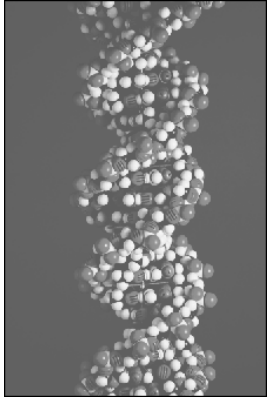


Chapter 39

Drugs for Asthma and Other Pulmonary Disorders



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Slide 42 Salmeterol Animation

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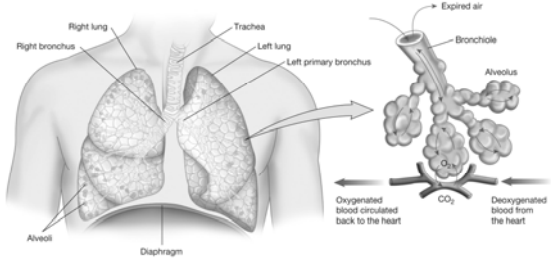
Respiratory System

- Respiration: process of bringing O₂ into body and moving carbon dioxide out
 - Involves two main processes
 - Ventilation moves air into and out of lungs
 - Perfusion is flow of blood through lungs

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Figure 39.1 The lower respiratory tract.



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Autonomic Control of Airways

- Bronchioles
 - Lined with smooth muscle that controls amount of air entering lungs
- Diameter of airways controlled by autonomic nervous system
 - Dilation occurs when sympathetic nervous branch is stimulated
 - Constriction occurs when parasympathetic branch is stimulated
 - Bronchospasm may also occur

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Administration by Inhalation

- Common route of administration for pulmonary drugs
- Rapid and efficient
- Rich blood supply allows for quick absorption and onset of action
- Delivers drugs directly to sites of action

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Aerosol Therapy

- Suspension of droplets or particles in a gas
- Onset of action almost immediate
- Drugs administered for local effect
 - Immediate relief of bronchospasm
 - Loosens thick mucus
- Side effects are reduced; systemic effects can still occur

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Devices Used for Aerosol Therapy

- Nebulizer
 - Vaporizes liquid drug into fine mist
 - Uses small machine and face mask
- Metered dose inhaler (MDI)
 - Propellant delivers measured dose of drug
 - Client times inhalation to puffs of drug
- Dry powder inhaler (DPI)
 - Client inhales powdered drug
 - Device activated by inhalation

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Figure 39.2 Devices used to deliver respiratory drugs: (a) metered-dose inhaler; (b) nebulizer with face mask; (c) dry-powder inhaler. Source: Pearson Educational/PH College.



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Figure 39.2 (continued) Devices used to deliver respiratory drugs: (a) metered-dose inhaler; (b) nebulizer with face mask; (c) dry-powder inhaler. Source: Pearson Educational/PH College.



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Figure 39.2 (continued) Devices used to deliver respiratory drugs: (a) metered-dose inhaler; (b) nebulizer with face mask; (c) dry-powder inhaler. Source: Pearson Educational/PH College.



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Disadvantages of Aerosol Therapy

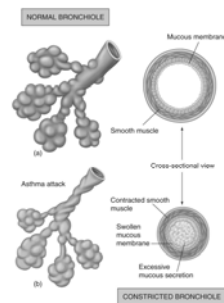
- Difficult to measure precise dose
 - Usually, only 10–50% of drug is placed
- Instruction may be complicated for some clients
- Side effects occur if client swallows drug or does not rinse mouth after inhalation

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Asthma Is Chronic Disease

- Has both inflammatory and bronchospasm components
- Symptoms occur
 - From exposure to triggers
 - Upon exertion (exercise induced)
- Status asthmaticus—prolonged attack
- Drugs used to
 - Prevent asthmatic attacks
 - Terminate attack in progress

Figure 39.3 Changes in bronchioles during an asthma attack: (a) normal bronchiole, (b) in asthma attack.



