

Minimum Alveolar Concentration

CoreNotes by Core Concepts Anesthesia Review, LLC

What You Must Know

1. The minimum alveolar concentration (MAC) is the alveolar concentration of anesthetic that prevents movement in 50% of subjects in response to a surgical stimulus.
2. Effectively, MAC reflects the ED₅₀ of inhaled anesthetics; ED₉₅ is approximately 1.3 MAC.
3. Anesthetic potency is inversely related to MAC.
4. MAC is expressed as a percentage at one atmosphere, but MAC changes with changes in atmospheric pressure.
5. MAC is highest during the 1st year of life and declines thereafter.
6. MACs are additive as anesthetics are combined, e.g. N₂O with desflurane.
7. Various factors affect MAC including age, genetics, temperature, pregnancy, adjuvant drugs and pathophysiologic conditions.
8. MAC-awake₅₀ is the alveolar concentration that inhibits appropriate response to spoken commands in 50% of subjects. The ratio of MAC-awake to MAC is not consistent for volatile agents.
9. MAC-bar₅₀ is the alveolar concentration that inhibits autonomic responses in 50% of subjects to a surgical stimulus and is estimated at 1.3 to 1.66 times MAC.

The minimum alveolar concentration (MAC) is the alveolar concentration of anesthetic that prevents movement in 50% of subjects in response to a surgical stimulus and is a very important anesthetic concept. MAC is inversely related to potency and thereby expresses the relative potency of inhaled anesthetics.

Agent	MAC @ 1 atm	Vapor Pressure @ 20° C
N ₂ O	104%	745 psi
Desflurane	6.6%	669 mmHg
Isoflurane	1.17%	238 mmHg
Sevoflurane	1.8%	157 mmHg

A variety of factors can alter the MAC:

Factors that Reduce MAC	Factors that Increase MAC
Increase in Age	Decrease in Age
CNS Depressants	CNS Stimulants
Acute Ethanol Ingestion	Chronic Ethanol Ingestion
Hypothermia	Hyperthermia
Pregnancy	Hyperthyroidism
Hyponatremia	Hypernatremia
Hypoxia	Levodopa Administration
Metabolic Acidosis	

Additional Reading:

Longnecker, DE, Brown, DL, Newman MF and Zapol, WM. *Anesthesiology*. New York: McGraw Hill, 2012: 607-608