

Tetracyclines, Macrolides, and Lincosamides

Key Terms

bacteriostatic	photosensitivity
bactericidal	reaction
myasthenia gravis	prophylaxis

Chapter Objectives

On completion of this chapter, the student will:

- Discuss the uses, general drug action, adverse reactions, contraindications, precautions, and interactions of the tetracyclines, macrolides, and lincosamides.
- Discuss important preadministration and ongoing assessment activities the nurse should perform on the patient taking a tetracycline, macrolide, or lincosamide.
- List some nursing diagnoses particular to a patient taking a tetracycline, macrolide, or lincosamide.
- 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 a tetracycline, macrolide, or lincosamide.

This chapter discusses three groups of broad-spectrum antibiotics: the tetracyclines, the macrolides, and the lincosamides. Examples of the tetracyclines include doxycycline (Vibramycin), minocycline (Minocin), and tetracycline (Sumycin). Examples of the macrolides include azithromycin (Zithromax), clarithromycin (Biaxin), and erythromycin (E-Mycin). The lincosamides include clindamycin (Cleocin) and lincosamycin (Lincocin). The Summary Drug Table: Tetracyclines, Macrolides, and Lincosamides describes the types of broad-spectrum antibiotics discussed in this chapter.

TETRACYCLINES

The tetracyclines are a group of anti-infectives composed of natural and semisynthetic compounds. They are useful in select infections when the organism shows sensitivity (see Chap. 7) to the tetracyclines, such as in cholera, Rocky Mountain spotted fever, and typhus.

ACTIONS

The tetracyclines exert their effect by inhibiting bacterial protein synthesis, which is a process necessary for reproduction of the microorganism. The ultimate effect of this action is that the bacteria are either destroyed or their multiplication rate is slowed. The tetracyclines are **bacteriostatic** (capable of slowing or retarding the multiplication of bacteria), whereas the macrolides and lincosamides may be bacteriostatic or **bactericidal** (capable of destroying bacteria).

USES

These antibiotics are effective in the treatment of infections caused by a wide range of gram-negative and gram-positive microorganisms. The tetracyclines are used in infections caused by Rickettsiae (Rocky Mountain spotted fever, typhus fever, and tick fevers). Tetracyclines are also used in situations in which penicillin is contraindicated, in the treatment of intestinal amebiasis, and in some skin and soft tissue infections. Oral

SUMMARY DRUG TABLE TETRACYCLINES, MACROLIDES, AND LINCOSAMIDES

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
Tetracyclines				
demeclocycline <i>deh-meh-kloe-sye'-kleen</i>	Declomycin	Treatment of infections due to susceptible microorganisms	Nausea, vomiting, diarrhea, hypersensitivity reactions, photosensitivity reactions, pseudomembranous colitis, hematologic changes, discoloration of teeth in fetus and young children	150 mg PO QID or 300 mg PO BID; gonorrhea: 600 mg PO initially then 300 mg PO q12h for 4 d
doxycycline <i>dox-i-sye'-kleen</i>	Doxychel Hyclate, Vibra-Tabs, Vibramycin, <i>generic</i>	Same as demeclocycline	Same as demeclocycline	100 mg PO q12h first day then 100–200 mg/d PO; gonorrhea: 200 mg PO immediately and 100 mg PO hs then 100 mg PO BID for 3 d; 200 mg IV first day then 100–200 mg/d IV
minocycline <i>min-oh-sye'-kleen</i>	Minocin, Minocin IV	Same as demeclocycline	Same as demeclocycline	200 mg PO initially then 100 mg IV q12h 100–200 mg initially then 50 mg PO QID
oxytetracycline <i>ox-i-tet-ra-sye'-kleen</i>	Terramycin, Terramycin IM, Uri-Tet	Same as demeclocycline	Nausea, vomiting, diarrhea, hypersensitivity reactions, photosensitivity reactions, pseudomembranous colitis, hematologic changes, discoloration of teeth in fetus and young children	1–2 g/d PO; 250 mg qd or 300 mg individualized doses q8–12h IM; 250–500 mg IV q12h
tetracycline <i>tet-ra-sye'-kleen</i>	Panmycin, Sumycin, Tetracap, <i>generic</i>	Same as demeclocycline	Same as demeclocycline	1–2 g/d PO in 2–4 divided doses
Macrolides				
azithromycin <i>ay-zithro-my'-cin</i>	Zithromax	Same as demeclocycline	Nausea, vomiting, diarrhea, abdominal pains, hypersensitivity reactions, pseudomembranous colitis	500 mg PO first day then 250 mg/d PO for 4 d
clarithromycin <i>klar-ith-ro-my'-cin</i>	Biaxin	Same as demeclocycline	Same as azithromycin	250–500 mg PO BID
dirithromycin <i>dir-ith-ro-my'-cin</i>	Dynabac	Same as demeclocycline	Nausea, vomiting, diarrhea, hypersensitivity reactions, photosensitivity reactions, pseudomembranous colitis, electrolyte imbalance	500 mg PO for 7–14 d
erythromycin base <i>er-ith-roe-my'-sin</i>	E-Mycin, Eryc, <i>generic</i>	Same as demeclocycline	Same as azithromycin	250 mg PO q6h or 333 mg q8h
erythromycin ethylsuccinate	EryPed, E.E.S., <i>generic</i>	Same as demeclocycline	Same as azithromycin	400 mg PO q6h
erythromycin estolate	Ilosone, <i>generic</i>	Same as demeclocycline	Same as azithromycin	250 mg PO q6h
erythromycin IV	Ilotycin Glucepate, <i>generic</i>	Same as demeclocycline	Same as azithromycin	Up to 4 g/d IV in divided doses
troleandomycin	Tao	Same as demeclocycline	Same as clindamycin	250–500 mg QID PO

