Autonomic Ganglia

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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)

Structure of the Ganglia

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

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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

### 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, ↓CO</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