# Local and General anesthesia

**General anesthesia**: is the loss of sensation throughout the entire body, accompanied by loss of consciousness. General anesthesia is necessary for major surgical procedures. General anesthetics can be divided into two groups:
**(1)** inhalation anesthetics.
**(2)** intravenous anesthetics.

## Stages of General Anesthesia

1. **Stage 1 (Loss of pain):** The client loses general sensation but may be awake. This stage proceeds until the client loses consciousness.
2. **Stage 2 (Excitement and hyperactivity):** The client may be delirious and try to resist treatment. Heart rate and breathing may become irregular and blood pressure can increase. IV agents are administered here to calm the client.
3. **Stage 3 (Surgical anesthesia):** Skeletal muscles become relaxed and delirium stabilizes. Cardiovascular and breathing activities stabilize. Eye movements slow and the client becomes still. Surgery is performed during this stage.
4. **Stage 4 (Paralysis of the medulla region in the brain)** (responsible for controlling respiratory and cardiovascular activity): If breathing or the heart stops, death could result. This stage is usually avoided during general anesthesia.

## Methods of inducing general anesthesia

**1.** Intravenous method.
**2.** Inhalational method.

**Classification of general anesthetic drugs: -**

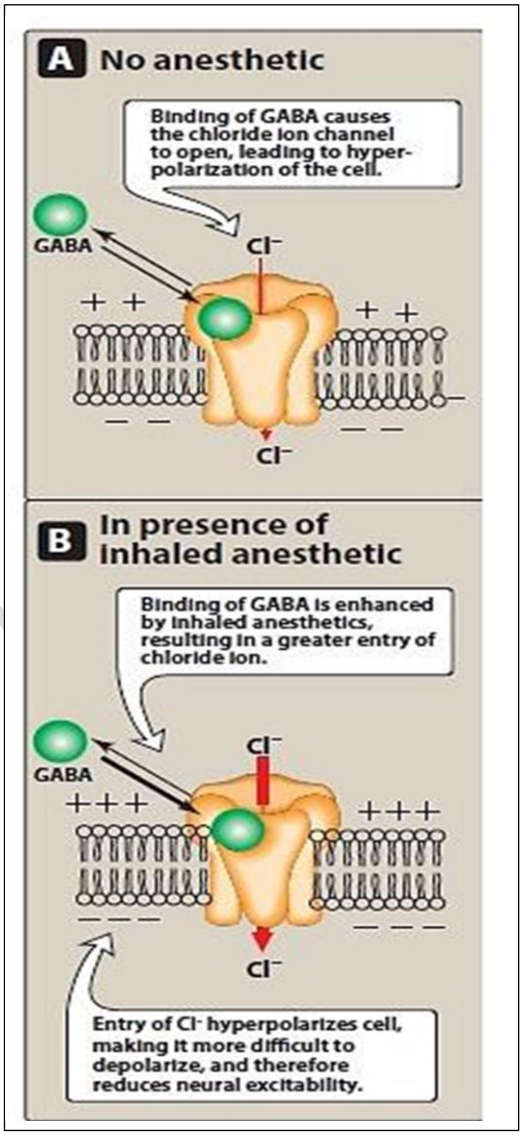
### 1) Inhalation anesthesia

**A. Volatile liquid**
- desflurane (Suprane)
- halothane (Fluothane)

**B. Gas**
- nitrous oxide.

**Mechanism of action:**

At clinically effective concentrations, general anesthetics increase the sensitivity of the γ-aminobutyric acid (GABA) receptors to the inhibitory neurotransmitter GABA. This increases chloride ion influx and hyperpolarization of neurons.




**USES:**

**1.** Nitrous oxide is a nonirritating potent analgesic but a weak general anesthetic.

**2.** Nitrous oxide alone cannot produce surgical anesthesia, but it is commonly combined with other more potent agents.

