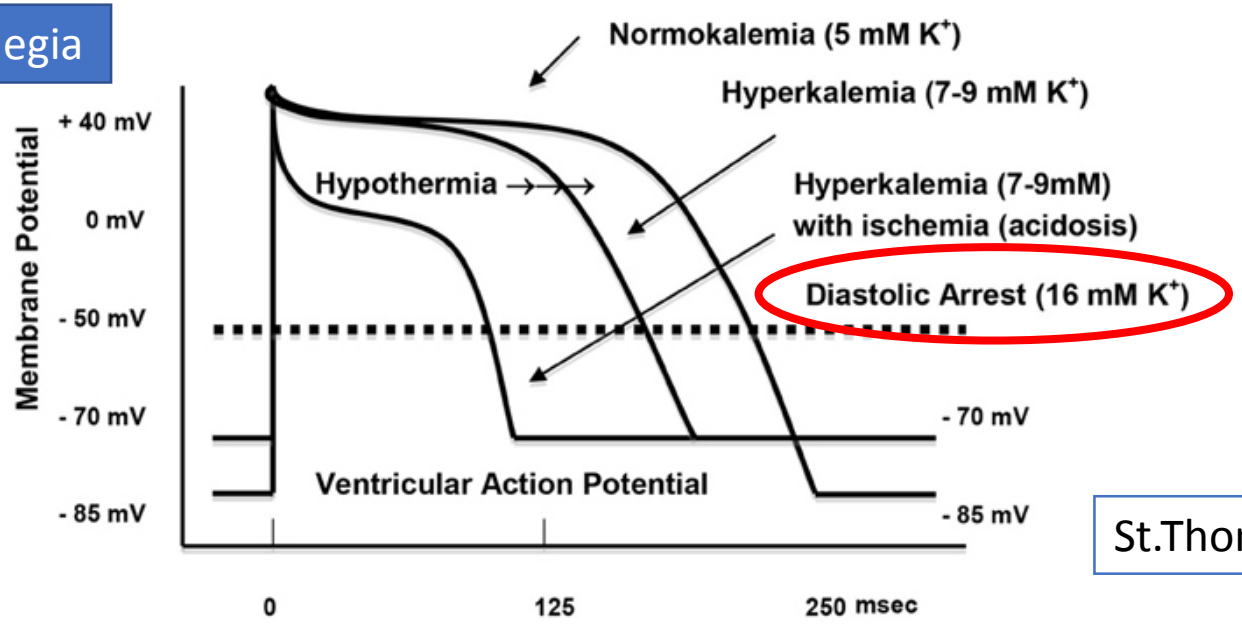
Different type of Cardioplegia : Goal to achieve “Diastolic cardiac arrest”

Blood cardioplegia

Extracellular cardioplegia

Crystalloid cardioplegia

Intracellular cardioplegia



del Nido cardioplegia

Cold cardioplegia

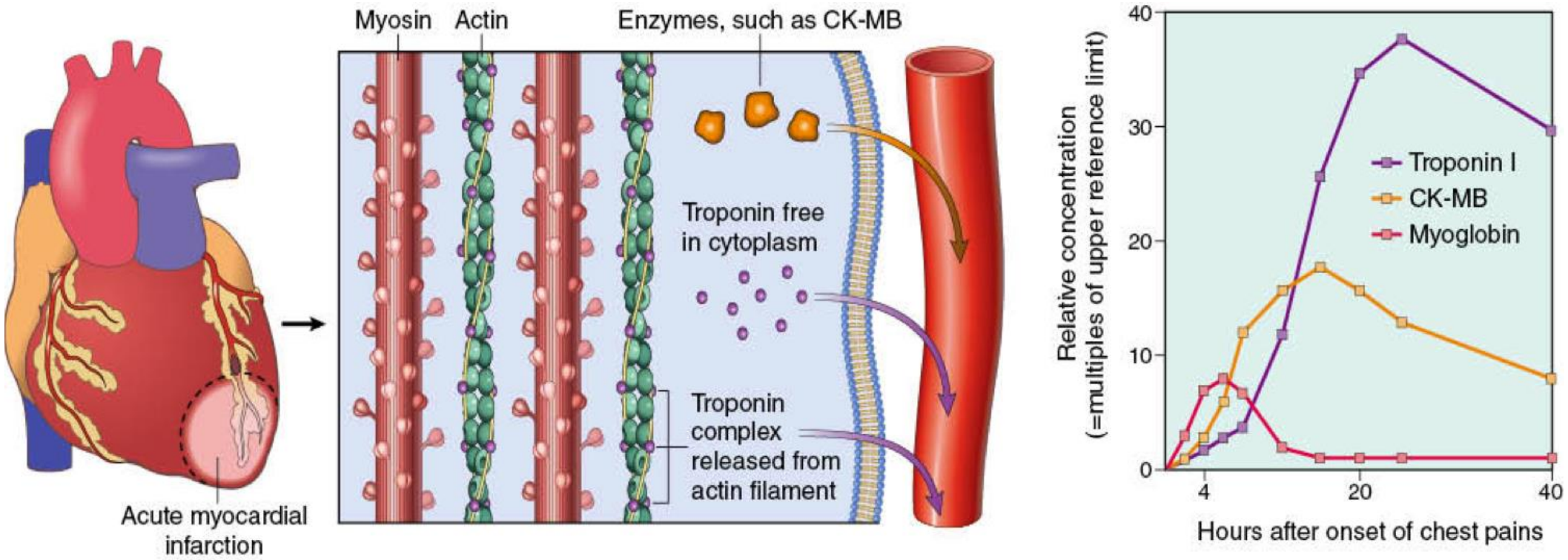
St.Thomas cardioplegia

Warm cardioplegia

Custodiol HTK

Myocardial protection during cardiac surgery and heart transplantation

How long we can stop the heart without cell death? : Post op cardiac enzyme monitoring



1. Onset of myocardial infarction
2. Plasma membrane of necrotic myocytes becomes leaky
3. Molecules leak out of cell into circulation
4. These molecules can be used as biomarkers for diagnosis of myocardial infarction

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