Doxycycline hyclate
PRODUCT DATA SHEET

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Product Name:	Doxycycline hyclate
Product Number:	D006
CAS Number:	24390-14-5
Molecular Formula:	$C_{22}H_{24}N_2O_8 \cdot HCl \cdot 0.5H_2O \cdot 0.5C_2H_6O$
Molecular Weight:	512.94
Form:	Powder
Appearance:	yellow crystalline powder
Solubility:	: soluble in aqueous solution (50 mg/ml)
Source:	*Streptomyces peucetius*
Water Content (Karl Fischer):	1.4-2.8%
pH:	2.0-3.0
Storage Conditions:	2-8°C
Description:	Doxycycline hyclate is a broad-spectrum tetracycline targeting bacteria responsible for respiratory infections. It is a matrix metalloproteinase inhibitor, and an inhibitor of mitochondrial biogenesis. Doxycycline has been shown have anti-cancer properties. Doxycycline hyclate is soluble in aqueous solution. We also offer: • Doxycycline hydrate (D064) • Doxycycline hydrochloride (D065)
Mechanism of Action:	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 hyclate has broad-spectrum activity against Gram-positive and Gram-negative bacteria, and Mycoplasma (ie. *M. pneumoniae). Certain* β-lactam resistant strains of vancomycin resistant *Enterococcus are also inhibited.*

Microbiology Applications

Doxycycline hyclate is commonly used in clinical *in vitro* microbiological antimicrobial susceptibility tests (panels, discs, and MIC strips) against gram positive, gram negative, and certain *Mycoplasma*species. Medical microbiologists use AST results to recommend antibiotic treatment options. Representative MIC values include:

- *Mycoplasma pneumoniae* 0.03 µg/mL – 0.25 µg/mL
- *Haemophilus influenzae* 0.5 µg/mL – 3.1 µg/mL
- For a complete list of doxycycline MIC values, click here.

Cancer Applications

Using 12 different human tumor cell lines represetnting 8 different cancer types (DCIS, breast, lung, ovarian, pancreatic, prostate, glioblastoma, melanoma), authors found that Doxyclycline inhibited cancer stem cell propagation across this entire panel of cell lines (Lamb et al, 2015).

Doxycycline can eradicate cancer stem cells in breast cancer patients *in vivo*. Authors found a quantitative decease 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 drug repurposing. (Scatena C et al, 2018).

References:

Catena 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

Chopra I, and Marilyn Roberts M (2001) Tetracycline antibiotics: Mode of action, applications, molecular biology, and epidemiology of bacterial resistance." *Microbiol. Molec. Biol. Rev.* 232-60.

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

Franco et al (2006) Doxycycline alters vascular smooth muscle cell adhesion, migration, and reorganization of fibrillar collagen matrices. Am. J. Pathol 16895):1697-1709

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*

TOKU-E reference:

Rose et al. used Doxycycline from TOKU-E 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 Aone or in Combination."