



## General Anesthetics

**Important: The doctor said differences in males and females slides will not be in the exam**

### Objectives

**By the end of the lecture , you should know:**

- ➔ Define anesthesia, balanced anesthesia, and pre-anesthetic medication
- ➔ Be able to define MAC, potency, blood: gas partition coefficient and oil: gas partition coefficient.
- ➔ Distinguish between inhalation and intravenous anesthetics.
- ➔ Identify the pharmacokinetics, pharmacological actions, and side effects of inhalation anesthetics.
- ➔ Identify the pharmacokinetics, pharmacodynamics, and side effects of intravenous anesthetics.
- ➔ Know the difference between neuroleptanalgesia and neuroleptanesthesia.

#### Color index:

Black : Main content  
Red : Important  
Blue: Males' slides only

Pink : Females' slides only  
Grey: Extra info or explanation  
Green : Dr. notes

*Editing File*

# Overview

## General Anesthesia

### Inhalational

#### Volatile liquids<sup>1</sup>

Methoxyflur-ane  
Halothane<sup>2</sup>  
Enflurane  
Isoflurane  
Desflurane  
Sevoflurane  
Ether<sup>3</sup>

#### Gas

Nitrous oxide  
zenon

#### Slower acting

##### Dissociative anesthesia

Ketamine

##### Opioid analgesia

fentanyl

##### Benzodiazepines

DiaZepam  
LoraZepam  
Midazolam

##### Barbiturate Ultra short acting

Thiopental  
methohexital

### Intravenous<sup>4</sup>

Can be used for induction

#### Faster Inducing agents

Propofol  
Etomidate  
Droperidol

1- all are halogenated (added molecule of Br, F, Cl) hydrocarbons, which is very significant to its route of excretion within the body & toxicity if that route is disturbed.

2-Halothane is toxic for CV patient ----> not used anymore

3-Ether isn't used anymore due to its severe ADRS such as toxicity to the liver

4- IV anesthesia is used for induction & inhaled anesthesia is used for maintenance

# Introduction:

**General Anesthetics:** Drugs used to induce **loss of pain sensation, loss of consciousness, skeletal muscle relaxation, analgesia, amnesia and inhibitions of undesirable autonomic reflexes.**

## types of anesthesia

General anesthesia

Local anesthesia

## stages of anesthesia

### Stage I (Analgesia)

- Loss of pain sensation
- The patient is **conscious** and conversational

### Stage II (Excitement)

- Increased respiratory rate.
- Increased, **irregular** blood pressure.
- Patient may experience delirium & violent behavior.
- Eye dilated & reactive.

### Stage III (surgical Anesthesia)

- Regular** respiration & relaxation of Sk. muscles.
- Eye reflexes decrease until the pupil is fixed.

Divided into 4 planes:  
1- cortical centers  
2- basal ganglia  
3- medulla

### Stage IV (coma and death)

- Medullary paralysis.
- Severe **depression of vasomotor.**
- Depression of respiratory centers.**
- Death may occur.

# Introduction:

## Characters of an ideal anesthetic drug<sup>1</sup>

smooth & rapid induction<sup>2</sup>

Rapid recovery

Wide safety margin

Minimal side effects

## Ideal general anesthesia

Girls slides

Loss of pain sensation & unconsciousness  
'Amnesia hypnosis'

Need for muscle relaxation

Analgesia  
"Loss of sensory & Autonomic reflexes"<sup>3</sup>



## Balanced Anesthesia:

**Balanced anesthesia:** is the use of more than one drug in combination to fulfil the patients needs, thus it will **increase** the **beneficial effects** & **decrease** the **adverse effects**

-Balanced anesthesia is achieved by a **combination of :**

**1- I.V** anesthesia

**2-inhaled** anesthesia

**3- Pre-anaesthetic** medications


1- But we don't have drug for the last two characteristics.

2- smooth means its able to bypass the first two stages of anesthesia and reach stage 3.

3-Loss of unwanted Autonomic reflexes

# Pre-Anesthetic Medications

- Calm the patient & relieve pain.
- Protect against undesirable effects of the subsequently administered anesthetics or the surgical procedure.
- Facilitate smooth induction of anaesthesia.
- Lower the dose of anaesthetic required.

