

CHAPTER 40

Antifungal Agents

NDEG 26A – Pharmacology I
Eliza Rivera-Mitu, RN, MSN

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Antifungal Agents: Definition

Drugs used to treat infections caused by fungi

- Systemic
- Topical

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Fungi

- Very large and diverse group of microorganisms
- Broken down into yeasts and molds
- Fungal infections also known as *mycoses*
- Some fungi are part of the normal flora of the skin, mouth, intestines, vagina

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Yeasts

- Single-cell fungi
- Reproduce by budding
- Can be used for
 - Baking
 - Alcoholic beverages

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Molds

- Multicellular
- Characterized by long, branching filaments called hyphae

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Mycotic Infections

Four general types

- Cutaneous
- Subcutaneous
- Superficial
- Systemic*

*Can be life threatening

*Usually occur in immunocompromised host

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Mycotic Infections (cont'd)

Candida albicans

- Due to antibiotic therapy, antineoplastics, or immunosuppressants (corticosteroids)
- May result in overgrowth and systemic infections

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Mycotic Infections (cont'd)

In the mouth

- Oral candidiasis or thrush
- Newborn infants and immunocompromised patients

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Mycotic Infections (cont'd)

Vaginal candidiasis

- “Yeast infection”
- Pregnancy, diabetes mellitus, oral contraceptives

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Antifungal Agents

Systemic

- amphotericin B, fluconazole, ketoconazole, itraconazole

Topical

- Examples: clotrimazole, miconazole, nystatin

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Antifungal Agents (cont'd)

Broken down into major groups based on their mechanisms of action

- Polyenes: amphotericin B and nystatin
- Flucytosine
- Imidazoles: ketoconazole, miconazole, clotrimazole, fluconazole
- Griseofulvin
- Allylamine: terbinafine

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Mechanism of Action

Polyenes: amphotericin B and nystatin

- Bind to sterols in cell membrane lining
- Result: fungal cell death
- Do not bind to human cell membranes or kill human cells

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Mechanism of Action (cont'd)

Flucytosine

- Also known as 5-fluorocytosine (antimetabolite)
- Taken up by fungal cells and interferes with DNA synthesis
- Result: fungal cell death

Mosby Items and derived items © 2005, 2002 by Mosby, Inc.

Mechanism of Action (cont'd)

Imidazoles: ketoconazole, miconazole, clotrimazole, fluconazole

- Inhibit an enzyme, resulting in cell membrane leaking
- Lead to altered cell membrane
- Result: fungal cell death

Mosby Items and derived items © 2005, 2002 by Mosby, Inc.

Mechanism of Action (cont'd)

Griseofulvin

- Disrupts cell division
- Result: inhibited fungal mitosis (reproduction)

Mosby Items and derived items © 2005, 2002 by Mosby, Inc.

Indications

- Systemic and topical fungal infections
- *Agent of choice for the treatment of many severe systemic fungal infections is amphotericin B
- Choice of agent depends on type and location of infection

Mosby Items and derived items © 2005, 2002 by Mosby, Inc.

TABLE 40-1 MYCOTIC INFECTIONS					
Mycosis	Fungus	Endemic Location	Reservoir	Transmission	Primary Tissue Affected
SYSTEMIC INFECTION					
Aspergillosis	<i>Aspergillus</i> spp.	Universal	Soil	Inhalation	Lungs
Blastomycosis	<i>Blastomyces dermatitidis</i>	North America	Soil, animal droppings	Inhalation	Lungs
Coccidioidomycosis	<i>Coccidioides immitis</i>	Southwestern United States	Soil, dust	Inhalation	Lungs
Cryptococcosis	<i>Cryptococcus neoformans</i>	Universal	Soil, pigeon droppings	Inhalation	Lungs/meninges of brain
Histoplasmosis	<i>Histoplasma capsulatum</i>	Universal	Soil, bird and chicken droppings	Inhalation	Lungs
CUTANEOUS INFECTION					
Candidiasis	<i>Candida albicans</i>	Universal	Humans	Direct contact, non-susceptible antibiotic overgrowth	Mucous membrane skin disseminated (may be systemic)
Dermatophytes, tinea	<i>Epidermophyton</i> spp., <i>Microsporum</i> spp., <i>Trichophyton</i> spp.	Universal	Humans	Direct and indirect contact with infected persons	Scalp, skin
SUPERFICIAL INFECTION					
Tinea versicolor	<i>Malassezia furfur</i>	Universal	Humans	Unknown*	Skin
<small>*Malassezia spp. are a usual part of the normal human flora and appear to cause infection in only select individuals.</small>					

Table 40-1 Mycotic Infections

Mosby Items and derived items © 2005, 2002 by Mosby, Inc.

Side Effects: Amphotericin B

“shake and bake”

- Fever
- Headache
- Malaise
- Hypotension
- Muscle and joint pain
- Lowered potassium and magnesium levels
- Chills
- Dysrhythmias
- Nausea
- Anorexia

Mosby Items and derived items © 2005, 2002 by Mosby, Inc.

Side Effects: Amphotericin B (cont'd)

- Main concerns:
 - *Renal toxicity
 - *Neurotoxicity: seizures and paresthesias

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Antifungal Agents: Side Effects (cont'd)

Fluconazole

- nausea, vomiting, diarrhea, stomach pain,
- increased liver function studies

Flucytosine

- nausea, vomiting, anorexia, headache, dizziness, others

Griseofulvin

- rash, urticaria, headache, nausea, vomiting, anorexia, others

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Antifungal Agents: Nursing Implications

- Before beginning therapy, assess for hypersensitivity, possible contraindications, and conditions that require cautious use
- Obtain baseline VS, CBC, liver function studies, and ECG
- Assess for other medications used (prescribed and OTC) in order to avoid drug interactions

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Nursing Implications

- Follow manufacturer's directions carefully for reconstitution and administration
- Monitor VS of patients receiving IV infusions every 15 to 30 minutes
- During IV infusions, monitor I&O and urinalysis findings to identify adverse renal effects

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Nursing Implications

Amphotericin B

- To reduce the severity of the infusion-related reactions, pretreatment with an antipyretic (acetaminophen), antihistamines, and antiemetics may be given
- A test dose of 1 mg per 20 mL 5% dextrose in water infused over 30 minutes should be given
- Use IV infusion pumps and the most distal veins possible

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Nursing Implications

- Tissue extravasation of fluconazole at the IV site may lead to tissue necrosis—monitor IV site carefully
- Oral forms of griseofulvin should be given with meals to decrease GI upset
- Monitor carefully for side/adverse effects

Mosby items and derived items © 2005, 2002 by Mosby, Inc.

Nursing Implications

Monitor for therapeutic effects

- Easing of the symptoms of infection
- Improved energy levels
- Normal vital signs, including temperature