Antifungal Agents

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- Antifungal agents treat fungal infections by targeting the cell wall, cell membrane, or intracellular components to inhibit fungal growth.

Mechanisms of Action

1. Cell Wall-Targeting Agents

- Inhibit beta-glucan synthesis, weakening the fungal cell wall.
- **Examples:** Echinocandins (**caspofungin, anidulafungin**).

2. Cell Membrane-Targeting Agents

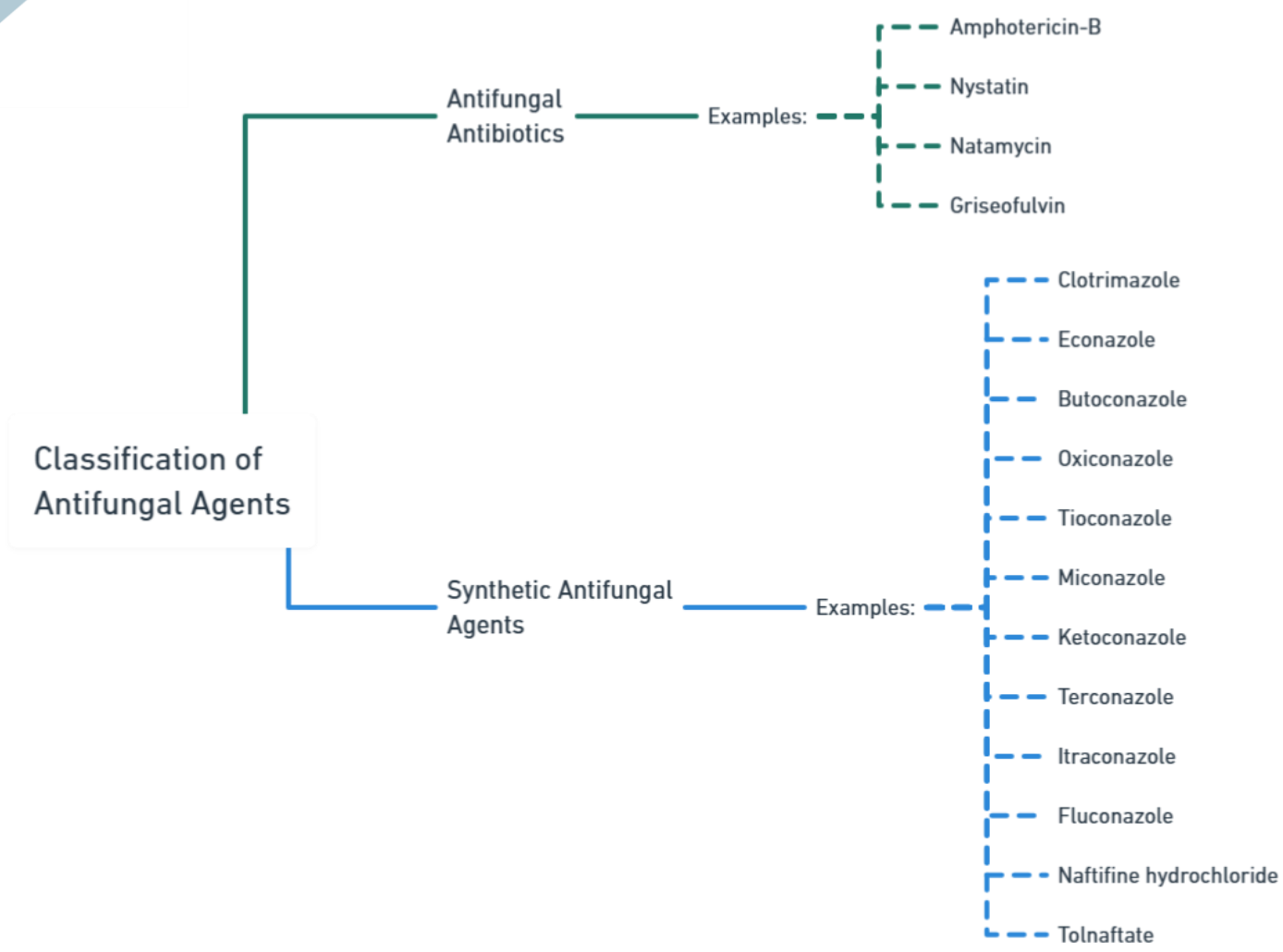
- Disrupt ergosterol synthesis, compromising membrane integrity.
- **Examples:**
  - **Azoles:** Fluconazole, Itraconazole.
  - **Polyenes:** Amphotericin B.

3. Intracellular Component-Targeting Agents

- Inhibit **nucleic acid synthesis** (e.g., **flucytosine**) or **cell wall synthesis** (e.g., **terbinafine**).

Classification of Antifungal Agents

They can be broadly classified into two categories:



1. Antifungal Antibiotics:

- These are naturally derived antifungal agents produced by microorganisms.
- **Examples include:**
  - Amphotericin-B
  - Nystatin
  - Natamycin
  - Griseofulvin

2. Synthetic Antifungal Agents:

- These are chemically synthesized antifungal drugs used for various fungal infections.
- **Examples include:**
  - Clotrimazole
  - Econazole
  - Butoconazole
  - Oxiconazole
  - Tioconazole

- Miconazole*
- Ketoconazole
- Terconazole
- Itraconazole
- Fluconazole
- Naftifine hydrochloride
- Tolnaftate

Brand Names Of Important Marketed Products

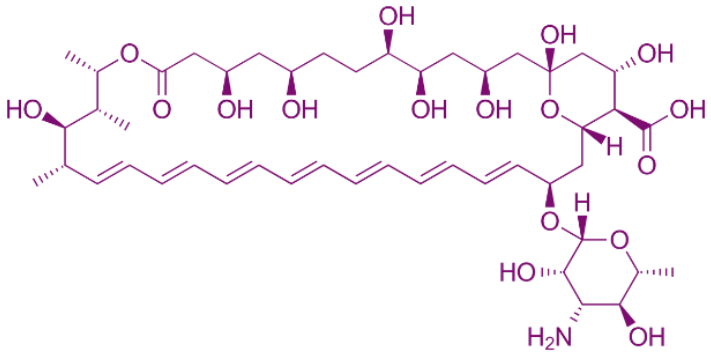
- Used to treat fungal infections of skin, nails, mucosa, and systemic infections.