 Drugs	Uses	Examples
opiates	Induce analgesia	Morphine
Anticholinergics	Prevent secretion of fluids into the respiratory tract <sup>1</sup>	Hyoscine
Sedatives & anxiolytics	Relieve anxiety	Diazepam
Antihistamines	Allergic reactions	Diphenhydramine
Antiemetics	Post surgical N&V	metoclopramide & prochlorperazine
H2-receptor blockers	Reduce gastric acidity	Ranitidine
Thiopental (Barbiturates) <sup>2</sup>	Smooth induction	-
Adjunct to general anesthesia		
Neuromuscular blockers	<ul style="list-style-type: none"> <li>- Facilitate intubation.</li> <li>- suppress muscle tone.</li> </ul>	<b>succinylcholine, vecuronium &amp; atracurium</b>

1- so aspiration of fluids is avoided & decrease the vagomimetic action on the heart so bradycardia is avoided.  
 parasympathetic antagonist= inhibit secretion.  
 2- can be used alone I.V (discussed later on)

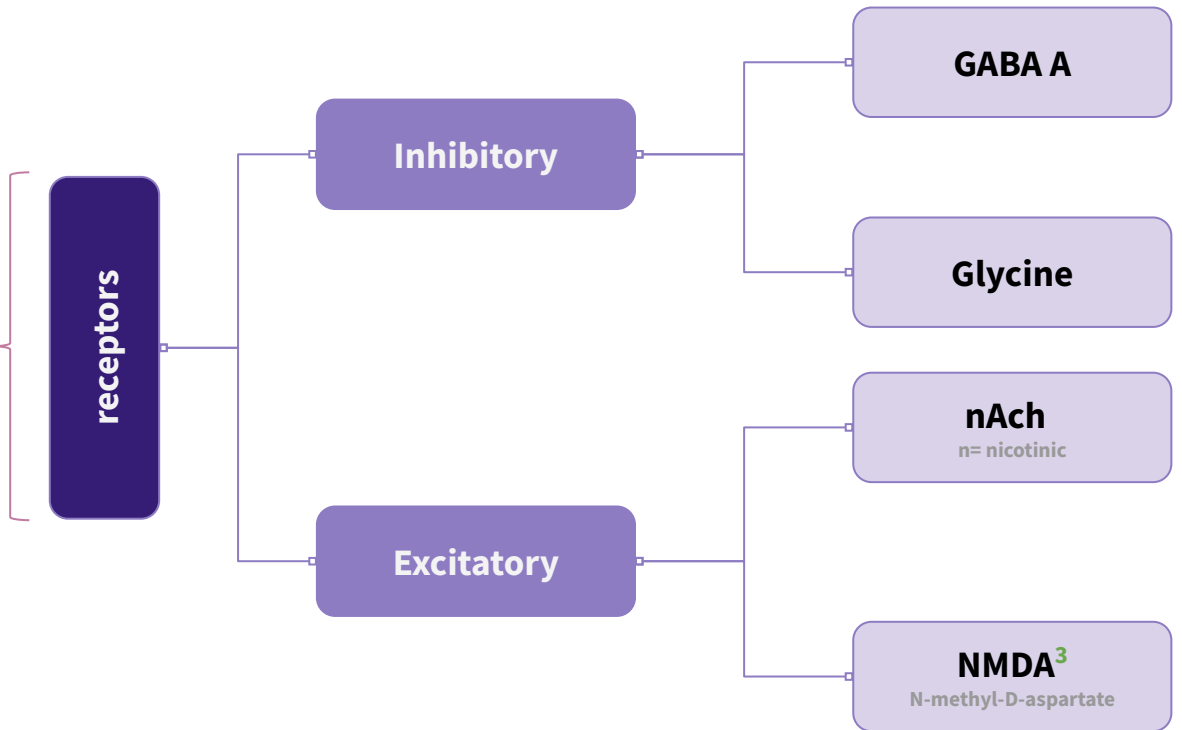
# MOA of General Anaesthetics

## MOA:

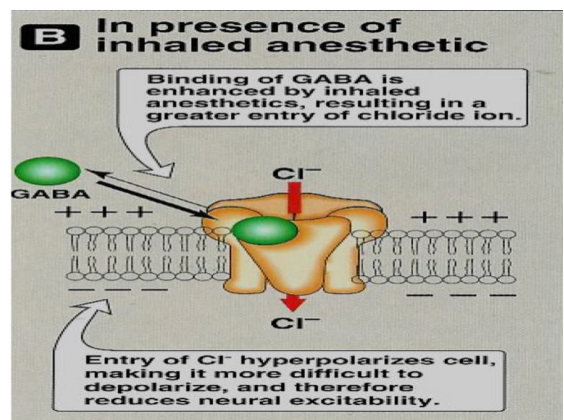
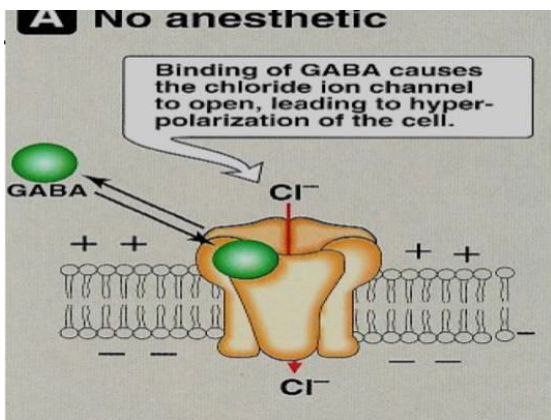
- Disruption of the function of ionic channels<sup>1</sup>
- Disruption of lipids associated with ionic channels<sup>2</sup>

