

Penicillin

Antibiotics of the penicillin class are derivatives of 6-aminopenicillanic acid consisting of a β -lactam ring linked to a thiazolidine ring and a side chain. This nucleus is from the condensation of the amino acids L-cysteine and D-valine. The function of penicillins is to inhibit protein synthesis through activity associated with the β -lactam ring.

Spectra are dependent on the side chain of individual congeners. The β -lactam blocks transpeptidation through association with the penicillin-binding proteins (PBPs). These antibiotics are analogs of the substrate, D-alanyl-D-alanine, whose bond is normally broken to form the cross-bridge glycines in transpeptidation. This analog competes for the binding of PBPs. As a result, no cross-bridges are formed and the cell wall becomes weak and eventually ruptures.

Penicillin is inactive against cells with previously made cell walls; it works only against the synthesis of new cell walls and is, as a result, bacteriocidal to actively growing cells.

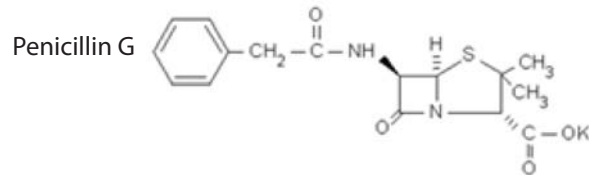
Penicillin is a narrow-spectrum antibiotic against gram-positive bacteria. Because the activity is derived from the β -lactam ring, Staphylococcal β -lactamase confers resistance through cleavage of the β -lactam ring. Some of the congeners include penicillin G (benzyl penicillin), ampicillin, carbenicillin, and amoxicillin.

Penicillin G has narrow-spectrum activity against gram-positive cocci, but is sensitive to penicillinase, making most strains of *Staphylococcus aureus* resistant.

Molecular Weight and Formula

372.5 C₁₆H₁₇KN₂O₄S

Molecular Structure:



Mode of Action:

Inhibitor of transpeptidation at the final stage of the reaction thereby preventing the formation of cross-bridges.

Conferred Resistance:

β -lactamases, a change in cell wall permeability, or a change in the penicillin-binding proteins.

Spectrum:

gram (+)

Microbiological Potency:

$\geq 1580 \mu\text{g}/\text{mg}$

Effective Concentration:

100,000 u/L

Storage:

Penicillin (solutions): Frozen (-5 to -20°C), protected from light

Product Information

Product Information	Catalog No.	Size
Penicillin-Streptomycin Solution, 50X	30-001-CI	6 x 100 mL
Penicillin-Streptomycin Solution, 100X	30-002-CI	6 x 100 mL
Penicillin-Streptomycin Solution, 100X	30-009-CI	6 x 100 mL

References:

1. Champoux, et. al. *Sherris Medical Microbiology: An Introduction to Infectious Diseases*. 3rd ed. Ed. Kenneth J. Ryan. Stamford: Appleton and Lange, 1994
2. Goodman and Gilman. *The Pharmacological Basis of Therapeutics*. 9th ed. Eds. Joel G. Hardman and Lee E. Limbird. New York: McGraw-Hill Health Professions Division, 1996