

## Antitubercular Drugs

### Key Terms

anaphylactoid reactions	nephrotoxicity
antitubercular drugs	optic neuritis
bacteriostatic	ototoxicity
circumoral	peripheral neuropathy
extrapulmonary	prophylactic
gout	tinnitus
Mycobacterium tuberculosis	tuberculosis
	vertigo

### Chapter Objectives

On completion of this chapter, the student will:

- Discuss the drugs used in the treatment of tuberculosis.
- Discuss the uses, general drug action, contraindications, precautions, interactions, and general adverse reactions associated with the administration of the antitubercular drugs.
- Discuss important preadministration and ongoing assessment activities the nurse should perform on the patient taking an antitubercular drug.
- List some nursing diagnoses particular to a patient taking an antitubercular drug.
- Explain directly observed therapy (DOT).
- Discuss ways to promote an optimal response to therapy, how to manage adverse reactions, and important points to keep in mind when educating patients about the use of the antitubercular drugs.

**T**uberculosis is a major health problem throughout the world, infecting more than 8 million individuals each year. It is the world's leading cause of death from infectious disease. Individuals living in crowded conditions, those with compromised immune systems, and individuals with debilitating conditions are especially susceptible to tuberculosis.

Tuberculosis is an infectious disease caused by the *Mycobacterium tuberculosis* bacillus. The pathogen is also referred to as the tubercle bacillus. The disease is transmitted from one person to another by droplets dispersed in the air when an infected person coughs or sneezes. These droplet nuclei are released into the air and inhaled by noninfected persons. Although tuberculosis primarily affects the lungs, other organs may also be affected. For example, if the immune system is poor, the infection can spread from the lungs to other organs of the body. **Extrapulmonary** (outside of the lungs) tuberculosis is the term used to distinguish tuberculosis affecting the lungs from infection with the *M. tuberculosis* bacillus in other organs of the body. Organs that can be affected include the liver, kidneys, spleen, and uterus. People with acquired immunodeficiency syndrome (AIDS) are at risk for tuberculosis because of

their compromised immune systems. Tuberculosis responds well to long-term treatment with a combination of three or more antitubercular drugs.

**Antitubercular drugs** are used to treat active cases of tuberculosis and as a **prophylactic** to prevent the spread of tuberculosis. The drugs used to treat tuberculosis do not “cure” the disease, but they render the patient noninfectious to others. Antitubercular drugs are classified as primary and second-line drugs. Primary (first-line) drugs provide the foundation for treatment. Second-line or secondary drugs are less effective and more toxic than primary drugs. These drugs are used in various combinations to treat tuberculosis. Sensitivity testing may be done to determine the most effective combination treatment, especially in areas of the country showing resistance. Second-line drugs are used to treat extrapulmonary tuberculosis or drug-resistant organisms. The primary antitubercular drugs are discussed in this chapter. Both primary and second-line antitubercular drugs are listed in the Summary Drug Table: Antitubercular Drugs. Certain fluoroquinolones such as ciprofloxacin, ofloxacin, levofloxacin, and sparfloxacin have proven effective against tuberculosis and are considered second-line drugs. See Chapter 10 for a discussion of the fluoroquinolones.

