Daptomycin
PRODUCT DATA SHEET

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Product Name:	Daptomycin
Product Number:	D024
CAS Number:	103060-53-3
Molecular Formula:	$C_{72}H_{101}N_{17}O_{26}$
Molecular Weight:	1620.67
Form:	Powder
Appearance:	pale yellow to light brown powder
Solubility:	soluble in water (100 mg/mL), DMSO (100 mM), methanol (mg/mL), and ethanol (50 mM).
Source:	*Streptomyces roseosporus*
Water Content (Karl Fischer):	≤5.0%
Storage Conditions:	-20°C
Description:	Daptomycin is a unique lipopeptide antibiotic derived from *Streptomyces roseosporus* that is effective against Gram-positive bacteria. This holoenzyme is composed of three subunits, encoded by the *dptA, dptBC*, and *dptD* genes, each responsible for incorporating particular amino acids into the peptide. The cloned *dpt* gene cluster allows study of Daptomycin biosynthesis and discovery of novel lipopetides through pathway engineering. Daptomycin is soluble in water, DMSO, methanol, and ethanol.
Mechanism of Action:	Daptomycin peptides interact with anionic phospholipids in the membrane of Gram-positive bacteria. Peptides integrate into the membrane by a calcium-mediated process and interact with membrane phospholipid head groups and acyl chains. Finally, a pore or channel is formed which can kill the cell by membrane disruption/depolarization or cellular uptake of daptomycin leading to disruption of intracellular processes such as synthesis of DNA, RNA, and protein which results in bacterial cell death. The activity of Daptomycin is dependent on the presence of physiologic levels of free calcium ions. Researchers found a gradual dissipation of membrane potential, thus membrane depolarization is an inherent part of its mechanism of action (Silverman et al, 2003).
Spectrum:	Daptomycin targets Gram-positive organisms including GRE (glycopeptide-resistant *Enterococci*) and MRSA (methicillin-resistant *Staphylococcus aureus*).

Microbiology Applications

Daptomycin has been used to study the impact of Staphylococcal accessory regulator (*sarA*) on Daptomycin susceptibility of *Staphylococcus aureus*. The mutation of sarA did not affect the Daptomycin MIC but resulted in increased susceptibility i*n vivo* in the context of an established biofilm (Weiss et al, 2009)

Representative MIC ranges for Daptomycin from the Antimicrobial Index appear below.

- Vancomycin resistant *Enterococcus faecalis* - ≤0.015 µg/mL – 4 µg/mL
- MRSA: 0.25 µg/mL - 2 µg/mL

References:

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Miao V et al (2006) Genetic engineering in *Streptomyces roseosporus* to produce hybrid lipopeptide antibiotics. Chem. Biol. 13(3):269-76 PMID 16638532

Silverman JA, Perlmutter NG, and Shapiro HM (2003) Correlation of daptomycin bactericidal activity and membrane depolarization in *Staphylococcus aureus.* Antimicrob. Agents Chemother. 47(8):2538-44 PMID 12878516

Straus, SK and Hancock REW (2006) Mode of action of the new antibiotic for Gram-positive pathogens Daptomycin: Comparison with cationic antimicrobial peptides and lipopeptides. Biomem. 1758(9):1215-1223

Weiss EC et al (2009) Impact of *sarA* on daptomycin susceptibility of *Staphylococcus aureus* biofilms i*n vivo*. Antimicrobial. Agents. Chemother. 53(10):4096-4102 PMID 19651914