SUMMARY DRUG TABLE TETRACYCLINES, MACROLIDES, AND LINCOSAMIDES (Continued)

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
<i>Lincosamides</i>				
clindamycin <i>klin-da-my'-sin</i>	Cleocin, <i>generic</i>	Same as demeclocycline	Abdominal pain, esophagitis, nausea, vomiting, diarrhea, skin rash, blood dyscrasias, pseudomembranous colitis, hypersensitivity reactions	150–450 mg PO q6h; 600–2700 mg/d in 2–4 equal doses; up to 4.8 g/d IV, IM
lincomycin <i>lin-koe-my'-sin</i>	Lincocin, Lincorex	Same as demeclocycline	Same as clindamycin	500 mg PO q6–8h; 600 mg IM q12–24h; up to 8 g/d IV

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

tetracyclines are used in the treatment of uncomplicated urethral, endocervical, or rectal infections caused by *Chlamydia trachomatis* and as adjunctive treatment in severe acne. Tetracycline in combination with metronidazole and bismuth subsalicylate is useful in treating *Helicobacter pylori* (a bacteria in the stomach that can cause peptic ulcer).

ADVERSE REACTIONS

Gastrointestinal reactions that may occur during tetracycline administration include nausea, vomiting, diarrhea, epigastric distress, stomatitis, and sore throat. Skin rashes also may be seen. A **photosensitivity** (phototoxic) **reaction** may be seen with this group of drugs, manifested by an exaggerated sunburn reaction when the skin is exposed to sunlight even for brief periods. Demeclocycline seems to cause the most serious photosensitivity reaction, whereas minocycline is least likely to cause this type of reaction.

The tetracyclines are not given to children younger than 9 years of age unless their use is absolutely necessary because these drugs may cause permanent yellow-gray-brown discoloration of the teeth. The use of the tetracyclines, especially prolonged or repeated therapy, may result in bacterial or fungal overgrowth of nonsusceptible organisms.

CONTRAINDICATIONS

The tetracyclines are contraindicated if the patient is known to be hypersensitive to any of the tetracyclines. Tetracyclines also are contraindicated during pregnancy because of the possibility of toxic effects to the developing fetus. The tetracyclines are classified Pregnancy Category D drugs. These drugs also are contraindicated

during lactation and in children younger than 9 years (may cause permanent discoloration of the teeth).

PRECAUTIONS

It is important to use the tetracyclines cautiously in patients with renal function impairment. In addition, doses greater than 2 g/d can be extremely damaging to the liver. The nurse should carefully check the expiration dates of the tetracyclines before administration because degradation of the tetracyclines can occur; after degradation, the agents are highly toxic to the kidneys.

