

MACROLIDE ANTIBIOTICS

Drug Class: Macrolides (Protein Synthesis Inhibitors) | **System:** Anti-Infective | **Prototype:** Erythromycin

Erythromycin

Azithromycin (Z-Pak)

Clarithromycin (Biaxin)

Fidaxomicin

NGN • NCJMM Aligned

1 DRUG OVERVIEW — WHY WE GIVE IT

- ▶ **Community-acquired pneumonia (CAP)** — covers typical + atypical pathogens
- ▶ **Atypical pneumonia:** Mycoplasma, Chlamydia pneumoniae, Legionella
- ▶ **Pertussis** (whooping cough) — azithromycin = 1st-line
- ▶ **Chlamydia trachomatis** — azithromycin 1 g PO × 1 dose
- ▶ **Strep pharyngitis / skin infections** in penicillin-allergic patients
- ▶ **H. pylori eradication** — clarithromycin in triple therapy
- ▶ **Acute COPD exacerbations & otitis media**
- ▶ **C. difficile** — fidaxomicin (narrow spectrum)

2 MECHANISM OF ACTION — SIMPLIFIED

Macrolide binds 50S ribosomal subunit → blocks protein synthesis → bacterial growth halts →
Bacteriostatic (bactericidal at high doses)

Spectrum: Gram-positive cocci + atypicals + some Gram-negative (H. influenzae, M. catarrhalis). Think “MACRO” = **M**ycoplasma, **A**typicals, **C**hlamydia, **R**espiratory, **O**titis.

3 THERAPEUTIC EFFECTS — “IS IT WORKING?”

- ▶ ↓ Fever & chills within 48–72 hours
- ▶ ↓ WBC count trending toward normal (4,500–11,000/mm³)
- ▶ Improved cough, sputum clearance, ↑ O₂ saturation
- ▶ ↓ CRP and procalcitonin
- ▶ Negative follow-up cultures
- ▶ Resolution of rash, ear pain, pharyngitis, or GU symptoms

4 SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- ▶ N/V/D — erythromycin = **worst GI**
- ▶ Abdominal cramping / epigastric pain
- ▶ Metallic taste (clarithromycin)
- ▶ Headache, dizziness
- ▶ Photosensitivity

SERIOUS 🚨

- ▶ **QT prolongation → Torsades** 🚨
- ▶ Hepatotoxicity / cholestatic jaundice
- ▶ Ototoxicity (high dose, prolonged)
- ▶ **C. difficile** pseudomembranous colitis
- ▶ SJS / TEN, anaphylaxis
- ▶ Infantile **pyloric stenosis** (erythromycin)

5 PRIORITY NURSING CONSIDERATIONS

- ▶ → **ASSESS** allergies (PCN, cephalosporin, prior macrolide reactions)
- ▶ → **MONITOR** 12-lead ECG / QTc (baseline & during therapy), LFTs, hearing, signs of superinfection (thrush, C. diff)
- ▶ → **HOLD** if QTc > 500 ms, new palpitations, jaundice, or severe diarrhea — **notify provider**
- ▶ → **NOTIFY** for rash, wheeze, angioedema, dark urine, bloody stools, syncope
- ▶ **Contraindications:** QT prolongation, severe hepatic impairment, myasthenia gravis, macrolide hypersensitivity, concurrent pimozide/ergotamines
- ▶ **Major Interactions (CYP3A4 inhibition — erythromycin & clarithromycin):** Warfarin (↑ INR/bleed), statins (**rhabdomyolysis**), digoxin, theophylline, carbamazepine, cyclosporine, benzodiazepines, other QT-prolonging drugs (amiodarone, fluoroquinolones, antipsychotics, methadone)
- ▶ **Azithromycin** has the **fewest CYP interactions** — often the safer choice in polypharmacy

6 LABS & DIAGNOSTICS

- ▶ **Cultures FIRST** (sputum, blood, GU) — then start empiric therapy
- ▶ **ECG / QTc** — baseline; critical if > 500 ms → **hold drug**
- ▶ **LFTs (ALT, AST, bilirubin)** — ↑ 3× baseline = hepatotoxicity
- ▶ **Electrolytes:** K⁺ (3.5–5.0) and Mg²⁺ (1.5–2.5) — low levels ↑ Torsades risk — correct BEFORE dosing
- ▶ **CBC** — watch ↑ WBC (infection) or eosinophilia (hypersensitivity)
- ▶ **BUN / Creatinine** — dose adjust in renal impairment (esp. clarithromycin)
- ▶ **Pregnancy test** — avoid clarithromycin & erythromycin estolate

