

Product Name:	Sulfamethazine
Product Number:	S026
CAS Number:	57-68-1
Molecular Formula:	$C_{12}H_{14}N_4O_2S$
Molecular Weight:	278.33
Form:	Powder
Appearance:	White to almost-white powder
Source:	Synthetic
Melting Point:	197 - 200°C
Description:	<p>Sulfamethazine, also known as sulfadimidine, is a bacteriostatic heterocyclic sulfonamide antibiotic that was first synthesized from sulfanilamide at Temple University in Philadelphia by William Caldwell in 1942. Sulfamethazine has broad-spectrum antimicrobial activity effectively targeting bacteria causing bronchitis, prostatitis, and urinary tract infections. It is used in disposition and depletion studies of kinetics and to develop procedures used for quantification. Sulfamethazine is also an inducer of CYP3A4.</p> <p>Sulfamethazine has been shown to suppress epigenetic silencing in <i>arabidopsis</i> by impairing folate synthesis.</p> <p>Sulfamethazine blocks the synthesis of dihydrofolic acid by inhibiting the enzyme dihydropteroate synthase. Sulfamethazine is a competitive inhibitor of bacterial para-aminobenzoic acid (PABA), which is required for bacterial synthesis of folic acid. It induces CYP3A4 expression and is acetylated by N-acetyltransferase.</p> <p>Sulfamethazine is soluble in DMSO (56 mg/mL at 25° C), water (<1 mg/mL at 25° C), and ethanol (<1 mg/mL at 25° C).</p> <p>Sulfamethazine conforms to United States Pharmacopeia standards.</p> <p>Synonyms: NSC 67457, NSC 683529, Sulfadimethyldiazine, Sulfadimidine, SMZ</p>
Mechanism of Action:	<p>Sulfonamides, like sulfamethazine, inhibit the enzymatic conversion of pteridine and p-aminobenzoic acid (PABA) to dihydropteroic acid by competing with PABA for binding to dihydrofolate synthetase, an intermediate of tetrahydrofolic acid (THF) synthesis. THF is required for the synthesis of purines and dTMP and inhibition of its synthesis inhibits bacterial growth.</p>

Spectrum:

Sulfamethazine, like other sulfonamides, is a broad-spectrum antimicrobial inhibiting both gram-positive and gram-negative bacteria, as well as some protozoa, such as coccidia. They are considered ineffective against most obligate anaerobes and should not be used to treat serious anaerobic infections. However, they may affect aerobic organisms that contribute to the lowered oxygen tension in the microenvironment and, as such, they may be useful in certain diseases involving *Fusobacteria*, although the organism itself is often resistant.

Microbiology Applications

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

Plant Biology Applications

Sulfamethazine (SMZ) is a chemical suppressor of epigenetic silencing. SMZ treatment released the silencing of transgenes as well as endogenous transposons and other repetitive elements. Plants treated with SMZ exhibit substantially reduced levels of DNA methylation and histone H3 Lys-9 dimethylation, but heterochromatic siRNA levels were not affected. SMZ is a structural analog and competitive antagonist to *p*-aminobenzoic acid (PABA), which is a precursor of folates. SMZ decreased the plant folate pool size and caused methyl deficiency, as demonstrated by reductions in *S*-adenosylmethionine levels and in global DNA methylation. Exogenous application of PABA or compounds downstream in the folate biosynthesis pathway restored transcriptional silencing in SMZ-treated plants.

References:

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