

# ANTIANGINAL DRUGS

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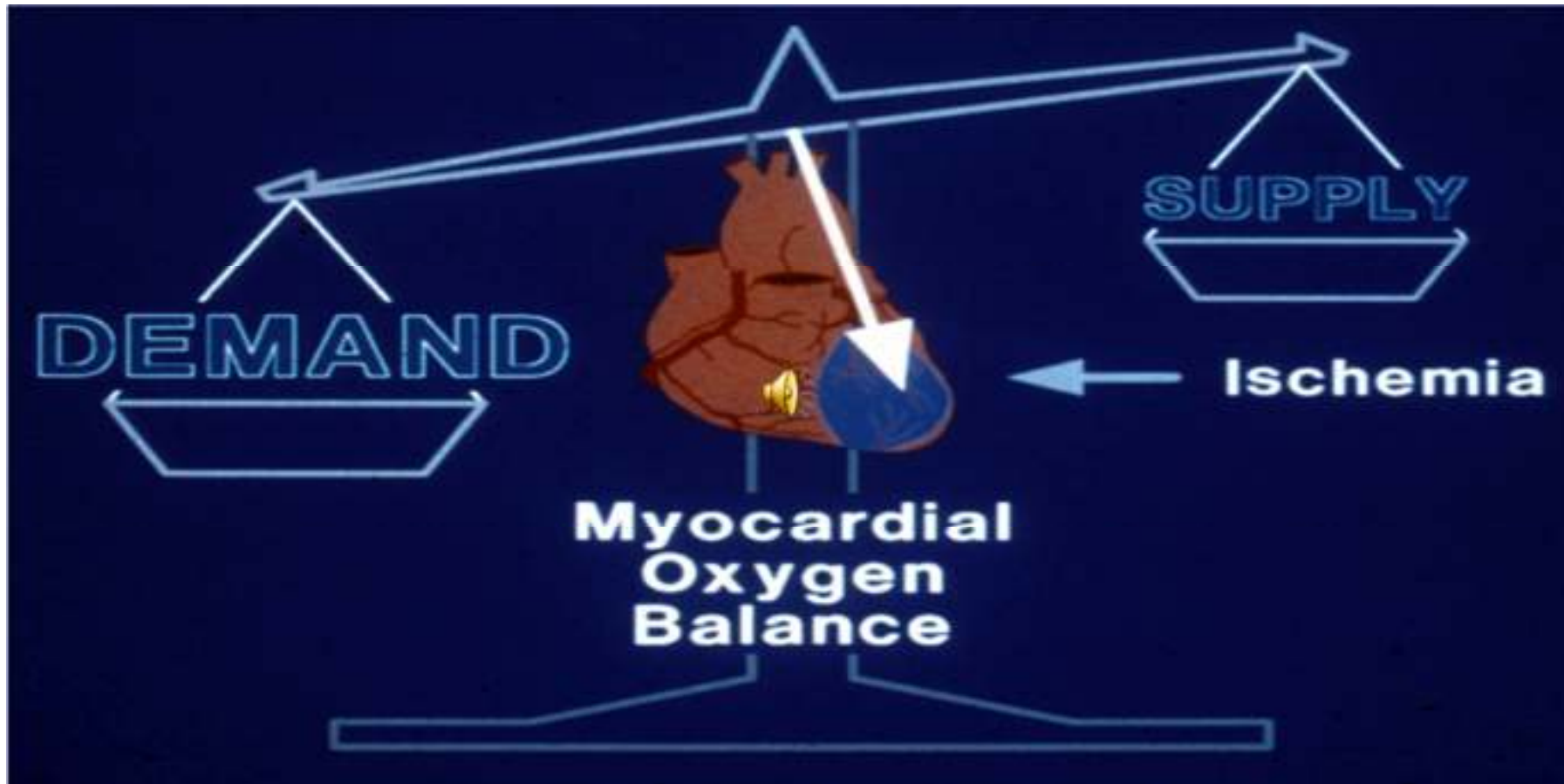
# Angina pectoris

- Disease affecting the coronary arteries which supply oxygenated blood from left ventricle to heart tissues



- The lumen of artery become restricted and it becomes less efficient in supplying the blood and oxygen to heart called as ischemia