Goals of Therapy

- Asthma has both bronchoconstriction component and inflammation component
- Goals of drug therapy are twofold
 - To *terminate* acute bronchospasms in progress
 - To *reduce the frequency* of asthma attacks
- Different medications needed to achieve each goal
- Client with asthma can present with acute or chronic symptoms

Beta-Adrenergic Agonists

- Most effective drugs for relieving acute bronchospasm
- Activate beta₂-receptors in bronchial smooth muscle to cause bronchodilation
- Fewer cardiac side effects than older nonselective beta-adrenergics
- Range from ultrashort to long acting

Inhalation versus Oral Therapy

- Inhalation Therapy
 - Produces rapid bronchodilation
 - Little systemic toxicity

Inhalation versus Oral Therapy (continued)

- Oral Therapy
 - Longer duration of action
 - Frequent side effects
 - Tolerance may develop

Anticholinergics

- Block parasympathetic nervous system with bronchodilator effect
- Occasionally used as alternative to beta-agonists in asthma therapy
- Used in inhaled form

Anticholinergics (continued)

- Ipratropium (Atrovent) is the most common anticholinergic prescribed for chronic obstructive pulmonary disease (COPD) and asthma.
- Most effective when used in combination with beta-agonist
 - Example: Combivent (ipratropium and albuterol)
- Tiotropium is the newest drug in this class

Methylxanthines

- Group of bronchodilators related to caffeine
- Once mainstay of chronic asthma pharmacotherapy
 - Example: theophylline
- Narrow margin of safety
- Interact with numerous drugs

Methylxanthines (continued)

- Side effects common
 - Nausea, vomiting, CNS stimulation
- Administered by intravenous or oral routes
- Primarily used for long-term prophylaxis of asthma that is unresponsive to beta-agonists or glucocorticoids

Glucocorticoids

- Potent anti-inflammatory drugs
- Inhaled, are drugs of choice for long-term prophylaxis of asthma
 - Must be taken daily
 - Systemic side effects rarely observed
- Oral drugs used for short-term therapy of severe, acute asthma
 - Limit therapy to under 10 days

Leukotriene Modifiers

- Leukotrienes are mediators of immune response
 - Involved in allergic and asthmatic reactions
- Leukotriene modifiers primarily used for asthma prophylaxis
 - Reduce inflammatory component of asthma
- Oral medication used when persistent asthma not controlled with other drugs

Mast-Cell Stabilizers

- Inhibit mast cells from releasing histamine and other chemical mediators
- Are safe for prophylaxis of asthma
- Less effective than inhaled glucocorticoids
- Ineffective at relieving acute bronchospasm

Role of the Nurse

- Monitor client's condition
- Provide client education
- Obtain medical, surgical, drug history
- Assess lifestyle and dietary habits
- Obtain description of symptomology and current therapies

Beta-Adrenergic Agonist Therapy for Asthma

- Assess vital signs prior to administration
 - Respiratory and pulse rate, lung sounds
 - Respiratory effort, skin color, oxygen-saturation level

Beta-Adrenergic Agonist Therapy for Asthma (continued)

- Should not be used if client has history of dysrhythmia or MI
- Use limited in children younger than 6 years
- Not recommended for women who are breast-feeding

Anticholinergic Therapy for Asthma

- Assess respiratory rate before and after first dose of MDI
- Monitor vital signs
 - Respiratory rate and pulse, respiratory effort
 - Skin color, oxygen-saturation level, lung sounds

Anticholinergic Therapy for Asthma (continued)

- Assess for history of narrow-angle glaucoma, benign prostatic hyperplasia, renal disorders, urinary bladder neck obstruction
 - Contraindicated in clients with history of these and in elderly
- Ipratropium not recommended in children younger than 12 years

Anticholinergic Therapy for Asthma (continued)

