chapter 15

Antifungal Drugs

Key Terms

fungicidal
fungistatic
fungus
mycotic infections
onychomycosis
tinea corporis
tinea cruris
tinea pedi

Chapter Objectives

On completion of this chapter, the student will:

- Distinguish between superficial and systemic fungal infections
- Discuss the uses, general drug action, adverse reactions, contraindications, precautions, and interactions of antifungal drugs.
- Discuss important preadministration and ongoing assessment activities the nurse should perform on the patient receiving an antifungal drug.
- List some nursing diagnoses particular to a patient taking an antifungal drug.
- List possible goals for a patient taking an antifungal drug.
- Discuss ways to promote an optimal response to therapy, how to manage adverse reactions, and important points to keep in mind when educating the patient and the family about the antifungal drugs.

Fungal infections range from superficial skin infections to life-threatening systemic infections. Systemic fungal infections are serious infections that occur when fungi gain entrance into the interior of the body.

A **fungus** is a colorless plant that lacks chlorophyll. Fungi that cause disease in humans may be yeastlike or moldlike; the resulting infections are called **mycotic infections** or fungal infections.

Mycotic (fungal) infections may be one of two types:

1. Superficial mycotic infections
2. Deep (systemic) mycotic infections

The superficial mycotic infections occur on the surface of, or just below, the skin or nails. Superficial infections include **tinea pedis** (athlete's foot), **tinea cruris** (jock itch), **tinea corporis** (ringworm), **onychomycosis** (nail fungus), and yeast infections, such as those caused by *Candida albicans*. Yeast infections or those caused by *C. albicans* affect women in the vulvovaginal area and can be difficult to control. Women who are at increased risk for vulvovaginal yeast infections are those who have diabetes, are pregnant, or are taking oral contraceptives, antibiotics, or corticosteroids.

Deep mycotic infections develop inside the body, such as in the lungs. Treatment for deep mycotic infections is often difficult and prolonged. The Summary Drug Table: Antifungal Drugs identifies drugs that are used to combat fungal infections.

ACTIONS

Antifungal drugs may be **fungicidal** (able to destroy fungi) or **fungistatic** (able to slow or retard the multiplication of fungi). Amphotericin B (Fungizone IV), miconazole (Monistat), nystatin (Mycostatin), and ketoconazole (Nizoral) are thought to have an effect on the cell membrane of the fungus, resulting in a fungicidal or fungistatic effect. The fungicidal or fungistatic effect of these drugs appears to be related to their concentration in body tissues. Fluconazole (Diflucan) has fungistatic activity that appears to result from the depletion of sterols (a group of substances related to fats) in the fungus cells.

Griseofulvin (Grisactin) exerts its effect by being deposited in keratin precursor cells, which are then gradually lost (due to the constant shedding of top skin cells), and replaced by new, noninfected cells. The mode of action of flucytosine (Ancobon) is not clearly understood. Clotrimazole (Lotrimin, Mycelex) binds with phospholipids in the fungal cell membrane,

