

# UNIT-I

## GENERAL ANESTHETICS



Ms.Manisha M.Patil

(Asist.Professor)

Department of Pharm. Chemistry



## INTRODUCTION

- ▶ Drugs that produce loss of consciousness are called as general anaesthetics.
- ▶ The absolute loss of sensation is termed as anaesthesia.
- ▶ The term anaesthesia is obtained from the Greek word (anaesthesia means insensitivity or lack of feeling).
- ▶ General anaesthetics produces depression of the central nervous system.
- ▶ The order of loss of sensation starts from cerebral cortex,basal ganglia,cerebellum and the spinal cord.
- ▶ General anesthetic drugs are used in surgical operations to induce unconsciousness and abolition of sensation of pain.
- ▶ Horace wells,a dentist first demonstrated the usageof (laughing gas)nitrous oxide,as an effective surgical anaesthetic in 1844.
- ▶ William Morton ,a dentist demonstrated the anaesthetic actions of diethyl ether in 1846 in Boston.

# Stages of Anesthesia

## Stage I: Analgesia

- Analgesia without amnesia

## Stage II: Excitement

- Nausea, vomiting, hyperreactivity, irregular respiration

## Stage III: Surgical Anesthesia

- Sleep, normal respiration and blood pressure

## Stage IV: Medullary Depression

- Depression of vasomotor and respiratory centers – coma and death

## CLASSIFICATION

- ▶ The general anaesthetic are classified based on the method of administration
  1. Inhalation anaesthetics
  2. Intravenous anaesthetics
  3. Basal anaesthetics



▶ **Inhalation anaesthetics:**

Halothane, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane

▶ **Ultrashort acting barbiturates:**

Methohexital sodium, Thiopental sodium

▶ **Dissociative anaesthetics:** Ketamine hydrochloride

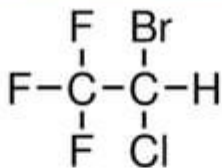
## INHALATION ANAESTHETICS

- ▶ Drugs either volatile liquids or gases that are administered through inhalation process.

Eg: Halothane, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane,  
Desflurane

## HALOTHANE

► Structure:



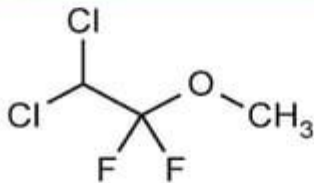
- Uses: 1. Halothane is a general anesthetic reduces blood pressure and decreases the pulse rate.
2. It induces muscle relaxation & reduces pain sensitivity by altering tissue excitability.



## METHOXYFLURANE



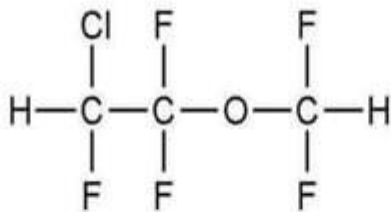
- ▶ Structure:



- ▶ Uses:
  - 1.Methoxy flurane is a inhalation medication used to reduce pain following trauma.
  - 2.Onset of action is rapid and short duration of action.
  - 3.It is used as a general anaesthetic

## ENFLURANE

► Structure:



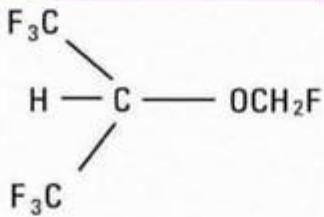
► Uses: 1. Enflurane is a halogenated ether

2. This drug is a structural isomer of methoxyflurane

3. It is used as a general anaesthetic, produces analgesia during vaginal delivery and low concentration is used for cesarean section.