Girls slides

Girls slides



Enhance the action of GABA A and glycine on receptors leading to Greater entrance of chloride ion → hyperpolarization → thus decrease neuronal excitability. ★



## Inhalation anesthetics

**Induction:** time elapsed between onset of administration of anesthetics and development of effective surgical anesthesia.

**Maintenance:** Time during which the patient is surgically anesthetized.

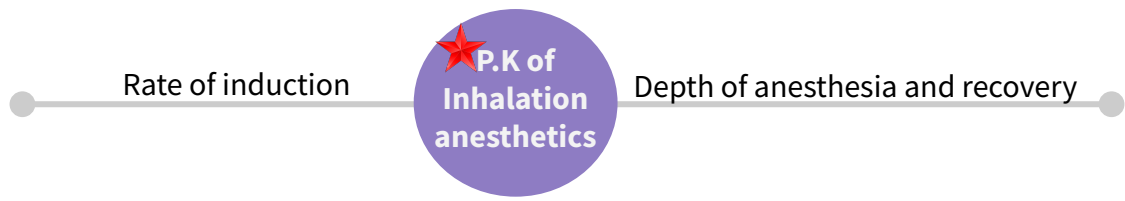
**Recovery:** The time from discontinuation of anesthetic drug until **consciousness is regained**.

1- more related to IV drugs.

2- more related to inhaled drugs.

3- glutamate receptor.

# Inhalation anesthetics



## Factors controlling induction & recovery:

- The anesthetic concentration in the inspired air → Direct
- **Blood solubility= Blood : gas partition coefficient → Inverse to induction rate<sup>1</sup>**
- Rate and depth of ventilation → Direct

## Minimum alveolar concentration (MAC)

It is the concentration of **inhalation anesthetic** that produce immobility in **50%** patients in response to surgical incision.

- Potency of anesthetic agents.
- **Oil: gas partition coefficient = lipid solubility (Direct with potency).**
- The **lower** the MAC value the more **potent** the drug ( **inverse** )
- MAC value increases with CNS stimulants & decreases with CNS depressants.<sup>2</sup>

★ Drugs	MAC value <sup>4</sup>	Solubility	Induction & Recovery	Potency
methoxyflurane <sup>3</sup>	<b>Low MAC value</b> 0.16	<b>12</b>	Slow	The <b>Most potent</b>
Halothane (Pleasant smell)	0.75	<b>2.3</b>	Slow	Potent
Isoflurane	1.4	<b>1.4</b>	Medium	Less potent
Enflurane (Pungent smell)	1.7	<b>1.8</b>	Medium	Less potent
Sevoflurane (Better smell)	2	<b>0.69</b>	Rapid	Less potent
Desflurane (Pungent smell)	6-7	<b>0.42</b>	<b>Poor &amp; Rapid</b>	Less potent
Nitrous oxide <sup>5</sup>	>100	<b>0.47</b>	<b>Rapid</b>	<b>Least potent</b>

1. How soluble is it within the blood? Does the drug have affinity to blood or not? The more soluble it is within the blood the longer time it'll take to saturate the blood before it reaches the site of action which is the CNS.

2. it lowers the concentration of anesthesia require, and elderly patients have hypersensitive neuronal receptors.

3. We don't use **methoxyflurane** anymore

4. **Remember the concept not the value. But the value represents the concentration of the gas within the gas tank used for the patient.**

