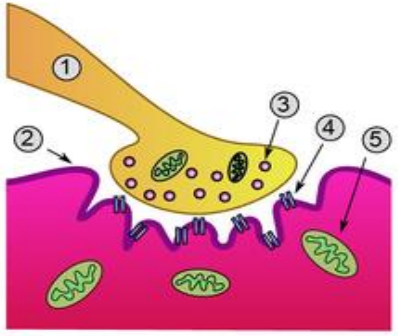
Muscle relaxants



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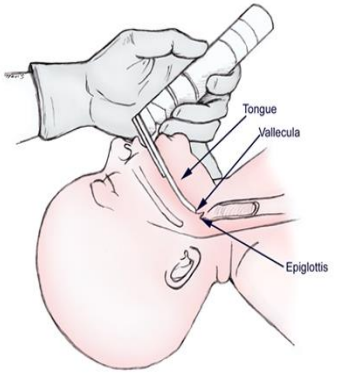
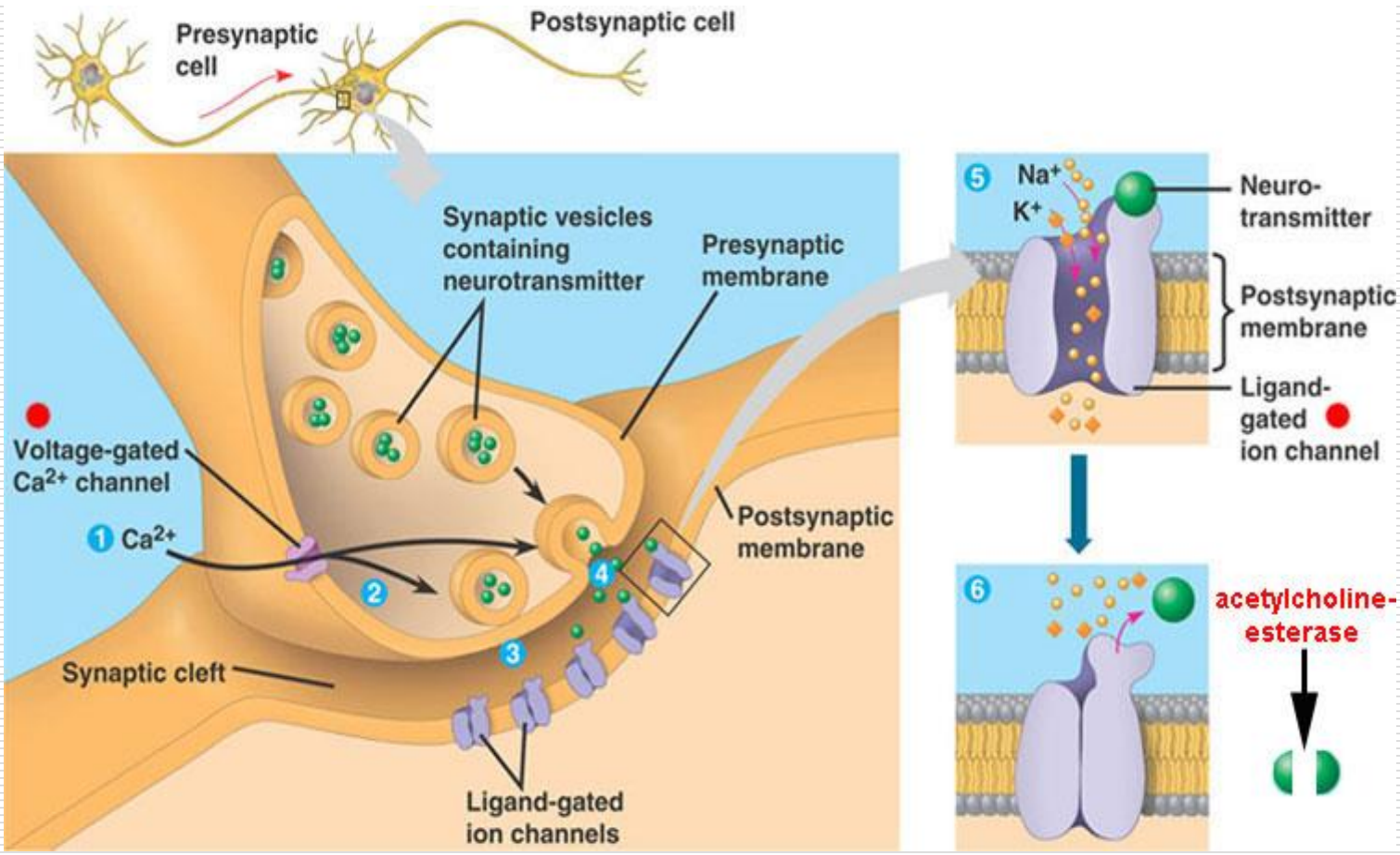


