Bacitracin
PRODUCT DATA SHEET

issue date 01/06/2020

Product Name:	Bacitracin
Product Number:	B002
CAS Number:	1405-87-4
Molecular Formula:	$C_{66}H_{103}N_{17}O_{16}S$
Molecular Weight:	1422.69
Form:	Powder
Appearance:	White to pale buff powder
Solubility:	freely soluble in aqueous solution.
Source:	*Bacillus subtilis* and *B. licheniformis.*
Potency (on a dry basis):	≥ 65µ/mg
pH:	5.5-7.5
Storage Conditions:	2-8 °C

Description:

Bacitracin is a branched cyclic dodecylpeptide antibiotic produced by *Bacillus licheniformis* and some strains of *Bacillus subtilis* (Azevedo et al 1993). It is synthesized as a mixture of up to 50 closely related congeners/fractions. Bacitracin includes the following fractions: A, B1, B, B2, B3, C, C1, C2, C3, D, E, F, G, H1, H2, H3, I1, I2, I3, and X. Bacitracin is freely soluble in aqueous solution.

For all Bacitracin products, click here.

Mechanism of Action:

Bacitracin prevents phosphorylation of bactoprenol, a transport protein which carries peptidoglycan components outside the cell membrane. Without the active phosphorylated bactoprenol, peptidoglycan synthesis cannot be completed and the cell lyses. Resistance to Bacitracin is understood to involve two mechanisms: A protein transporter (BcrABC) which pumps bacitracin out of the cell after it has entered, and via another protein (BacA) which provides the active phosphorylated bactoprenol from a different synthetic pathway.

Spectrum:

Bacitracin inhibits cell wall synthesis in Gram-positive bacteria including *Streptococcus pyogenes* and *Staphylococcus aureus*. Representative MIC values include:

- *Staphylococcus aureus* 2µg/mL - >32 µg/mL
- *Streptococcus agalactiae* >16 µg/mL (Group B)
- For a complete list of bacitracin MIC values, click here.

Microbiology Applications

Bacitracin is a useful tool to differentiate between ß-hemolytic, group A Streptococci (*Streptococcus pyogenes*) and ß-hemolytic Streptococococci of other groups. Bacitracin can be used as a supplement in chocolate agar to facilitate the isolation of *Haemophilus influenzae*. Bacitracin can be used to study the regulatory network in *B. subtilis*. By systematically analyzing the Bacitracin stimulon, authors can pinpoint the loci induced by Bacitracin (Mascher et al 2003).

Plant Biology Applications

Tobacco hairy roots and cell suspensions were used in plant transformation studies to produce full length murine IgG1 monoclonal antibody. Bacitracin has been shown to prevent degradation of peptides and hormones in plant systems. Treatment with Bacitracin was not sufficient to prevent loss of antibody from the cultures, but improved the growth rates by up to 53%. (Sharp and Doran, 1999).

References:

Bell, RG (1992) Preparative high-performance liquid chromatographic separation and isolation of Bacitracin components and their relationship to microbiological activity. J. Chromatog. 590:163-68

Cain BD, Norton PG, Eubanks W, Nick HS and Allen CM (1993) Amplification of the bacA gene confers bacitracin resistance to *Escherichia coli*. J. Bacteriol. 175(12):3784-3789 PMID 8389741

Jacobsen C et al (2015) Regulation of tissue factor in NT2 germ cell tumor cells by cisplatin chemotherapy. Thromb Res. 136(3):673-681 PID 26205155

Langer F et al (2013) Rapid activation of monocyte tissue factor by antithymocyte globulin is dependent on complement and protein disulfide isomerase. Blood 121 (12):2324-2335 PMID 23315166

Mascher T, Margulis NG, Wang T, Ye RW, Helmann JD (2003) Cell wall stress responses in *Bacillus subtilis*: The regulatory network of the bacitracin stimulon. Mol. Microbiol 50(5):1591-1604 PMID 14651641

Mueller MJ, Brodschelm W (1993) Signaling in the elicitation process is mediated through the octadecanoid pathway leading to jasmonic acid. Proc. Natl. Acad. Sci. 90: 7490-7494 PMID 11607420

Sharp, JM and Doran, PM.(1999) Effect of bacitracin on growth and monoclonal antibody production by tobacco hairy roots and cell suspensions. Biotechnol. Bioprocess Eng. 4: 253

Stone KJ and Strominger JL (1971) Mechanism of action of bacitracin: Complexation with metal ion and C55-isoprenyl pyrophosphate. PNAS 68 (12): 3223-3227 PMID 4332017

Webb, NE " Dose-response models reveal critical features of inhibitor activity and viral infection." phD diss. UCLA, 2015