INTERACTIONS

Antacids containing aluminum, zinc, magnesium, or bismuth salts, or foods high in calcium impair absorption of the tetracyclines. When the tetracyclines are administered with oral anticoagulants, an increase in the effects of the anticoagulant may occur. When tetracyclines are administered to women using oral contraceptives, a decrease in the effect of the oral contraceptive may be seen. This may result in breakthrough bleeding or pregnancy. When digoxin is administered with the tetracyclines there is an increased risk for digitalis toxicity (see Chapter 39). The effects of this could last for months after tetracycline administration is discontinued. Tetracyclines may reduce insulin requirements. Blood glucose levels should be monitored frequently during tetracycline therapy.

MACROLIDES

The macrolides are effective against a wide variety of pathogenic organisms, particularly infections of the respiratory and genital tract.

ACTIONS

The macrolides are bacteriostatic or bactericidal in susceptible bacteria. The drugs act by binding to cell membranes and causing changes in protein function.

USES

These antibiotics are effective in the treatment of infections caused by a wide range of gram-negative and gram-positive microorganisms. In addition, the drugs are used to treat acne vulgaris and skin infections, in conjunction with sulfonamides to treat upper respiratory infections caused by *Hemophilus influenzae*, and as prophylaxis before dental or other procedures in patients allergic to penicillin.

ADVERSE REACTIONS

Most of the adverse reactions seen with the administration of azithromycin and clarithromycin are related to the gastrointestinal tract and include nausea, vomiting, diarrhea, and abdominal pain. Abdominal cramping, nausea, vomiting, diarrhea, and allergic reactions have been reported with the administration of erythromycin. However, there appears to be a low incidence of adverse reactions associated with normal oral doses of erythromycin. As with almost all antibacterial drugs, pseudomembranous colitis may occur ranging in severity from mild to life threatening.

CONTRAINDICATIONS

These drugs are contraindicated in patients with a hypersensitivity to the macrolides and patients with pre-existing liver disease.

PRECAUTIONS

It is important to use these drugs cautiously during pregnancy and lactation. Azithromycin and erythromycin are Pregnancy Category B drugs, and clarithromycin, dirithromycin, and troleandomycin are Pregnancy Category C drugs. Because azithromycin, erythromycin, and troleandomycin are primarily eliminated from the body by the liver, these drugs should be used with great caution in patients with liver dysfunction. There is a decreased gastrointestinal absorption of the macrolides when administered with kaolin, aluminum salts, or magaldrate.

INTERACTIONS

Use of the macrolides increases serum levels of digoxin and increases the effects of anticoagulants. Use of antacids decreases the absorption of most macrolides. The macrolides should not be administered with clindamycin, lincomycin, or chloramphenicol; a decrease in the therapeutic activity of the macrolides can occur. Concurrent administration of the macrolides with theophylline may increase serum theophylline levels.

LINCOSAMIDES

The lincosamides, another group of anti-infectives, are effective against many gram-positive organisms, such as streptococci and staphylococci. However, because of their high potential for toxicity, the lincosamides are usually used only for the treatment of serious infections in which penicillin or erythromycin (a macrolide) is not effective.

ACTIONS

The lincosamides act by inhibiting protein synthesis in susceptible bacteria, causing death.

USES

These antibiotics are effective in the treatment of infections caused by a wide range of gram-negative and gram-positive microorganisms. The lincosamides are used for the more serious infections. In serious infections they may be used in conjunction with other antibiotics.

ADVERSE REACTIONS

Abdominal pain, esophagitis, nausea, vomiting, diarrhea, skin rash, and blood dyscrasias may be seen with the use of the lincosamides. These drugs also can cause pseudomembranous colitis, which may range from mild to very severe. Discontinuing the drug may relieve mild symptoms of pseudomembranous colitis.

CONTRAINDICATIONS

The lincosamides are contraindicated in patients with hypersensitivity to the lincosamides, those with minor bacterial or viral infections, and during lactation and infancy.

PRECAUTIONS

It is important to use these drugs with caution in patients with a history of gastrointestinal disorders, renal disease, or liver impairment. The neuromuscular blocking action of the lincosamides poses a danger to patients with **myasthenia gravis** (an autoimmune disease manifested by extreme weakness and exhaustion of the muscles).

INTERACTIONS

When kaolin or aluminum is administered with the lincosamides, the absorption of the lincosamide is decreased. When the lincosamides are administered with the neuromuscular blocking drugs (drugs that are used as adjuncts to anesthetic drugs that cause paralysis of the respiratory system) the action of the neuromuscular blocking drug is enhanced, possibly leading to severe and profound respiratory depression.