# Definition of Angina



# GOALS OF TREATMENT

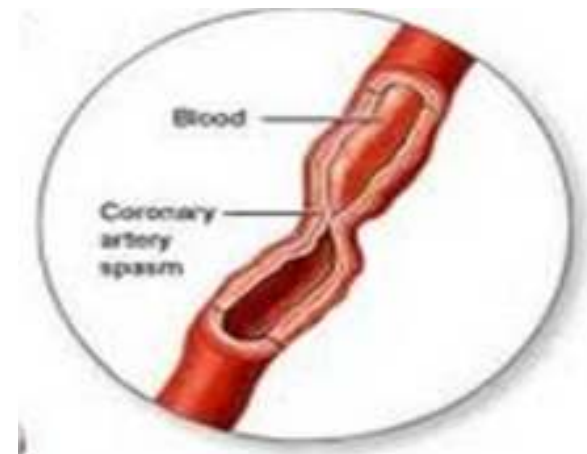
- Therapy of angina is mainly directed to minimize the Anginal attacks
- By restoring the balance between oxygen supply/oxygen demand to cardiac muscles or dilating coronary vessels
- Reversing and preventing myocardial ischemia  
**SUPPLY AND DEMAND.**
- Improve the quality of life.



# TYPES OF ANGINA

- Stable or **classical**
- Unstable angina or **acute coronary syndrome**
- Prinzmetal or **variant angina**

Atherosclerotic coronary artery



- What antianginal drugs do ?
- Decrease the demand of oxygen or increase the supply of oxygen
- Dilates coronary arteries
- Decrease the after load



# CLASSIFICATION

## 1) NITRATES:

- a) **Short acting:** Glyceryl trinitrate (GTN)
  - b) **Long acting:** Isosorbide dinitrate, Isosorbide mononitrate, Erythrityl tetranitrate, Pentaerythrityl tetranitrate
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## 2) B blockers: Metoprolol, Atenolol, Bisoprolol, Celiprolol

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## 3) Calcium Channel Blockers:

- a) Verapamil, Diltiazem
  - b) Dihydropyridine ---Nifedipine, Amlodipine, Nitrendipine, Nimodipine
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## 4) Potassium Channel opener: Nicorandil, Pinacidil, Cromakalim, Minoxidil, Diazoxide

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## 5) Cytoprotective drugs: Trimetazidine, Ranolazine.

# Organic Nitrates

These are esters of simple organic alcohols or polyols with nitric acid

**Glyceryl trinitrate (GTN)**

**Amyl nitrate**

**Isosorbide mononitrate,**

**Erythrityl tetranitrate,**

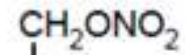
**Pentaerythrityl tetranitrate**



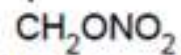
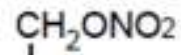
# I. Nitrites and Nitrates