**3.** Nitrous oxide does not depress respiration and does not produce muscle relaxation.

**4.** Halothane is a potent anesthetic but a relatively weak analgesic. Thus, it is usually co-administered with nitrous oxide, opioids, or local anesthetics. Halothane relaxes both skeletal and uterine muscles and can be used in obstetrics when uterine relaxation is indicated.

## 2) I.V Anesthesia

A. Barbiturate and barbiturate Like agents
   - propofol (Diprivan)
   - diazepam (Valium)

B. Benzodiazepines
   - lorazepam (Ativan)
   - midazolam (Versed)

C. Opioids alfentanil (Alfenta)
   - fentanyl (Duragesic)

D. Others ketamine (Ketalar)

**USES:**

- **Propofol** is an IV sedative/hypnotic used for induction and/or maintenance of anesthesia.

- **Ketamine** a short-acting, non-barbiturate anesthetic, induces a dissociated state in which the patient is unconscious (but may appear to be awake) and does not feel pain. This dissociative anesthesia provides sedation, amnesia, and immobility.

- **Barbiturates** Thiopental is an ultra–short-acting barbiturate. It is a potent anesthetic but a weak analgesic. Barbiturates require supplementary analgesic administration during anesthesia.

## Non-Anesthetic Drugs (as Adjuncts to Surgery):

A number of drugs are used either to complement the effects of general anesthetics or to treat anticipated side effects of the anesthesia. They may be given prior to, during, or after surgery.

e.g.:

1. **barbiturates and benzodiazepines** : The preoperative drugs given to relieve anxiety and provide mild sedation.
2. **Opioids such as morphine:** may be given to counteract pain that the client will experience after surgery.
3. **Anticholinergics** such as atropine may be administered to dry secretions and to suppress the bradycardia caused by some anesthetics.

## Local Anesthetics

Local anesthetics are drugs that produce a rapid loss of sensation to a limited part of the body, without loss of consciousness. They produce their therapeutic effect by blocking the entry of sodium ions (Na+) into neurons.

## Mechanism of Action of Local Anesthetics:

Local anesthetics act by blocking sodium channels in neurons. Because the blocking of sodium channels is a nonselective process, both sensory and motor impulses are affected. Therefore, both sensation and muscle activity will temporarily diminish in the area treated with the local anesthetic.

*** Small amounts of epinephrine (Adrenalin) are sometimes added to the anesthetic solution to constrict blood vessels in the immediate area where the local anesthetic is applied. In addition to reducing bleeding in the area, this keeps the anesthetic in the area longer, thus extending the duration of action of the drug.

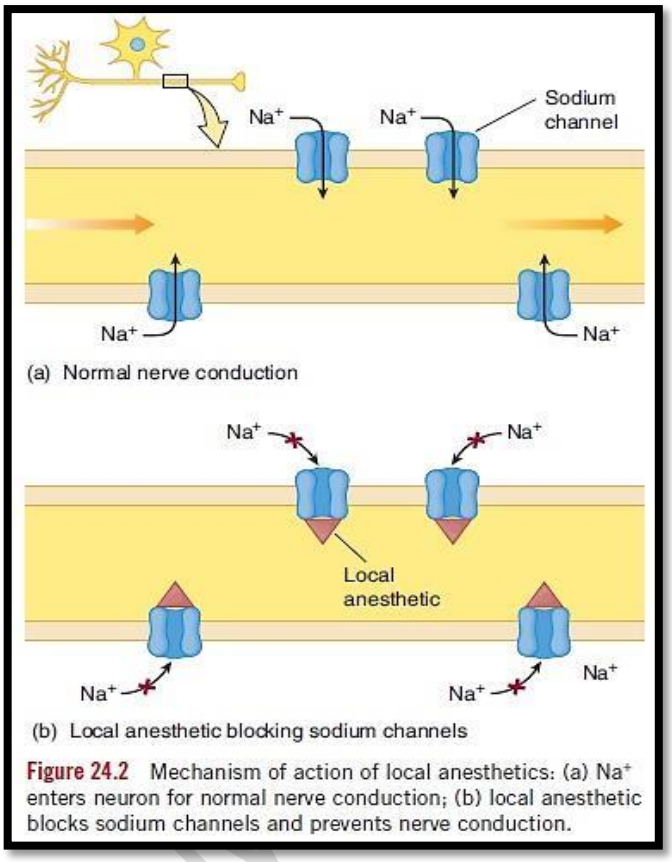



**Figure 24.2** Mechanism of action of local anesthetics: (a) $Na^+$ enters neuron for normal nerve conduction; (b) local anesthetic blocks sodium channels and prevents nerve conduction.

