Autonomic Ganglia

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Structure of the Ganglia

1. N1 fast EPSP
2. M2 slow IPSP
3. M1 slow EPSP
4. Late, slow EPSP

Neurons of the ANS

Structure and Physiology of the Autonomic Ganglia

Nicotinic Receptor
- Ganglionic nicotinic (sympathetic & parasympathetic)
  - pentamer: 2 distinct subunits (α,β) - α2β3 or α3β2
  - α subunit (chains) contain the Ach binding sites
  - binding of Ach → opening of ion channel (Na+ in, K+ out)

Ganglionic stimulants
- Nicotine
  - tobacco (0.3-20mg, fatal dose, 40mg)
  - metabolized & excreted rapidly
  - ↑ HR, ↑ BP, ↑ respiratory rate
- Ach, DMPP (experimental)
- Lobeline (tobacco)
- Insecticides & rodenticide
  - nicotine is often the effective agent
- Toxicity
  - CNS stimulation: convulsions, headache
  - NMJ paralysis: depolarizing blockade
  - hypertension, hypotension, cardiac arrhythmias
  - vomiting, diarrhea, salivation

Treatment of Poisoning from Ganglionic Stimulants

- Treatment:
  - vomiting induced for oral ingestion such as insecticides
- Treatment symptom-directed
  - muscarinic excess: anticholinergic (atropine)
  - NMJ blockade: mechanical respiration
  - CNS stimulation: anticonvulsant (diazepam)
Ganglionic Blocking Agents

- **Mecamylamine**
  - effective orally, CNS effects

- **Trimethapan**
  - inactive orally
  - used in hypertensive emergency (CNS origin)
  - controlled hypotension during surgery
  - short duration of action, 5-10 min, no CNS action

- **Toxicity:** hypotension, postural hypotension

- **Treatment:** pressor agent to counter hypotension

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**Predominant autonomic NS on effector sites**

<table>
<thead>
<tr>
<th>Site</th>
<th>Predominant ANS</th>
<th>Effect of Ganglionic Blockade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterioles</td>
<td>Sympathetic</td>
<td>vasodilation, hypotension</td>
</tr>
<tr>
<td>Veins</td>
<td>Sympathetic</td>
<td>vasodilation, ↓venous return, ↓CO2</td>
</tr>
<tr>
<td>Heart</td>
<td>Parasympathetic</td>
<td>tachycardia</td>
</tr>
<tr>
<td>Iris</td>
<td>Parasympathetic</td>
<td>mydriasis (dilation)</td>
</tr>
<tr>
<td>Ciliary muscle</td>
<td>Parasympathetic</td>
<td>cycloplegia (loss of accommodation)</td>
</tr>
<tr>
<td>GI tract</td>
<td>Parasympathetic</td>
<td>↓tone, ↓motility, constipation</td>
</tr>
<tr>
<td>Urinary</td>
<td>Parasympathetic</td>
<td>urinary retention</td>
</tr>
<tr>
<td>Salivary glands</td>
<td>Parasympathetic</td>
<td>xerostomia (dry mouth)</td>
</tr>
<tr>
<td>Sweat glands</td>
<td>Sympathetic</td>
<td>anhidrosis (low sweating)</td>
</tr>
</tbody>
</table>

Note: Ganglia block also high dose nicotine or high dose AchE inhibitors