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General anesthetics

Presented By;-

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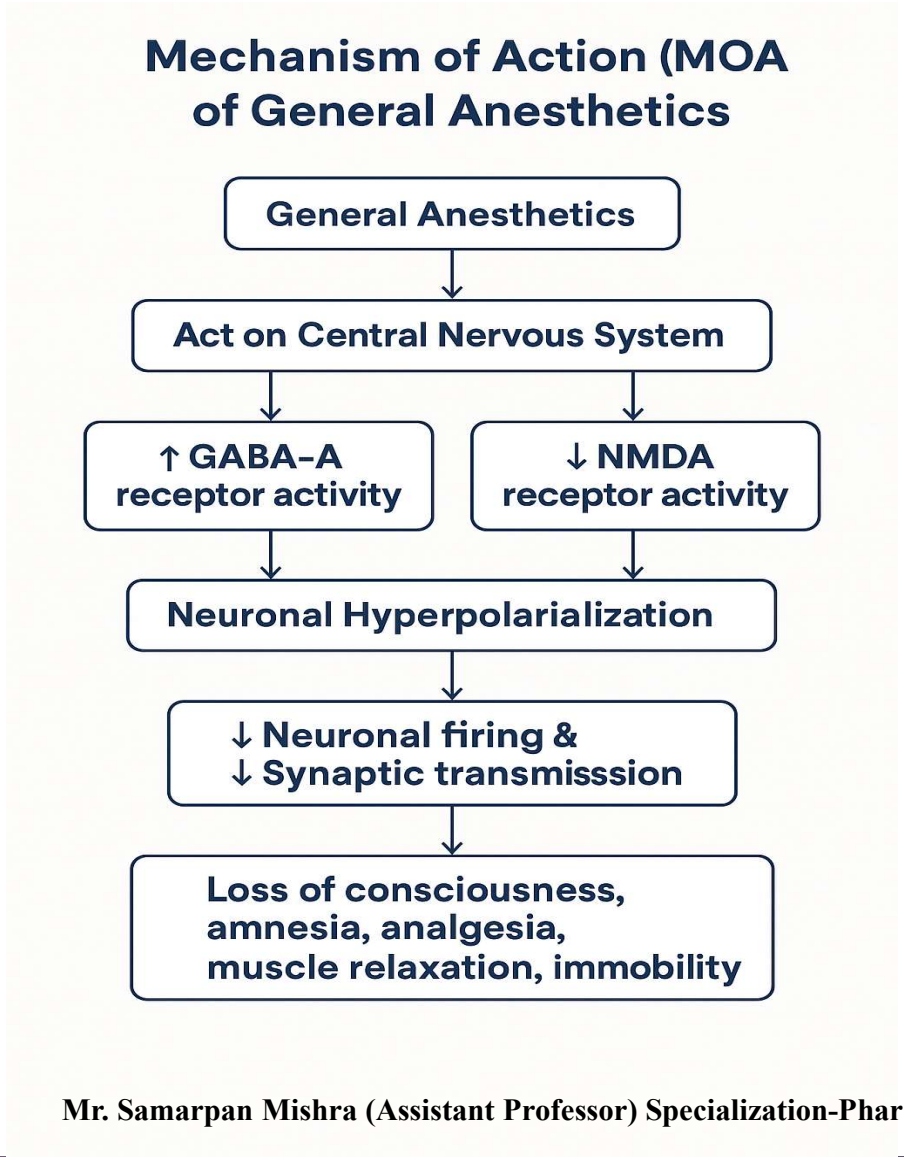
Specialization:- Pharmaceutical Chemistry

General anesthetics

- **General anesthetics** are **CNS depressant drugs** that produce a **reversible loss of sensation**, **loss of consciousness**, **amnesia**, **analgesia**, and **muscle relaxation**.
- They are used during **major surgical procedures**.

