Tobramycin
PRODUCT DATA SHEET

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Product Name:	Tobramycin
Product Number:	T009
CAS Number:	32986-56-4
Molecular Formula:	$C_{18}H_{37}N_5O_9$
Molecular Weight:	467.51
Form:	Powder
Appearance:	White or off-white hygroscopic powder
Source:	*Streptomyces tenebrarius*
Water Content (Karl Fischer):	Not more than 8.0%
pH:	9.0 - 11.0
Storage Conditions:	2-8°C

Description:

Tobramycin is an aminoglycoside antibiotic derived from *Streptomyces tenebrarius*. Tobramycin is a member of a broad-spectrum antibiotic complex, nebramycin, that was originally isolated in 1967 by Eli Lilly and Company. The nebramycin complex was separated into various factors, with nebramycin factor 6 showing in-vitro activity of clinical usefulness. Nebramycin factor 6 was subsequently designated tobramycin.

Tobramycin is a bactericidal protein synthesis inhibitor, able to bind to the 16S rRNA of the 30S ribosomal subunit, inhibiting translocation, and eliciting miscoding of the proteins. Tobramycin has also shown a disruptive effect on the outer membrane of gram-negative bacteria at high concentrations.

Tobramycin is active against gram-negative bacteria and is frequently used to eliminate *Pseudomonas aeruginosa* in cystic fibrosis patients. Tobramycin like other aminoglycosides can be used to treat gram positive bacterial infection, but other types of antibiotics are more potent and less toxic. Tobramycin shows activity against mycobacteria but is mostly ineffective against fungi and viruses.

TOKU-E offers two forms of tobramycin: tobramycin (T009) and tobramycin sulfate (T010). Both forms are freely soluble in aqueous solution ≥50 mg/mL.

Mechanism of Action:

Following active transport into the cell, tobramycin binds irreversibly to a specific aminoglycoside receptor on the bacterial 30S ribosomal subunit and interferes with the initiation complex between messenger RNA and the 30S subunit, thereby inhibiting initiation of protein synthesis, consequently leading to bacterial cell death. In addition, tobramycin induces misreading of the mRNA template causing incorrect amino acids to be incorporated into the growing polypeptide chain, consequently interfering with protein elongation.

Spectrum:

Tobramycin is effective against aerobic, gram-negative bacteria, like Acinetobacter and Enterobacter, but is particularly effective against Pseudomonas bacterial strains. Infections caused by Gram-positive bacteria can also be treated with aminoglycosides, like tobramycin sulfate, but other types of antibiotics are more potent and less damaging to the host. In the past the aminoglycosides have been used in conjunction with penicillin-related antibiotics in streptococcal infections for their synergistic effects, particularly in endocarditis. Tobramycin is mostly ineffective against anaerobic bacteria, fungi, and viruses.

Microbiology Applications

Tobramycin is commonly used in clinical *in vitro* microbiological antimicrobial susceptibility tests (panels, discs, and MIC strips) against gram negative microbial isolates. Medical microbiologists use AST results to recommend antibiotic treatment options for infected patients. Representative MIC values include:

- *Pseudomonas aeruginosa* 0.25 µg/mL - 16 µg/mL
- For a complete list of tobramycin MIC values, click here.

It is used to treat *pseudomonas aeruginosa* lung infections and is used in combination with other antibiotics to treat urinary tract infections, gynecologic infections, peritonitis, endocarditis, pneumonia, sepsis, respiratory infections, osteomyelitis and other soft-tissue infections. It is a potential therapy for sinus infections.

Tobramycin is used in Antimicrobial resistance studies.

Plant Biology Applications

Tobramycin can be used to eliminate *Pseudomonas aeruginosa* infections in plants, soil, and water.

Tobramycin has been used in conjunction with the *aac(6')-Ie/aph(2")-Ia* gene as an efficient selection system for the transformation of chloroplasts. The system's efficiency is comparable to the selection of transplastomic lines with spectinomycin resistance conferred by the resistance gene *aadA*. Importantly, no spontaneous antibiotic resistance mutants appeared under tobramycin selection.

Tabatabaei, I., Ruf, S., & Bock, R. (2016). A bifunctional aminoglycoside acetyltransferase/phosphotransferase conferring tobramycin resistance provides an efficient selectable marker for plastid transformation. *Plant molecular biology*, *93*(3), 269-281.

References:

Davis, Bernard D. "Mechanism of Bactericidal Action of Aminoglycosides."Microbiological Reviews 51.3 (1987): 341-50.

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Brogden, R N., et al., 1976. Tobramycin: a review of its antibacterial and pharmacokinetic properties and therapeutic use. Drugs. 12(3): 166-200. PMID: 789045