7 ADMINISTRATION & SAFETY

- ▶ **Erythromycin:** PO with food to reduce GI upset (enteric-coated = empty stomach); IV infuse slowly — rapid push → phlebitis/hypotension
- ▶ **Azithromycin:** PO with or without food; IV **run ≥ 60 min**; separate from aluminum/magnesium antacids by 2 hours
- ▶ **Clarithromycin:** regular = with/without food; **XR = with food**; **do NOT crush ER**
- ▶ **Z-Pak dosing:** 500 mg day 1, then 250 mg days 2–5 (long half-life keeps working after last dose)
- ▶ Complete **full course** — stopping early → resistance
- ▶ Maintain hydration; monitor IV site; assess for thrombophlebitis

8 PATIENT EDUCATION

- ▶ Take at the **same time daily**; finish the entire prescription
- ▶ Report immediately: rash, hives, SOB, facial/tongue swelling, yellow skin/eyes, dark urine, **palpitations or fainting**, hearing changes
- ▶ **Severe or bloody diarrhea** (even weeks later) → call provider (C. diff — **do NOT** take anti-diarrheals)
- ▶ May ↓ effectiveness of **oral contraceptives** — use backup method for 7+ days
- ▶ Avoid **grapefruit juice** (erythromycin, clarithromycin)
- ▶ Use sunscreen — photosensitivity possible
- ▶ Probiotics (2 hrs apart from dose) may reduce GI distress
- ▶ Disclose **all meds** — warfarin, statins, digoxin, and heart meds matter most

9 NCLEX TEST TRAPS ⚠️

- ▶ **TRAP:** “PCN-allergic patient needs an antibiotic” — macrolide is correct, but check for **QT prolongation** first
- ▶ **TRAP:** Z-Pak is only 5 days — students pick “continue 10 days” (wrong). Long half-life = therapeutic long after last dose
- ▶ **TRAP:** Diarrhea dismissed as “normal” — bloody/watery/fever = **C. difficile** until proven otherwise
- ▶ **TRAP:** Clarithromycin in pregnancy — **avoid**; erythromycin base/ethylsuccinate safer. Erythromycin **estolate** is contraindicated (hepatotoxic)
- ▶ **TRAP:** Statin + clarithromycin → **rhabdomyolysis**; report muscle pain, dark urine, ↑ CK immediately
- ▶ **TRAP:** Warfarin + macrolide → ↑ INR → bleeding — priority is **monitor INR + assess for bleeding**
- ▶ **TRAP:** Infant on erythromycin with projectile vomiting → **pyloric stenosis**
- ▶ **TRAP:** Not effective for **viral** infections — flu/cold is a distractor answer

10 MEMORY BOOSTERS

- ▶ “**MACRO**” = **M**ycoplasma, **A**typicals, **C**hlamydia, **R**espiratory, **O**titis
- ▶ **The 3 C’s of Macrolide Toxicity:** **C**ardiac (QT/Torsades), **C**holestasis (liver), **C**. diff
- ▶ **Ending “-thromycin”** = macrolide family (except azithromycin — shortened)
- ▶ “**E-Z-C**” ranks interaction risk: **E**rythromycin > **C**larithromycin > **AZ**ithromycin (safest)
- ▶ “**Big Mac gives you Heart burn & a Heart beat**” → GI + QT effects
- ▶ **Z-Pak** = “**5 and done**” — 5 pills, 5 days, long tail action

CLINICAL JUDGMENT SNAPSHOT

1 #1 PRIORITY RISK

QT prolongation → Torsades de Pointes → cardiac arrest. Risk multiplies with hypokalemia, hypomagnesemia, or other QT-prolonging drugs (amiodarone, fluoroquinolones, antipsychotics, methadone).

2 WHAT WILL HARM THE PATIENT FIRST

A **lethal drug interaction** — warfarin bleed, statin-induced rhabdomyolysis, digoxin toxicity — OR a new **ventricular dysrhythmia** from QT prolongation. Harm appears *before* signs of infection worsen.

3 FIRST NURSING ACTION (NGN SCENARIO)

NEW order: assess allergies → review full med list for QT + CYP3A4 interactions → verify baseline ECG, LFTs, K⁺/Mg²⁺ → obtain cultures BEFORE first dose.

Patient reports palpitations / syncope / chest pain: *STOP the drug → obtain 12-lead ECG → notify provider → check K⁺ and Mg²⁺ → place on cardiac monitor.*

★ MOST TESTED DRUGS IN THIS CLASS

DRUG	KEY FEATURE	NCLEX PEARL
Erythromycin	Original macrolide; strongest CYP3A4 inhibitor	Worst GI upset; pyloric stenosis in infants; avoid with statins & warfarin
Azithromycin (Z-Pak)	Long half-life; 5-day course; fewest interactions	1 g single dose for chlamydia; best choice in polypharmacy; IV over ≥ 60 min
Clarithromycin (Biaxin)	Used in H. pylori triple therapy	Metallic taste; avoid in pregnancy; major statin interaction → rhabdomyolysis
Fidaxomicin	Narrow-spectrum, minimal absorption	First-line for C. difficile colitis; expensive; minimal systemic effects