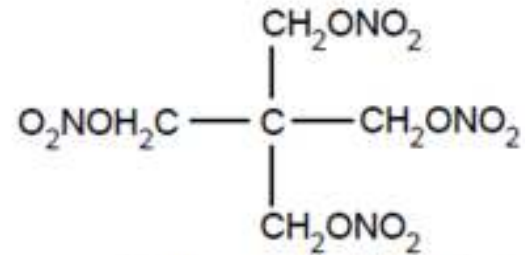
Amyl nitrite



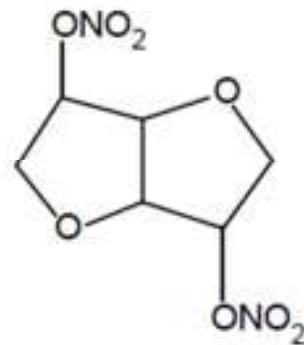
Nitroglycerine



Erythryl tetranitrate



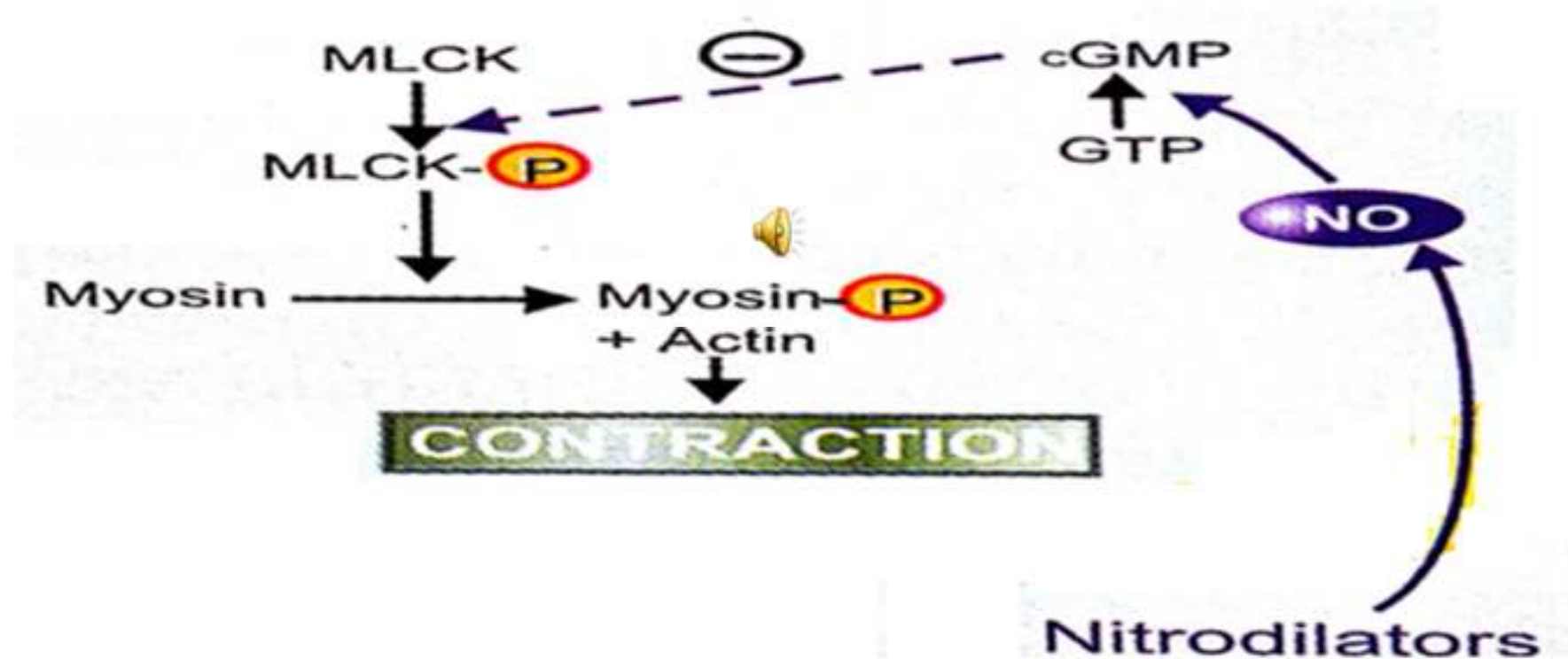
Pentaerythritol tetranitrate



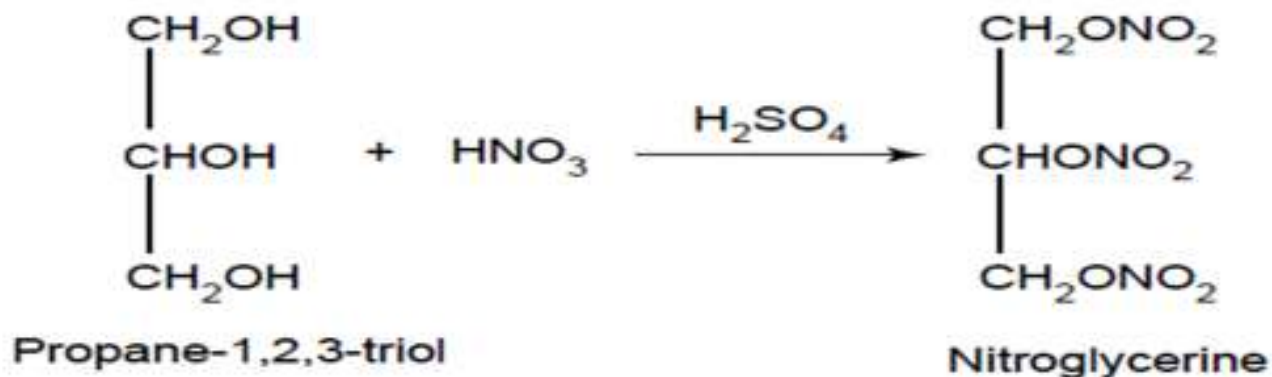
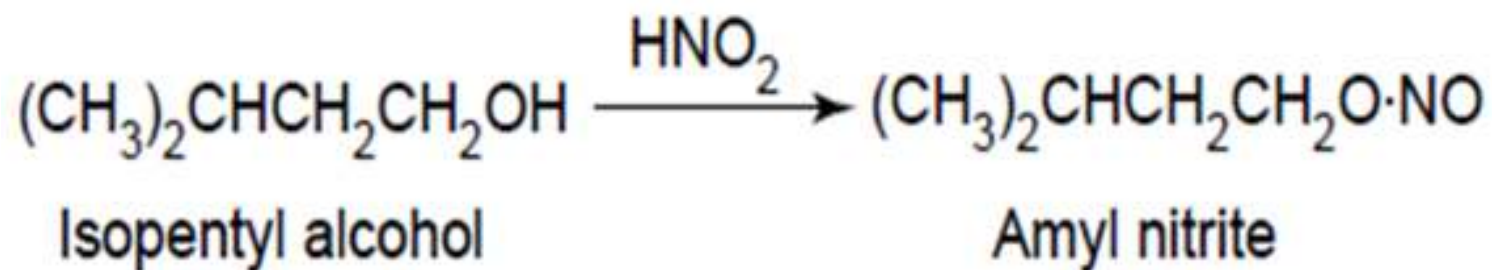
Isosorbide dinitrate

