

Antibiotics

Macrolides

Historical Background

- First discovered in **1952** (Erythromycin from *Saccharopolyspora erythraea*).
- Used for respiratory infections and atypical bacteria.

Nomenclature

- Named after the **macrocyclic lactone ring**.
- Examples:
 - Erythromycin
 - Clarithromycin
 - Azithromycin

Stereochemistry

- 14-, 15-, or 16-membered lactone rings.
- Various sugar moieties (e.g., desosamine, cladinose).

Structure-Activity Relationship (SAR)

- **Lactone ring size:** Affects ribosomal binding.
- **Sugar modifications:**
 - Improve acid stability (Clarithromycin, Azithromycin).
 - Enhance bioavailability.
- **C-9 modifications:** Affect **efflux pump resistance**.

Chemical Degradation Classification

- **Acid instability:** Leads to inactive ketal products (Erythromycin).
- Hydrolysis of lactone ring.
- Oxidative degradation.

Important Products

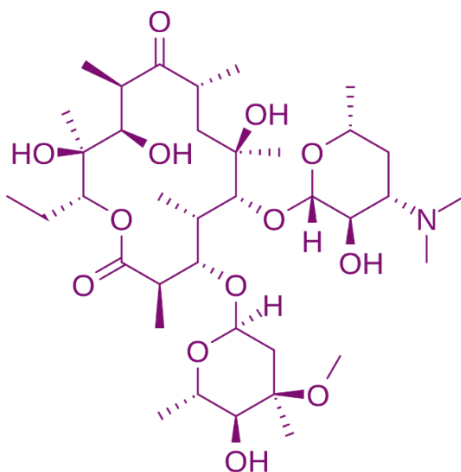
- **Erythromycin** (first macrolide).
- **Clarithromycin** (acid-stable, better absorption).
- **Azithromycin** (long half-life, broad spectrum).
- **Roxithromycin** (enhanced tissue penetration).

Various Macrolides Drugs

1. Erythromycin

Chemical Structure / Formula

- **Formula:** $C_{37}H_{67}NO_{13}$
- **Core Structure:** 14-membered lactone ring with deoxy sugars (cladinose and desosamine).



Mechanism of Action

- Binds to the **50S ribosomal subunit**, inhibiting translocation of the growing peptide chain.
- Bacteriostatic at low concentrations but bactericidal at high concentrations.

Uses

- **Respiratory tract infections** (pneumonia, pertussis, diphtheria).
- **Chlamydia infections** (alternative to doxycycline).
- **Gastroparesis treatment** (prokinetic effect via motilin receptor activation).

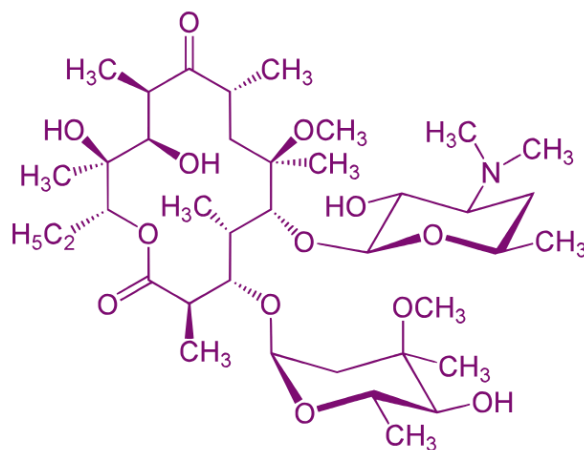
Side Effects

- **GI upset** (nausea, vomiting, diarrhea: stimulates motilin receptors).
- **QT prolongation** → risk of torsades de pointes.
- **Cholestatic hepatitis** (rare).
- **CYP3A4 inhibition** → increases levels of other drugs (e.g., warfarin, theophylline).

2. Clarithromycin

Chemical Structure / Formula

- **Formula:** $C_{38}H_{69}NO_{13}$
- **Structure:** A methylated derivative of erythromycin (at position 6), increasing stability.



Mechanism of Action

- Same as erythromycin: **binds to the 50S ribosome**, preventing bacterial protein synthesis.

Uses

- Respiratory infections (pneumonia, bronchitis, sinusitis).
- H. pylori eradication therapy (used in triple therapy).
- Mycobacterium avium complex (MAC) infections in HIV patients.

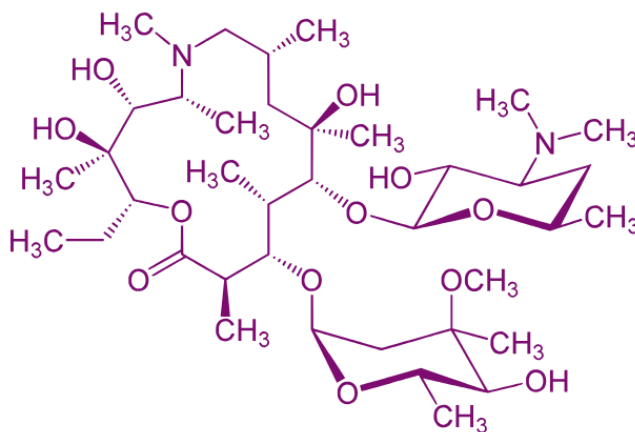
Side Effects

- Similar to erythromycin (GI upset, QT prolongation, CYP3A4 inhibition).
- **Metallic taste** (unique side effect).

3. Azithromycin

Chemical Structure / Formula

- **Formula:** $C_{38}H_{72}N_2O_{12}$
- **Structure:** 15-membered lactone ring (azalide), increasing tissue penetration and half-life.



Mechanism of Action

- Same as erythromycin: **binds to the 50S ribosome**, inhibiting protein synthesis.



FREE PREVIEW

[Click here to visit our website](#)

PHARMACY PREMIUM NOTES

Complete subject
and semesters are
available on
FirstHope app only.



[Scan or click here](#)

Click here to get the app



Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHopeNotes

Instagram

@firsthope.official

[Click here to follow >](#)

YouTube channel

FirstHope-Pharmacy / Live streams

[Click here to watch >](#)

WhatsApp channel

Follow FirstHope on WhatsApp

[Click here to join >](#)

FirstHope website

firsthopenotes.com

[Click here to visit >](#)

B.Pharm / D.Pharm / M.Pharm / Pharm.D

Preview notes. Complete subjects and semesters in the FirstHope app.