NGN NCLEX 2026 · PHARMACOLOGY REFERENCE

Antifungal *Medications*

Pharmacology — Anti-Infectives · Fungal Therapy

Antifungals treat infections caused by fungi (yeasts, molds, dermatophytes). The two most-tested risks across all classes are **hepatotoxicity** (azoles, terbinafine, griseofulvin) and **nephrotoxicity + infusion reactions** with Amphotericin B. Master the drug-class signatures, the "shake-and-bake" pre-medication routine, and the patient teaching for swish-and-swallow, fatty meals, and full course completion.

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Definition & Overview

WHAT ANTIFUNGALS ARE & WHY THEY MATTER

- **Antifungals** kill or inhibit fungi — yeasts (Candida), molds (Aspergillus), and dermatophytes (tinea).
- Fungi share more biology with human cells than bacteria do — so antifungals are **more toxic** than most antibiotics.
- Treatment courses are **long** (weeks to months) — adherence and monitoring are central nursing concerns.
- The two most-tested risks: **hepatotoxicity** (azoles, terbinafine) and **nephrotoxicity + infusion reactions** (Amphotericin B).

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Pathophysiology (Simplified)

HOW THEY WORK — TARGET THE FUNGAL CELL

POLYENES (AMPHOTERICIN B, NYSTATIN)
Bind *ergosterol* in the fungal cell membrane → punch holes → cell leaks → fungal death.

↓

AZOLES (-AZOLE DRUGS)
Block ergosterol *synthesis* via fungal CYP450 → weak membrane → growth halts.

↓

ECHINOCANDINS (-FUNGIN DRUGS)
Block glucan synthesis → fungal *cell wall* falls apart.

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ALLYLAMINES (TERBINAFINE) & GRISEOFULVIN
Disrupt ergosterol synthesis earlier in pathway / block fungal mitosis.

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Common Fungal Infections You'll See

MATCH THE BUG TO THE DRUG

Candidiasis (Thrush, Vaginal, Invasive)

White plaques in mouth, vaginal yeast, bloodstream infection in immunocompromised. **Tx:** Nystatin (oral/topical), Fluconazole (systemic), Caspofungin (invasive).

Aspergillosis

Lung infection in immunocompromised (chemo, transplant). **Tx:** Voriconazole (1st line), Amphotericin B, Caspofungin.

Cryptococcosis

Meningitis in HIV/AIDS. **Tx:** Amphotericin B + Flucytosine, then Fluconazole maintenance.

Tinea (Ringworm, Athlete's Foot, Jock Itch)

Skin dermatophyte. **Tx:** Topical antifungals; Griseofulvin or Terbinafine (oral) for severe/scalp.

Onychomycosis (Nail Fungus)

Thick, discolored nails. **Tx:** Oral **Terbinafine** (Lamisil) — long course (6–12 weeks).

Histo / Blasto / Coccidio (Endemic mycoses)

Lung-based systemic infections (Ohio Valley, SW US). **Tx:** Itraconazole, Amphotericin B for severe.

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Pharmacology — The Key Drugs

CLASS · MECHANISM · SIDE EFFECTS · NURSING CONSIDERATIONS

Drug / Class	Use & Mechanism	Key Side Effects	Nursing Considerations
Amphotericin B *"Amphoterrible" · Polyene · IV*	Severe systemic fungal infections. Binds ergosterol → punches holes in fungal membrane.	"Shake & Bake" — fever, chills, rigors; **nephrotoxicity**, hypokalemia, hypomagnesemia, anemia, thrombophlebitis.	**Pre-medicate:** acetaminophen + diphenhydramine; meperidine for rigors. Infuse over 2–6 hr. Monitor BUN/Cr, K^+, Mg^{2+}. Liposomal form (AmBisome) is less toxic.
Fluconazole *Diflucan · Azole · PO/IV*	Candidiasis (vaginal, oral, systemic), cryptococcal meningitis maintenance.	**Hepatotoxicity**, GI upset, headache, rash. Many drug interactions via CYP450.	Monitor LFTs. Watch warfarin (↑ INR), statins (↑ rhabdo risk), phenytoin. Single 150 mg dose for uncomplicated vaginal thrush.
Ketoconazole *Nizoral · Azole · PO*	Systemic mycoses, dermatophytes.	**Hepatotoxicity** (black box), **gynecomastia**, ↓ testosterone, ↓ cortisol, QT prolongation.	Take **with food & acidic drink** (needs stomach acid). Avoid antacids/PPIs. Avoid alcohol. Monitor LFTs.
Itraconazole / Voriconazole *Azoles · PO/IV*	Aspergillus (voriconazole 1st line), endemic mycoses.	Hepatotoxicity, visual disturbances (voriconazole — **"seeing things"**), QT prolongation, peripheral edema (itraconazole).	Itraconazole: caps with food, solution on empty stomach. Voriconazole: photosensitivity — sunscreen.
Nystatin *Mycostatin · Polyene · Topical/PO susp.*	Oral and cutaneous **Candida** (thrush, diaper rash).	Minimal — not absorbed systemically. Mild GI if swallowed.	**"Swish & Swallow"** — hold in mouth 2 min, swallow. NPO 30 min after. For infants: swab inside cheeks with applicator.
Terbinafine *Lamisil · Allylamine · PO/topical*	Onychomycosis (nail fungus), tinea.	**Hepatotoxicity**, taste disturbance, GI upset, rare Stevens-Johnson.	Monitor LFTs at baseline & periodically. Long course (6–12 weeks). Teach to report jaundice, dark urine.
Griseofulvin *Grifulvin · PO*	Dermatophytes (tinea capitis, severe ringworm).	Photosensitivity, GI upset, headache, **disulfiram-like** reaction with alcohol.	**Give with HIGH-FAT meal** ↑ absorption. Avoid alcohol & sun. Long course (weeks–months). May ↓ effectiveness of oral contraceptives.
Caspofungin *Cancidas · Echinocandin · IV*	Invasive Candida & Aspergillus (resistant or AmphoB-intolerant).	Histamine-like infusion reaction (flush, rash), elevated LFTs, fever.	IV only — infuse over ~1 hr. Less nephrotoxic than Amphotericin B. Monitor LFTs.
Flucytosine *Ancobon · Antimetabolite · PO*	Combined with Amphotericin B for cryptococcal meningitis.	**Bone marrow suppression** (↓ WBC, ↓ platelets), GI, hepatotoxicity.	Monitor CBC, LFTs. Almost never used alone — synergy with AmphoB.