- Ipratropium not recommended in children younger than 12 years
- Tiotropium not recommended in clients younger than 18 years
- Anticholinergics not recommended for women who are breast-feeding



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Methylxanthine Therapy for Asthma

- Assess vital signs
 - Respiratory and pulse rate, cardiac rhythm, lung sounds
 - Respiratory effort, skin color, oxygen-saturation level
- Contraindicated with certain conditions
 - Coronary artery disease, angina pectoris
 - Severe renal or liver disorders, peptic ulcer
 - Benign prostatic hyperplasia, diabetes mellitus



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Methylxanthine Therapy for Asthma (continued)

- Use cautioned in elderly clients and children
- Not recommended in women who are breast-feeding



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Glucocorticoid Therapy for Asthma

- Assess client for presence/history of conditions
 - Asthma, allergic rhinitis, hypertension, heart disease
 - Blood clots, Cushing's syndrome
 - Fungal infections, diabetes mellitus



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Glucocorticoid Therapy for Asthma (continued)

- Monitor vital signs
 - Respiratory and pulse rates, respiratory effort, lung sounds
 - Skin color, oxygen-saturation level, body weight
- Assess for signs and symptoms of infection
- Steroid inhalers
 - Use cautiously with hypertension, GI disease, congestive heart failure, thromboembolic disease



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Glucocorticoid Therapy for Asthma (continued)

- Not recommended for pregnant or breast-feeding women
- Primary purpose of inhaled glucocorticoids is to *prevent* respiratory distress
 - Do not use this medication during acute asthma attack



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Glucocorticoid Therapy for Asthma (continued)

- Client should watch for signs and symptoms of simple infections
 - Rinse mouth after using steroid inhalers
 - Closely monitor blood-glucose levels

Leukotriene Therapy for Asthma

- Monitor vital signs
 - Respiratory and pulse rates, respiratory effort, lung sounds
 - Skin color, oxygen-saturation level
- Monitor CBC and periodic liver-function tests

Leukotriene Therapy for Asthma (continued)

- Closely monitor prothrombin time (PT) and international normalized ratio (INR) in clients taking warfarin (Coumadin)
- Closely monitor phenytoin level with concurrent phenytoin therapy
 - Reduce theophylline dose; monitor zileuton levels

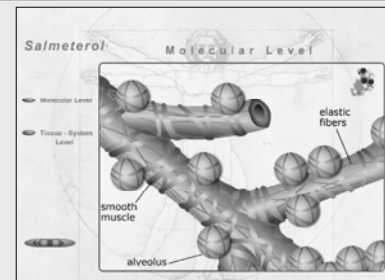
Leukotriene Therapy for Asthma (continued)

- Assess for signs and symptoms of infection, especially in elderly
- Advise clients not to use leukotriene modifiers during acute asthma attack

Bronchodilators— Beta-Adrenergic Agonists

- **Prototype drug:** salmeterol (Serevent)
- **Mechanism of action:** selectively binds to beta2-adrenergic receptors in bronchial smooth muscle to cause bronchodilation

Salmeterol Animation



Click [here](#) to view an animation on the topic of salmeterol.

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Bronchodilators—Beta-Adrenergic Agonists (continued)

- **Primary use:** prevention of exercise-induced bronchospasm
 - Best suited for management of chronic asthma
 - Not indicated for termination of acute bronchospasm
- **Adverse effects:** headaches, throat irritation nervousness, restlessness, tachycardia

Bronchodilators—Anticholinergic

- **Prototype drug:** ipratropium (Atrovent)
- **Mechanism of action:** causes bronchodilation by blocking cholinergic receptors in bronchial smooth muscle

Bronchodilators—Anticholinergic (continued)

- **Primary use:** relief of acute bronchospasm
 - Sometimes combined with beta-agonists or glucocorticoids
 - Also prescribed for chronic bronchitis and for symptomatic relief of nasal congestion
- **Adverse effects:** cough, drying of nasal mucosa, hoarseness, bitter taste

