chapter 38

Antitussives, Mucolytics, and Expectorants

Key Terms

antitussive
coughing
expectorant
mucolytic
nonproductive cough
productive cough

Chapter Objectives

On completion of this chapter, the student will:

- Define the terms antitussive, mucolytic, and expectorant.
- Describe the uses, general drug actions, adverse reactions, contraindications, precautions and interactions of antitussive, mucolytic, and expectorant drugs.
- Discuss important preadministration and ongoing assessment activities the nurse should perform on patients receiving an antitussive, mucolytic, or expectorant drug.
- List some nursing diagnoses particular to a patient taking an antitussive, mucolytic, or expectorant drug.
- Discuss ways to promote an optimal response to therapy, how to manage common adverse reactions, and important points to keep in mind when educating the patient about the use of an antitussive, mucolytic, or expectorant drug.

Upper respiratory infections are among the most common afflictions of humans. The drugs used to treat the discomfort associated with an upper respiratory infection include antitussives, mucolytics, and expectorants. Many of these drugs are available as nonprescription (over-the-counter) drugs, whereas others are available only by prescription.

ANTITUSSIVES

Coughing is the forceful expulsion of air from the lungs. A cough may be productive or nonproductive. With a **productive cough,** secretions from the lower respiratory tract are expelled. A **nonproductive cough** is a dry, hacking one that produces no secretions. An **antitussive** is a drug used to relieve coughing. Many antitussive drugs are combined with another drug, such as an antihistamine or expectorant, and sold as nonprescription cough medicine. Other antitussives, either alone or in combination with other drugs, are available by prescription only.

ACTIONS

Some antitussives depress the cough center located in the medulla and are called centrally acting drugs. Codeine and dextromethorphan are examples of centrally acting antitussives. Other antitussives are peripherally acting drugs, which act by anesthetizing stretch receptors in the respiratory passages, thereby decreasing coughing. An example of a peripherally acting antitussive is benzonatate (Tessalon).

USES

Antitussives are used to relieve a nonproductive cough. When the cough is productive of sputum, it should be treated by the primary health care provider who, based on a physical examination, may or may not prescribe or recommend an antitussive.

SUMMARY DRUG TABLE ANTITUSSIVE, MUCOLYTIC, AND EXPECTORANT DRUGS

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
Antitussives				
Narcotic				
codeine sulfate *koe'-deen*	*generic*	Suppression of nonproductive cough, relief of mild to moderate pain	Sedation, nausea, vomiting, dizziness, constipation, CNS depression	10–20 mg PO q4–6h; maximum dosage 120 mg/d
Nonnarcotic				
benzonatate *ben-zoe'-naa-tate*	Tessalon Perles, *generic*	Symptomatic relief of cough	Sedation, headache, mild dizziness, constipation, nausea, GI upset, skin eruptions, nasal congestion	Adults and children older than 10 years: 100 mg TID (up to 600 mg/d)
dextromethorphan HBr *dex-troe-meth-or'-fan*	Drixoral Cough Liquid Caps, Robitussin Pediatric, Sucrets, Suppress, Trocal	Symptomatic relief of cough	Sedation, headache, mild dizziness, constipation, nausea, GI upset, skin eruptions, nasal congestion	Adults and children older than 12 years: 10–30 mg q4–8h, sustained release (SR) 60 mg q12h PO; children 6–12 years: 5–10 mg q4h or 15 mg q6–8h, SR 30 mg q12h PO; children 2–6 years: 2.5–7.5 mg q4–8h, SR 15 mg q12h PO
dextromethorphan HBr and benzocaine	Spec-T, Tetra-Formula, Cough X, Vicks Formula 44 Cough	Symptomatic relief of cough	Same as dextromethorphan HBr	Varies, depending on formulation; take as directed on package
diphenhydramine HCl *dye-fen-hye'-dra-meen*	Benadryl, *generic*	Symptomatic relief of cough, allergies, sleep aid, motion sickness, Parkinson's disease	Sedation, headache, mild dizziness, constipation, nausea, GI upset, skin eruptions, postural hypotension	Adults: 25 mg q4h PO not to exceed 150 mg/d; children (6–12 years): 25 mg PO q4h (not to exceed 75 mg/d); children 2–6 years old, 6.25 mg q4h (not to exceed 25 mg/d)
Mucolytic				
acetylcysteine *a-se-teel-sis'-tay-een*	Mucomyst, *generic*	Reduction of viscosity of mucus in acute and chronic bronchopulmonary disease, tracheostomy care, atelectasis due to mucus obstruction	Stomatitis, nausea, vomiting, fever, drowsiness, bronchospasm, irritation of the trachea and bronchi	10 mL of 20% solution or 2–20 mL of 10% solution q2–6h
Expectorants				
guaifenesin (glyceryl guaiacolate) *gwye-fen'-e-sin*	Fenesin, Humibid LA, Liquibid Muco-Fen-LA, Tussin, *generic*	Relief of dry, nonproductive cough, and in the presence of mucus in the respiratory tract	Nausea, vomiting, dizziness, headache, rash	Adults and children 12 years and older: 100–400 mg PO q4h; children 6–12 years: 100–200 mg q4h PO; children 2–6 years: 50–100 mg q4h
potassium iodide *poe-tass'-ee-um-eye-o-dide*	Pima, SSKI, *generic*	Symptomatic relief of chronic pulmonary diseases for which tenacious mucus complicates the problem	Iodine sensitivity or iodinism (sore mouth, metallic taste, increased salivation, nausea, vomiting, epigastric pain, parotid swelling, and pain)	300–1000 mg PO after meals BID or TID, up to 1.5 g PO TID
terpin hydrate *ter'-pin-high'-drate*	*generic*	Symptomatic relief of dry, nonproductive cough	Drowsiness, nausea, vomiting or abdominal pain	85–170 mg TID or QID PO

