

Periodic Graphics

A collaboration between C&EN and
Andy Brunning, author of the popular
graphics blog *Compound Interest*

More
online

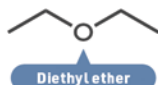
To see more of
Bunning's work, go to
compoundchem.com.
To see all of C&EN's
Periodic Graphics,
visit **cenm.ag/
periodicgraphics**.

THE CHEMISTRY OF ANESTHETICS

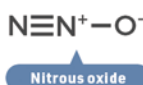
Surgery has become a lot more comfortable since the first demonstrations of ether anesthesia in the 1840s. Here we look at the different types of anesthesia, the compounds involved, and how they work.

A BRIEF HISTORY OF ANESTHESIA

1842



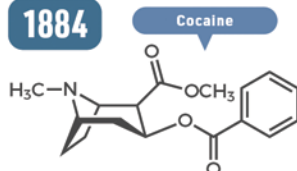
1844



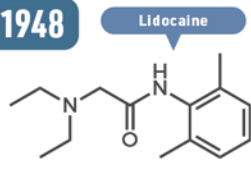
The year shown for each compound indicates the year of first clinical use.

Diethyl ether and nitrous oxide were the earliest anesthetics, though use at "ether frolics" and laughing gas parties preceded their use as general anesthetics. Diethyl ether can cause nausea and vomiting, so it's now rarely used. Nitrous oxide is still used, often as a carrier gas for stronger anesthetics.

1884

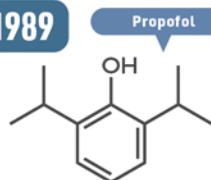


1948

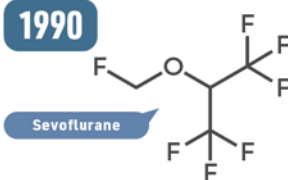


Cocaine was the first local anesthetic, but that use is now rare. Today, lidocaine is the most widely used local anesthetic.

1989



1990



Propofol is the most common intravenous general anesthetic today, while halogenated hydrocarbons and ethers are the most commonly used inhaled anesthetics.

TYPES OF ANESTHESIA



General anesthesia

Makes patients unconscious and sensation-free



Regional anesthesia

Numbs an area of the body, such as with an epidural



Local anesthesia

Numbs a small area, such as for dental operations

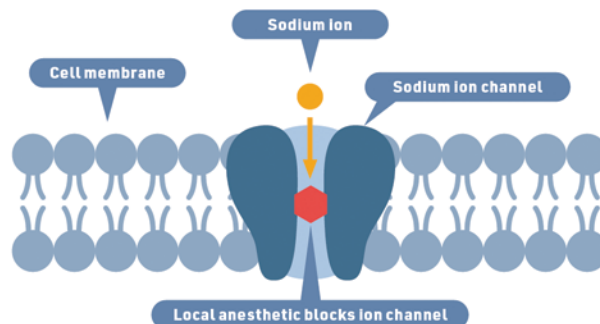


Sedation

Makes patients drowsy and relaxed but not unconscious

HOW ANESTHETICS WORK

All anesthetics stop nerves from passing pain signals to the brain. Local anesthetics block sodium ion channels, stopping sodium ions from entering nerve cells and halting nerve impulses.



General anesthetics reduce nerve transmission at synapses, the gap between neurons where neurotransmitters are released. But exactly how they do this is still not known.