SUMMARY DRUG TABLE ANTIFUNGAL DRUGS

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
amphotericin B desoxycholate *am-foe-ter'-i-sin*	Amphocin, Fungizone IV, *generic*	Systemic fungal infections	Headache, hypotension, fever, shaking, chills, malaise, nausea, vomiting, diarrhea, abnormal renal function, joint and muscle pain	Desoxycholate: 0.25 mg/kg/d IV
amphotericin B, lipid-based	Abelcet, AmBisome, Amphotec			Lipid-based: 3–6 mg/kg/d IV
caspofungin acetate *kass-poe-fun-jin*	Cancidas	Invasive aspergillosis, hepatic insufficiency	Headache, rash, nausea, vomiting, abdominal pain, hematologic changes, fever	70 mg loading dose IV, followed by 50 mg/d IV
fluconazole *floo-kon'-a-zole*	Diflucan	Oropharyngeal and esophageal candidiasis, vaginal candidiasis, cryptococcal meningitis	Headache, nausea, vomiting, diarrhea, skin rash	50–400 mg/d PO, IV
flucytosine (5-FC) *floo-sye'-toe-seen*	Ancobon	Systemic fungal infections	Nausea, diarrhea, rash, anemia, leukopenia, thrombocytopenia, renal insufficiency	50–150 mg/kg/d PO q6h
griseofulvin microsize *griz-ee-oh-full'-vin*	Fulvicin V/F, Grifulvin V, Grisactin	Ringworm infections of the skin, hair, nails	Nausea, vomiting, diarrhea, oral thrush, headache, rash, urticaria	Microsize: 30–50 lb, 125–250 mg/d; >50 lb, 250–500 mg/d PO
griseofulvin ultramicrosize	Fulvicin P/G, Gris-PEG			Ultramicrosize: 30–50 lb, 82.5–165 mg/d; >50 lb, 165–330 mg/d in divided doses PO Microsize: 500 mg–1g PO; Ultramicrosize: 330–750 mg PO
itraconazole *eye-tra-kon'-a-zole*	Sporanox	Capsules or parenteral: fungal infections; oral solution: oral or esophageal candidiasis	Nausea, vomiting, diarrhea, rash, abdominal pain, edema	200–400 mg/d PO, IV as a single or divided dose
ketoconazole *kee-toe-koe'-na-zole*	Nizoral, *generic*	Treatment of fungal infections	Nausea, vomiting, abdominal pain, headache, pruritus	200 mg/d PO; may increase to 400 mg/d PO
nystatin, oral *nye-stat'-in*	*generic*	Nonesophageal membrane GI candidiasis	Rash, diarrhea, nausea, vomiting	500,000–1,000,000 U TID

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

increasing permeability of the cell and resulting in loss of intracellular components. (See Tables 15-1 and 15-2.)

USES

Antifungal drugs are used to treat superficial and deep fungal infections. The antifungal drugs specifically discussed in this chapter are: amphotericin B (Fungizone), fluconazole (Diflucan), flucytosine (Ancobon), griseofulvin (Grisactin), ketoconazole (Nizoral), and miconazole (Monistat). The specific uses of antifungal drugs are given in the Summary Drug Table: Antifungal Drugs. Miconazole is an antifungal drug used to treat vulvovaginal "yeast" infections and is representative of all of the vaginal antifungal agents. (See Table 15-2.) Fungal infections of the skin or mucous membranes may be treated with topical or vaginal preparations. A listing of the topical antifungal drugs appears in

Herbal Alert: Antifungal Herbs

Researchers have identified several antifungal herbs that are effective against tinea pedis (athlete's foot), such as tea tree oil (Melaleuca alternifolia) *and garlic* (Allium sativum).

Tea tree oil comes from an evergreen tree native to Australia. The herb has been used as a nonirritating, antimicrobial for cuts, stings, wounds, burns, and acne. It can be found in shampoos, soaps, and lotions. Tea tree oil should not be ingested orally but is effective when used topically for minor cuts and stings. Tea tree oil is used as an antifungal to relieve and control the symptoms of tinea pedis. Topical application is most effective when used in a cream with at least 10% tea tree oil. Several commercially prepared ointments are available. The cream is applied to affected areas twice daily for several weeks.

Garlic is used as an antifungal. A cream of 0.4% ajoene (the antifungal component of garlic) was found to relieve symptoms of athlete's foot and, like tea tree oil, is applied twice daily. (For more information on garlic, see Herbal Alert in Chap. 44.)

Table 15-1, and the vulvovaginal antifungal agents are listed in Table 15-2.

ADVERSE REACTIONS

When topical antifungal drugs, such as clotrimazole (see Table 15-1), are applied to the skin or mucous membranes, few adverse reactions are seen. On occasion, a local reaction, such as irritation or burning, may occur with topical use. The vulvovaginal antifungal drugs may cause local irritation, redness, stinging, or abdominal pain. Few adverse reactions are seen with the use of the vulvovaginal antifungal drugs.