# Nitrates/nitrites

## Mechanism of action:

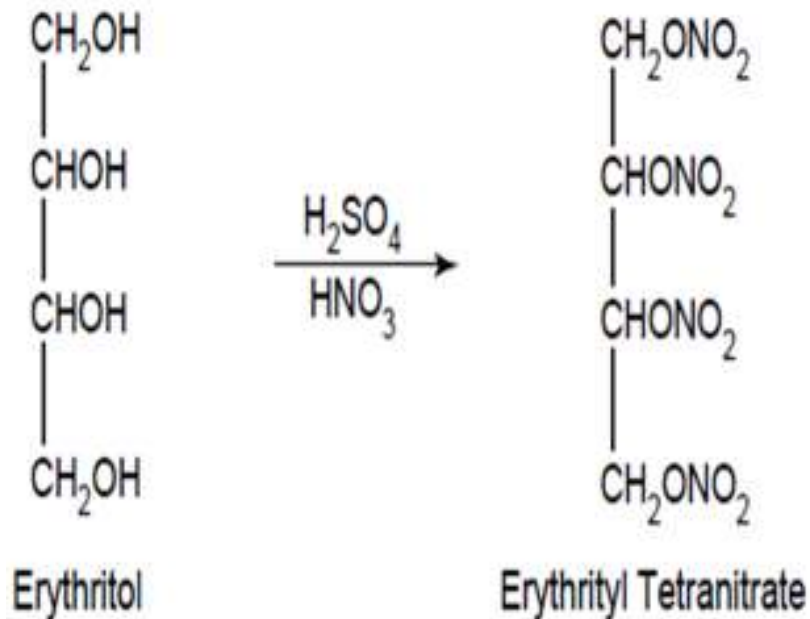


# Synthesis of nitrates

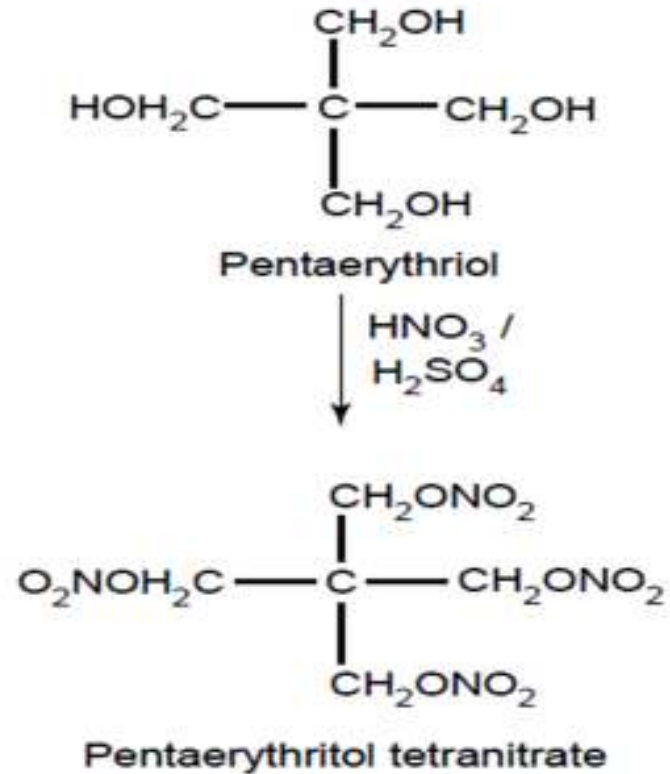


# Synthesis of nitrates

## Erythrityl Tetranitrate



## Pentaerythritol tetranitrate



# Nitrates

## uses

- Stable angina
- Unstable angina
- Cyanide poisoning

## Adverse effects

- Head ache
- Palpitation
- Tolerance



# Calcium channel blockers

- The contraction of the cardiac and vascular smooth muscle is dependent on extracellular calcium concentration

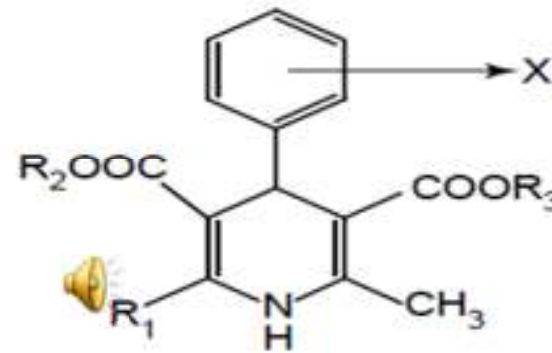


- Transport of calcium into cardiac and vascular smooth muscle is regulated voltage gated channel