*The term *generic* indicates the drug is available in generic form.

ADVERSE REACTIONS

Use of codeine may result in respiratory depression, euphoria, light-headedness, sedation, nausea, vomiting, and hypersensitivity reactions. The more common adverse reactions associated with the antitussives are listed in the Summary Drug Table: Antitussive, Mucolytic, and Expectorant Drugs. When used as directed, nonprescription cough medicines containing two or more ingredients have few adverse reactions. However, those that contain an antihistamine may cause drowsiness.

CONTRAINDICATIONS

Antitussives are contraindicated in patients with known hypersensitivity to the drugs. The narcotic antitussives (those with codeine) are contraindicated in premature infants or during labor when delivery of a premature infant is anticipated. Codeine is a Pregnancy Category C drug except in the pregnant woman at term or when taken for extended periods, when it is considered a Pregnancy Category D drug.

PRECAUTIONS

All antitussives are given with caution to patients with a persistent or chronic cough or when the cough is accompanied by excessive secretion. Individuals with a high fever, rash, persistent headache, nausea, or vomiting should take antitussives only when advised to do so by the primary health care provider. Antitussives containing codeine are used with caution in patients having an acute asthmatic attack, those with COPD, and those with pre-existing respiratory disorders. Administration of codeine may obscure the diagnosis in patients with acute abdominal conditions.

Antitussives containing codeine are classified as Pregnancy Category C (during pregnancy) and Pregnancy Category D (during labor) drugs. Safe use of non-narcotic antitussives during pregnancy has not been established. They are used with caution and only when clearly needed during pregnancy and lactation.

The narcotic antitussives are used cautiously in patients with head injury and increased intracranial pressure, acute abdominal disorders, convulsive disorders, hepatic or renal impairment, prostatic hypertrophy, and asthma or other respiratory conditions.

INTERACTIONS

Other central nervous system (CNS) depressants and alcohol may cause additive depressant effects when administered with antitussives containing codeine. When dextromethorphan is administered with the monoamine oxidase inhibitors (see Chap. 31), patients may experience hypotension, fever, nausea, jerking motions to the leg, and coma.

NURSING PROCESS

The Patient Receiving an Antitussive Drug

ASSESSMENT

Preadministration Assessment

A hospitalized patient may occasionally have an antitussive preparation prescribed, especially when a nonproductive cough causes discomfort or threatens to cause more serious problems, such as raising pressure in the eye (increased intraocular pressure) after eye surgery or increasing intracranial pressure in those with CNS disorders. During the preadministration assessment, the nurse documents the type of cough (productive, nonproductive) and describes the color and amount of any sputum present. The nurse takes and records vital signs because some patients with a productive cough may have an infection.