## SUMMARY DRUG TABLE ANTITUBERCULAR DRUGS

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
<b>Primary Drugs</b>				
ethambutol <i>eth-am'-byoo-tole</i>	Myambutol	Pulmonary tuberculosis (TB)	Optic neuritis, fever, pruritis, headache, nausea, anorexia, dermatitis, hypersensitivity, psychic disturbances	15–25 mg/kg/d PO
isoniazid <i>eye-soe-nye'-a-zid</i>	INH, Laniazid, Nydrazid, generic	Active TB; prophylaxis for TB	Peripheral neuropathy, nausea, vomiting, epigastric distress, jaundice, hepatitis, pyridoxine deficiency, skin eruptions, hypersensitivity	Active TB: up to 300 mg/d PO or up to 300 mg/d IM, to 900 mg IM 2–3 times/wk First-line treatment: 300 mg INH and 600 mg rifampin PO in single dose TB prophylaxis: 30 mg/d PO
pyrazinamide <i>peer-a-zin'-a-mide</i>	generic	Active TB	Hepatotoxicity, nausea, vomiting, diarrhea, myalgia, rashes	15–30 mg/kg/d maximum, 3 g/d PO; 50–70 mg/kg twice weekly PO
rifabutin <i>rif-ah-byou'-tin</i>	Mycobutin	Active TB	Nausea, vomiting, diarrhea, rash, discolored urine	300 mg PO as a single dose or BID
rifampin <i>rif-am'-pin</i>	Rifadin, Rimactane, generic	Active TB	Heartburn, drowsiness, fatigue, dizziness, epigastric distress, hematologic changes, renal insufficiency, rash	600 mg PO, IV
streptomycin <i>strep-toe-mye'-sin</i>	generic	TB; infections due to susceptible microorganisms	Nephrotoxicity, ototoxicity, numbness, tingling, paresthesia of the face, nausea, dizziness	Up to 1 g/d IM
isoniazid (150 mg) and rifampin 300 mg	Rifamate	TB	See individual drugs	1–2 tablets daily PO
<b>Second-line Drugs</b>				
aminosalicylate <i>a-meen-oh-sal'-sa-late</i> (p-aminosalicylic acid; 4-aminosalicylic acid)	Paser	TB	Nausea, vomiting, diarrhea, abdominal pain, hypersensitivity reactions	4 g (1 packet) PO TID
capreomycin sulfate <i>kap-ree-oh-mye'-sin</i>	Capastat Sulfate	TB	Hypersensitivity reactions, nephrotoxicity, hepatic impairment, pain and induration at injection site, ototoxicity	1 g/d (maximum, 20 mg/kg/d) IM
cycloserine <i>sy-e-kloe-ser'-een</i>	Seromycin Pulvules	TB	Convulsions, somnolence, confusion, renal impairment, sudden development of congestive heart failure, psychoses	500 mg to 1 g PO in divided doses

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

## ACTIONS

Most antitubercular drugs are **bacteriostatic** (slow or retard the growth of bacteria) against the *M. tuberculosis* bacillus. These drugs usually act to inhibit bacterial cell wall synthesis, which slows the multiplication rate of the bacteria. Only isoniazid is bactericidal, with rifampin and streptomycin having some bactericidal activity.

## USES

Antitubercular drugs are used in combination with other antitubercular drugs to treat active tuberculosis. Isoniazid (INH) is the only antitubercular drug used alone. While isoniazid is used in combination with other drugs for the treatment of primary tuberculosis, a primary use is in preventive therapy (prophylaxis) against tuberculosis. For example, when a diagnosis of tuberculosis is present, family members of the infected individual must be given prophylactic treatment with isoniazid for 6 months to 1 year. Display 12-1 identifies prophylactic uses for isoniazid.

## RESISTANCE TO THE ANTITUBERCULAR DRUGS

Of increasing concern is the development of mutant strains of tuberculosis that are resistant to many of the antitubercular drugs currently in use. Bacterial resistance develops, sometimes rapidly, with the use of antitubercular drugs. Treatment is individualized and

based on laboratory studies identifying the drugs to which the organism is susceptible. To slow the development of bacterial resistance, the Centers for Disease Control (CDC) recommends the use of three or more drugs with initial therapy, as well as in retreatment. Using a combination of drugs slows the development of bacterial resistance.

Tuberculosis caused by drug-resistant organisms should be considered in patients who have no response to therapy and in patients who have been treated in the past.

## STANDARD TREATMENT

Standard treatment for tuberculosis is divided into two phases: the initial phase followed by a continuing phase. During the initial phase, drugs are used to kill the rapidly multiplying *M. tuberculosis* and to prevent drug resistance. The initial phase lasts approximately 2 months and the continuing phase approximately 4 months, with the total treatment regimen lasting for 6 to 9 months, depending on the patient's response to therapy.

The initial phase must contain three or more of the following drugs: isoniazid, rifampin, and pyrazinamide, along with either ethambutol or streptomycin. The CDC recommends treatment to begin as soon as possible after the diagnosis of tuberculosis. The treatment recommendation regimen is for the administration of rifampin, isoniazid, and pyrazinamide for a minimum of 2 months (8 weeks), followed by rifampin and isoniazid for 4 months (16 weeks) in areas with a low incidence of tuberculosis. In areas of high incidence of tuberculosis, the CDC recommends the addition of streptomycin or ethambutol for the first 2 months.