# Calcium channel blockers

## 1,4-Dihydro Pyridines



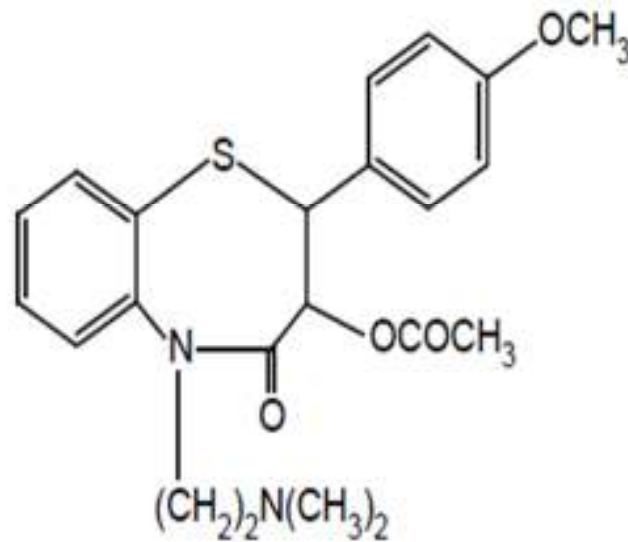
Compound	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	X
Amlodipine	-CH <sub>2</sub> O(CH <sub>2</sub> ) <sub>2</sub> NH <sub>2</sub>	-C <sub>2</sub> H <sub>5</sub>	-CH <sub>3</sub>	2-Cl
Felodipine	-CH <sub>3</sub>	-C <sub>2</sub> H <sub>5</sub>	-CH <sub>3</sub>	2,3-Cl
Nifedipine	-CH <sub>3</sub>	-CH <sub>3</sub>	-CH <sub>3</sub>	2-NO <sub>2</sub>