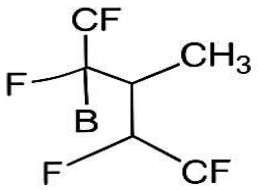
MOA of General anesthetics



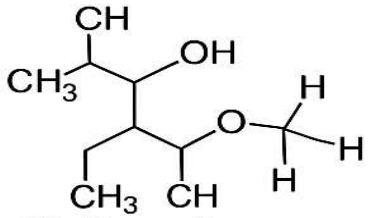
Classification General anesthetics

- **Inhalation anesthetics:-** Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.
- **Ultra short acting barbitutrates:-** Methohexital sodium*, Thiamylal sodium, Thiopental sodium.
- **Dissociative anesthetics:-** Ketamine hydrochloride.*

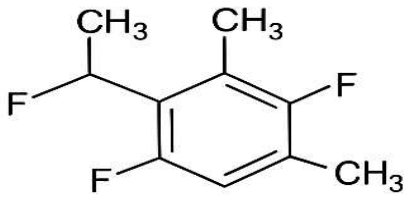
Chemical Structure



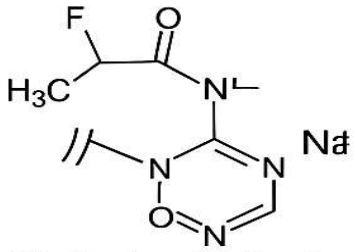
Halothane



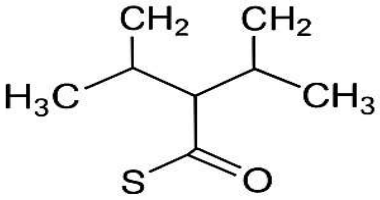
Methoxyflurane



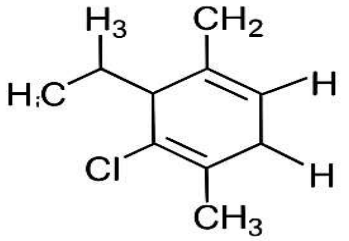
Sevoflurane



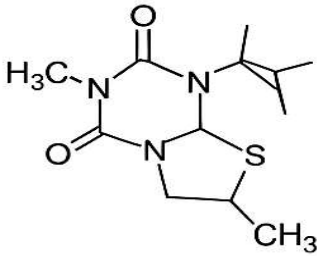
Methohexital sdium



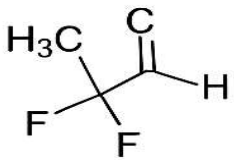
Thiamylal sodium



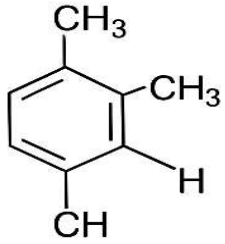
Thiopental sodium



Thiamylal sodium



Desflurane



Ketamine hdrochlrde

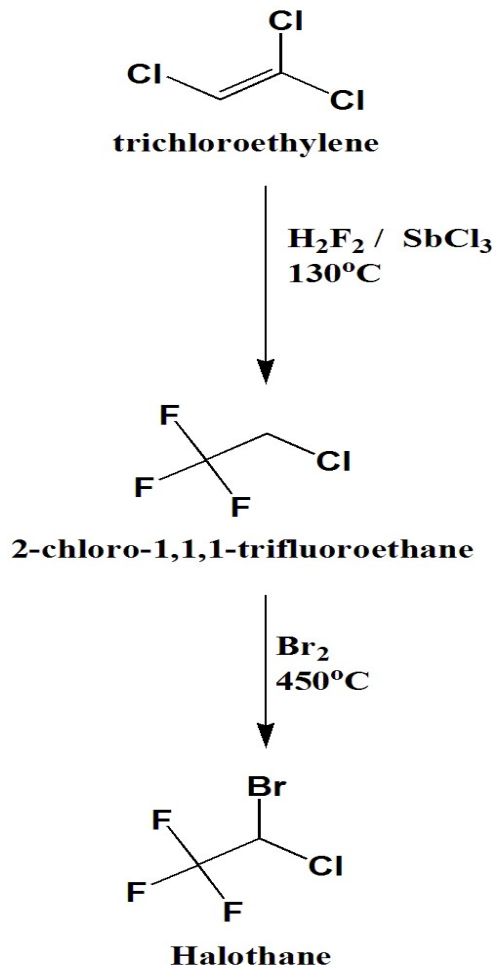
Inhalation anesthetics

Drugs Name	Introduction/Description	Mechanism of Action (MOA)	Uses
Halothane*	A halogenated hydrocarbon, formerly popular, but now largely replaced in developed countries due to the risk of severe liver injury (halothane hepatitis).	Works on multiple ion channels, activating GABA and glycine receptors, and inhibiting acetylcholine and sodium channels, ultimately depressing CNS activity.	Used for the induction and maintenance of general anesthesia, particularly in pediatric cases where the risk of liver toxicity is lower.
Methoxyflurane	A volatile liquid, rarely used as a general anesthetic now due to significant dose-related nephrotoxicity (kidney damage).	Acts as a positive allosteric modulator of GABA and glycine receptors and a negative modulator of acetylcholine receptors.	Primarily used for short-term analgesia (pain relief), such as during labor, but generally avoided for prolonged anesthesia.