5. Nitrous oxide has the lowest Solubility, the fastest induction and recovery, the highest MAC and least potent.

# Pharmacological actions of inhalation anesthetics

System	Pharmacological action
CNS	<ul style="list-style-type: none"> <li>• ↓ metabolic rate.</li> <li>• ↑ ICP (due to cerebral vasodilatation) <b>thus contraindicated in head injuries.</b></li> <li>• Dose -dependent EEG changes (Enflurane). - <b>Enflurane contraindicated in Epilepsy.</b> Remember E with E</li> </ul>
Cardiovascular	<ul style="list-style-type: none"> <li>• Hypotension</li> <li>• Bradycardia Except (Isoflurane ,Desflurane ).</li> <li>• Myocardial depression (Halothane, Enflurane).<sup>1</sup></li> <li>• Sensitize heart to catecholamines (Halothane)</li> <li>• <b>Halothane contraindicated in pheochromocytoma</b></li> </ul>
Respiratory	<ul style="list-style-type: none"> <li>• All respiratory depressants</li> <li>• Airway irritation (Desflurane-Enflurane due to pungent odor).</li> </ul>
Liver	<ul style="list-style-type: none"> <li>• Decrease hepatic flow</li> <li>• Hepatotoxicity (<b>Only halothane</b>) <b>only in adults.</b> Remember ( 3 Hs ). (:</li> </ul>
Uterus & skeletal muscle	<ul style="list-style-type: none"> <li>• Uterine relaxation BUT Nitrous oxide has minimal relaxant effect (labor)</li> <li>• All are skeletal muscle relaxants. (of variable degrees)</li> </ul>



## Inhalation anesthetics

Anesthetic drugs	Features	Side effects
<b>Methoxyflurane</b> <i>(Not used anymore)</i>	<ul style="list-style-type: none"> <li>• For veterinary use only</li> </ul>	<ul style="list-style-type: none"> <li>• Slow induction</li> <li>• nephrotoxicity</li> </ul>
<b>Halothane</b> <b>3H</b>	<ul style="list-style-type: none"> <li>• Non irritant - Potent anesthetic, Weak analgesic.</li> <li>• Can be used in children</li> </ul>	<ul style="list-style-type: none"> <li>• Slow induction and recovery.</li> <li>• <b>Sensitization of Heart to catecholamines</b></li> <li>• <b>Hepatotoxicity</b><sup>2</sup></li> <li>• <b>Malignant Hyperthermia</b></li> </ul>
<b>Enflurane</b>	<ul style="list-style-type: none"> <li>• is <b>metabolized to fluoride</b> (8%)</li> <li>• Contraindicated in patients with seizure disorders.</li> <li>• <b>Not for renal failures</b> (release fluoride)</li> </ul>	<ul style="list-style-type: none"> <li>• Pungent (less induction -Not for pediatrics).</li> <li>• Airway irritation.</li> <li>• CNS stimulation (<b>Epilepsy</b>-like seizure- abnormal <b>EEG</b>).</li> </ul>
<b>Isoflurane</b>	<ul style="list-style-type: none"> <li>• Stable compound (2%), Low biotransformation (Less fluoride).</li> <li>• <b>No nephrotoxicity</b> - No hepatotoxicity.</li> </ul>	-
<b>Sevoflurane</b>	<ul style="list-style-type: none"> <li>• Better smell, little effect on HR, <b>No airway irritation (children)</b></li> </ul>	-
<b>Desflurane</b>	<ul style="list-style-type: none"> <li>• Less metabolized (0.05 %), low boiling point (special equipment)</li> </ul>	<ul style="list-style-type: none"> <li>• Pungent odor</li> <li>• <b>Airway irritation</b></li> </ul>
<b>Nitrous oxide</b>	<ul style="list-style-type: none"> <li>• Potent analgesics, Minimal CVS adverse effects, contraindicated in pregnancy (<b>uterine relaxant</b>).</li> </ul>	<ul style="list-style-type: none"> <li>• Weak anesthetic (low potency, combined).</li> <li>• Diffusion hypoxia<sup>3</sup>, Nausea and vomiting.</li> <li>• <b>Inactivation of B 12 megaloblastic anemia, congenital anomalies.</b></li> </ul>

1: Halothane increases the sensitivity of CVS to circulating catecholamines such as adrenaline and noradrenaline which are produced by the Adrenal medulla so if a patient has pheochromocytoma -tumor of adrenal gland that results in the excessive release of epinephrine and norepinephrine- the patient will suffer from severe tachycardia and severe elevation of BP. 2: **in adults only.**

3: Nitrous Oxide is eliminated via respiration, and b/c it has low blood:gas solubility coefficient, rapid elimination of N2O will make it diffuse out of the blood in large volumes which will dilute the oxygen in lung alveoli reducing alveolar oxygen tension producing "Diffusion Hypoxia".