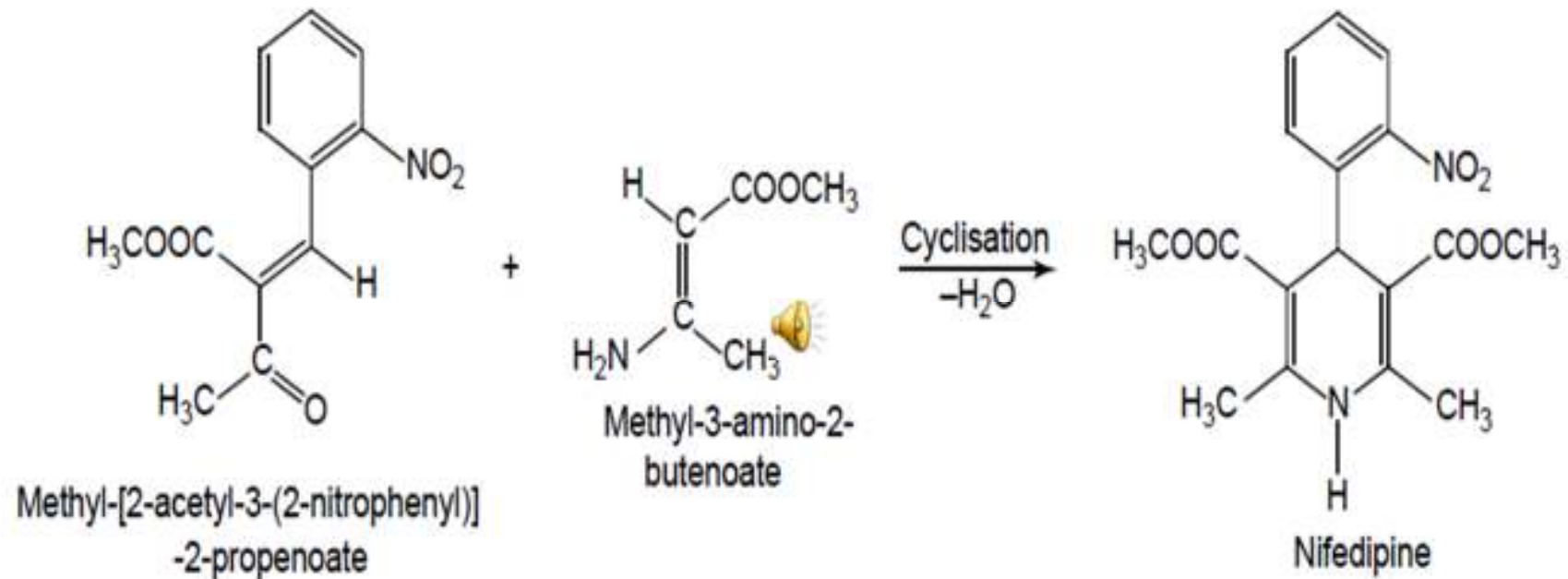


# Calcium channel blockers

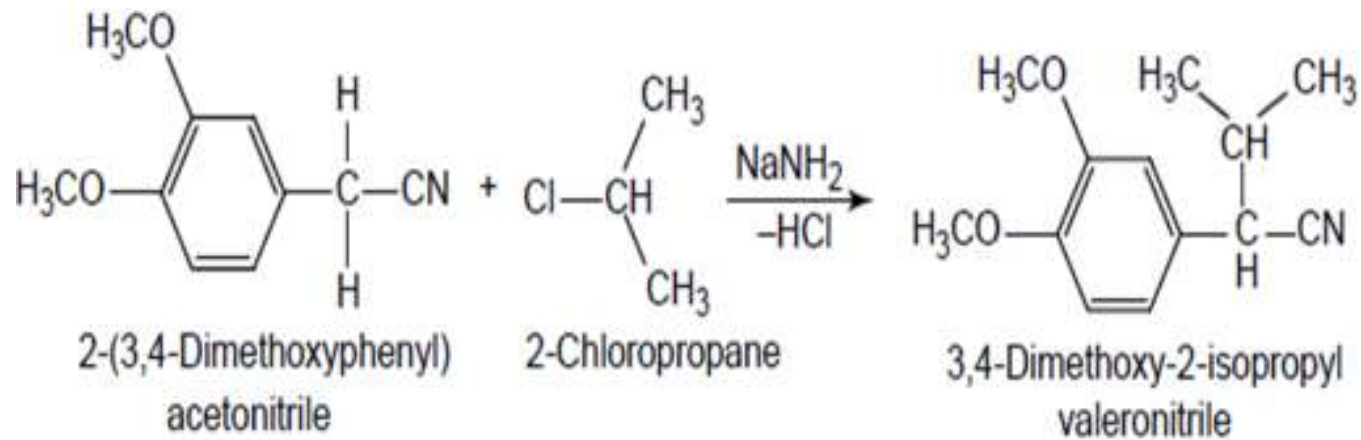
Benzothiazepine derivatives  
Diltiazem



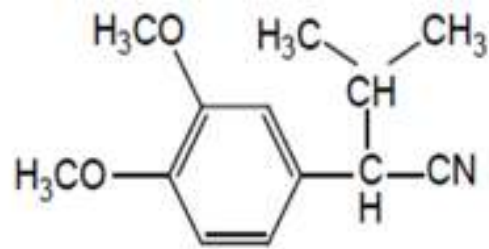
# Synthesis of Nifedipine Hantczsh



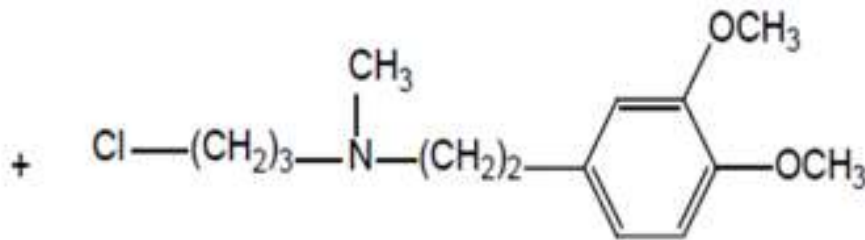
# Synthesis of Verapamil



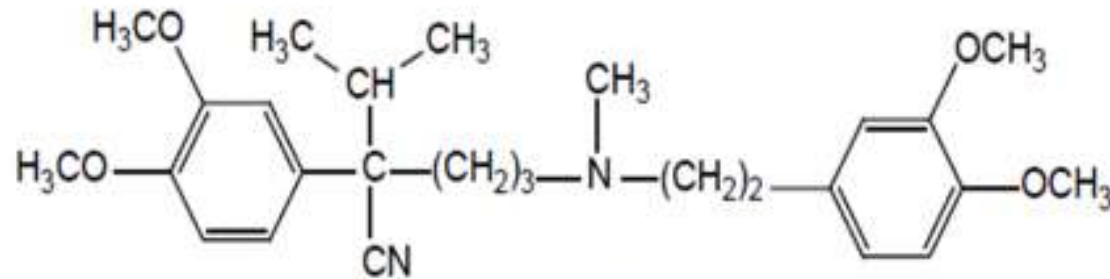
# Verapamil contd



3,4-Dimethoxy-2-isopropyl  
valero nitrile



3,4-Dimethoxy phenyl ethyl-N-methyl-3-chloro propylamine



Verapamil

# Calcium channel blockers

- **Uses**
  - Hypertension
  - Vasospastic angina
  - Migraine
  - Preterm labour
  -
- **Adverse effects**
  - Constipation
  - Bradycardia
  - Heart block
  - Gum hyperplasia