Ongoing Assessment

During the ongoing assessment, the nurse observes for a therapeutic effect (eg, coughing decreases). The nurse auscultates lung sounds and takes vital signs periodically. When a patient has a cough, the nurse describes and records in the chart the type of cough (productive or nonproductive of sputum) and the frequency of coughing. The nurse also notes and records whether the cough interrupts sleep or causes pain in the chest or other parts of the body.

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes for the patient may include an optimal response to therapy and an understanding of and compliance with the prescribed treatment regimen.

Nursing Diagnoses Checklist

- ✓ **Ineffective Airway Clearance** related to congestion or coughing
- ✓ **Disturbed Sleep Pattern** related to coughing at night
- ✓ **Risk for Ineffective Therapeutic Regimen Management** related to lack of knowledge of drug regimen, adverse drug effects

IMPLEMENTATION

Promoting an Optimal Response to Therapy

The nurse gives antitussives orally. When the nurse gives the drug as a tablet, the patient should swallow the drug whole and not chew it. Chewing of benzonatate tablets may result in a local anesthetic effect (oropharyngeal anesthesia) with possible choking.

One problem associated with the use of an antitussive is related to its drug action. Although not an adverse reaction, depression of the cough reflex can cause a pooling of secretions in the lungs. A pooling of the secretions that are normally removed by coughing may result in more serious problems, such as pneumonia and atelectasis. For this reason, using an antitussive for a productive cough is often contraindicated.

Another problem can arise from the use of nonprescription cough medicine for self-treatment of a chronic cough. Indiscriminate use of antitussives by the general public may prevent early diagnosis and treatment of serious disorders, such as lung cancer and emphysema.

Nursing Alert

The nurse should advise the patient taking a nonprescription cough medicine that if a cough lasts more than 10 days or is accompanied by fever, chest pain, severe headache, or skin rash, the patient should consult the primary health care provider.

PROMOTING SLEEP. The nurse notes whether coughing keeps the patient awake at night or if the patient has difficulty falling asleep after being awakened by coughing. If sleep is frequently interrupted by coughing, the problem is discussed with the primary health care provider.

Educating the Patient and Family

The nurse discourages the indiscriminate use of nonprescription cough medicines, especially when coughing produces sputum. The nurse advises the patient to read the label carefully, follow the dosage recommendations, and consult the primary health care provider if the cough persists for more than 10 days or if fever or chest pain occurs. If an antitussive is prescribed for use at home, the nurse includes the following information in a teaching plan:

- Do not exceed the recommended dose.
- If chills, fever, chest pain, or sputum production occurs, contact the primary health care provider as soon as possible.
- Drink plenty of fluids. A fluid intake of 1500 to 2000 mL is recommended.
- If taking oral capsules, do not chew or break open the capsules; swallow them whole.
- If the cough is not relieved or becomes worse, contact the primary health care provider.
- Avoid irritants such as cigarette smoke, dust, or fumes to decrease irritation to the throat. Take frequent sips of water, suck on sugarless hard candy, or chew gum to diminish coughing.
- Remember than codeine may impair mental or physical abilities required for the performance of potentially hazardous tasks. Observe caution when driving or performing tasks requiring alertness, coordination, or physical dexterity. Do not use with alcohol or other CNS depressants (eg, antidepressants, hypnotics, sedatives, tranquilizers). Codeine may cause orthostatic hypotension when rising too quickly from a sitting or lying position. Do not take for persistent or chronic cough, such as occurs with smoking, asthma, or emphysema or when the cough is accompanied by excessive secretions, except when under the supervision of a physician.

EVALUATION

- The therapeutic effect is achieved and coughing is relieved.
- The patient sleeps through the night.
- The patient and family demonstrate an understanding of the drug regimen.

MUCOLYTICS AND EXPECTORANTS

A **mucolytic** is a drug that loosens respiratory secretions. An **expectorant** is a drug that aids in raising thick, tenacious mucus from the respiratory passages.

ACTIONS

A drug with mucolytic activity appears to reduce the viscosity (thickness) of respiratory secretions by direct action on the mucus. An example of a mucolytic drug is acetylcysteine (Mucomyst).

Expectorants increase the production of respiratory secretions, which in turn appears to decrease the viscosity of the mucus. This helps to raise secretions from the respiratory passages. An example of an expectorant is guaifenesin.