# Inhalation anesthetics

Girls slides only

Drug	Desflurane
Potency	<ul style="list-style-type: none"> <li>Less potent than Halothane</li> </ul>
Induction & Recovery	<ul style="list-style-type: none"> <li>Rapid induction and fast recovery (Low solubility)</li> </ul>
Smell	<ul style="list-style-type: none"> <li>Pungent (worst odor)</li> </ul>
Metabolization	<ul style="list-style-type: none"> <li>Less metabolized (0.05%)</li> <li>Low boiling point (special equipment)</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Pungent odor (irritation - cough)</li> </ul>
Contraindication	<ul style="list-style-type: none"> <li>All of the inhalation anesthetic drugs are contraindicated in head injury.</li> </ul>

Drug	Sevoflurane
Potency	<ul style="list-style-type: none"> <li>Less potent than Halothane</li> </ul>
Induction & Recovery	<ul style="list-style-type: none"> <li>Rapid onset and recovery (Low solubility)</li> </ul>
Smell	<ul style="list-style-type: none"> <li><b>Better smell</b></li> </ul>
Metabolization	<ul style="list-style-type: none"> <li>Less metabolized (3-5% fluoride)</li> </ul>
Uses	<ul style="list-style-type: none"> <li><b>No airway irritation (preferable for children)</b></li> </ul>
Advantages	<ul style="list-style-type: none"> <li>Little effect on HR</li> </ul>
Contraindication	<ul style="list-style-type: none"> <li>All of the inhalation anesthetic drugs are contraindicated in head injury.</li> </ul>

Drug	Halothane
Potency	<ul style="list-style-type: none"> <li>Potent anesthetic</li> </ul>
Induction & Recovery	<ul style="list-style-type: none"> <li>Slow induction &amp; recovery</li> </ul>
Action	<ul style="list-style-type: none"> <li>Weak analgesic, weak skeletal muscle relaxant</li> </ul>
Metabolization	<ul style="list-style-type: none"> <li>Metabolized to toxic metabolites (trifluoroethanol) <b>hepatotoxic.</b></li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>CVS depression                             <ul style="list-style-type: none"> <li>Hypotension, bradycardia (vagomimetic action)</li> <li>↓ Myocardial contractility, ↓ Cardiac output</li> </ul> </li> </ul>
Adverse effects	<ul style="list-style-type: none"> <li>Hepatotoxicity (repeated use).</li> <li>Malignant hyperthermia.</li> <li>Cardiac arrhythmias.</li> <li>Sensitizes heart to action of catecholamines → arrhythmias</li> </ul>

# Inhalation anesthetics

Girls slides only

Drug	Nitrous Oxide (N <sub>2</sub> O)
Potency	<ul style="list-style-type: none"> <li>the lowest potency</li> </ul>
Induction & Recovery	<ul style="list-style-type: none"> <li>Rapid induction and recovery ( the lowest solubility )</li> </ul>
Uses	<ul style="list-style-type: none"> <li>Weak anesthetic (Low potency, combined) &amp; potent analgesic</li> <li>Outpatient anesthesia (Dental procedures) &amp; balanced anesthesia.</li> <li>Neuroleptanalgesia</li> <li>Delivery.</li> </ul>
Advantages	<ul style="list-style-type: none"> <li>No muscle relaxation, no respiratory depression, not hepatotoxic, &amp; minimal CVS adverse effects</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Diffusion Hypoxia: (respiratory diseases).</li> <li>Nausea and vomiting.</li> <li>Inactivation of B12 →megaloblastic anemia.</li> <li>Bone marrow depression-Leukopenia (chronic use).</li> <li>Abortion - Congenital anomalies with repeated exposure eg. nurses</li> </ul>
Contraindication	<ul style="list-style-type: none"> <li>Pregnancy(uterine relaxant), Pernicious anemia, &amp; Immunosuppression.</li> </ul>

Drug	Enflurane
Potency	<ul style="list-style-type: none"> <li>Less potent than halothane</li> </ul>
Induction & Recovery	<ul style="list-style-type: none"> <li>More rapid induction and recovery than halothane</li> </ul>
Action	<ul style="list-style-type: none"> <li>Better muscle relaxation, Better analgesic properties</li> </ul>
Metabolization	<ul style="list-style-type: none"> <li>Metabolized to fluoride (8%), excreted in the kidney</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Pungent (Less induction -Not for pediatrics).</li> <li>CNS stimulation (Epilepsy-like seizure- abnormal EEG)</li> </ul>
Contraindication	<ul style="list-style-type: none"> <li>Patients with seizure disorders.      • Not for renal failures.</li> </ul>

Drug	Isoflurane (Forane)
Potency	<ul style="list-style-type: none"> <li>Potent anesthetic</li> </ul>
Induction & Recovery	<ul style="list-style-type: none"> <li>More rapid induction &amp; recovery than halothane</li> </ul>
P.K	<ul style="list-style-type: none"> <li>Stable compound (2%)</li> <li>Low biotransformation (Less fluoride)</li> </ul>
Advantages	<ul style="list-style-type: none"> <li>No nephrotoxicity - No hepatotoxicity.</li> <li>Good analgesic action.</li> <li>No sensitization of the heart.      • No cardiac arrhythmias.</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Pungent (Not for pediatrics).</li> </ul>

# Intravenous anesthetics

01

NO need for special equipments.