### DISPLAY 12-1 Prophylactic Uses for Isoniazid

Isoniazid may be used in the following situations:

- Household members and other close associates of those recently diagnosed as having tuberculosis
- Those whose tuberculin skin test has become positive in the last 2 years
- Those with positive skin tests whose radiographic findings indicate nonprogressive, healed, or quiescent (causing no symptoms) tubercular lesions
- Those at risk of developing tuberculosis (eg, those with Hodgkin's disease, severe diabetes mellitus, leukemia, and other serious illnesses and those receiving corticosteroids or drug therapy for a malignancy)
- All patients younger than 35 years (primarily children to age 7) who have a positive skin test
- Persons with acquired immunodeficiency syndrome or those who are positive for the human immunodeficiency virus and have a positive tuberculosis skin test or a negative tuberculosis skin test but a history of a prior significant reaction to purified protein derivative (a skin test for tuberculosis)

## RETREATMENT

At times treatment fails due to noncompliance with the drug regimen or to inadequate initial drug treatment. When treatment fails, retreatment is necessary. Retreatment generally includes the use of four or more antitubercular drugs. Retreatment drug regimens most often consist of the secondary drugs ethionamide, aminosalicylic acid, cycloserine, and capreomycin. Ofloxacin and ciprofloxacin may also be used in retreatment. At times during retreatment, as many as seven or more drugs may be used, with the ineffective drugs discontinued when susceptibility test results are available.

This chapter will discuss the following primary antitubercular drugs: ethambutol, isoniazid, pyrazinamide, rifampin, and streptomycin. Other primary and secondary drugs are listed in the Summary Drug Table: Antitubercular Drugs.

## ETHAMBUTOL

### ADVERSE REACTIONS

**Optic neuritis** (a decrease in visual acuity and changes in color perception), which appears to be related to the dose given and the duration of treatment, has occurred in some patients receiving ethambutol. Usually, this adverse reaction disappears when the drug is discontinued. Other adverse reactions are dermatitis, pruritus, **anaphylactoid reactions** (unusual or exaggerated allergic reactions), joint pain, anorexia, nausea, and vomiting.

### CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Ethambutol is contraindicated in patients with a history of hypersensitivity to the drug. Ethambutol is not recommended for children younger than 13 years. The drug is used with caution during lactation, in patients with hepatic and renal impairment, and during pregnancy (Category B). Because of the danger of optic neuritis, the drug is used cautiously in patients with diabetic retinopathy or cataracts.

## ISONIAZID

### ADVERSE REACTIONS

The incidence of adverse reactions appears to be higher when larger doses of isoniazid are prescribed. Adverse reactions include hypersensitivity reactions, hematologic changes, jaundice, fever, skin eruptions, nausea, vomiting, and epigastric distress. Severe, and sometimes fatal, hepatitis has been associated with isoniazid therapy and may appear after many months of treatment. **Peripheral neuropathy** (numbness and tingling of the extremities) is the most common symptom of toxicity.

### CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Isoniazid is contraindicated in patients with a history of hypersensitivity to the drug. The drug is used with caution during lactation, in patients with hepatic and renal impairment, and during pregnancy (Category C). Daily consumption of alcohol when taking isoniazid may result in a higher incidence of drug-related

hepatitis. Aluminum salts may reduce the oral absorption of isoniazid. The action of the anticoagulants may be enhanced when taken with isoniazid. There is a possibility of increased serum levels of phenytoin with concurrent use of isoniazid. When isoniazid is taken with foods containing tyramine, such as aged cheese and meats, bananas, yeast products, and alcohol, an exaggerated sympathetic-type response can occur (eg, hypertension, increased heart rate, palpitations).

## PYRAZINAMIDE

### ADVERSE REACTIONS

Hepatotoxicity is the principal adverse reaction seen with pyrazinamide use. Symptoms of hepatotoxicity may range from none (except for slightly abnormal hepatic function tests) to a more severe reaction such as jaundice. Nausea, vomiting, diarrhea, myalgia, and rashes also may be seen.

### CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Pyrazinamide is contraindicated in patients with a history of hypersensitivity to the drug. The drug is also contraindicated in patients with acute **gout** (a metabolic disorder resulting in increased levels of uric acid) and in patients with severe hepatic damage. The drug is used with caution during lactation, in patients with hepatic and renal impairment, and during pregnancy (Category C). Pyrazinamide is used cautiously in patients infected with human immunodeficiency virus, who may require longer treatment, and in patients with diabetes mellitus, in whom management is more difficult. Pyrazinamide decreases the effects of allopurinol, colchicines, and probenecid.

## RIFAMPIN

### ADVERSE REACTIONS

Nausea, vomiting, epigastric distress, heartburn, fatigue, dizziness, rash, hematologic changes, and renal insufficiency may be seen with administration of rifampin. Rifampin may also cause a reddish-orange discoloration of body fluids, including urine, tears, saliva, sweat, and sputum.

## CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Rifampin is contraindicated in patients with a history of hypersensitivity to the drug. The drug is used with caution during lactation, in patients with hepatic and renal impairment, and during pregnancy. Serum concentrations of digoxin may be decreased by rifampin. Isoniazid and rifampin administered concurrently may result in a higher risk of hepatotoxicity than when either drug is used alone. The use of rifampin with the oral anticoagulants or oral hypoglycemics may decrease the effects of the anticoagulant or hypoglycemic drug. There is a decrease in the effect of the oral contraceptives, chloramphenicol, phenytoin, and verapamil when these agents are administered concurrently with rifampin.

## STREPTOMYCIN

### ADVERSE REACTIONS

**Nephrotoxicity** (damage to the kidneys), **ototoxicity** (damage to the organs of hearing by a toxic substance), numbness, tingling, **tinnitus** (ringing in the ears), nausea, vomiting, **vertigo** (dizziness), and **circumoral** (around the mouth) paresthesia may be noted with the administration of streptomycin. Soreness at the injection site may also be noted, especially when the drug is given for a long time.

## CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Streptomycin is contraindicated in patients with a history of hypersensitivity to the drug or any other aminoglycoside. Streptomycin is a Pregnancy Category D drug and can cause fetal harm when administered to a pregnant woman. This drug is used cautiously in patients with preexisting hearing difficulty or tinnitus and in patients with renal insufficiency. The ototoxic effects of streptomycin are potentiated when administered with ethacrynic acid, furosemide, and mannitol. (See Chapter 10 for additional information about streptomycin.)

## NURSING PROCESS

### ● The Patient Receiving an Antitubercular Drug

#### ASSESSMENT

##### *Preadministration Assessment*

Once the diagnosis of tuberculosis is confirmed, the primary health care provider selects the drug that will best

control the spread of the disease and make the patient noninfectious to others. Many laboratory and diagnostic tests may be necessary before starting antitubercular therapy, including radiographic studies, culture and sensitivity tests, and various types of laboratory tests, such as a complete blood count. It also is important to include a family history and a history of contacts, if the patient has active tuberculosis, as part of the assessment.

Depending on the severity of the disease, patients may be treated initially in the hospital and then discharged to their home for supervised follow-up care, or they may have all treatment instituted on an outpatient basis.

#### *Ongoing Assessment*

When performing the ongoing assessment, the nurse observes the patient daily for the appearance of adverse reactions. These observations are especially important when a drug is known to be nephrotoxic or ototoxic. It is important to report any adverse reactions to the primary health care provider. In addition, the nurse carefully monitors vital signs daily or as frequently as every 4 hours when the patient is hospitalized.

## NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. The nursing diagnoses Noncompliance and Ineffective Management of Therapeutic Regimen also are discussed in Chapter 4.

## PLANNING

The expected outcomes for the patient may include an optimal response to antitubercular therapy, management of common adverse reactions, and an understanding of and compliance with the prescribed treatment regimen.

