Chapter 5

The Central and Peripheral Nervous Systems
The Nervous System

- Anatomical description of the autonomic branches
  - Parasympathetic fibers: arise from cranial/sacral portions of spinal cord
  - Sympathetic fibers: leave cord primarily from thoracic/lumbar regions
The Nervous System

- **Contrasts between parasympathetic and sympathetic regulation**
  - Parasympathetic controls day-to-day bodily functions
    - Overstimulation = *SLUD syndrome*
  - Sympathetic reacts as a general alarm system
    - Not essential to life, but allows coping with violent stress
The Nervous System

- Neurotransmitters
  - Acetylcholine
  - Norepinephrine

- Efferent and afferent nerve fibers
  - Efferent: *From* brain/spinal cord *to* neuroeffector sites
  - Afferent: *From* peripherery *to* spinal cord
The Nervous System

- Terminology of drugs affecting the nervous system:
  - Terms based on nerve fiber anatomy:
    - Parasympathomimetic
    - Parasympatholytic
    - Sympathomimetic
    - Sympatholytic
The Nervous System

- Terminology of drugs affecting the nervous system:
  - Terms based on neurotransmitter and receptor:
    - Cholinergic
    - Anticholinergic
    - Adrenergic
    - Antiadrenergic
Parasympathetic Branch

- Cholinergic neurotransmitter function
- Muscarinic and nicotinic receptors and effects
  - Muscarinic effects
  - Nicotinic effects
- Subtypes of muscarinic receptors
  - $M_1$, $M_2$, $M_3$, $M_4$, $M_5$
Cholinergic Agents

- Direct acting
- Indirect acting
  - Cholinesterase reactivator (Pralidoxime)
Anticholinergic Agents

- Atropine as a prototype parasympatholytic agent
- Parasympatholytic (antimuscarinic) effects
Sympathetic Branch

- Adrenergic neurotransmitter function
- Enzyme inactivation
  - COMT
  - MAO
Sympathetic Branch

- Sympathetic (adrenergic) receptor types
  - α and β receptors
  - β₁ and β₂ receptors
  - α₁ and α₂ receptors
  - Dopaminergic receptors
Sympathomimetic and Sympatholytic Agents

- **Sympathomimetics**
  - Stimulate sympathetic system and produce adrenergic effects

- **Sympatholytics**
  - Block adrenergic effects
Neural Control of Lung Function

- Inflammatory cell mediator receptors
  - Histamine
  - Prostaglandin
  - Leukotriene
  - Platelet-activating factor
  - Adenosine
  - Bradykinin
Neural Control of Lung Function

- Sympathetic innervation and effects
  - Airway smooth muscle
    - β Receptors
    - α Receptors
  - Lung blood vessels
  - Mucous glands
Neural Control of Lung Function

- Parasympathetic innervation and effects
  - Muscarinic receptors in the airway
    - $M_1$ Receptors
    - $M_2$ Receptors
    - $M_3$ Receptors
  - Muscarinic receptors on blood vessels
Neural Control of Lung Function

- Nonadrenergic, noncholinergic inhibitory nerves
  - Neither parasympathetic nor sympathetic
  - Cause relaxation of smooth airway muscle

- Nonadrenergic, noncholinergic excitatory nerves
  - Neither parasympathetic nor sympathetic
  - Cause contraction of smooth airway muscle