Neuromuscular transmission



Remember !!

- Musle relaxants produce paralysis not anesthesia.
- Used to facilitate endotracheal intubation, mechanical ventilation and immobility during surgery.
- The main site of action is nicotinic receptors on the postsynaptic membrane.

classification

- Peripherally acting
  (neuromuscular blockers)
- Centrally acting
  (baclofen, diazepam)
- Direct acting
  (dantrolene)

Peripherally acting

(A) Presynaptic neuromuscular blockers:

- Inhibit Ach synthesis (triethylcholine, hemicholinium)
- Inhibit Ach release (Mg, aminoglycosides, botulinum toxin)

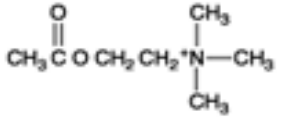
(B) Postsynaptic neuromuscular blockers:

- Depolarizing (succinylcholine or suxamethonium)
- Nondepolarizing (d-tubocurarine, gallamine, atracurium, pancuronium, vecuronium

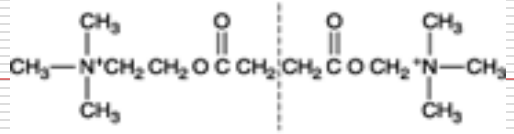
Depolarizing muscle relaxants (succenylcholine)

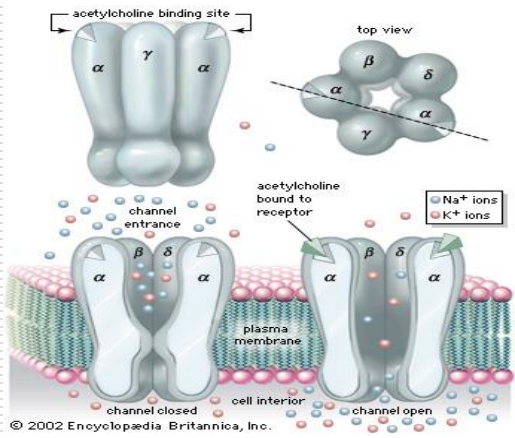
- Quaternary ammonium compound, composed of two acetylcholine compound, water soluble.
- ***Dose;*** I.V. 1.5 mg/kg (higher dose in pediatric)
  I.M. 4-6 mg/kg (pediatric)
- ***Onset;*** 30-60 sec.
- ***Duration;*** less than 10 min. prolonged by high dose or abnormal metabolism.
- ***Metabolism;*** hydrolysed by pseudocholine esterase into succenyl and choline

Acetylcholine



Succinylcholine (diacetylcholine)





Mechanism of action;

- Phase I;

  Combine with nicotinic receptors leading to depolarization of motor end plate, initial muscle twitching, persistant depolarization and paralysis.

  phase I block is augmented by anticholinesterase.

- Phase II;

  prolonged exposure of the membrane to succenylecholine leads to desensitization of the membrane.

  phase II is reversed by anticholinesterase.

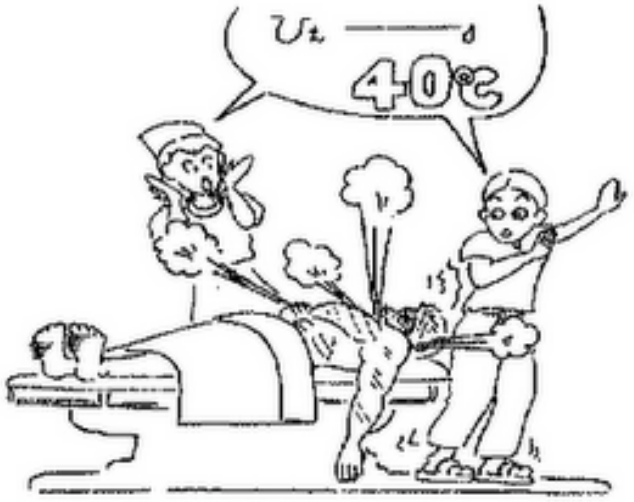
Causes of abnormal metabolism;