## IMPLEMENTATION

#### *Promoting an Optimal Response to Therapy*

The diagnosis, as well as the necessity of long-term treatment and follow-up, is often distressing to the

### Nursing Diagnoses Checklist

- ✓ **Disturbed Sensory Perception: Tactile, Auditory, Visual** related to adverse reactions of antitubercular drugs
- ✓ **Risk for Impaired Skin Integrity** related to adverse reactions of the antitubercular drugs
- ✓ **Noncompliance** related to indifference, lack of knowledge, other factors
- ✓ **Risk of Ineffective Therapeutic Regimen Management** related to indifference, lack of knowledge, long-term treatment regimen, other factors



patient. Patients with a diagnosis of tuberculosis may have many questions about the disease and its treatment. The nurse allows time for the patient and family members to ask questions. In some instances, it may be necessary to refer the patient to other health care workers, such as a social service worker or a dietitian.

When administering the antitubercular drug by the parenteral route, the nurse is careful to rotate the injection sites. At the time of each injection, the nurse inspects previous injection sites for signs of swelling, redness, and tenderness. If a localized reaction persists or if the area appears to be infected, it is important to notify the primary health care provider.

The nurse should give antitubercular drugs by the oral route and on an empty stomach, unless gastric upset occurs. If gastric upset occurs, it is important to notify the primary health care provider before the next dose is given.

**DIRECTLY OBSERVED THERAPY (DOT).** Because the antitubercular drugs must be taken for prolonged periods, compliance with the treatment regimen becomes a problem and increases the risk of the development of resistant strains of tuberculosis. To help prevent the problem of noncompliance, directly observed therapy (DOT) is used to administer these drugs. When using DOT, the patient makes periodic visits to the office of the primary care provider or the health clinic, where the drug is taken in the presence of the nurse. The nurse watches the patient swallow each dose of the medication regimen. In some cases, the nurse uses the direct observation method to administer the antitubercular drug in the patient's home, place of employment, or school. DOT may occur daily or two to three times weekly, depending on the patient's health care regimen. Studies indicate that taking the antitubercular drugs intermittently does not cause a drop in the therapeutic blood levels of antitubercular drugs, even if the drugs were given only two or three times a week.

**MANAGING VARIOUS TREATMENT REGIMENS.** The nurse uses the following interventions in the management of patients receiving antitubercular drugs to promote an optimal response to therapy.

**Ethambutol.** The nurse administers ethambutol once every 24 hours at the same time each day. It is a good idea to give the drug with food to prevent gastric upset. If a dose is missed, the nurse should tell the patient not to double the dose the next day. The nurse should explain to the patient that the urine, feces, saliva, sputum, sweat, and tears may be colored reddish-orange or brownish-orange and that this is normal.

**Isoniazid.** The nurse gives isoniazid to the patient whose stomach is empty, at least 1 hour before or 2 hours after

meals. If gastrointestinal upset occurs, the patient can take the drug with food. The nurse teaches the patient to minimize alcohol consumption because of the increased risk of hepatitis. To prevent pyridoxine (vitamin B<sub>6</sub>) deficiency, 6 to 50 mg pyridoxine daily may be prescribed.

**Pyrazinamide.** This drug is given once a day with food to prevent gastric upset. An alternative dosing regimen of twice weekly dosing has been developed to promote patient compliance on an outpatient basis. When administered on an outpatient basis, this drug, as well as the other antitubercular drugs, is administered using DOT.

**Rifampin.** The nurse administers rifampin once daily to the patient with an empty stomach, at least 1 hour before or 2 hours after meals. It is a good idea to explain to patients that their urine, feces, saliva, sputum, sweat, and tears may be colored reddish-orange and that this is normal.

**Streptomycin.** Streptomycin is usually administered daily as a single IM injection. The preferred site is the upper outer quadrant of the buttock or the midlateral thigh. The deltoid area is used only if the area is well developed. In patients 60 years of age or older, the dosage is reduced because of the risk of increased toxicity.

### Monitoring and Managing Adverse Reactions

Managing adverse reactions in patients taking antitubercular drugs is an important responsibility of the nurse. The nurse must continuously observe for signs of adverse reactions and immediately report them to the primary health care provider. Some information specific to the different antitubercular drugs is provided below.

**ETHAMBUTOL.** The nurse monitors for any changes in visual acuity and promptly reports any visual changes to the primary health care provider. Vision changes are usually reversible if the drug is discontinued as soon as symptoms appear. The patient may need assistance with ambulation if visual disturbances occur. Psychic disturbances may occur. If the patient appears depressed, withdrawn, noncommunicative, or has other personality changes, the nurse must report the problem to the primary health care provider.