Anti-inflammatory Agents—Glucocorticoids

- **Prototype drug:** beclomethasone (Becloment, Beconase, Vancenase, Vanceril)
- **Mechanism of action:** acts by reducing inflammation
- **Primary use:** to decrease frequency of asthma attacks
 - Also for allergic rhinitis
 - Should not be used to terminate asthma attacks in progress
- **Adverse effects:** oropharyngeal candidiasis

Leukotriene Modifiers

- **Prototype drug:** zafirlukast (Accolate)
- **Mechanism of action:** prevents airway edema and inflammation by blocking leukotriene receptors in airways
- **Primary use:** for prophylaxis of persistent, chronic asthma
- **Adverse effects:** headache, nausea, diarrhea

Beta-adrenergic agonists

- Most effective drugs for relieving acute bronchospasm
- Activate beta2-receptors in bronchial smooth muscle to cause bronchodilation
 - Inhalation therapy produces rapid bronchodilation
 - Oral therapy has longer duration of action

Anticholinergics

- Block parasympathetic nervous system for bronchodilator effect
- Occasionally used as alternative to beta-agonists in asthma therapy

Methylxanthines

- Group of bronchodilators related to caffeine
- Once mainstay of chronic asthma pharmacotherapy
 - Example: theophylline

Methylxanthines (continued)

- For long-term prophylaxis of asthma that is unresponsive to beta-agonists or glucocorticoids
 - Less effective and produce more side effects than beta-agonists

Glucocorticoids

- Potent anti-inflammatory drugs
- When inhaled, often drugs of choice for long-term prophylaxis of asthma
- Oral drugs used for short-term therapy of severe, acute asthma

Leukotriene Modifiers

- Act by reducing inflammatory component of asthma
- Primarily used for asthma prophylaxis
 - When persistent asthma not controlled with other drugs

Mast-Cell Stabilizers

- Inhibit mast cells from releasing histamine and other chemical mediators
- Safe drugs for prophylaxis of asthma
- Ineffective at relieving acute bronchospasm
- Less effective than inhaled glucocorticoids

Assessment

- Obtain complete health history
- Assess for symptoms related to respiratory deficiency
- Obtain vital signs
- Auscultate bilateral breath sounds for air movement and adventitious sounds
- Assess pulmonary function with pulse oximeter, peak expiratory flow meter, and/or arterial blood gases



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Nursing Diagnoses

- Impaired gas exchange, related to bronchial constriction
- Ineffective tissue perfusion, related to adverse effects of drugs
- Deficient knowledge, related to drug therapy



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Nursing Diagnoses

- Anxiety, related to difficulty in breathing
- Disturbed sleep pattern, related to side effects of drugs
- Activity intolerance, related to ineffective drug therapy



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Planning—client will

- Exhibit adequate oxygenation
- Report a reduction in subjective symptoms of respiratory deficiency
- Demonstrate understanding of drug's action
- Report at least six hours of uninterrupted sleep



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Implementation

- Monitor vital signs, including pulse, blood pressure, respiratory rate
- Monitor pulmonary function
- Monitor client's ability to use inhaler
- Observe for side effects



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Implementation (continued)

- Maintain environment free of respiratory contaminants
- Maintain dietary intake adequate in essential nutrients and vitamins
- Ensure adequate hydration (3–4 L/day)
- Provide emotional and psychosocial support
- Monitor client compliance with pharmacotherapy



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Evaluation

- Client reports decrease in respiratory-deficiency symptoms
- Client accurately states drug's action and side effects
- Breath sounds and pulmonary-function values demonstrate adequate oxygenation
- Client reports having at least six hours of uninterrupted sleep

Bronchodilators for Asthma

Table 39.2 Bronchodilators for Asthma

Anti-inflammatory Drugs for Asthma

Table 39.3 Anti-inflammatory Drugs for Asthma