NURSING PROCESS

● The Patient Receiving a Tetracycline, Macrolide, or Lincosamide

ASSESSMENT

Preadministration Assessment

It is important to establish an accurate database before the administration of any antibiotic. The nurse should identify and record signs and symptoms of the infection. Signs and symptoms may vary and often depend on the organ or system involved and whether the infection is external or internal. Examples of some of the signs and symptoms of an infection in various areas of the body are pain, drainage, redness, changes in the appearance of sputum, general malaise, chills and fever, cough, and swelling.

The nurse obtains a thorough allergy history, especially a history of drug allergies. Some antibiotics have a higher incidence of hypersensitivity reactions in those with a history of allergy to drugs or other substances. If the patient has a history of allergies and has not told the primary health care provider, the nurse should not administer the first dose of the drug until this problem is discussed with the primary health care provider.

It also is important to take and record vital signs before the first dose of the antibiotic is given. The primary health care provider may order culture and sensitivity tests, and these should also be performed before the first dose of the drug is given. Other laboratory tests such as renal and hepatic function tests, complete blood count, and urinalysis may also be ordered by the primary health care provider.

Ongoing Assessment

An ongoing assessment is important during therapy with the tetracyclines, macrolides, and lincosamides. The nurse should take vital signs every 4 hours or as ordered by the primary health care provider. The nurse must notify the primary health care provider if there are changes in the vital signs, such as a significant drop in blood pressure, an increase in the pulse or respiratory rate, or a sudden increase in temperature.

Each day, the nurse compares current signs and symptoms of the infection against the initial signs and symptoms and records any specific findings in the patient's chart.

When an antibiotic is ordered for the prevention of a secondary infection (**prophylaxis**), the nurse observes the patient for signs and symptoms that may indicate the beginning of an infection despite the prophylactic use of the antibiotic. If signs and symptoms of an infection occur, the nurse must report them to the primary health care provider.

NURSING DIAGNOSES

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

PLANNING

The expected outcomes of the patient may include an optimal response to therapy, which includes control of the infectious process or prophylaxis of bacterial infection, an absence of adverse drug effects, and an understanding of and compliance with the prescribed treatment regimen.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

Before therapy is begun, culture and sensitivity tests (see Chap. 7) are performed to determine which antibiotic will best control the infection. These drugs are of no value in the treatment of infections caused by a virus or fungus. There may be times when a secondary bacterial infection has occurred or potentially will occur when the patient has a fungal or viral infection. The primary health care provider may then order one of the

Nursing Diagnoses Checklist

- ✓ **Risk for Imbalanced Body Temperature: Hyperthermia** related to infection
- ✓ **Diarrhea** related to superinfection secondary to antibiotic therapy, adverse drug reaction
- ✓ **Risk for Impaired Skin Integrity** related to adverse drug reaction

broad-spectrum antibiotics, but its purpose is for the prevention (prophylaxis) or treatment of a secondary bacterial infection that could potentially develop after the primary fungal or viral infection.

ORAL ADMINISTRATION. To control the infectious process or prevent a bacterial infection, the nurse must keep several important things in mind when administering the tetracyclines, macrolides, and lincosamides.

Tetracyclines. It is important to give the tetracyclines on an empty stomach; tetracyclines are not to be taken with dairy products (milk or cheese). The exceptions are doxycycline (Vibramycin) and minocycline (Minocin), which may be taken with dairy products or food. The nurse should give clindamycin with food or a full glass of water. The nurse can give troleandomycin and clarithromycin without regard to meals. All tetracyclines should be given with a full glass of water (240 mL).

Nursing Alert

The nurse should not give tetracyclines along with dairy products (milk or cheese), antacids, laxatives, or products containing iron. When these drugs are prescribed, the nurse makes sure they are given 2 hours before or after the administration of a tetracycline. Food or drugs containing calcium, magnesium, aluminum, or iron prevent the absorption of the tetracyclines if ingested concurrently.

Macrolides. The nurse gives clarithromycin without regard to meals. Clarithromycin may be taken with milk, if desired. Azithromycin tablets may be given without regard to meals. However, azithromycin suspension is given 1 hour or more before a meal or 2 hours or more after a meal. Dirithromycin is given with food or within 1 hour of eating. Erythromycin is given on an empty stomach (1 hour before or 2 hours after meals) and with 180 to 240 mL of water.

