Adrenal Medulla
Chapter 14: Sympathoadrenal System Receptors

adrenergic & cholinergic

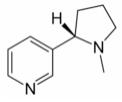
1906 Dale: epinephrine elicits two opposing actions in same tissue

1933 Dale: nerves releasing sympathetic transmitter NE & Ach
today refer to:
1) sympathetic postganglionic neurons releasing NE

2) parasympathetic postganglionic neurons releasing Ach

1936 Dale: Nobel Prize in Physiology & Medicine

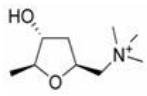
I. Cholinergic receptors respond to **Ach**
plant substances:
1. nicotine → isolated 1828ID 1843



Nicotiana tabacum

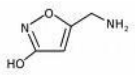
a) night shade plants → tobacco
b) tomato, potato, egg plant, green peppers
c) coca leaves
d) neurotoxin against insects
e) pharmacology
1) crosses BBB within 7 sec
2) ½ life: 2 hr
3) ↑ E (adrenaline)
↑heart rate
↑respiration
↑blood glucose
↑blood pressure
4) DA (dopamine)
↓MAO (monoamine oxidase) → ? smoking ↑

2. Muscarine isolated in 1869



a) muscarine: trace

b) muscimol: pharmacologically active



1) selective agonist for $GABA_A$

2) low dose symptoms within 15-30 min:
   - salivation
   - perspiration
   - lacrimation (tearflow)

3) large dose symptoms:
   - abdominal pain
   - severe nausea
   - diarrhea
   - blurred vision
   - labored breathing
   - generally subsides within 2 hours

4) death rare:
   - cardiac or respiratory failure

Amanita muscaria

3. cholinergic agonists: nicotine & muscarine

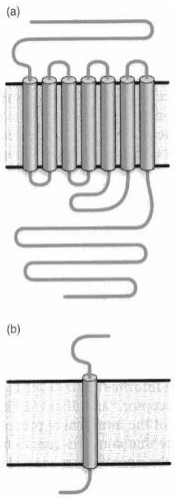
a) nicotine: stimulates skeletal muscle

b) muscarine: stimulates autonomic cells smooth muscles

c) above two indicate receptor differences →

1) curare/turbocurare block nicotinic receptors

2) atropine blocks muscarinic receptors
   a. 3 different pharmacological types
   b. 5 different molecular forms
   c. family of 7-helix G proteins
      - 3 serotonin receptor subtypes
      - 1 substance K receptor
        - rhodopsin
        - opsin



II. Adrenergic receptors (AR) respond to NE

1) Two types

a) a-AR

b) ß-AR

2) different in sensitivity to sympathetic amines

a) a-AR E > NE > ISO

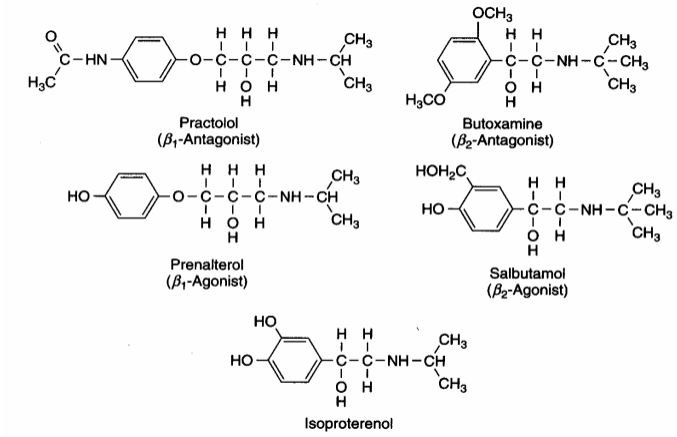
secondary effects on smooth muscle contraction

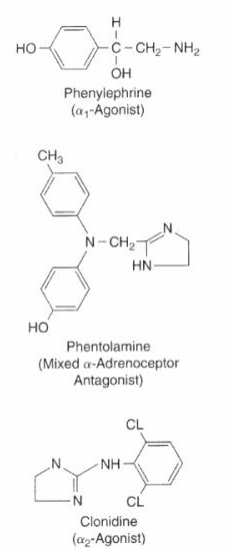
phenylephrine → agonist receptor response to catecholamines

b) ß-AR ISO > E> NE

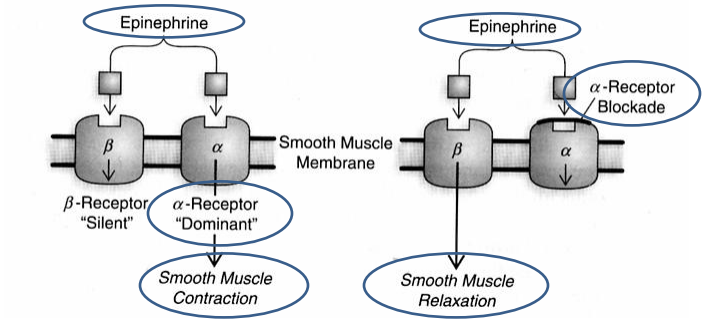
secondary effects on smooth muscle relaxation

isoproterenol → agonist receptor response to catecholamines





Experimental Demonstration of Epinephrine (catecholamine) Reversal



1933 Cannon & Rosenblueth: 2 sympathins : E (excitatory) & I (inhibitory)

incubation of smooth muscles in a-AR& ß-AR antagonists

? smooth muscle response

dual-receptor hypothesis

single sympathetic neurotransmitter effect → two receptors