USES

The mucolytic acetylcysteine may be used as part of the treatment of bronchopulmonary diseases such as emphysema. It is primarily given by nebulization but also may be directly instilled into a tracheostomy to liquefy (thin) secretions. The mucolytic drugs are effective as adjunctive therapy in chronic bronchopulmonary diseases, such as chronic emphysema, emphysema with

bronchitis, chronic asthma, tuberculosis, and bronchiectasis, and acute bronchopulmonary diseases, such as pneumonia and tracheobronchitis. It is also used in pulmonary conditions of cystic fibrosis and in tracheostomy care. Acetylcysteine has an additional use in preventing liver damage caused by acetaminophen overdosage.

Expectorants are used to help raise respiratory secretions. An expectorant may also be included along with one or more additional drugs, such as an antihistamine, decongestant, or antitussive, in some prescription and nonprescription cough medicines.

ADVERSE REACTIONS

The more common adverse reactions associated with mucolytic and expectorant drugs are listed in the Summary Drug Table: Antitussive, Mucolytic, and Expectorant Drugs.

CONTRAINDICATIONS

The expectorants and mucolytics are contraindicated in patients with known hypersensitivity. The expectorant potassium iodide is contraindicated during pregnancy (Pregnancy Category D).

PRECAUTIONS

The expectorants are used cautiously in patients with persistent cough that may be caused by a serious condition needing medical evaluation. Acetylcysteine is used cautiously in those with severe respiratory insufficiency or asthma and in older adults or debilitated patients. The expectorants are used cautiously during pregnancy and lactation. Acetylcysteine is a Pregnancy Category B drug; guaifenesin is a Pregnancy Category C drug.

INTERACTIONS

No significant interactions have been reported when the expectorants are used as directed. The exception is iodine products. Lithium and other antithyroid drugs may potentiate the hypothyroid effects of these drugs if used concurrently with iodine products. When potassium-containing medications and potassium-sparing diuretics are administered with iodine products, the patient may experience hypokalemia, cardiac arrhythmias, or cardiac arrest. Thyroid function tests may also be altered by iodine.

NURSING PROCESS

The Patient Receiving a Mucolytic or an Expectorant

ASSESSMENT

Preadministration Assessment

Before administering the drug, the nurse assesses the respiratory status of the patient. The nurse documents lung sounds, amount of dyspnea (if any), and consistency of sputum (if present). A description of the sputum is important as a baseline for future comparison.

Ongoing Assessment

After administering the drug, the nurse notes any increase in sputum or change in consistency. The nurse documents, on the patient's chart, a description of the sputum raised. Patients with thick, tenacious mucus may have difficulty breathing. It is important to notify the primary health care provider if the patient has difficulty breathing because of an inability to raise sputum and clear the respiratory passages.

Immediately before and after treatment with the mucolytic acetylcysteine, the nurse auscultates the lungs and records the findings of both assessments on the patient's chart. Between treatments, the nurse evaluates the patient's respiratory status and records these findings on the patient's chart. These evaluations aid the primary health care provider in determining the effectiveness of therapy. If any problem occurs during or after treatment, or if the patient is uncooperative, the nurse discusses the problem with the primary health care provider.

When expectorants are given to those with chronic pulmonary disease, the nurse evaluates the effectiveness of drug therapy (ie, the patient's ability to raise sputum) and records this finding in the patient's chart.

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes for the patient may include an optimal response to drug therapy and an understanding of and compliance with the drug regimen.

Nursing Diagnoses Checklist

- ✓ **Ineffective Breathing Pattern** related to thick, tenacious sputum
- ✓ **Risk for Ineffective Therapeutic Regimen Management** related to lack of knowledge of drug regimen, adverse drug effects, treatment modalities

Patient and Family Teaching Checklist

Using Respiratory Equipment at Home

The nurse:

