Local Anesthetics

- Local anesthetics act directly on nerve axons to reversibly block nerve conduction. They produce a lack of sensation in the area innervated by those nerve fibers.

LOCAL ANESTHETICS: AMIDES
Bupivacaine MARCAINE
Lidocaine XYLOCAINE
Mepivacaine CARBOCAINE
Ropivacaine NAROPIN
LOCAL ANESTHETICS: ESTERS
Chloroprocaine NESACAINE
Tetracaine GENERIC ONLY

The methods by which local anesthetics can be administered

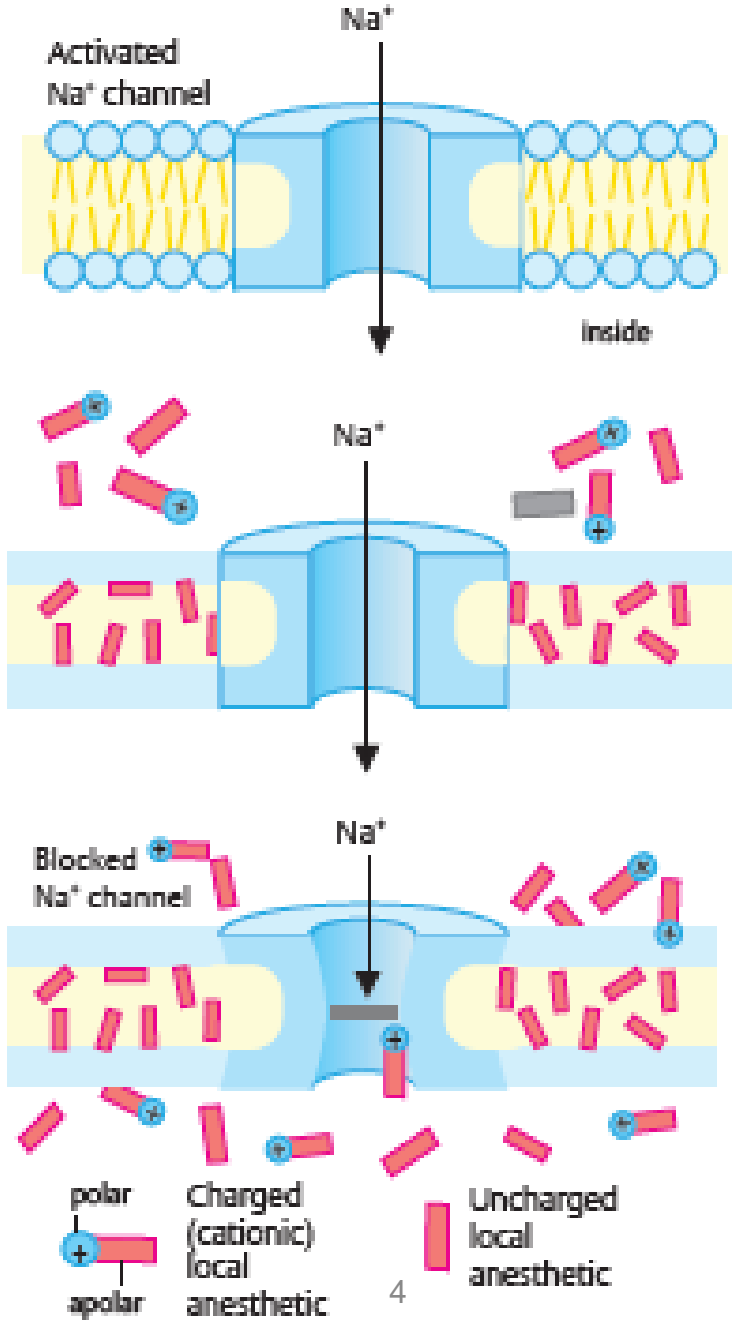
Methods of Local Anesthetic Administration	Technique	Clinical Situation
Topical	Applied to skin or mucous membranes	Typically used prior to injection of anesthetics to make the procedure less painful Also used prior to eye surgery and endoscopy
Infiltration	Inject dilute solution and let diffuse (e.g., subcutaneous or submucosal)	Very common in dentistry to anesthetize most teeth
Nerve block	Inject close to the nerve trunk, proximal to the intended area of anesthesia	Very common in dentistry to anesthetize mandibular teeth Can be useful in cases where pain sensation to a limb needs to be blocked (e.g., following femur fracture)
Spinal	Inject anesthetic in the subarachnoid space	Chronic pain or surgery
Epidural	Inject within the vertebral canal but outside the dura	Very commonly used in labor and delivery

Lidocaine, Articaine, and Bupivacaine (Amides); Benzocaine, Procaine,and Tetracaine (Esters)

- Mechanism of action.
- Local anesthetics exist in two forms in the body: as an uncharged base and as a charged acid. Only the uncharged base can cross nerve membranes. However, once inside the axon, the charged form is active.
- Local anesthetics interfere with the propagation of action potentials in nerve axons by blocking Na+ channels from the cytoplasmic side of the channel

▶ Effects of local anesthetics.

Local anesthetics block the inner gate of the Na+ channels in nerve cells, preventing Na+ influx and action potential initiation and propagation. Charged (cationic) local anesthetic is thought to block the sodium channel by becoming incorporated into the phospholipid membrane or channel protein. Uncharged local anesthetic may also become incorporated into the apolar region of the channel protein. (CNS, central nervous system.)



Pharmacokinetics

- — Local anesthetics differ mainly in their rate of onset and duration of action
- — Termination of action at the site of injection is by diffusion of the active drug into the systemic
- circulation followed by metabolism. Ester local anesthetics are inactivated primarily by hydrolysis via esterases in plasma and the liver. Amide local anesthetics are metabolized primarily by the live

Rate and Onset of action of Some Common Local Aesthetic Agents

Local Anesthetic Agent	Rate of Onset	Duration of Action*
Lidocaine	Rapid	Short
Articaine	Rapid	Intermediate
Bupivacaine	Slow	Long
Procaine	Rapid	Short
Tetracaine	Slow	Long

* The duration of action is prolonged when combined with epinephrine.

Side effects

- The toxic effects of local anesthetics are dependent on the amount of drug that gains entry into the systemic circulation.
- ***CNS effects****:* These include stimulation, restlessness, and tremor that may lead to clonic convulsions.
- This is followed by depression and death due to respiratory failure. Direct systemic
- injection may lead directly to death.
- ***Cardiac effects****:* Direct effects on the myocardium include decreased electrical excitability,
- decreased conduction rate, and a negative inotropic effect. Sudden cardiac death may occur.
- ***Hypersensitivity:*** This is rare, but it can cause dermatitis, asthma attacks, or fatal anaphylactic reactions. Allergy is more frequent with esters.