

Product Name:	Doxycycline hydrate
Product Number:	D064
CAS Number:	17086-28-1
Molecular Formula:	$C_{22}H_{24}N_2O_8 \cdot H_2O$
Molecular Weight:	462.46
Form:	solid
Appearance:	Yellow to orange solid
Solubility:	It is soluble in ethanol, methanol, DMF and DMSO.
Source:	semi-synthetic
Description:	<p>Doxycycline hydrate is a third-generation tetracycline and matrix metalloproteinase inhibitor, synthesized in 1958. It has broad-spectrum antibacterial and antiprotozoan activity, and interferes with bacterial protein synthesis. It is soluble in ethanol, methanol, DMF and DMSO.</p> <p>We also offer:</p> <ul style="list-style-type: none">• Doxycycline hyclate (D006)• Doxycycline hydrochloride (D065)
Mechanism of Action:	Doxycycline hydrate is prepared by hydrogenolysis of oxytetracycline to remove the 6-hydroxy group. Tetracycline antimicrobials bind to the bacterial 30S ribosomal subunit interfering with tRNA/mRNA interaction, ultimately inhibiting protein synthesis. Tetracyclines can inhibit the MMP enzyme family and inhibit mitochondrial biogenesis.
Spectrum:	Doxycycline hydrate has broad-spectrum activity against Gram-positive and Gram-negative bacteria, and antiprotozoan activity.
Microbiology Applications	<p>Doxycycline is commonly used in clinical <i>in vitro</i> microbiological antimicrobial susceptibility tests (panels, discs, and MIC strips) against Gram-positive, Gram-negative, and certain <i>Mycoplasma</i> species. Medical microbiologists use AST results to recommend antibiotic treatment options. Representative MIC values include:</p> <ul style="list-style-type: none">◦ <i>Mycoplasma hypopneumoniae</i> 0.1 ug/ml◦ <i>Enterococcus spp.</i> (vancomycin-resistant) 4 ug/ml◦ For a complete list of Doxycycline MIC values, click here.

Cancer Applications

Doxycycline was able to inhibit cancer stem cell progression across an entire panel of 12 different tumor cell lines representing different cancer types (DCIS, breast, lung, ovarian, pancreatic, prostate, glioblastoma, melanoma (Lamb et al, 2015).

Doxycycline can eradicate cancer stem cells in breast cancer patients in vivo. Authors found a quantitative decrease in CD44 and ALDH1 expression, biomarkers of 'stemness'. This is promising work in using cancer stem cells for cancer prevention, and is an excellent candidate for compound repurposing (Scatena C et al, 2018).

References:

Franco et al (2006) Doxycycline alters vascular smooth muscle cell adhesion, migration, and reorganization of fibrillar collagen matrices. Am. J. Pathol 168(9):1697-1709 PMID

Gossen M et al (1995) Transcriptional activation by tetracyclines in mammalian cells. Science 268(5218):1766-1769 PMID 7792603 PMID 16651635

Lamb R et al (2015) Antibiotics that target mitochondria effectively eradicate cancer stem cells, across multiple tumor types: treating cancer like an infectious disease. Oncotarget. 6(7):4569-84

Rosenblatt JE et al (1966) Comparison of in vitro activity and clinical pharmacology of doxycycline with other tetracyclines. Antimicrob. Agents Chemother. 6:134

Scatena C et al (2018) Doxycycline, an inhibitor of mitochondrial biogenesis, effectively reduces cancer stem cells (CSCs) in early breast cancer patients: A clinical pilot study. Front. Oncol. 8:452 PMID 30364293

TOKU-E reference:

Rose et al. used in Doxycycline in methacrylate-based copolymer films and studied their effects on biofilm formation: "[Prevention of Biofilm Formation by Methacrylate-Based Copolymer Films Loaded With Rifampin, Clarithromycin, Doxycycline Alone or in Combination.](#)"