- Hypothermia.
- Low enzyme level

  (liver disease, renal disease, pregnancy, drugs as cholinesterase inhibitors, MAO inhibitors, cyclophospamide).
- Genetically aberrant enzymes

Side effects;

- Increase of decrease in the HR and blood pressure.
- Hyperkalemia.
- Fasiculations.
- Muscle pain.
- Increased intragastric pressure.
- Increased IOP.
- Malignant hyperthermia.
- Increased intracranial pressure.
- Prolonged paralysis.



Nondepolarizing muscle relaxants

- Short acting

  (mivacurium)

- Intermediate acting

  (atracrium, rocuronium, vecuronium, gallamine, cisatracrium)

- Long acting

  (metocurarine, pipicronium, doxacurium)

Mechanism of action;

- Competitive antagonism with Ach at the nicotinic receptors of the NMJ.
- Cholinesterase inhibitors can reverse blockad (neostigmine)

Pharmacological properties;

- Blocking of autonomic ganglia
- Vagal block (gallamine, pancuronium)
- Catecholamine release (gallamine, pancuronium)
- Histamine release (tubocurarine, mivacurium, atracrium)
- Metabolism;

  Hepatic (pancuronium, vecuronium)
- Excretion;

  Biliary (rocuronium, vecuronium)

  Renal (pancuronium, gallamine)

Doses;

drug	Dose for intubation	Maintenance dose	Time to intubation	Duration of action	Systemic effects
atracurium	0.5-0.6 mg/kg	0.15-0.2 mg/kg	90-120 Sec.	20-25 Min	Hist. release Dec. bl.p.
rocuronium	0.6-0.7 mg/kg	0.15-0.2 mg/kg	90-100 Sec	20-30 Min	
vecuronium	0.1 mg/kg	0.02-0.03 mg/kg	90-120 Sec	15-20 Min	
mivacurium	0.15-0.2 mg/kg	0.1 mg/kg	100-120 Sec	10-15 Min	
pancuronium	0.1 mg/kg	0.015 mg/kg	120-150 sec	35-45 min	Long acting

Variables affecting nondepolarizing muscle relaxants;

- Temperature; hypothermia (↑)

  (decreasing metabolism and excretion)
- Acid base balance; acidosis (↑)
- Electrolyte abnormalities;

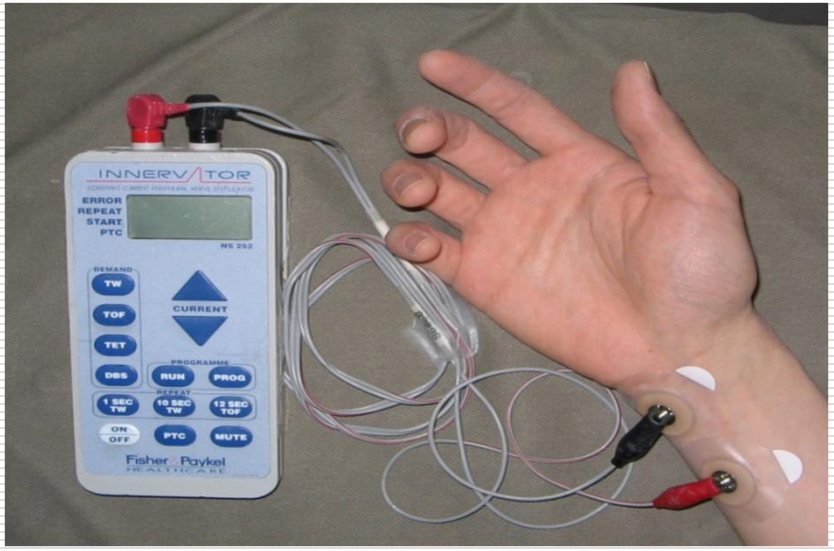
  (hypokalemia, hypocalcemia, hypermagnesemia) (↑)
- Age; neonates