Rapid induction & recovery EXCEPT benzodiazepines

02

03

Injected slowly (rapid induction) compared with inhalation.

Recovery is due to redistribution from CNS.<sup>1</sup>

04

5

Analgesic activity: Opioids & ketamine

Amnesic action: benzodiazepines & ketamine.

6

7

Can be used alone in short operation & Outpatients anesthesia.

Patient with hypovolemia or shock suffer from severe hypotension so I can't give them Barbiturates, Propofol, Etomidate and Benzodiazepines since they decrease BP.  
We can give them Katamine because it's the only one that increase sympathetic → ↑BP.

1: termination of action results from redistribution of the drug from the brain into adipose tissues (away from the site of action).



# Intravenous Anesthetics

## Ultrashort acting barbiturates

<b>Drug</b>	Thiopental & Methohexital
<b>Onset</b>	<ul style="list-style-type: none"> <li>Rapid (1 min) (high lipid solubility)</li> </ul>
<b>Duration of Action</b>	<ul style="list-style-type: none"> <li>Ultra short (<b>15 - 20 min</b>)</li> </ul>
<b>Metabolization</b>	<ul style="list-style-type: none"> <li><b>slowly by the liver</b></li> <li>Slow recovery</li> <li>Hangover.</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>Potent anesthetic.</li> <li><b>↓ICP (used in head injury)</b></li> <li>Induction in major surgery.</li> <li>Alone in minor surgery.</li> </ul>
<b>ADR</b>	<ul style="list-style-type: none"> <li>CVS collapse, respiratory depression, <b>precipitate porphyria attack</b>,<sup>1</sup> &amp; hypersensitivity reaction.</li> </ul>
<b>Contraindication</b>	<ul style="list-style-type: none"> <li>COPD &amp; severe hypotension (<b>hypovolemic &amp; shock patient</b>)</li> </ul>

## Propofol Hypnotic (Non Barbiturate)

<b>Onset</b>	<ul style="list-style-type: none"> <li>Rapid</li> </ul>
<b>Duration of Action</b>	<ul style="list-style-type: none"> <li>Short</li> </ul>
<b>Metabolization</b>	<ul style="list-style-type: none"> <li>Rapidly in liver ( 10 times - Elimination <math>\frac{1}{2}</math> = 30 – 60 min).</li> <li>Faster recovery than thiopental</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li><b>↓ICP</b></li> <li><b>Antiemetic action.</b></li> </ul>
<b>ADR</b>	<ul style="list-style-type: none"> <li><b>Hypotension (↓PVR)</b></li> <li><b>Excitation (involuntary movements).</b><sup>2</sup></li> <li><b>Pain at site of injection.</b></li> <li><b>Expensive.</b></li> <li>Clinical infections due to bacterial contamination.</li> </ul>

## Benzodiazepines

<b>Drug</b>	Midazolam, Diazepam, & Lorazepam
<b>Onset</b>	<ul style="list-style-type: none"> <li>Slower than other agent</li> </ul>
<b>Induction &amp; Recovery</b>	<ul style="list-style-type: none"> <li><b>Slow induction and recovery</b></li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>No pain.</li> <li><b>Anxiolytic and amnesic action.</b></li> <li>Induction of general anesthesia.</li> <li>Alone in minor procedure (endoscopy).</li> <li><b>In balanced anesthesia (Midazolam).</b></li> </ul>
<b>ADR</b>	<ul style="list-style-type: none"> <li>Respiratory depression</li> </ul>

1: Barbiturates are liver microsomal enzymes inducers, they induce enzymes that are involved in the synthesis of porphyrins.

2: EEG changes are seen.



# Intravenous Anesthetics

## Etomidate

Ultrashort acting hypnotic (Non Barbiturates)


<b>Onset &amp; D.O.A</b>	<ul style="list-style-type: none"> <li>● Rapid onset &amp; short D.O.A</li> </ul>
<b>Metabolization</b>	<ul style="list-style-type: none"> <li>● Rapidly in liver.</li> <li>● Fairly fast recovery</li> <li>● Less hangover</li> </ul>
<b>ADR</b>	<ul style="list-style-type: none"> <li>● <b>Minimal CVS and respiratory depressant effects.</b></li> <li>● <b>Involuntary movements during induction</b> (diazepam)<sup>1</sup></li> <li>● Postoperative nausea &amp; vomiting.</li> <li>● Pain: at the site of injection.</li> <li>● <b>Adrenal suppression</b></li> </ul>