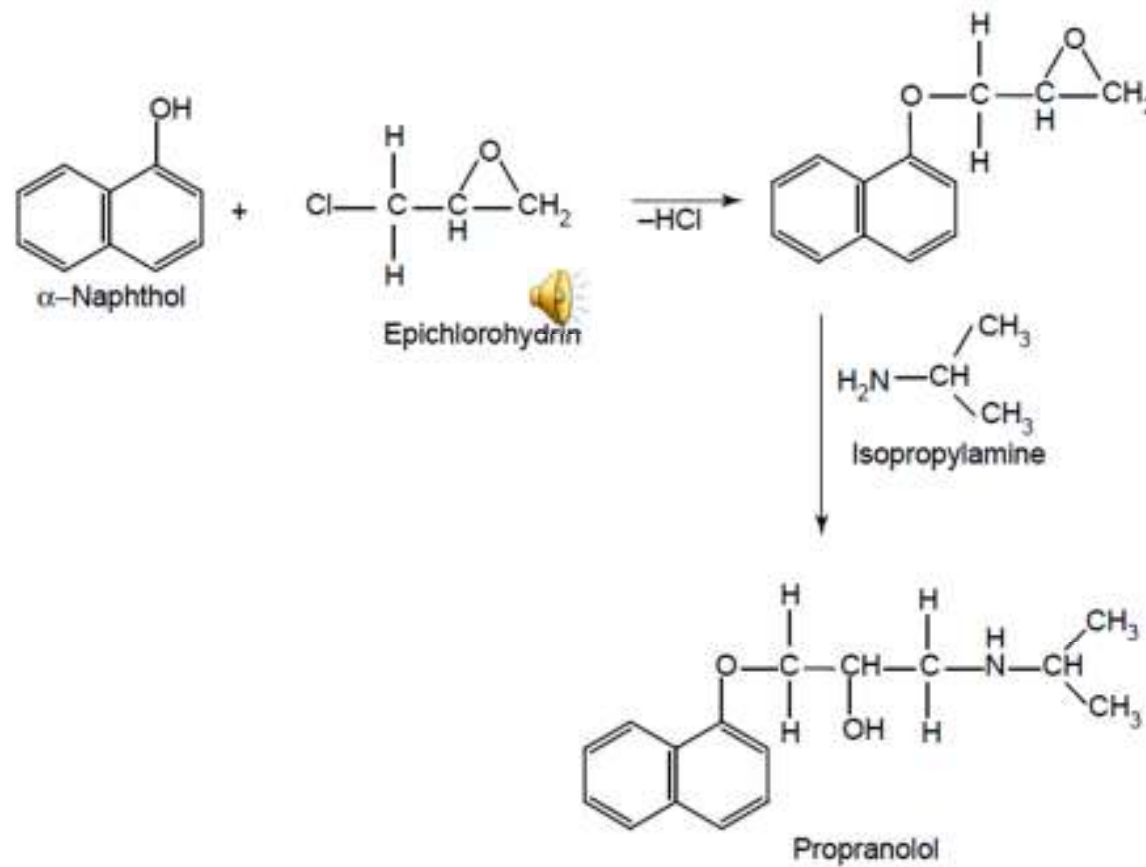


# Beta Blockers

- Drugs that block the action of catecholamines through beta receptors
- Non selective - Propranalol, nadolol
- Cardioselective – Metoprolol, atenolol  
esmolol
- With additional alpha blocking - labetalol