**ISONIAZID.** Severe and sometimes fatal hepatitis may occur with isoniazid therapy. The nurse must carefully monitor all patients at least monthly for any evidence of liver dysfunction. It is important to instruct patients to report any of the following symptoms: anorexia, nausea, vomiting, fatigue, weakness, yellowing of the skin or eyes, darkening of the urine, or numbness in the hands and feet.



### Gerontologic Alert

Older adults are particularly susceptible to a potentially fatal hepatitis when taking isoniazid, especially if they consume alcohol on a regular basis. Two other antitubercular drugs, rifampin and pyrazinamide, can cause liver dysfunction in the older adult. Careful observation and monitoring for signs of liver impairment are necessary (eg, increased serum aspartate transaminase, increased serum alanine transferase, increased serum bilirubin, and jaundice).

**PYRAZINAMIDE.** Patients should have baseline liver functions tests to use as a comparison when monitoring liver function during pyrazinamide therapy. The nurse should monitor the patient closely for symptoms of a decline in hepatic functioning (ie, yellowing of the skin, malaise, liver tenderness, anorexia, or nausea). The primary health care provider may order periodic liver function tests. Hepatotoxicity appears to be dose related and may appear at any time during therapy.

**RIFAMPIN.** The patient is informed about the reddish-orange or reddish-brown discoloration of body fluids (eg, tears, sweat, sputum, saliva). Advise the patient not to wear soft contact lenses during therapy because they may be permanently stained.

**STREPTOMYCIN.** This drug may cause ototoxicity, resulting in hearing loss. The nurse should monitor for any signs of hearing loss, including tinnitus, and vertigo. The patient may have hearing checked by audiometry before beginning therapy and periodically during therapy. Tinnitus, roaring noises, or a sense of fullness in the ears indicates the need for audiometric examination or termination of the drug. Hearing loss occurs most often for high-frequency sounds. These drugs must be discontinued if the patient reports any hearing loss or if tinnitus occurs. Prompt action by the nurse is critical in preventing permanent hearing loss.

### Educating the Patient and Family

Antitubercular drugs are given for a long time, and careful patient and family education and close medical supervision are necessary. Noncompliance can be a problem whenever a disease or disorder requires long-term treatment. For this reason, the DOT method of administration is preferred. The patient and family must understand that short-term therapy is of no value in treating this disease. The nurse remains alert for statements made by the patient or family that may indicate future noncompliance with the drug regimen necessary in controlling the disease. (See Patient and Family Teaching Checklist: Increasing Compliance in Tubercular Drug Treatment Programs.)



### Patient and Family Teaching Checklist

#### Increasing Compliance in Tubercular Drug Treatment Program

##### The nurse:

- ✓ Discusses tuberculosis, its causes and communicability, and the need for long-term therapy for disease control.
- ✓ Reinforces that short-term treatment is ineffective.
- ✓ Reviews the drug therapy regimen, including the prescribed drugs, doses, and frequency of administration.
- ✓ Reassures the patient that various combinations of drugs are effective in treating tuberculosis.
- ✓ Urges the patient to take the drugs exactly as prescribed and not to omit, increase, or decrease the dosage unless directed to do so by the health care provider.
- ✓ Instructs the patient about possible adverse reactions and the need to notify prescriber should any occur.
- ✓ Arranges for direct observation therapy with the patient and family.
- ✓ Instructs the patient in measures to minimize gastrointestinal upset.
- ✓ Advises the patient to avoid alcohol and the use of nonprescription drugs, especially those containing aspirin, unless use is approved by the health care provider.
- ✓ Reassures the patient and family that the results of therapy will be monitored by periodic laboratory and diagnostic tests and follow-up visits with the health care provider.