- ✓ Contacts the respiratory care provider to arrange for equipment delivery to the patient's home.
- ✓ Describes equipment such as compressor, filter, tubing, aerosol cup, and mask or mouthpiece to be used for therapy, including rationale for use and need for electrical power source.
- ✓ Reviews the drug therapy regimen, including the prescribed drug and solution strength, dosage, amount and type of diluent, if required, and frequency of administration.
- ✓ Demonstrates step-by-step procedure for equipment setup and drug preparation and administration.
- ✓ Evaluates return demonstration of procedure.
- ✓ Recommends sitting or high Fowler's position to maximize lung expansion and drug dispersion.
- ✓ Instructs to observe for misting as evidence of proper equipment function.
- ✓ Encourages slow, even breathing during treatment and coughing and expectorating as necessary.
- ✓ Stresses the importance of continuing treatment until the entire drug has evaporated and misting has ceased.
- ✓ Reviews the signs and symptoms of possible adverse reactions and impaired respiratory function, including changes in cough, color and amount of sputum, shortness of breath, or difficulty breathing and stresses the need to notify health care provider at once should any occur.
- ✓ Instructs to rinse equipment after each use with warm or cool water and allow to air dry.
- ✓ Recommends storing equipment parts in clean plastic bag or container.
- ✓ Reviews manufacturer's instructions for daily cleaning of equipment parts and routine maintenance of compressor.
- ✓ Provides written list for trouble-shooting problems such as changing filter, tightening connections, or replacing aerosol cup.
- ✓ Explains use of any additional drug therapy.
- ✓ Stresses need for fluid intake to liquefy secretions.
- ✓ Emphasizes importance of periodic laboratory tests and follow-up visits with health care provider to evaluate effectiveness of therapy.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

When the mucolytic acetylcysteine is administered by nebulization, the nurse explains the treatment to the patient and demonstrates how the nebulizer will be used. The nurse remains with the patient during the first few treatments, especially when the patient is elderly or exhibits anxiety. The nurse supplies the patient with tissues and places a paper bag for disposal of the tissues within the patient's reach. If acetylcysteine is ordered to be inserted into a tracheostomy, the nurse must make sure suction equipment is at the bedside to be immediately available for aspiration of secretions.

When acetylcysteine is administered for acetaminophen overdosage, the drug is given as soon as the overdosage is discovered. Treatment should begin as soon as possible after overdose and within 24 hours of ingestion.

Educating the Patient and Family

Acetylcysteine usually is administered in the hospital but may be prescribed for the patient being discharged and renting or buying respiratory therapy equipment for use at home (see Patient and Family Teaching Checklist: Using Respiratory Equipment at Home). The nurse gives the patient or a family member full instruction in the use and maintenance of the equipment, as well as the technique of administration of acetylcysteine.

When an expectorant is prescribed, the nurse instructs the patient to take the drug as directed and to contact the primary health care provider if any unusual symptoms or other problems occur during use of the drug or if the drug appears to be ineffective.

EVALUATION

- The therapeutic effect is achieved, and secretions are thinned and easily expectorated.
- The patient and family demonstrate an understanding of the drug regimen and use of equipment to administer the drug (mucolytic).

● *Critical Thinking Exercises*

1. *Your neighbor, Mr. Peterson, tells you that he has had a chronic cough for the past several months and asks you what the best "cough medicine" to buy is. Describe the advice you would give to Mr. Peterson.*
2. *Ms. Moore, a patient in a nursing home, has had a cough for the past 3 weeks. Ms. Moore's physician is aware of her problem and has ordered an expectorant but told her that he wants her to cough and raise sputum. Ms. Moore's family asks you if something can be given to their mother to stop her from coughing. Explain how you would discuss this problem and explain the prescribed therapy with Ms. Moore's family.*
3. *Discuss any precautions the nurse would consider when the expectorants are administered. Give a rationale for your answer.*

Review Questions

1. Antitussives are given with caution to patients with _____.
   - **A.** an unproductive cough
   - **B.** a chronic cough
   - **C.** hypertension
   - **D.** hypotension

2. Which of these drugs is classified as an expectorant?
   - **A.** Guaifenesin
   - **B.** Codeine
   - **C.** Dextromethorphan
   - **D.** Diphenhydramine

3. Which of the following statements is appropriate for the nurse to include in discharge instructions for a patient taking an antitussive?
   - **A.** Increase the dosage if the drug does not relieve the cough.
   - **B.** Limit fluids to less than 1000 mL each day.
   - **C.** Expect the cough to worsen during the first few days of treatment.
   - **D.** Frequent sips of water and sugarless hard candy may diminish coughing.

4. Which of these drugs would be prescribed for a patient with an acetaminophen overdosage?
   - **A.** Acetylcysteine
   - **B.** Guaifenesin
   - **C.** Benzonatate
   - **D.** Dextromethorphan

Medication Dosage Problems

1. A patient is prescribed 200 mg of guaifenesin syrup. The drug is available in a syrup of 200 mg/5 mL. The nurse administers _____.

2. Codeine 10 mg is prescribed for a patient with a severe unproductive cough. The drug is available as an oral solution of 10 mg/5 mL. The nurse administers _____.