

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 (**cas**pofungin, **anidula**fungin).

2. Cell Membrane-Targeting Agents

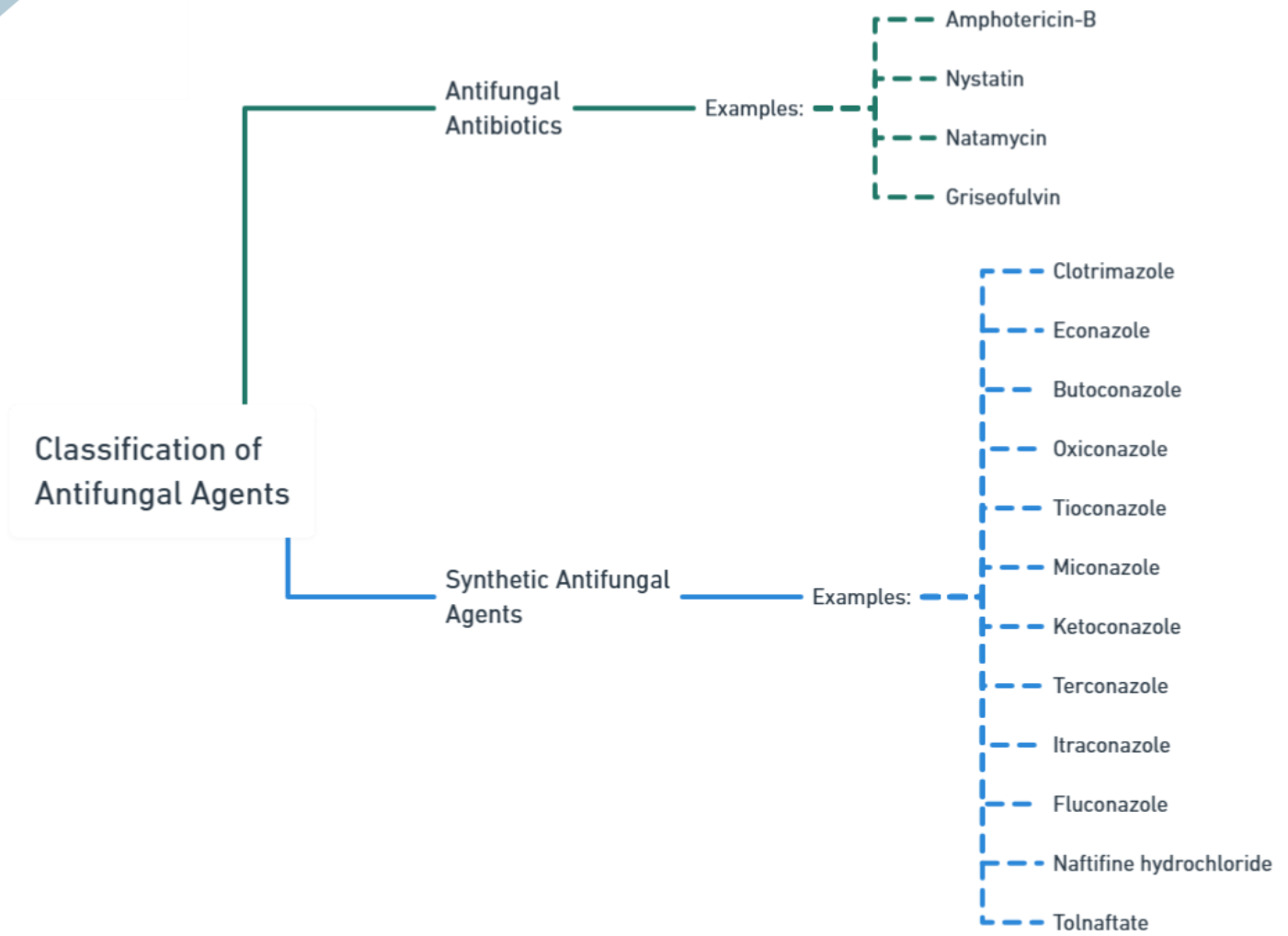
- Disrupt ergosterol synthesis, compromising membrane integrity.
- **Examples:**
 - **Azoles:** Fluconazole, Itraconazole.
 - **Polyenes:** Amphotericin B.

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)

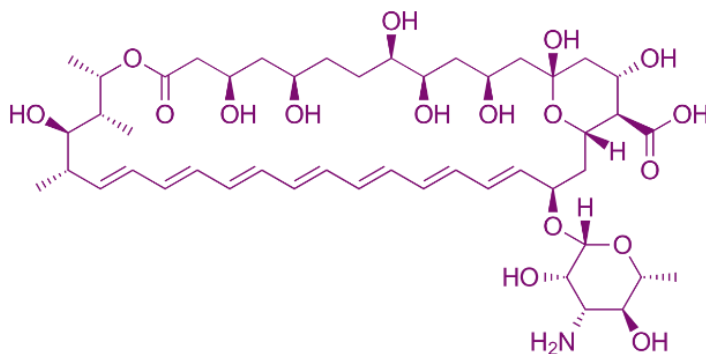
1. Amphotericin B

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).

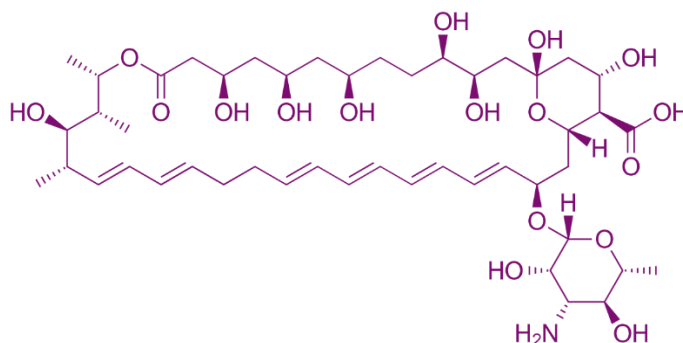
Side Effects

- 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).

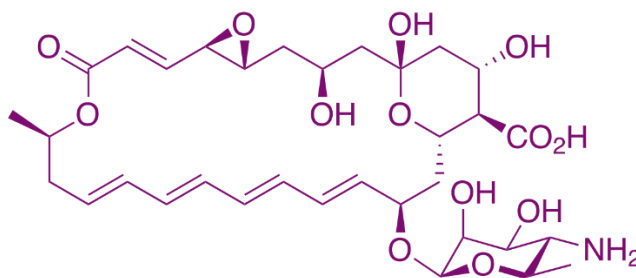
Side Effects

- 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).

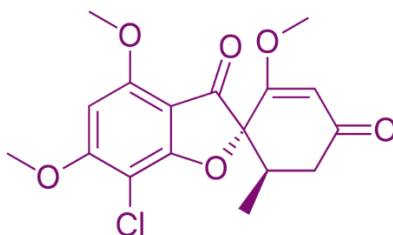
Side Effects

- 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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