## Classifications of local anesthetic drugs:

**TABLE 24.2 Select Local Anesthetics**

| Chemical Classification | Drug |
|---|---|
| Esters | benzocaine (Zilactin, Anbesol)<br>chloroprocaine (Nesacaine)<br>cocaine<br>tetracaine (Pontocaine) |
| Amides | articaine (Septanest)<br>bupivacaine (Marcaine)<br>dibucaine (Nupercaine, Nupercainal)<br>**Pr** lidocaine (Xylocaine)<br>mepivacaine (Carbocaine)<br>prilocaine (Citanest)<br>ropivacaine (Naropin) |
| Miscellaneous agents | cetylpyridinium and benzocaine (Cepacol)<br>pramoxine (Tronothane) |

## Actions and Uses:

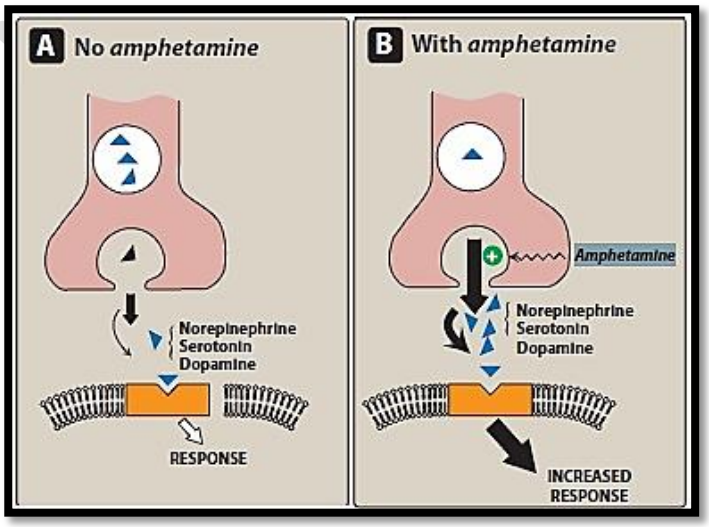
Lidocaine, the most frequently used injectable local anesthetic, acts by blocking neuronal pain impulses. It is injected as a nerve block for spinal and epidural anesthesia. Its actions are achieved by blocking sodium channels located within the membranes of neurons.

## Central Nervous System Stimulants

are a group of pharmacological agents. They are known to increase alertness, enhance the ability to concentrate, and delay the symptoms of fatigue. The stimulants range from widely accessible (caffeine) to Schedule I controlled substances (ecstasy).