The nurse reviews the dosage schedule and adverse effects associated with the prescribed antitubercular drug with the patient and family. Information that applies to all patients taking these drugs includes:

- The results of antitubercular therapy will be monitored at periodic intervals. Laboratory and diagnostic tests and visits to the primary health care provider's office or clinic are necessary.
- Take these drugs exactly as directed on the prescription container. Do not omit, increase, or decrease a dose unless advised to do so by the primary health care provider.
- Avoid the use of nonprescription drugs, especially those containing aspirin, unless use has been approved by the primary health care provider.
- Discuss the drinking of alcoholic beverages with the primary health care provider. A limited amount of alcohol may be allowed, but excessive intake should usually be avoided.

The nurse includes the following information in the teaching plan when a specific antitubercular drug is prescribed:

**Ethambutol:** Take this drug once a day at the same time each day. If a dose is missed, do not double the dose the next day. Notify the primary health care provider of any changes in vision or the occurrence of a skin rash.

**Isoniazid:** Take this drug 1 hour before or 2 hours after meals. However, if gastric upset occurs, take isoniazid with food. Notify the primary health care provider of weakness, yellowing of the skin, loss of appetite, darkening of the urine, skin rashes, or numbness or tingling of the hands or feet. Avoid tyramine-containing foods (see Chap. 31). To prevent pyridoxine (vitamin B<sub>6</sub>) deficiency, 6 to 50 mg of pyridoxine daily may be prescribed.

**Pyrazinamide:** Notify the primary health care provider if any of the following occurs: nausea, vomiting, loss of appetite, fever, malaise, visual changes, yellow discoloration of the skin, or severe pain in the knees, feet, or wrists. (Note: Pain in these areas may be a sign of active gout.)

**Rifampin:** Take the drug once daily on an empty stomach (1 hour before or 2 hours after meals). A reddish-brown or reddish-orange discoloration of tears, sputum, urine, or sweat may occur. Soft contact lenses may be permanently stained if worn while the patient is taking the drug. Notify the primary health care provider of any yellow discoloration of the skin, fever, chills, unusual bleeding or bruising, and skin rash or itching. If taking an oral contraceptive, check with primary health care provider because reliability of the contraceptive may be affected.

## EVALUATION

- The therapeutic effect is achieved.
- Adverse reactions are identified, reported to the primary health care provider, and managed successfully.
- The patient verbalizes an understanding of treatment modalities and the importance of continued follow-up care.
- The patient and family demonstrate understanding of the drug regimen.
- The patient complies with the prescribed drug regimen.

## ● Critical Thinking Exercises

1. Ms. Burns has received a diagnosis of tuberculosis. She is concerned because her primary health care provider has informed her that the treatment regimen consists of three drugs, isoniazid, rifampin, and pyrazinamide, taken for the next 2 months, followed by a 4-month treatment regimen with two of the drugs.

Determine what rationales the nurse can give Ms. Burns for the use of multiple drugs and the need for long-term therapy.

2. While Mr. Johnson is taking isoniazid, explain what instructions the nurse should give him concerning side effects.

## ● Review Questions

1. The nurse explains to the patient that to slow bacterial resistance to an antitubercular drug the primary health care provider may prescribe \_\_\_\_\_.
  - A. at least three antitubercular drugs
  - B. an antibiotic to be given with the drug
  - C. vitamin B<sub>6</sub>
  - D. that the drug be given only once a week
2. Which of the following drugs is the only antitubercular drug to be prescribed alone?
  - A. rifampin
  - B. pyrazinamide
  - C. streptomycin
  - D. isoniazid
3. The nurse monitors the patient taking isoniazid for toxicity. The most common symptom of toxicity is \_\_\_\_\_.
  - A. peripheral edema
  - B. circumoral edema
  - C. peripheral neuropathy
  - D. jaundice
4. Which of the following is a dose-related adverse reaction to ethambutol?
  - A. peripheral neuropathy
  - B. optic neuritis
  - C. hyperglycemia
  - D. fatal hepatitis
5. Which of the following antitubercular drugs is contraindicated in patients with gout?
  - A. rifampin
  - B. streptomycin
  - C. isoniazid
  - D. pyrazinamide

## ● Medication Dosage Problems

1. A patient is prescribed isoniazid syrup 300 mg. The isoniazid is available as 50 mg/mL. The nurse should administer \_\_\_\_\_.
2. Rifampin 600 mg PO is prescribed. The drug is available in 150-mg tablets. The nurse should administer \_\_\_\_\_.