Amphotericin B

Amphotericin B is the most effective drug available for the treatment of most systemic fungal infections. Administration often results in serious reactions,

TABLE 15-1 Topical Antifungal Drugs

GENERIC NAME (FORM)	TRADE NAMES	USES
amphotericin B (cream or lotion)	Fungizone	Mycotic infections
butenafine HCL (Cream)	Mentax	Mycotic infections
ciclopirox (cream, lotion)	Loprox, Penlac Nail Lacquer	Tinea pedis, tinea cruris, tinea corporis, mild to moderate onychomycosis of fingernails and toenails
clioquinol (cream)	*generic*	Tinea pedis, tinea cruris, and other ringworm infections
clotrimazole (Cream, solution, lotion)	Lotrimin, *generic*	Tinea pedis, tinea cruris, tinea corporis
econazole (cream)	Spectazole	Tinea pedis, tinea cruris, tinea corporis
gentian violet (solution)	*generic*	Abrasions, minor cuts, surface injuries, and superficial fungus infections
haloprogin	Halotex	Tinea pedis, tinea cruris, tinea corporis
miconazole nitrate (cream, solution, spray)	Fungoid Tincture, Lotrimin, Micatin, Monistat	Tinea pedis, tinea cruris, tinea corporis
naftifine (cream, gel)	Naftin	Cutaneous or mucocutaneous mycotic infections
oxiconazole nitrate (cream, lotion)	Oxistat	Tinea pedis, tinea cruris, tinea corporis
sulconazole nitrate (cream, solution)	Exelderm	Tinea pedis, tinea cruris, tinea corporis
tolnaftate (cream, solution, gel, spray)	Aftate, Genaspor, Tinactin, Ting, *generic*	Tinea pedis, tinea cruris, tinea corporis
triacetin (solution, cream, spray)	Fungoid, Ony-Clear Nail	Tinea pedis, tinea cruris, tinea corporis
undecylenic acid (ointment, cream, powder)	Cruex, Desenex	Tinea pedis; relief and prevention of diaper rash, itching, burning and chafing, prickly heat; tinea cruris; excessive perspiration, irritation of the groin area

TABLE 15-2 Vaginal Antifungal Drugs

GENERIC NAME	SELECT TRADE NAME(S)
butoconazole nitrate *byoo-toe-koe'-nuh-zole*	Femstat 3, Gynazole-1, Mycelex-3
clotrimazole *kloe-trye'-ma-zole*	Lotrimin 3, Mycelex-7, *generic*
miconazole nitrate *mi-kon'-a-zole*	Monistat 3, Monistat 7, Monistat Dual Pak, M-Zole 3 Combination Pack, *generic*
nystatin *nye-stat'-in*	*generic*
terconazole *ter-kon'-a-zole*	Terazol 7, Terazol 3
tioconazole *tee-o-kon'-a-zole*	Monistat 1, Vagistat-1

including fever, shaking, chills, headache, malaise, anorexia, joint and muscle pain, abnormal renal function, nausea, vomiting, and anemia. This drug is given parenterally, usually for a period of several months. Its use is reserved for serious and potentially life-threatening fungal infections. Some of these adverse reactions may be lessened by use of aspirin, antihistamines, or antiemetics.

Fluconazole

Administration may result in nausea, vomiting, headache, diarrhea, abdominal pain, and skin rash. Abnormal liver function tests may be seen and may require follow-up tests to determine if liver function has been affected.

Flucytosine

Administration may result in nausea, vomiting, diarrhea, rash, anemia, leukopenia, and thrombocytopenia. Signs of renal impairment include elevated blood urea nitrogen (BUN) and serum creatinine levels. Periodic renal function tests are usually performed during therapy.

Griseofulvin

Administration may result in a hypersensitivity-type reaction that includes rash and urticaria. Nausea, vomiting, oral thrush, diarrhea, and headache also may be seen.

Itraconazole

The most common adverse reactions are nausea, vomiting, and diarrhea. On occasion, severe hypokalemia (low potassium level) has occurred in patients receiving 600 mg or more of the drug on a daily basis. Hepatotoxicity is a possibility with itraconazole administration.