## Ketamine

given IV, IM (**can be used in Children**)

<b>Onset &amp; D.O.A</b>	<ul style="list-style-type: none"> <li>● Rapid onset but in comparison to other I.V or I.M. Short D.O.A</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>● <b>Dissociative anesthesia</b> (Analgesic activity, Amnesic action immobility, complete separation from the surrounding environment).</li> <li>● <b>Used in (hypovolemic, shock &amp; elderly) patients.</b></li> <li>● Potent bronchodilator (asthmatics).</li> </ul>
<b>ADR</b>	<ul style="list-style-type: none"> <li>● <b>Risk of hypertension and cerebral hemorrhage</b> ↑ICP</li> <li>● Postoperative: <b>hallucination vivid dreams &amp; disorientation &amp; illusions</b></li> <li>● <b>↑ BP &amp; cardiac output</b> → ( <b>↑ central sympathetic activity</b>).</li> <li>● <b>Increases plasma catecholamine levels</b>→↑ ICP</li> </ul>
<b>Contraindication</b>	Head injuries & CV diseases (hypertension-stroke).

## Opiate drugs

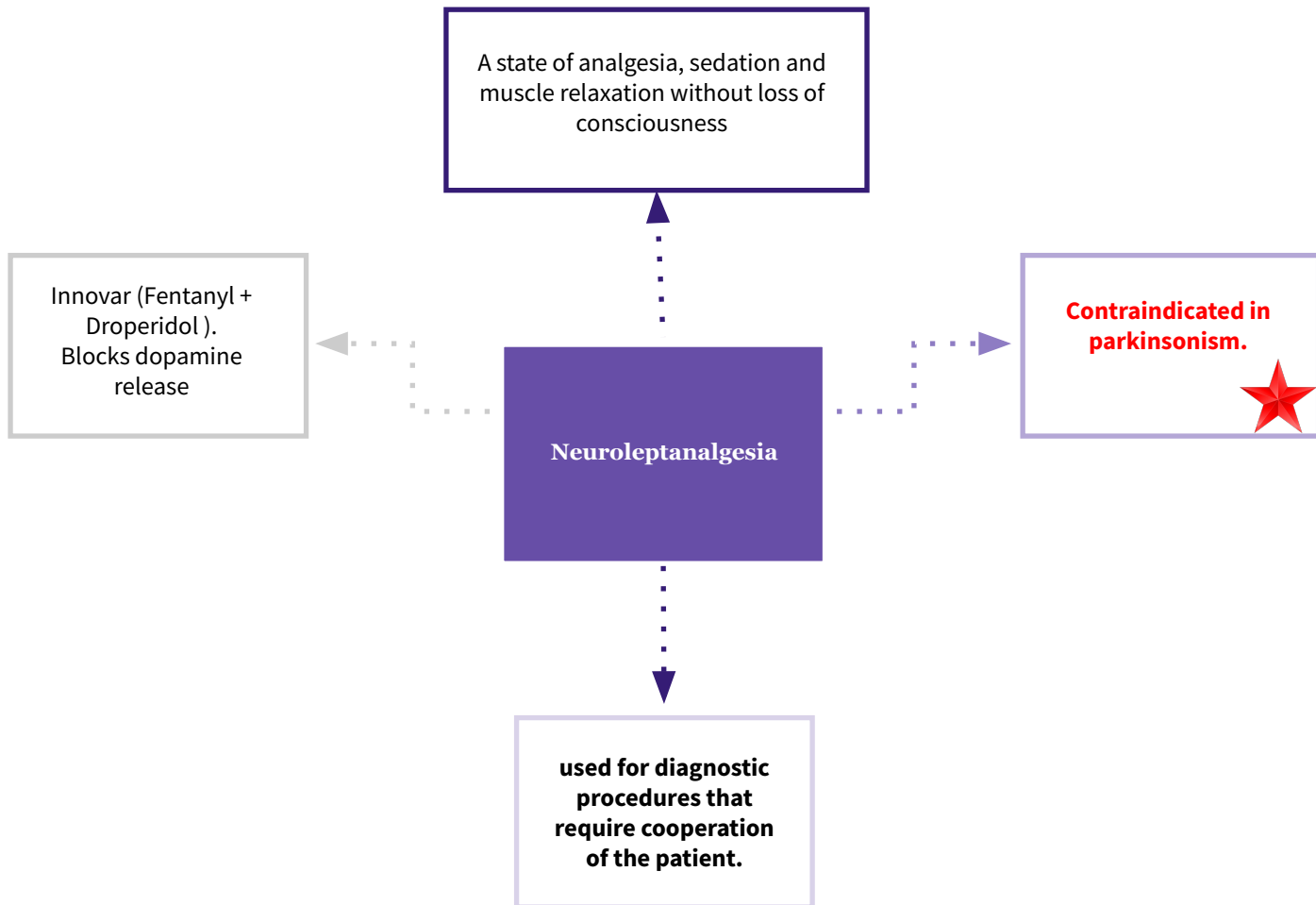
<b>Drug</b>	<b>Fentanyl, Alfentanil, Sufentanil, Remifentanil</b>
<b>Onset &amp; D.O.A</b>	<ul style="list-style-type: none"> <li>● Rapid onset &amp; short D.O.A</li> </ul>
<b>Uses</b> 	<ul style="list-style-type: none"> <li>● <b>Potent analgesia.</b> (NOT anesthetic )</li> <li>● <b>Cardiac surgery</b> (morphine + nitrous oxide)</li> <li>● <b>Neuroleptanalgesia</b> (Fentanyl+Droperidol ).</li> <li>● <b>Neuroleptanesthesia</b> (Fentanyl+Droperidol + nitrous oxide).</li> </ul>
<b>ADR</b>	<ul style="list-style-type: none"> <li>● Respiratory depression, bronchospasm (wooden rigidity)</li> <li>● Hypotension</li> <li>● nausea &amp; vomiting</li> <li>● Increase in ICP -Urinary retention.</li> <li>● Prolongation of labor &amp; fetal distress.</li> </ul>
<b>Contraindication</b>	<ul style="list-style-type: none"> <li>● <b>Head injuries.</b></li> <li>● <b>Pregnancy.</b></li> <li>● Bronchial asthma.</li> <li>● Chronic obstructive lung diseases.</li> <li>● Hypovolemic shock (Large dose only)</li> </ul>

