

# Tetracyclines Study Cheat Sheet



## Mechanism of Action

Tetracycline antibiotics work by inhibiting the 30S ribosomal subunit of susceptible bacteria, which interferes with bacterial protein synthesis.  
 → Tetracyclines are primarily bacteriostatic, but there are scenarios in which they can exhibit bactericidal activity.  
 → Newer tetracyclines can have a greater spectrum of activity due to less efflux-mediated resistance and tighter binding at their site of action.

## Comparison of Tetracycline Antibiotics\*

	<u>Doxycycline</u>	<u>Minocycline</u>	<u>Tigecycline</u>	<u>Eravacycline</u>	<u>Omadacycline</u>
<b>Brand name:</b>	Doryx, Vibramycin	Minocin, Solodyn	Tygacil	Xerava	Nuzyra
<b>FDA-approval:</b>	1967	1971	2009	2018	2018
<b>Typical adult dose:</b>	100mg Q12H	200mg x1, then 100mg Q12H	100mg x1 loading dose, then 50mg Q12H	1mg/kg IV Q12H	Per indication. IV and PO differ. Requires loading dose.
<b>Formulations:</b>	IV, PO	IV, PO	IV	IV	IV, PO
<b>Renal adjust:</b>	No	CrCl < 80	No	No	No
<b>Hepatic adjust:</b>	No	No	Child Pugh C	Child Pugh C	No
<b>MRSA activity:</b>	Yes	Yes	Yes	Yes	Yes
<b>Utility for VRE:</b>	No	No	Yes	Yes	Yes
<b>Anaerobic activity:</b>	Fair	Fair	Good	Good	Good
<b>Gram negative activity:</b>	Fair	Fair	Good	Good	Good
<b>Side effects:</b>	Esophagitis, photosensitivity	Esophagitis, photosensitivity	Nausea <sup>§</sup> , vomiting <sup>§</sup> , HA, pancreatitis, hepatic effects	Nausea, vomiting, infusion site reactions	Nausea, vomiting, HA, hepatic effects, infusion site reactions
<b>Class effect:</b>	Tooth discoloration, enamel hypoplasia, bone growth inhibition → generally avoid use in < 8 years of age.				
<b>Other:</b>	DOC for Lyme disease. Used for MRSA skin infections.	Has activity versus <i>Stenotrophomonas</i> . Used for acne.	Poor serum concentrations. Has a FDA boxed warning for increased death.	FDA-approved for cIAI in adults.	FDA-approved for CABP and ABSSSI. Carries warning for mortality imbalance w/ CABP.

Note 1: Tetracycline is not included because numerous supply issues and infrequent use in clinical practice reduce the current clinical relevance.

<sup>§</sup>Note 2: Nausea and vomiting with tigecycline can be particularly problematic. Eravacycline and omadacycline may have less nausea and vomiting.

## HIGHLIGHTS

- Notable tetracycline resistance is conferred by the “tet” genes (e.g., tetA, tetM). This resistance is typically related to increased efflux or ribosomal protection.
- Since tetracyclines are not impacted by beta-lactamases, they can be useful against ESBL-producing organisms and carbapenemase producing organisms.
- Tigecycline’s major hole in coverage is *Pseudomonas aeruginosa*. Eravacycline and omadacycline also lack coverage for *Pseudomonas*.
- Doxycycline hyclate and doxycycline monohydrate are equally clinically effective. They are just different salt forms of doxycycline.
- Periostat (doxycycline 20mg tablets taken Q12H) is only indicated for periodontitis. Oracea (doxycycline 40mg tablet taken Q24H) is only indicated for rosacea.  
 — Anti-inflammatory effects of doxycycline have garnered interest amongst dermatologists and contributed to the development of Oracea.
- Tetracyclines (like fluoroquinolones and macrolides) have activity versus many atypical bacteria (e.g., *Legionella*, *Mycoplasma*, *Chlamydia*).
- Tetracyclines have a wide range of uses, including for malaria prophylaxis, mycobacteria infection, VRE cIAI, community-acquired MRSA skin infection, and acne.
- The utility of the newer tetracyclines eravacycline and omadacycline is likely to be for infections due to multi-drug resistant bacteria.

**Abbreviations:** ABSSSI = acute bacterial skin & skin structure infections, CABP = community-acquired bacterial pneumonia, cIAI = complicated intra-abdominal infection, CrCl = creatinine clearance, DOC = drug of choice, ESBL = extended-spectrum β-lactamase, HA = headache, MRSA = methicillin-resistant *Staph. aureus*, VRE = vancomycin-resistant Enterococci