## SEVOFLURANE

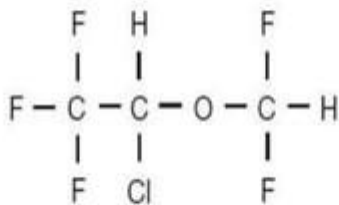
► Structure:



- Uses:
1. Inhalation anaesthetic
  2. Used for pediatric patients
  3. Bronchodilator
  4. Rapid onset of anaesthetic action

## ISOFLURANE

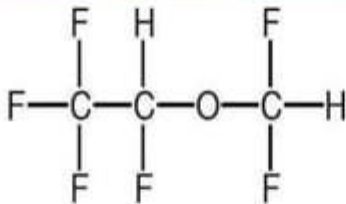
► Structure:



- Uses:
1. Isoflurane has become the routine anaesthetic, but use may be restricted due to high cost.
  2. It is a good general anaesthetic

## DESFLURANE

- ▶ Structure:



- ▶ Uses: 1. Used to cause general anaesthesia (loss of consciousness) before and during surgery in adults.

## Ultrashort acting barbiturates

- ▶ Drugs having very short duration of action (15-30 minutes) and commonly used for anaesthesia are called as ultra – short acting barbiturates

### BARBITURATE SPEED

Ultra-Short  
Acting



Surgery

Short to  
Intermediate  
Acting



Sleep

Long  
Acting

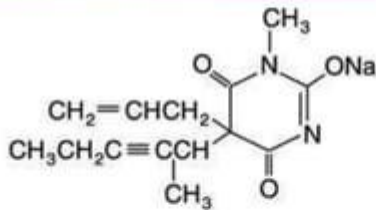


Pain/Migraine  
Relief

## Methohexital sodium



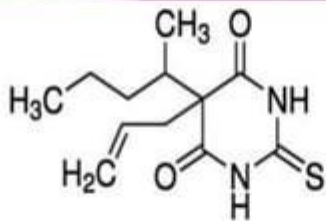
► Structure:



- Uses:
1. Ultrashort onset & duration of action
  2. Ideal agent for short term loss of consciousness during nerve conduction blockade.

## Thiamylal sodium

► Structure:



► Uses: 1. Used mainly as inducing anaesthetic in lab animals.

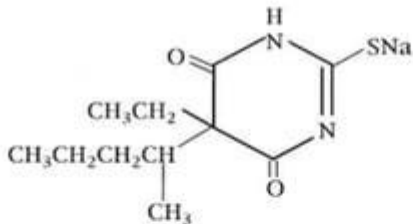
2. Rapid action but not rapid recovery due to high lipophilicity and drug accumulation in the tissues.

3. Ultra short acting barbiturate



## Thiopental sodium

► Structure:



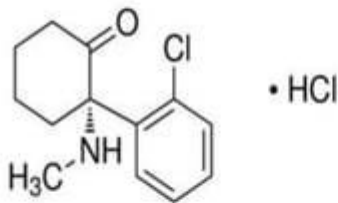
- Uses:
1. Widely used anaesthetic agent
  2. Rapid and pleasant induction of anaesthesia
  3. Produce unconsciousness rapidly
  4. Very short duration of action and produces amnesia.

## Dissociative anaesthetics

- ▶ Drugs that distort perceptions of sight ,sound and produce feelings of detachment – dissociation –from the environment and self .
- ▶ The patient appears to be awake but is detached from the environment and is unresponsive to pain.
- ▶ **Ketamine** is used as a unique drug because of its hypnotic,analgesia and amnesia effects.

## Ketamine hydrochloride

► Structure:

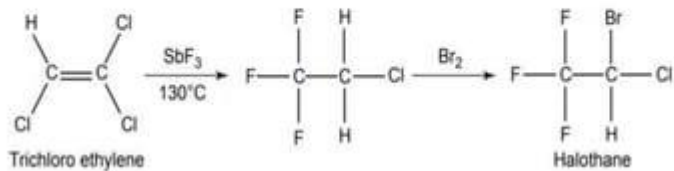


- Uses:
1. As a sedative and used during emergency surgery in field conditions and in war zones.
  2. anaesthesia in children for minor procedures such as ear foreign body removal.
  3. Used as spinal anaesthesia or epidural anaesthesia.