Lincosamides. Food impairs the absorption of lincomycin. The patient should take nothing by mouth (except water) for 1 to 2 hours before and after taking lincomycin. Clindamycin may be given without regard to food.

PARENTERAL ADMINISTRATION. When these drugs are given intramuscularly, the nurse inspects previous injection sites for signs of pain or tenderness, redness, and swelling. Some antibiotics may cause temporary local reactions, but persistence of a localized reaction should be reported to the primary health care provider. It is important to rotate injection sites and record the site used for injection in the patient's chart.

When these drugs are given intravenously (IV), the nurse should inspect the needle site and area around the needle for signs of extravasation of the IV fluid or signs

of tenderness, pain, and redness (which may indicate phlebitis or thrombophlebitis). If these symptoms are apparent, the nurse should restart the IV in another vein and bring the problem to the attention of the primary health care provider.

Monitoring and Managing Adverse Drug Reactions

The nurse observes the patient at frequent intervals, especially during the first 48 hours of therapy. It is important to report to the primary health care provider the occurrence of any adverse reaction before the next dose of the drug is due. The nurse should report serious adverse reactions, such as a severe hypersensitivity reaction, respiratory difficulty, severe diarrhea, or a decided drop in blood pressure, to the primary health care provider immediately because a serious adverse reaction may require emergency intervention.

The nurse observes the patient for the signs and symptoms of a bacterial or fungal superinfection, such as vaginal or anal itching, sore throat, sores in the mouth, diarrhea, fever, chills, and sore throat. It is important to report any new signs and symptoms occurring during antibiotic therapy to the primary health care provider, who must then decide if these problems are part of the original infection or if a superinfection has occurred.

HYPERTHERMIA. The nurse monitors the temperature at frequent intervals, usually every 4 hours unless the patient has an elevated temperature. When the patient has an elevated temperature the nurse checks the temperature, pulse, and respirations every hour until the temperature returns to normal and administers an antipyretic if prescribed by the primary care provider.

DIARRHEA. Diarrhea may be an indication of a superinfection or pseudomembranous colitis, both of which can be serious. The nurse should inspect all stools for the presence of blood or mucus. If diarrhea does occur and there appears to be blood and mucus in the stool, the nurse saves a sample of the stool and tests for occult blood using a test such as Hemocult. If the stool tests positive for blood, the nurse saves the stool for possible further laboratory analysis.

The nurse should encourage the patient with diarrhea to drink fluids to replace those lost with the diarrhea. It is important to maintain an accurate intake and output record to help determine fluid balance.

Educating the Patient and Family

The patient and family must understand the prescribed therapeutic regimen. It is not uncommon for patients to stop taking a prescribed drug because they feel better. A detailed plan of teaching helps to reduce the incidence of this problem.

The nurse should explain, in easy to understand terms, the adverse reactions associated with the specific

Home Care Checklist

AVOIDING DRUG–FOOD INTERACTIONS

In some instances, drugs may be taken with food or milk to minimize the risk for gastrointestinal upset. However, most tetracyclines, when given with foods containing calcium, such as dairy products, are not absorbed as well as when they are taken on an empty stomach. So, if the patient is to receive tetracycline at home, it is important to be sure he or she knows to take the drug on an empty stomach, 1 hour before or 2 hours after a meal. In addition, the nurse teaches the patient to avoid the following foods before or after taking the drug:

- Milk (whole, low-fat, skim, condensed, or evaporated)
- Cream (half-and-half, heavy, light)
- Sour cream
- Coffee creamers
- Creamy salad dressings
- Eggnog
- Milkshakes
- Cheese (natural and processed)
- Yogurt (regular, low-fat, or nonfat)
- Cottage cheese
- Ice cream
- Frozen custard
- Frozen yogurt
- Ice milk

prescribed antibiotic. The nurse tells the patient to contact the primary health care provider if any potentially serious adverse reactions, such as hypersensitivity reactions, moderate to severe diarrhea, sudden onset of chills and fever, sore throat, or sores in the mouth, occur.