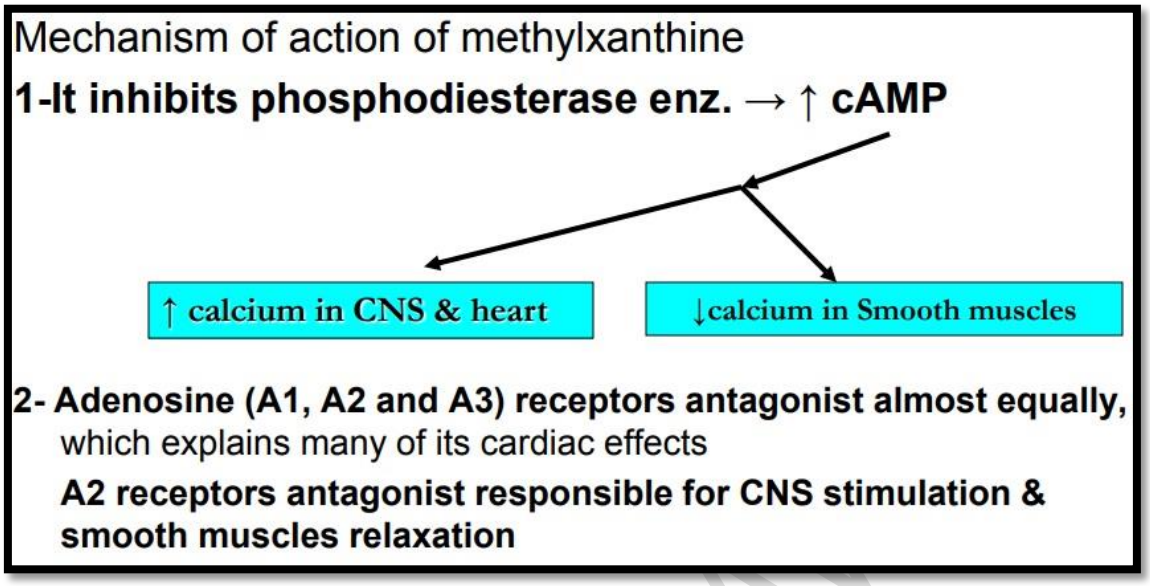
*** **Clinical applications** of the CNS stimulants are limited. principal indication (attentiondeficit/ hyperactivity disorder (ADHD).

- **Most widely used stimulant drugs**
  1. Amphetamines.
  2. methylxanthines (e.g., caffeine, theophylline , theobromine).
- **Mechanism of action**
  1. **Amphetamines**:
     - As with cocaine, the effects of amphetamine on the CNS and peripheral nervous system are indirect.
     - *Amphetamine*, achieves this effect by releasing intracellular stores of catecholamines.
     - Because amphetamine also inhibits monoamine oxidase (MAO) and is a weak reuptake transport inhibitor, high levels of catecholamines are readily released into synaptic spaces.
     - Amphetamine stimulates the entire cerebrospinal axis, cortex, brainstem, and medulla. This leads to increased alertness, decreased fatigue, depressed appetite, and insomnia.



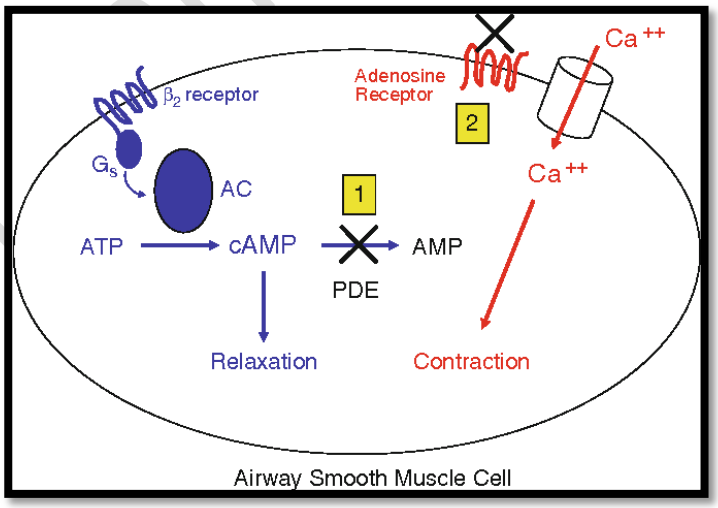

**Mechanism of amphetamine**

## 2. Methylxanthines




### Pharmacologic effects of methylxanthine

1. **Bronchi.** Caffeine and other methylxanthines cause relaxation of bronchial smooth muscle and thereby promote bronchodilation. Theophylline is an especially effective bronchodilator, and hence can be used to treat asthma.
2. **CNS:** Consumption of 1.5 g of caffeine (12 to 15 cups of coffee) produces anxiety and tremors.
3. **CVS**: High doses of caffeine stimulate the heart.




M.O.A of methylxanthines