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Signs & Symptoms of Toxicity

WHAT TO WATCH FOR — CATCH IT EARLY

Early infusion / mild toxicity

- AmphoB: fever, chills, rigors, headache during infusion ("shake & bake")
- Azoles: mild GI upset, headache, rash
- Nystatin: bitter taste, mild GI if swallowed in large amounts

Severe / Late — REPORT IMMEDIATELY

- RED FLAG **Hepatotoxicity:** jaundice, dark urine, RUQ pain, ↑ AST/ALT (any azole, terbinafine, griseofulvin)
- RED FLAG **Nephrotoxicity:** ↓ urine output, ↑ BUN/Cr (AmphoB)
- RED FLAG **Hypokalemia / Hypomagnesemia:** dysrhythmias, weakness, tetany (AmphoB)
- RED FLAG **Bone marrow suppression:** fever, bruising, bleeding (flucytosine, AmphoB)
- RED FLAG **Stevens-Johnson / severe rash** (terbinafine, azoles)

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Priority Nursing Interventions

ABCS · SAFETY · NCLEX PRIORITIZATION

- **Assess** baseline vital signs, LFTs (AST/ALT/bilirubin), BUN/Cr, CBC, electrolytes (K^+, Mg^{2+}) before therapy and routinely during.
- **Pre-medicate** for Amphotericin B infusion: acetaminophen + diphenhydramine 30 min before; meperidine on hand for rigors.
- **Infuse** Amphotericin B slowly over **2–6 hours**; use an infusion pump; protect bag from light.
- **Monitor** intake & output, daily weight, and urine color with Amphotericin B (nephrotoxicity).
- **Administer** Nystatin "swish & swallow" — hold 2 min, then swallow; **NPO 30 min** after.
- **Teach** Griseofulvin with high-fat food; Ketoconazole with food & acidic drink; Voriconazole sunscreen.
- **Hold** drug & notify provider for jaundice, dark urine, ↓ UOP, fever, or severe rash.
- **Check** drug interactions — azoles + warfarin, statins, phenytoin, oral contraceptives.

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NCLEX Test Traps

WRONG CHOICE VS RIGHT CHOICE — DON'T GET CAUGHT

✕ WRONG / TEMPTING DISTRACTORS

- ✕ Starting Amphotericin B without premedication "to save time"
- ✕ Rinsing the mouth with water immediately after Nystatin swish-and-swallow
- ✕ Telling a client on Griseofulvin to take it on an empty stomach
- ✕ Giving Ketoconazole with an antacid or PPI to prevent GI upset
- ✕ Continuing Fluconazole without monitoring INR in a client on warfarin
- ✕ Treating AmphoB infusion fever as a "drug allergy" → discontinuing the drug
- ✕ Telling a tinea capitis client they'll feel better in 3 days and can stop early
- ✕ Reassuring a male client that Ketoconazole gynecomastia is "harmless cosmetic"

✓ CORRECT / PRIORITY ACTION

- ✓ Premedicate AmphoB with acetaminophen + diphenhydramine 30 min before infusion
- ✓ Have client hold Nystatin 2 min, swallow, then **NPO × 30 min**
- ✓ Teach Griseofulvin **WITH a high-fat meal** for absorption
- ✓ Take Ketoconazole with food & an **acidic** drink (e.g., cola); avoid antacids/PPIs
- ✓ Monitor INR closely and anticipate warfarin dose ↓ on azoles
- ✓ Recognize "shake & bake" as an expected infusion reaction → slow rate, premedicate
- ✓ Teach **full course completion** (weeks–months) even when symptoms resolve
- ✓ Report gynecomastia/changes — may indicate hormone effect requiring drug switch