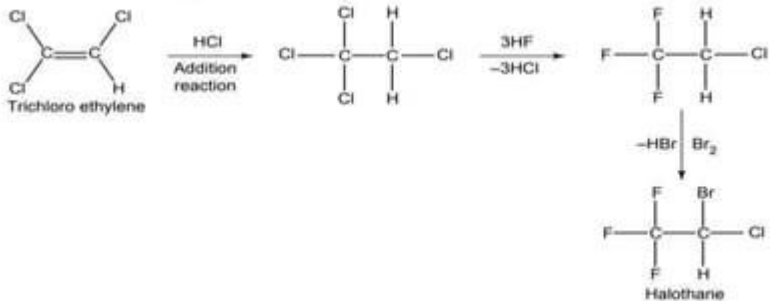
# SYNTHESIS OF HALOTHANE

## Synthesis

### Route I. From: Trichloro ethylene

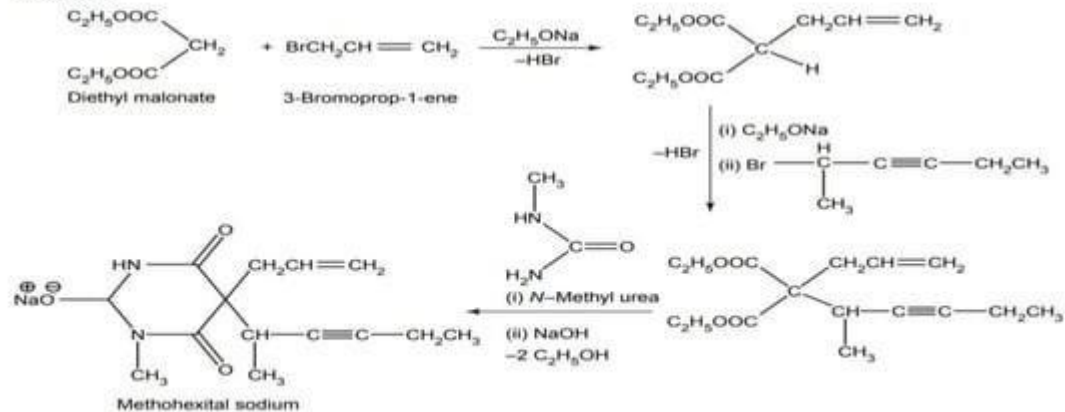


Route II. From: Trichloro ethylene



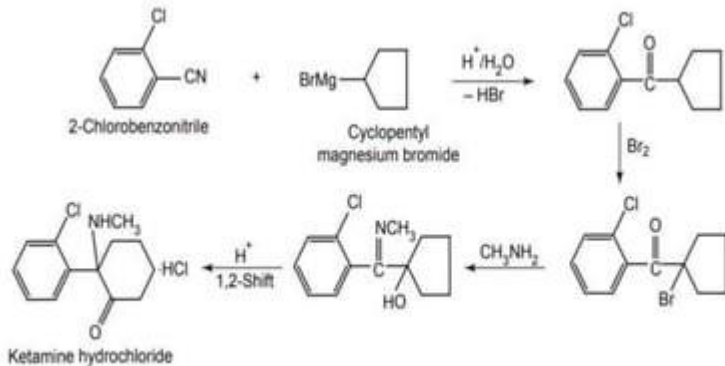
# SYNTHESIS OF METHOHEXITAL SODIUM

## Synthesis



# SYNTHESIS OF KETAMINE HYDROCHLORIDE

## Synthesis



## Modern theory on Mechanism of General Anesthesia

- Mainly acts via interaction with membrane proteins
- Different agents - different molecular mechanism
- **Major sites:** Thalamus & RAS, Hippocampus and Spinal cord
- **Major targets** – ligand gated (not voltage gated) ion channels
- **Important one** – **GABAA receptor gated  $\text{Cl}^-$  channel complexes**; examples – many inhalation anesthetics, barbiturates, benzodiazepines and propofol
  - Potentiate the GABA to open the  $\text{Cl}^-$  channels
  - Also direct activation of  $\text{Cl}^-$  channel by some inhaled anesthetics and Barbiturates





The  
expert in  
anything  
was  
once a  
beginner.



THANK  
YOU