

7.29 / J9.09 Cellular Neurobiology

A child's garden of blockers and toxins

Blockers and Toxins at neuromuscular junction

- I. Presynaptic
 - A. Calcium channel blockers
 - 1) Nifedipine (see below).
 - 2) Cobalt (Co^{++}) - blocks voltage dependent Ca^{++} channels
 - B. Toxins that block vesicle exocytosis
 - 1) Tetanus toxin (component) is a protease that cleaves the synaptic vesicle protein Synaptobrevin - blocks synaptic vesicles exocytosis (other components of Tetanus toxin proteins cleave to similar proteins and do similar things)
 - 2) Botulinium toxin (World's champ toxin) acts similarly to tetanus toxin.
- II. Postsynaptic
 - A. Acetylcholine Receptor Antagonists
 - 1) succinyl choline - "muscle relaxant"
 - 2) flaxedil - another muscle relaxant
 - 3) β ,D-tubocurarine (an active ingredient in curare)
 - 4) Cobra venom toxin (najatoxin)
 - 5) α -bungarotoxin(Btx) - toxin from *Bungarus multicinctus* - a Taiwanese sea snake - affinity toxin used to isolate and purify the ACh receptor α subunit protein
 - 6) Myasthenia Gravis, an auto immune disease in which patients make antibodies to their acetylcholine receptors
 - B. Acetylcholinesterase inhibitors
 - 1) Eserine, neostigmine, phytostigmine
 - 2) organophosphorus insecticides -- e.g. Raid -- bad for bugs
 - 3) organophosphorus nerve gases -- tabun, sarin, VX, etc. -- bad for you
- III. Sodium Channel agents
 - A. Tetrodotoxin - TTX - a sodium channel blocker

- B. Antagonists of Sodium Channel *inactivation* (the h-gate)
 - 1) internal pronase
 - 2) DDT (for arthropods only -- e.g. insects and lobsters)
 - 3) pyrethrin insecticides
 - 4) lipid soluble toxins such as veratridine and batrachotoxin

- IV. Potassium Channel blockers (covered in detail in Nicholls et al, pg. 118. You should know two of these.)
 - A. Tetraethylammonium (TEA)
 - B. 2-aminopyridine

- V. Calcium Channel blockers
 - A. Co^{++}
 - B. Nifedipine (for L-type Ca^{++} Channels)
 - C. various toxins from pretty seashell mollusks, e.g.,
 ω -conotoxin from *Conus litteratus*. These calcium-channel toxins
all start with " ω "