Ketoconazole

This drug is usually well tolerated, but nausea, vomiting, headache, dizziness, abdominal pain, and pruritus may be seen. Most adverse reactions are mild and transient. On rare occasions, hepatic toxicity may be seen, and use of the drug must be discontinued immediately. Periodic hepatic function tests are recommended to monitor for hepatic toxicity.

Miconazole

Administration of miconazole for a vulvovaginal fungal infection may cause irritation, sensitization, or vulvovaginal burning. Skin irritation may result in redness, itching, burning, or skin fissures. Other adverse reactions with miconazole include cramping, nausea, and headache. Adverse reactions associated with topical use are usually not severe.

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Amphotericin B

Amphotericin B is contraindicated in patients with a history of allergy to the drug and during lactation. It is used cautiously in patients with renal dysfunction, electrolyte imbalances, and in combination with antineoplastic drugs (because it can cause severe bone marrow suppression). This drug is a Pregnancy Category B drug and is used during pregnancy only when the situation is life threatening. When given with the corticosteroids, severe hypokalemia may occur. There may be an increased risk of digitalis toxicity if digoxin is administered concurrently with amphotericin B. Administration with nephrotoxic drugs (eg, aminoglycosides or cyclosporine) may increase the risk of nephrotoxicity in patients also taking amphotericin B. Amphotericin B decreases the effects of miconazole. Amphotericin B is given only under close supervision in the hospital setting.

Fluconazole

Fluconazole is contraindicated in patients with known hypersensitivity to the drug. The drug is used cautiously in patients with renal impairment and during pregnancy (Category C) and lactation. The drug is given during pregnancy only if the benefit of the drug clearly outweighs any possible risk to the infant. When fluconazole is administered with oral hypoglycemics, there is an increased effect of the oral hypoglycemics.

Fluconazole may decrease the metabolism of phenytoin and warfarin.

Flucytosine

Flucytosine is contraindicated in patients with known hypersensitivity to the drug. Flucytosine is used cautiously in patients with bone marrow depression and with extreme caution in those with renal impairment. The drug is also used cautiously during pregnancy (Category C) and lactation. When flucytosine and amphotericin B are administered concurrently, the risk of flucytosine toxicity is increased.

Griseofulvin

Griseofulvin is contraindicated in patients with known hypersensitivity to the drug and in those with severe liver disease. This drug is used cautiously during pregnancy (Category C) and lactation. It is important to use caution when administering concurrently with penicillin because there is a possibility of cross-sensitivity. When griseofulvin is administered with warfarin, the anticoagulant effect may be decreased. When administered with the barbiturates the effect of griseofulvin may be decreased. A decrease in the effects of oral contraceptives may occur with griseofulvin therapy, causing breakthrough bleeding, pregnancy, or amenorrhea. Blood salicylate concentrations may be decreased when the salicylates are administered with griseofulvin.

Itraconazole

Itraconazole is contraindicated in patients with a known hypersensitivity to the drug. The drug is used cautiously in patients with hepatitis, those with human immunodeficiency virus, impaired liver function, and in pregnant women (Pregnancy Category C). In patients with hypochlorhydria, the absorption of itraconazole is decreased. Multiple drug interactions occur with itraconazole. Itraconazole elevates blood concentrations of digoxin and cyclosporine. Phenytoin decreases blood levels of itraconazole and alters the metabolism of phenytoin. Histamine antagonists, isoniazid, and rifampin decrease plasma levels of itraconazole. There is an increased anticoagulant effect when warfarin is administered concurrently with itraconazole.

Ketoconazole

Ketoconazole is contraindicated in patients with known hypersensitivity to the drug. Ketoconazole is used cautiously in patients with hepatic impairment, those who are pregnant (Category C), and during lactation. The absorption of ketoconazole is impaired when the drug is taken with histamine antagonists and antacids. Ketoconazole enhances the anticoagulant effect of warfarin and causes an additive hepatotoxicity when given with other hepatotoxic drugs and alcohol. Administration of ketoconazole with rifampin or isoniazid may decrease the blood levels of ketoconazole.