# BETA BLOCKERS

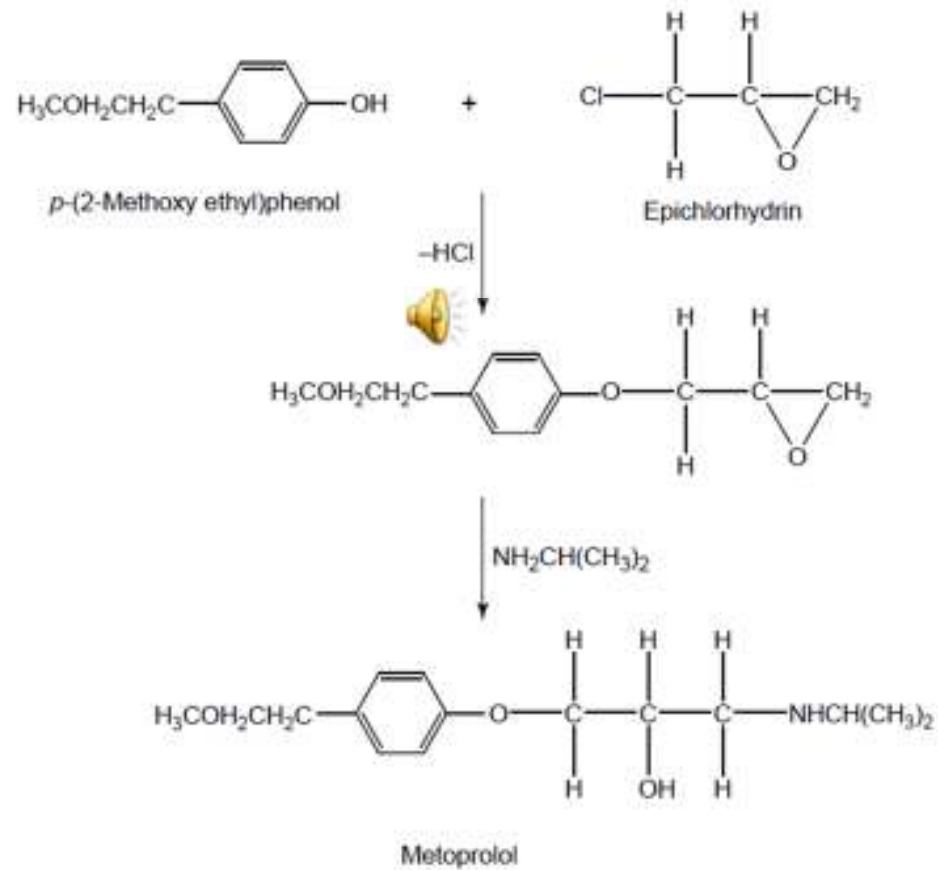
## Synthesis






# METAPROLOL

Route II: From *p*-(2-Methoxy ethyl) phenol

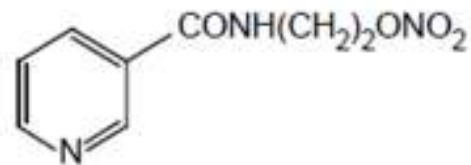


# Potassium channel opener

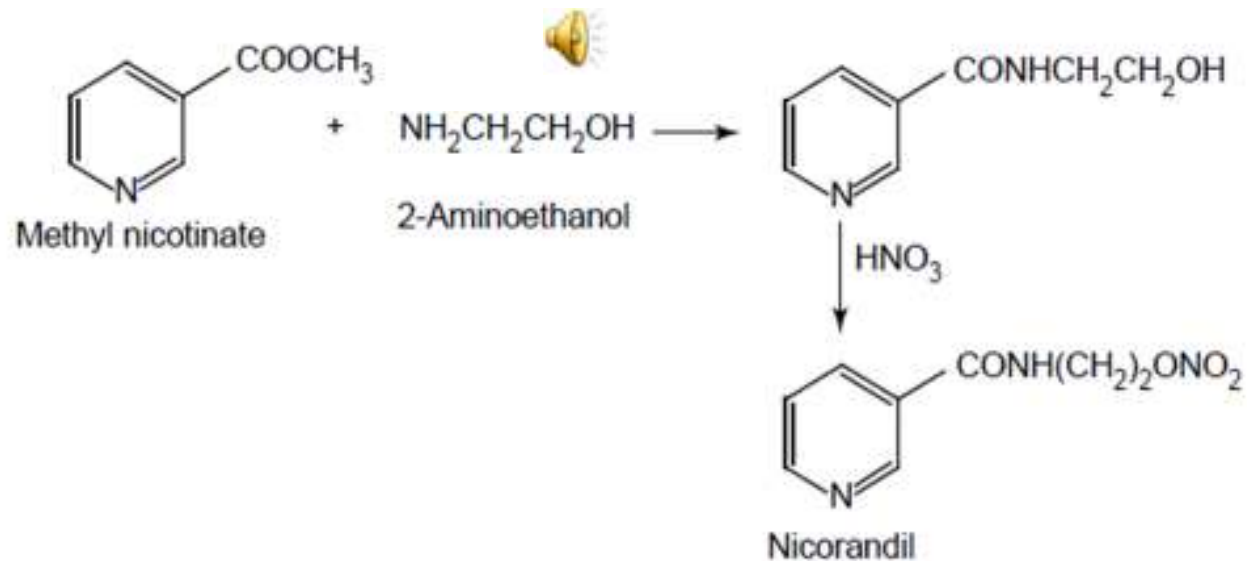
- Nicorandil
- These drug opens the ATP – sensitive K channels 
- Opening of this leads to hyper polarisation
- Followed by closing of calcium channels
- Less intracellular calcium -- muscle relaxation

# Nicorandil


v. Nicorandil (Nicoram, Cortflo, Zynicor)



Synthesis



# Trimetazidine

- **Calcium Channel Blocker**
- **Protective effect on ischemic myocardium & left ventricular function**
- **used in Exertional  angina**

Thank you