

Product Name:	Streptomycin Sulfate, EP
Product Number:	S040
CAS Number:	3810-74-0
Molecular Formula:	$C_{21}H_{39}N_7O_{12} \cdot 1.5H_2SO_4$
Molecular Weight:	728.69
Form:	Powder
Appearance:	White or almost white powder
Solubility:	Acetone: Soluble Chloroform: Soluble Water: >20 mg/mL
Source:	<i>Streptomyces Griseus</i>
Elemental Analysis:	Sulfate: 18.0 - 21.5%
Potency (on a dry basis):	Not less than 720 IU/mg
pH:	4.5 - 7.0
Description:	

Streptomycin sulfate is a freely soluble aminocyclitol glycoside antibiotic, that was co-discovered by Salman Waksman, Albert Schatz, and Elizabeth Bugie at the Rutgers University in 1943 and was later patented in 1948. Streptomycin is isolated from *Streptomyces griseus* and shows bacteriostatic activity at low concentrations and bactericidal activity at higher concentrations against mycobacteria and gram-negative bacteria. It is less active against gram-positive bacteria. Streptomycin sulfate has been found to be effective against certain β -lactam sensitive VRE or vancomycin resistant *Enterococcus species*; a glycopeptide antibiotic resistant "superbug".

Streptomycin sulfate is often used alone or in combination with penicillin and other agents to inhibit bacterial contamination in cell culture applications. It is recommended for use in molecular biology applications at 25-50 μ g/mL, in cell culture applications at 100 mg/L and in embryo culture at 50 mg/L.

Streptomycin is a protein synthesis inhibitor that acts by binding to the 30S ribosomal subunit at the S12 protein thereby inducing a misreading of the genetic code, inhibiting the initiation of translation of DNA, which then results in death for a susceptible bacterium. Streptomycin has also shown activity as a miRNA inhibitor, that is capable of down-regulating miR-21, a miRNA that is overexpressed in a wide variety of cancers.

Streptomycin sulfate is readily water-soluble (20 mg/ml) but of low solubility in organic solvents.

Streptomycin Sulfate, EP conforms to European Pharmacopeia standards.

Mechanism of Action: Streptomycin is a protein synthesis inhibitor. It binds to the small 16S rRNA of the 30S subunit of the bacterial ribosome, interfering with the binding of formyl-methionyl-tRNA to the 30S subunit. This leads to codon misreading, eventual inhibition of protein synthesis and ultimately death of microbial cells through mechanisms that are still not understood. Speculation on this mechanism indicates that the binding of the molecule to the 30S subunit interferes with 50S subunit association with the mRNA strand. This results in an unstable ribosomal-mRNA complex, leading to a frameshift mutation and defective protein synthesis; leading to cell death.

Spectrum: Streptomycin sulfate is highly active against gram-negative and *Mycobacterium*, and less active against gram-positive bacteria. Streptomycin sulfate has been found to be effective against certain β -lactam sensitive VRE or vancomycin resistant *Enterococcus species*; a glycopeptide antibiotic resistant "superbug".

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

- *Mycobacterium tuberculosis* 1 $\mu\text{g/mL}$ – 2 $\mu\text{g/mL}$
- *Escherichia coli* 0.5 $\mu\text{g/mL}$ – 7.8 $\mu\text{g/mL}$
- For a complete list of streptomycin MIC values, [click here](#).

Streptomycin is commonly used for bacterial gene selection with the *aadA* resistance gene. Common working concentrations are between 50 – 100 $\mu\text{g/mL}$.

Media Supplements

Streptomycin can be used as a selective agent in several types of isolation media:

STAA Agar - STAA Selective Supplement

STAA Agar - STA Selective Supplement

Plant Biology Applications

Streptomycin has been used in a number of crop protection applications in the USA to prevent fire blight, soft rot caused by *Pectobacterium* species, bacterial blight caused by *Pseudomonas cichorii*, fruit-spotting in apples and pears, and bacterial spot in peppers and tomatoes caused by *Xanthomonas spp.* Streptomycin could potentially be used to control *cyanobacterial* blooms in ornamental ponds and aquaria. (McManus et al. 2002).

Electrophoresis Applications

When purifying protein from a biological extract, streptomycin sulfate is sometimes added as a means of removing nucleic acids. Since it binds to ribosomes and precipitates out of solution, it serves as a method for removing rRNA, mRNA, and even DNA if the extract is from a prokaryote

Cancer Applications

Streptomycin sulfate can down-regulate the levels of mature miR-21, a miRNA that is overexpressed in a wide variety of cancers and has been causally linked to cellular proliferation, apoptosis, and migration. Inhibition of mir-21 in MCF-7 breast cancer cells causes reduced cell growth. Streptomycin down-regulates miR-21 by binding to pre-miRNA (its precursor) and blocking the function of the Dicer enzyme, an essential step in miRNA maturation.

References:

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A. Schatz et al., "Streptomycin, a substance exhibiting antibiotic activity against Gram-positive and Gram-negative bacteria," *Proc Exp Biol Med* , 55:66-9, 1944.

K.H. Pfuete et al., "The first clinical trial of streptomycin in human tuberculosis." *Am Rev Tuberc* , 71:752-4, 1955.

McManus P.S., Stockwell V.O., Sundin G.W. and Jones A.L., 2002, Antibiotic use in plant agriculture. *Annu. Rev. Phytopathol.* 2002. 40:443–65

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