The nurse develops a teaching plan that includes the following information:

- Take the drug at the prescribed time intervals. These time intervals are important because a certain amount of the drug must be in the body at all times for the infection to be controlled.
- Do not to increase or omit the dose unless advised to do so by the primary health care provider.
- Complete the entire course of treatment. Never stop the drug, except on the advice of a primary health care provider, before the course of treatment is completed even if symptoms improve or disappear. Failure to complete the prescribed course of treatment may result in a return of the infection.
- Take each dose with a full glass of water. Follow the directions given by the pharmacist regarding taking the drug on an empty stomach or with food (see Home Care Checklist: Avoiding Drug–Food Interactions).
- Notify the primary health care provider if symptoms of the infection become worse or there is no improvement in the original symptoms after about 5 days.
- Avoid the use of alcoholic beverages during therapy unless use has been approved by the primary health care provider.
- When a tetracycline has been prescribed, avoid exposure to the sun or any type of tanning lamp or bed. When exposure to direct sunlight is unavoidable, completely cover the arms and legs and wear a

wide-brimmed hat to protect the face and neck. Application of a sunscreen may or may not be effective. Therefore, consult the primary health care provider before using a sunscreen to prevent a photosensitivity reaction.

EVALUATION

- The therapeutic effect is achieved, and the infection is controlled or prevented.
- Adverse reactions are identified, reported to the primary health care provider, and managed successfully through appropriate nursing interventions.
- The patient and family demonstrate understanding of the drug regimen.
- The patient verbalizes the importance of complying with the prescribed therapeutic regimen.

● Critical Thinking Exercises

1. Ms. Jones has been prescribed tetracycline. She works nights and is home sleeping during the day. To decrease the possibility of noncompliance with the treatment regimen, discuss how and what you would teach Ms. Jones about her drug regimen.
2. Mr. Park, a patient in a nursing home, has been receiving clarithromycin (Biaxin) for an upper respiratory infection for 9 days. The nurse assistant reports that he has been incontinent of feces for the past 2 days. Analyze whether this matter should be investigated.
3. When taking the drug history of Mr. Woods, a patient in the outpatient clinic, you note that he has been taking 0.25 mg digoxin, one baby aspirin, and the tetracycline minocycline (Minocin). Based on your knowledge of the tetracyclines, determine whether there is any reason to be concerned about the drug regimen that Mr. Woods is on. Explain your answer.
4. Ms. Evans, age 75 years, is to be dismissed on a regimen of doxycycline (Vibramycin). You note that she is alert and has good communication skills. Because she lives alone, she will be responsible for administering her own drug. Devise a teaching plan for Ms. Evans. You may want to use the teaching plan form in Chapter 5.

● Review Questions

1. A patient asks the nurse why the primary health care provider prescribed an antibiotic when she was told that she has a viral infection. The most correct

response by the nurse is that the antibiotic may be used to prevent a _____.

- A. primary fungal infection
 - B. repeat viral infection
 - C. secondary bacterial infection
 - D. breakdown of the immune system
2. A patient is receiving erythromycin for an infection. The patient's response to therapy is best evaluated by _____.
 - A. monitoring vital signs every 4 hours
 - B. comparing initial and current signs and symptoms
 - C. monitoring fluid intake and output
 - D. asking the patient if he is feeling better
 3. When asked to describe a photosensitivity reaction, the nurse correctly states that this reaction may be described as a(n) _____.
 - A. tearing of the eyes on exposure to bright light
 - B. aversion to bright lights and sunlight
 - C. sensitivity to products in the environment
 - D. exaggerated sunburn reaction when the skin is exposed to sunlight
 4. When giving one of the macrolide antibiotics, the nurse assesses the patient for the most common adverse reactions, which are _____.
 - A. related to the gastrointestinal tract
 - B. skin rash and urinary retention
 - C. sores in the mouth and hypertension
 - D. related to the nervous system

● Medication Dosage Problems

1. Mr. Baker is prescribed azithromycin for a lower respiratory tract infection. The nurse tells Mr. Baker to take the drug on an empty stomach. Azithromycin is available in 250-mg tablets. The primary health care provider has ordered 500 mg on the first day, followed by 250 mg on days 2 to 5. How many tablets would Mr. Baker take on the first day? _____. On the last day of therapy? _____
2. A patient is prescribed 600 mg of lincomycin every 12 hours IM. The drug is available as 300 mg/mL. How many milliliters would the nurse administer?
3. A patient is prescribed 200 mg of minocycline oral suspension initially, followed by 100 mg PO every 12 hours. The minocycline is available as an oral suspension of 50 mg/5 mL. How many milliliters would the nurse administer as the initial dose? _____