Miconazole

Miconazole is contraindicated in patients with known hypersensitivity to the drug. The drug is given cautiously in cases of chronic or recurrent candidiasis. With recurrent or chronic candidiasis the patient may have underlying diabetes. Recurrent or chronic candidiasis requires an evaluation for diabetes. The drug is used cautiously during pregnancy (Category C). If used during pregnancy, a vaginal applicator may be contraindicated. Manual insertion of the vaginal tablets may be preferred. Because small amounts of these drugs may be absorbed from the vagina, the drug is used during the first trimester only when essential.

NURSING PROCESS

The Patient Receiving an Antifungal Drug

ASSESSMENT

Preadministration Assessment

Information gathered before the administration of the first dose establishes a database for comparison during therapy. In performing the preadministration assessment before giving the first dose of an antifungal drug, the nurse assesses the patient for signs of the infection. The nurse inspects for superficial fungal infections of the skin or skin structures (eg, hair, nails) and describes them on the patient's record. The nurse carefully documents any skin lesions, such as rough itchy patches, cracks between the toes, and sore and reddened areas, to obtain an accurate database. It also is important to describe any vaginal discharge or white plaques or sore areas of the mucous membranes. The nurse takes and records vital signs. The nurse weighs the patient scheduled to receive amphotericin or flucytosine because the dosage of the drug is determined according to the patient's weight.

Ongoing Assessment

The ongoing assessment involves careful observation of the patient every 2 to 4 hours for adverse drug reactions when the antifungal drug is given by the oral or parenteral route. When these drugs are applied topically to the skin, the nurse inspects the area at the time of each application for localized skin reactions. When these drugs are administered vaginally, the nurse questions the patient regarding any discomfort or other sensations

experienced after insertion of the antifungal preparation. The nurse notes improvement or deterioration of lesions of the skin, mucous membranes, or vaginal secretions in the chart. It is important for the nurse to evaluate and chart the patient's response to therapy daily.

NURSING DIAGNOSES

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

PLANNING

The expected outcomes for the patient depend on the reason for administration of the antifungal drug but may include a therapeutic response to the antifungal drug, management of adverse reactions, and an understanding of and compliance with the prescribed treatment regimen.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

Superficial and deep fungal infections respond slowly to antifungal therapy. Many patients experience anxiety and depression over the fact that therapy must continue for a prolonged time. Depending on the method of treatment, patients may be faced with many problems during therapy and therefore need time to talk about problems as they arise. Examples of problems are the cost of treatment, hospitalization (when required), the failure of treatment to adequately control the infection, and loss of income. The nurse must help the patient and the family to understand that therapy must be continued until the infection is under control. In some cases, therapy may take weeks or months.

DISTURBED BODY IMAGE. The lesions caused by the fungal infections may cause the patient to feel negatively about the body or a body part. It is important for the nurse to develop a therapeutic nurse–patient relationship that conveys an attitude of caring and develops a sense of trust. The nurse listens to the patient's concerns and assists the patient in accepting the situation as temporary. The nurse encourages the patient to verbalize any feelings or anxiety about the effect of the disorder on body image. The nurse explains the disorder and the treatment regimen in terms the patient can understand and discusses the need at times for long-term treatment to eradicate the infection.

RISK FOR INEFFECTIVE TISSUE PERFUSION: RENAL. When the patient is taking a drug that is potentially toxic to the kidneys, the nurse must carefully monitor fluid intake and output. In some instances, the nurse may need to perform hourly measurements of the urinary output. Periodic laboratory tests are usually ordered to monitor the patient's response to therapy and to detect toxic drug reactions. Serum creatinine levels and BUN levels are checked frequently during the course of therapy to monitor kidney function. If the BUN exceeds 40 mg/dL or if the serum creatinine level exceeds 3 mg/dL, the primary health care provider may discontinue the drug therapy or reduce the dosage until renal function improves.

