

Sodium ions

Local anesthetics **selectively inhibit** the peak permeability of sodium, whose value is normally about five to six times greater than the minimum necessary for impulse conduction. The following sequence is a proposed mechanism of action of local anesthetics:

1. Displacement of calcium ions from the sodium channel receptor site, which permits...
2. Binding of local anesthetic molecule to this receptor site, which thus produces...
3. Blockade of the sodium channel, and a...
4. Decrease in sodium conductance, which leads to...
5. Depression of the rate of electrical depolarization, and a...
6. Failure to achieve the threshold potential level, along with a...
7. Lack of development of propagated action potentials, which is called...
8. Conduction blockade

The mechanism whereby sodium ions gain entry to the axoplasm of the nerve, thereby initiating an action potential, is altered by local anesthetics. The nerve membrane remains in a polarized state because ionic movements responsible for the action potential fail to develop. Nerve block produced by local anesthetics is called a **nondepolarizing nerve block**.



1. Local anesthetics **reversibly block** nerve impulse conduction and produce **reversible** loss of sensation at their administration site. The **site** of action of local anesthetics is at the **lipoprotein sheath** of the nerves.
2. Local anesthetics are clinically effective on both axons and free nerve endings.
3. **Important: Small, myelinated nerve fibers** which conduct pain and temperature sensations, are **affected first**, followed by touch, proprioception, and skeletal muscle tone.
4. Emergence from a local anesthetic nerve block follows the same diffusion patterns as induction does; however, it does so in **reverse order**.
5. Recovery is usually a slower process than induction because the anesthetic is bound to the drug receptor site in the sodium channel and therefore is released more slowly than it is absorbed.
6. **Potassium, calcium, and chloride conductance's** remain unchanged.