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Patient & Family Education

WHAT TO TEACH BEFORE DISCHARGE

- **Complete the full course** — even when symptoms resolve. Fungal infections require weeks to months of therapy.
- **Take with food when indicated:** Griseofulvin (high-fat meal ↑ absorption); Ketoconazole (food + acidic drink); Itraconazole capsules with food.
- **Empty stomach when indicated:** Itraconazole solution; some Fluconazole regimens.
- **Nystatin:** Swish in mouth 2 minutes, then swallow. Do not eat or drink for 30 minutes after.
- **Avoid alcohol** with Griseofulvin (disulfiram-like reaction) and all azoles (↑ hepatotoxicity).
- **Photosensitivity:** Wear sunscreen and protective clothing with Voriconazole & Griseofulvin.
- **Report immediately:** jaundice, dark urine, RUQ pain, unusual bruising/bleeding, fever, severe rash, decreased urine output.
- **Drug interactions:** Tell every provider you're on an antifungal — major CYP450 interactions with warfarin, statins, anti-seizure drugs, oral contraceptives.
- **Use barrier contraception** while on Griseofulvin (and consider it with azoles) — OCPs may be less effective.
- **Hygiene for tinea:** Keep skin dry, don't share towels/combs; treat household members and pets if applicable.

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Memory Boosters & Mnemonics

PATTERN RECOGNITION FOR FAST RECALL

🔥 "SHAKE & BAKE" — Amphotericin B Infusion Reaction

S hivers · **H** igh fever · **A** che (headache) · **K** idneys hurt · **E** lectrolytes drop (K^+, Mg^{2+}). Premedicate with **Tylenol + Benadryl**; **meperidine** for rigors.

💊 "AMPHOTERRIBLE" — Why AmphoB Is the Worst

If you hear "Amphotericin," think **terrible to the kidneys, terrible to electrolytes, terrible during infusion**. Always pre-medicate. Always infuse slowly.

🦷 The "-AZOLES" — All Hit the Liver

FluconAZOLE, KetoconAZOLE, ItraconAZOLE, VoriconAZOLE → all **hepatotoxic**. Monitor LFTs. Avoid alcohol. Watch CYP450 drug interactions (warfarin, statins, OCPs).

👅 "SWISH, SWALLOW, STOP" — Nystatin Rule

SWISH 2 minutes · **SWALLOW** the dose · **STOP** eating and drinking for 30 minutes so the medication stays in contact with the lesions.

🍔 "GRISEO + GREASE = GO" — Griseofulvin Absorption

Griseofulvin needs **fat** to absorb. Take with a **high-fat meal** (whole milk, peanut butter, eggs). No alcohol. No sunshine without sunscreen.

👀 "VORI Makes You See Things"

Voriconazole causes **visual disturbances** (blurred vision, photophobia, color changes) — usually transient. Teach: don't drive until you know how it affects you.

🧠 The "-FUNGINs" Work on the Wall

CaspoFUNGIN, MicaFUNGIN, AnidulaFUNGIN → echinoCAN**DINS** destroy the fungal cell **WALL**. IV only. Safer than AmphoB but still watch LFTs.

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NCJMM Clinical Judgment Scenario

NEXT GENERATION CLINICAL JUDGMENT — SIX STEPS

SCENARIO: *A 58-year-old client with newly diagnosed cryptococcal meningitis is admitted for IV Amphotericin B and Flucytosine. Thirty minutes into the first AmphoB infusion, the client reports severe chills, a temperature of 102.4°F, shaking, and lower back discomfort. BP 138/82, HR 116, RR 22, SpO_2 96%. UOP over the past 4 hours: 90 mL.*

1 RECOGNIZE CUES

Fever 102.4°F, rigors, tachycardia, back pain during AmphoB infusion. Low UOP (≈22 mL/hr — borderline).

2 ANALYZE CUES

"Shake & bake" pattern matches an **expected AmphoB infusion reaction**. Low UOP raises concern for early **nephrotoxicity**. Back pain warrants ruling out hemolysis vs. simple rigor pain.

3 PRIORITIZE HYPOTHESES

#1 AmphoB infusion reaction · #2 Early nephrotoxicity · #3 Electrolyte shift (K^+, Mg^{2+}) → rule out dysrhythmia.

4 GENERATE SOLUTIONS

Slow the infusion · Administer ordered acetaminophen & diphenhydramine · Notify provider · Anticipate meperidine for rigors · Draw BUN/Cr, K^+, Mg^{2+} · Monitor I&O hourly.

5 TAKE ACTION

Slow infusion rate, give premedications as ordered, place client in semi-Fowler's, reassess VS q15 min, send labs, document fluid balance, prepare to give meperidine for persistent rigors.

6 EVALUATE OUTCOMES

Temp ↓ within 1 hr, rigors resolved, UOP ≥ 30 mL/hr maintained, K^+ and Mg^{2+} within range, infusion completed safely. Plan: schedule premedication 30 min before next dose & trend renal labs daily.