IMPAIRED SKIN INTEGRITY AND RISK FOR INFECTION. Many fungal infections are associated with lesions that are at risk for infection. The nurse monitors the patient's temperature, pulse, respirations, and blood pressure every 4 hours or more often if needed. The nurse inspects for superficial fungal infections of the skin or skin structures (eg, hair, nails) and describes them on the patient's record. The nurse carefully documents any skin lesions, such as rough itchy patches, cracks between the toes, and sore and reddened areas. The nurse checks the skin for localized signs of infection (ie, increased redness or swelling). The nurse monitors the skin lesions daily, describing lesions and any changes observed. It is important that the nurse note any improvement or healing of the lesions. Gloves are used when caring for open lesions to minimize autoinoculation or transmission of the disease.

Nursing Diagnoses Checklist

Drug-specific nursing diagnoses are listed below. Depending on the drug, dose, and reason for administration, one or more of the following nursing diagnoses may apply to a person receiving an antifungal drug:

- ✓ **Disturbed Body Image** related to changes in skin and mucous membranes
- ✓ **Risk for Ineffective Tissue Perfusion: Renal** related to adverse reactions of the antifungal drug
- ✓ **Risk for Infection** related to the presence of skin lesions
- ✓ **Impaired Skin Integrity** related to the presence of skin lesions

Administering Specific Antifungal Drugs

AMPHOTERICIN B. The nurse administers this drug daily or every other day over several months. The patient is often acutely ill with a life-threatening deep fungal infection. The nurse should reconstitute the drug according to the manufacturer's instructions. Sterile water is used for reconstitution because any other diluent may cause precipitation. Immediately after the drug is reconstituted, the nurse administers the IV infusion over a period of 6 hours or more.

The manufacturer recommends that the IV solution be protected from exposure to light. It is a good idea to wrap a brown paper bag or aluminum foil around the

infusion bottle after reconstitution of the powder and during administration of the solution. Although solutions of amphotericin B are light sensitive, research indicates that if used within 8 hours, there is negligible loss of drug activity. Because the solution decomposes slowly, it is probably not necessary to protect the container from light if the drug is used within 8 hours of reconstitution. The nurse should consult the primary health care provider or hospital pharmacist regarding whether or not to use a protective covering for the infusion container.

The nurse checks the IV infusion rate and the infusion site frequently during administration of the drug. This is especially important if the patient is restless or confused.

On occasion amphotericin B may be administered as an oral solution for oral candidiasis. The patient is instructed to swish and hold the solution in the mouth for several minutes (or as long as possible) before swallowing. The oral solution may be used for as long as 2 weeks.

FLUCONAZOLE. The drug may be administered orally or intravenously. Initially the patient receives 200 to 400 mg, followed by 100 to 200 mg per day for at least 14 days. When given as a continuous infusion, the drug is infused at a maximum rate of 200 mg per hour. When administering IV do not remove the overwrap until ready to use. The nurse tears the overwrap down the side at the slit and removes the solution container. When administering IV, the nurse must follow the manufacturer's directions regarding removal of the wrapping around the container. It is important not to administer solution that is cloudy or contains precipitate. The nurse then checks the bag for minute leaks by squeezing firmly. The solution is discarded if any leaks are found.

FLUCYTOSINE. The nurse gives flucytosine orally. The prescribed dose may range from 2 to 6 capsules/dose. To decrease or avoid nausea and vomiting, the capsules may be taken a few at a time during a 15-minute period.

GRISEOFULVIN. This drug is given orally as a single dose or in two to four divided doses. Prolonged therapy is usually needed to eradicate the fungus.

KETOCONAZOLE. This drug is given with food to minimize gastrointestinal irritation. Tablets may be crushed. Ketoconazole is absorbed best in an acid environment. Do not administer antacids, anticholinergics, or histamine blockers until at least 2 hours after ketoconazole is given.

ITRACONAZOLE. Give the drug orally with food to increase absorption. When administering IV, use only components provided by the manufacturer for reconstitution. Do not dilute with any other diluent. The drug is infused during a period of 60 minutes. Doses greater than 200 mg are given in 2 divided dosages.

MICONAZOLE. This drug is self-administered on an outpatient basis. See Patient and Family Education for information to give to the patient concerning this drug.