Enflurane	A halogenated ether with a lower incidence of hepatotoxicity than halothane, but associated with epileptiform activity on EEG (especially with hypocapnia).	Modulates multiple ion channels, including potentiating inhibitory GABA receptors and inhibiting excitatory NMDA receptors.	Used for the induction and maintenance of general anesthesia.
Sevoflurane	A sweet-smelling, non-irritating, highly fluorinated ether, commonly used today. It has minimal airway irritation.	Temporarily reduces CNS activity by binding to GABA, glutamate, and glycine receptors, and increasing membrane permeability to calcium ions.	A preferred agent for the induction and maintenance of general anesthesia in both adults and children, due to its favorable properties and low organ toxicity.
Isoflurane	A stable halogenated ether, widely used in modern anesthesia practice, though it can be an airway irritant.	Binds to GABA, glutamate, and glycine receptors; inhibits the action of glycine receptors, leading to a loss of motor function.	Used primarily for the maintenance of general anesthesia following induction with an intravenous agent.
Desflurane	A highly fluorinated ether requiring a specialized heated vaporizer due to its low boiling point. It is a potent airway irritant.	Like other volatile agents, it is believed to act on multiple ion channels, primarily by enhancing inhibitory neurotransmission and reducing excitatory signals.	Used for the maintenance of general anesthesia for inpatient and outpatient surgery in adults; often used in cases where rapid emergence from anesthesia is desired.

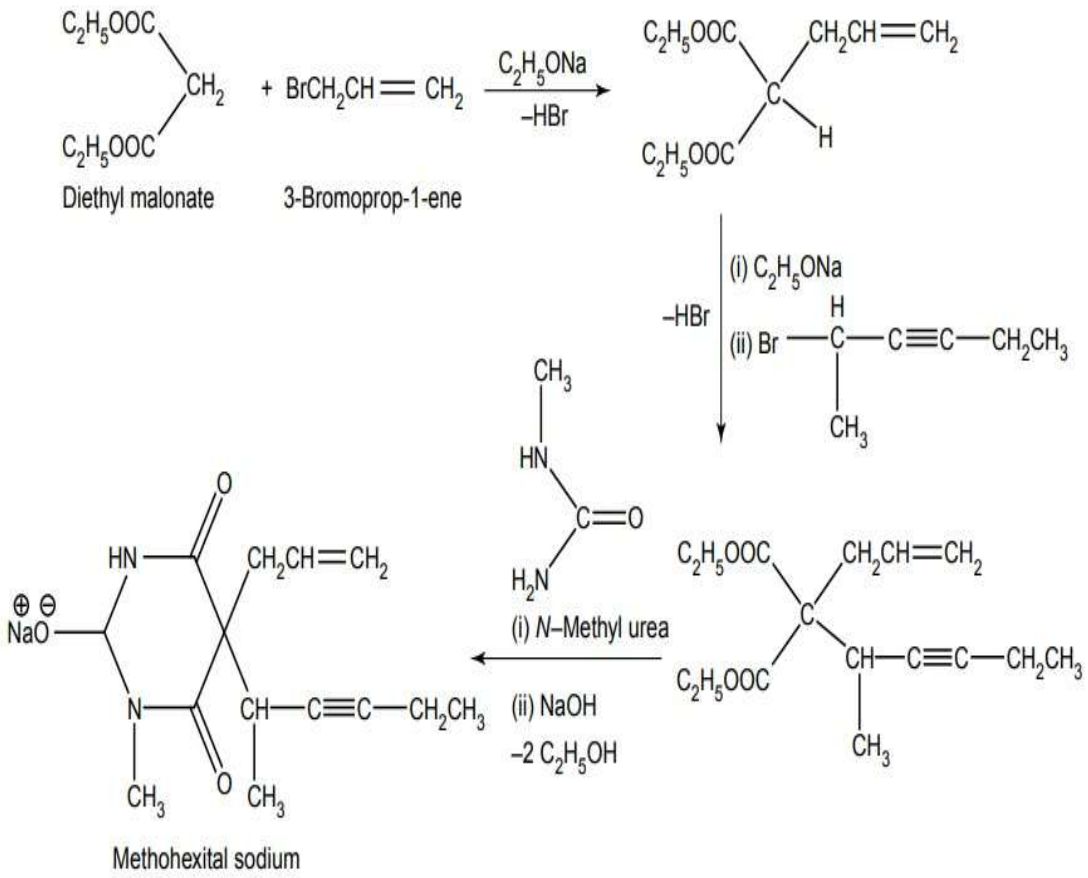
Ultra short acting Barbitutrates / Dissociative anesthetics