Drug Name	Brand Name(s)	Formulation	Use
Clotrimazole	**Candid, Canesten**	Cream, Tablet	Vaginal and skin candidiasis
Ketoconazole	**Nizoral, Ketocon**	Cream, Shampoo	Dandruff, skin infections
Fluconazole	**Diflucan, Forcan, Zocon**	Tablet, Injection	Systemic & mucosal candidiasis
Itraconazole	**Sporanox, Canditral**	Capsule, Oral Solution	Deep mycoses
Terbinafine	**Lamisil, Sebifin**	Cream, Tablet	Tinea, Onychomycosis
Amphotericin B	**Fungizone, AmBisome**	IV Injection	Systemic mycoses
Griseofulvin	**Grisovin FP, Fulvicin**	Tablet	Tinea capitis/corporis
Nystatin	**Mycostatin, Nilstat**	Oral/Topical	Oral and vaginal candidiasis

Various Antifungal Antibiotics (Drugs)

1. Amphotericin B

Chemical Structure / Formula



- **Formula:** C47H73NO17
- **Structure:** A polyene macrolide with a hydrophilic and hydrophobic region.

Mechanism of Action

- Binds to **ergosterol** in fungal cell membranes, creating **pores** that lead to **leakage of ions (K+, Mg2+)**, causing fungal cell death.

Uses

- Systemic fungal infections:
  - Aspergillosis, Histoplasmosis, Cryptococcosis, Mucormycosis.
  - Candida infections (severe, invasive cases).

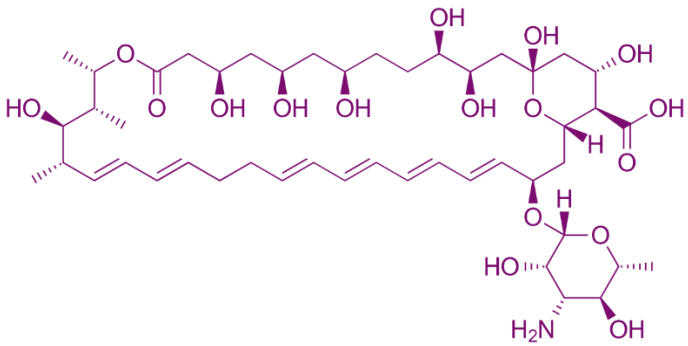
Side Effects

- Nephrotoxicity (dose-dependent, reversible).
- Infusion reactions (fever, chills, hypotension).
- Electrolyte imbalance (hypokalemia, hypomagnesemia**).**

2. Nystatin

Chemical Structure / Formula

- **Formula:** C47H75NO17
- **Structure:** A **polyene antifungal** similar to Amphotericin B.



Mechanism of Action

- Binds to **ergosterol**, disrupting fungal membrane integrity and causing **leakage of ions**.

Uses

- Topical and oral candidiasis (thrush, diaper rash, vaginal yeast infections).

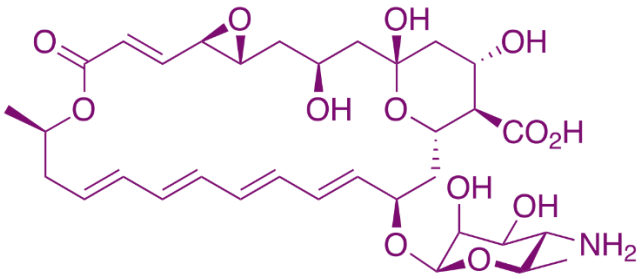
Side Effects

- Minimal with topical use.
- GI upset with oral use (nausea, vomiting, diarrhea).

3. Natamycin

Chemical Structure / Formula

- **Formula:** C33H47NO13
- **Structure:** A **polyene macrolide** with **tetrahydrofuran rings**.



Mechanism of Action

- Binds to **ergosterol**, altering fungal membrane permeability.

Uses

- Ophthalmic antifungal (fungal keratitis, conjunctivitis).

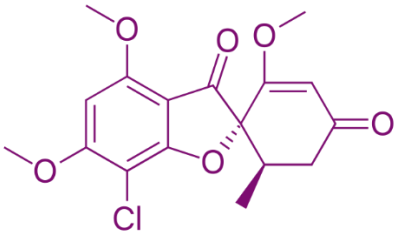
Side Effects

- Mild eye irritation, burning sensation.

4. Griseofulvin

Chemical Structure / Formula

- **Formula:** C17H17ClO6
- **Structure:** A **benzofuran derivative** with a **chlorinated ring system**.



Mechanism of Action

- Binds to fungal microtubules, inhibiting mitosis.
- Deposited in keratin-rich tissues (nails, skin, hair), preventing fungal growth.

Uses

- Dermatophytic infections (tinea, ringworm, athlete's foot, onychomycosis).

Side Effects

- Hepatotoxicity, GI upset, photosensitivity.
- Induces CYP450 (drug interactions).

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