Monitoring and Managing Adverse Reactions

AMPHOTERICIN B. Fever (sometimes with shaking chills) may occur within 15 to 20 minutes of initiation of the treatment regimen. It is important to monitor the patient's temperature, pulse, respirations, and blood pressure carefully during the first 30 minutes to 1 hour of treatment. The nurse should monitor vital signs every 2 to 4 hours during therapy, depending on the patient's condition.

The nurse must carefully monitor fluid intake and output because this drug may be nephrotoxic (harmful to the kidneys). In some instances, the nurse may need to perform hourly measurements of the urinary output. Periodic laboratory tests are usually ordered to monitor the patient's response to therapy and detect toxic drug reactions.

Nursing Alert

Renal damage is the most serious adverse reaction with the use of amphotericin B. Renal impairment usually improves with modification of dosage regimen (reduction of dosage or increasing time between dosages). Serum creatinine levels and BUN levels are checked frequently during the course of therapy to monitor kidney function. If the BUN exceeds 40 mg/dL or if the serum creatinine level exceeds 3 mg/dL, the primary health care provider may discontinue the drug or reduce the dosage until renal function improves.

FLUCONAZOLE. Because older adults are more likely to have decreased renal function, they are at increased risk for further renal impairment or renal failure.

Gerontological Alert

Before administering this drug to an elderly patient or one that has renal impairment, the primary health care provider may order a creatinine clearance. The initial dose is 50 to 100 mg PO or IV, depending on the results of the creatinine clearance. The nurse reports the laboratory results to the primary health care provider because dosage adjustments may be made on the results of the creatinine clearance.

FLUCYTOSINE. To reduce the incidence of gastrointestinal distress, the nurse may give the capsules one or two at a time during a 15-minute period. If gastrointestinal distress still occurs, the nurse should notify the primary health care provider. Before therapy is begun, electrolytes, hematological status, and renal status are

Home Care Checklist

USING TOPICAL ANTIFUNGAL AGENTS

Often patients are required to apply topical drugs for fungal infections of the skin. A majority of the adverse effects that occur with topical drugs are a result of applying the drug improperly. Typically, if applied correctly, the drug usually is not systemically absorbed. However, many times, patients think that if a little or some is good, then "more is better." Applying more than the amount necessary increases the patient's risk for systemic absorption. To ensure that the patient applies the topical antifungal drug properly, the nurse includes the following points in the teaching plan:

- ☑ Gather all necessary supplies and wash hands before starting.
- ☑ Wash the area first to remove any debris and old drug.
- ☑ Pat the area dry with a clean cloth.
- ☑ Open the container (or tube) and place the lid or cap upside down on the counter or surface.
- ☑ Use a tongue blade, gloved finger (either with a nonsterile gloved hand or finger cot), cotton swab, or gauze pad to remove the drug, then apply it to the skin.
- ☑ Wipe the drug onto the affected area using long smooth strokes in the direction of hair growth.
- ☑ Apply a thin layer of drug to the area (more is *not* better).
- ☑ Use a new tongue blade, applicator, or clean gloved finger to remove additional drug from the container (if necessary).
- ☑ Apply a clean, dry dressing (if appropriate) over the area.

determined. Renal impairment can cause accumulation of the drug.

ITRACONAZOLE. Although rare, the patient may develop hepatitis during itraconazole administration. The nurse closely monitors the patient for signs of hepatitis, including anorexia, abdominal pain, unusual tiredness, jaundice, and dark urine. The primary health care provider may order periodic liver function tests.

Educating the Patient and Family

If the patient is being treated with topical antifungal drugs, the nurse includes the following points in the teaching plan (see Home Care Checklist: Using Topical Antifungal Drugs):

- Clean the involved area and apply the ointment or cream to the skin as directed by the primary health care provider.
- Do not increase or decrease the amount used or the number of times the ointment or cream should be applied unless directed to do so by the primary health care provider.
- During treatment for a ringworm infection, keep towels and facecloths used for bathing separate from those of other family members to avoid the spread of the infection. It is important to keep the affected area clean and dry.