Drug Name	Introduction/Description	Mechanism of Action (MOA)	Uses
Methohexital sodium*	An ultrashort-acting barbiturate with rapid onset (within minutes) and short duration of action (4-7 minutes after a single dose).	Potentiates the inhibitory effects of GABA on the GABA-A receptor complex, increasing the duration of chloride channel opening.	Used for the induction of anesthesia, short surgical or dental procedures, and is the preferred agent for electroconvulsive therapy (ECT) as it lowers the seizure threshold.
Thiamylal sodium	An ultra-short acting barbiturate with a rapid onset.	Facilitates the action of the inhibitory neurotransmitter GABA at GABA-A receptors, depressing the CNS.	Used for the induction of general anesthesia and for short-duration procedures.
Thiopental sodium	An extremely short-acting barbiturate that makes anesthesia induction pleasant and smooth. Its use has stopped in the US but remains available elsewhere.	Works by depressing the CNS via facilitating GABA action at GABA-A receptors.	Used for the induction of general anesthesia before surgery and to induce deep sedation.
Ketamine hydrochloride*	Produces a unique state called dissociative anesthesia, characterized by a trance-like state, profound analgesia, amnesia, and intact protective airway reflexes.	The primary mechanism is non-competitive antagonism of the N-methyl-D-aspartate (NMDA) receptor, a glutamate receptor. It also interacts with opioid receptors and monoaminergic systems.	Used for anesthesia induction and maintenance (especially in trauma, emergency, and pediatric cases), pain management (analgesia), and treatment-resistant depression.

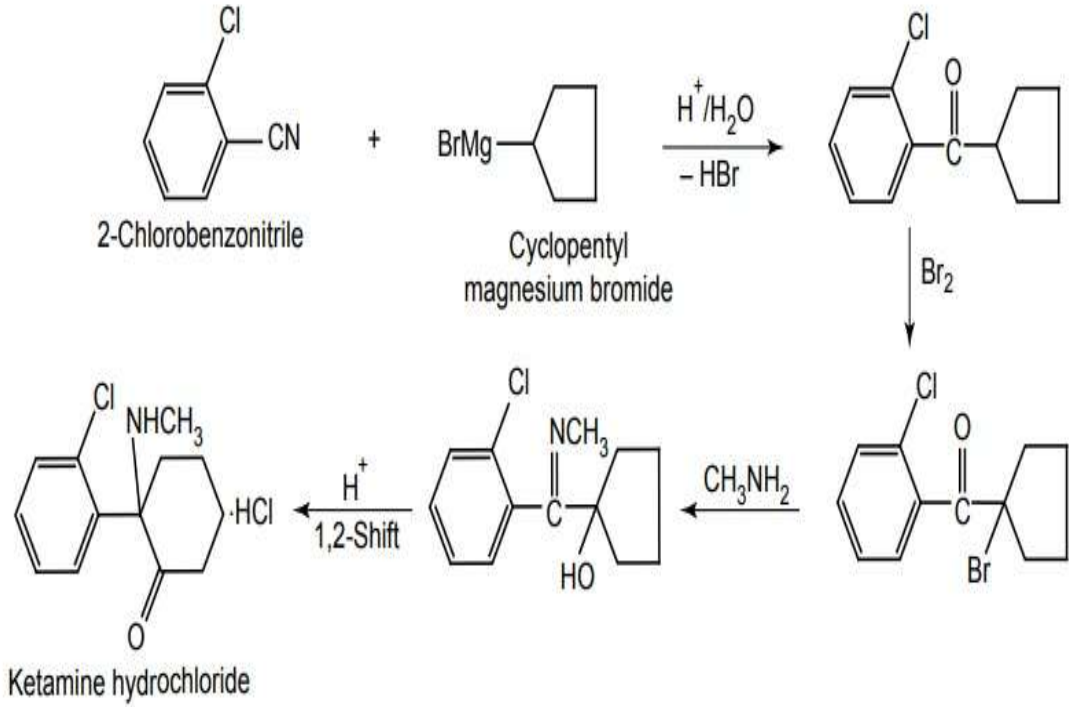
Synthesis of Halothane



Synthesis of Methohexital Sodium



Synthesis of Ketamine hydrochloride



Thank you

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