1- usually coadministered with diazepam to avoid the involuntary movement.

# Opiate drugs

1

## Neuroleptanalgesia



2

## Neuroleptanesthesia

A combination of (Fentanyl + Droperidol + nitrous oxide).

# Quiz

## MCQ

1- Which of the following is an inhalation anesthetic?

- A) Etomidate
- B) Nitrous Oxide
- C) Prochlorperazine
- D) Diazepam

2- Which of the following can be used as an adjunct to general anesthetics?

- A) Succinylcholine
- B) Ranitidine
- C) Prochlorperazine
- D) Diphenhydramine

3- The \_\_\_\_ the MAC, the \_\_\_\_ the Drug:

- A) higher, more potent
- B) higher, less potent
- C) lower, more potent
- D) lower, less potent

4- Which of the following is more potent?

- A) Nitrous Oxide
- B) Sevoflurane
- C) Enflurane
- D) Halothane

5- A patient with liver failure is undergoing surgery. Which of the following should not be used?

- A) Nitrous Oxide
- B) Sevoflurane
- C) Enflurane
- D) Halothane

6- Which of the following has analgesic and amnesic actions:

- A) Thiopental
- B) Etomidate
- C) Midazolam
- D) Ketamine

7- A patient undergoing major surgery has a head injury. Which of the following is indicated?

- A) Ultrashort acting barbiturates
- B) Opioids
- C) Benzodiazepines
- D) Ultrashort acting hypnotics

8- Which of the following is indicated in asthmatics?

- A) Ketamine
- B) Diazepam
- C) Fentanyl
- D) Lorazepam

## SAQ

1- Name the adjuncts to general anesthetics with two examples:

2- Describe the mechanism of action of general anesthetics:

Extra Qs written by [Abdulrahman M. Bedaiwi \( Click Here \)](#)

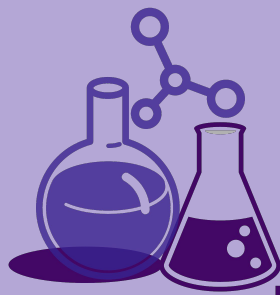
### MCQ

Q1	B
Q2	A
Q3	C&B
Q4	D
Q5	D
Q6	D
Q7	A
Q8	A

### SAQ

Q1	1- Preanesthetics: Opiates (Morphine), Anticholinergics (hyoscine) 2- Neuromuscular blocking agents (Succinylcholine, vecuronium)
Q2	Info in the lecture

**Answers:**



pharmacology

Team 438

***Good Luck ,  
Future Doctors!***

**Team Leaders:**

May Babaeer

Zyad Aldosari

**This Stunning Work Was Done By:**

Khalid Aldossari

Naif Aldossari

**Edited by:**

Salman Alagla



Share with us your  
ideas!