Drug-specific teaching points include:

- Flucytosine: Nausea and vomiting may occur with this drug. Reduce or eliminate these effects by taking a few capsules at a time during a 15-minute period. If nausea, vomiting, or diarrhea persists, notify the primary health care provider as soon as possible.
- Griseofulvin: Beneficial effects may not be noticed for some time; therefore, take the drug for the full course of therapy. Avoid exposure to sunlight and sunlamps because an exaggerated skin reaction (which is similar to a severe sunburn) may occur even after a brief exposure to ultraviolet light. Notify the primary health care provider if fever, soar throat, or skin rash occurs.
- Ketoconazole: Complete the full course of therapy as prescribed by the primary health care provider. Do not take this drug with an antacid. In addition, avoid the use of nonprescription drugs unless use of a specific drug is approved by the primary health care provider. This drug may produce headache,

dizziness, and drowsiness. If drowsiness or dizziness should occur, observe caution while driving or performing other hazardous tasks. Notify the primary health care provider if abdominal pain, fever, or diarrhea becomes pronounced.

- Itraconazole: The drug is taken with food. Therapy will continue for at least 3 months until infection is controlled. Report unusual fatigue, yellow skin, darkened urine, anorexia, nausea, and vomiting.
- Miconazole: If the drug (cream or tablet) is administered vaginally, insert the drug high in the vagina using the applicator provided with the product. Wear a sanitary napkin after insertion of the drug to prevent staining of the clothing and bed linen. Continue taking the drug during the menstrual period if vaginal route is being used. Do not have intercourse while taking this drug, or advise the partner to use a condom to avoid reinfection. To prevent recurrent infections, avoid nylon and tight-fitting garments. If there is no improvement in 5 to 7 days, stop using the drug and consult a primary care provider because a more serious infection may be present. If abdominal pain, pelvic pain, rash, fever, or offensive-smelling vaginal discharge is present, do not use the drug, but notify the primary health care provider.

EVALUATION

- The therapeutic effect occurs and signs and symptoms of infection improve.
- Optimal skin integrity is maintained.
- Adverse reactions are identified, reported to the primary health care provider, and managed through appropriate nursing interventions.
- The patient and family demonstrate an understanding of the drug regimen.
- The patient verbalizes the importance of complying with the prescribed treatment regimen.

● *Critical Thinking Exercises*

1. *A nurse is preparing to administer amphotericin B to a patient with a systemic mycotic infection. This is the first time the nurse has administered amphotericin B. Determine what information the nurse should be aware of concerning the administration of this drug. Explain your answer.*
2. *Mr. Harding, age 35 years, has received a diagnosis of a fungal infection. The primary health care provider has prescribed a topical antifungal drug. Develop a teaching plan concerning the application of a topical antifungal drug.*

● *Review Questions*

1. Mr. Carr is receiving amphotericin B for a systemic fungal infection. Which of the following would most likely indicate to the nurse that Mr. Carr is experiencing an adverse reaction to amphotericin B?
   - **A.** fever and chills
   - **B.** abdominal pain
   - **C.** drowsiness
   - **D.** flushing of the skin
2. Which of the following laboratory tests would the nurse monitor in patients receiving flucytosine?
   - **A.** liver function tests
   - **B.** complete blood count
   - **C.** renal functions tests
   - **D.** prothrombin levels
3. The nurse monitors a patient taking itraconazole for the most common adverse reaction, which is _____.
   - **A.** nausea
   - **B.** hypokalemia
   - **C.** irregular pulse
   - **D.** confusion
4. The nurse would withhold griseofulvin if the patient has _____.
   - **A.** anemia
   - **B.** respiratory disease
   - **C.** had a recent myocardial infarction
   - **D.** severe liver disease

● *Medication Dosage Problems*

1. A patient weighs 140 pounds. If amphotericin B 1.5 mg/kg per day is prescribed, what is the total daily dosage of amphotericin B for this patient?
2. The primary care provider has prescribed fluconazole 200 mg PO initially, followed by 100 mg PO daily. On hand are fluconazole 100-mg tablets. What would the nurse administer as the initial dose?