  (increased sensitivity)
- Concurrent diseases;

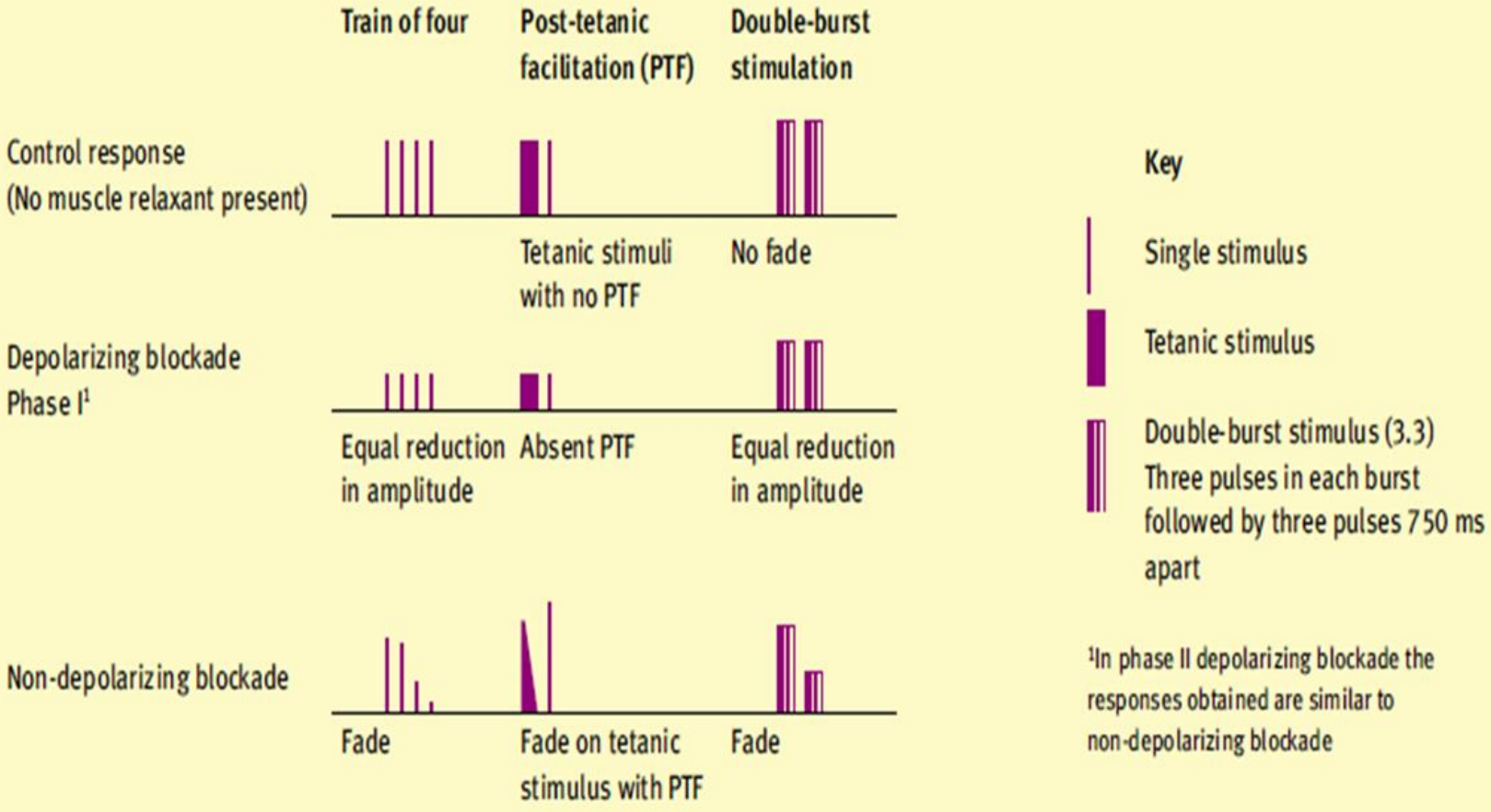
  (hepatic, renal, neuromuscular diseases, burns)

Neuromuscular monitoring

- Nerve stimmulator



Response to different modes of nerve stimulation



Thank You