Sulfamethoxazole
PRODUCT DATA SHEET

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Product Name:	Sulfamethoxazole
Product Number:	S045
CAS Number:	723-46-6
Molecular Formula:	$C_{10}H_{11}N_3O_3S$
Molecular Weight:	253.28
Form:	Crystalline Powder
Appearance:	White to off-white crystalline powder
Source:	Synthetic
Melting Point:	168°C – 172°C
Storage Conditions:	2 - 8°C
Description:	Sulfamethoxazole is a bacteriostatic sulfonamide antibiotic that was first synthesized in 1957 by researchers at Shionogi Inc. in Japan. Sulfamethoxazole was launched as Sinomin by Shionogi Inc. in 1959. Sulfamethoxazole has broad-spectrum antimicrobial activity and is normally given in combination with Trimethoprim, a dihydrofolate reductase inhibitor, which inhibits the reduction of dihydrofolic acid to tetrahydrofolic acid. Studies have shown that bacterial resistance develops more slowly with the combination of the two drugs than with either Trimethoprim or Sulfamethoxazole alone. Sulfamethoxazole blocks the synthesis of dihydrofolic acid by inhibiting the enzyme dihydropteroate synthase. Sulfamethoxazole is a competitive inhibitor of bacterial para-aminobenzoic acid (PABA), which is required for bacterial synthesis of folic acid. Sulfamethoxazole is insoluble in water and freely soluble in acetone. Sulfamethazine conforms to United States Pharmacopeia standards. Synonyms: Gantanol, Sinomin, sulfamethylisoxazole, sulfisomezole, sulphamethoxazole, SMX
Mechanism of Action:	Sulfonamides, like sulfamethoxazole, 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.

Spectrum:

Sulfamethoxazole, 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. Sulfamethoxazole has shown activity against Chlamydia trachomatis.

Microbiology Applications

Sulfamethoxazole (SMX) 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.

Sulfamethoxazole can be added to Muller Hinton II agar for antibiotic susceptibility testing protocols.

Plant Biology Applications

The sulfanilamide family comprises a clinically important group of antimicrobial compounds which also display bioactivity in plants. There is evidence that sulfanilamides, like Sulfamethoxazole, inhibit folate biosynthesis in both bacteria and plants.

References:

Henry, Richard J. "The Mode of Action of Sulfonamides." *Bacteriology Reviews*: 175-84. *www.ncbi.gov*. Web. 27 Aug. 2012.

Schreiber, K. J. *et al*. Forward chemical genetic screens in *Arabidopsis* identify genes that influence sensitivity to the phytotoxic compound sulfamethoxazole. *BMC Plant Biol.* 12, 226 (2012).