Activity	Class
Cidal	Penicillins
Cidal	Cephalosporins
Cidal	Monobactams (Aztreonam)
Cidal	Carbapenems
Cidal	Aminoglycosides
Static	Macrolides
Cidal	Quinolones
Static	Tetracyclines
Static	Sulfonamides
Cidal	Metronidazole
Cidal	Vancomycin
Cidal	Daptomycin
Cidal for <i>Streptococci</i> Static for <i>Staphylococci</i> and <i>Enterococci</i>	Linezolid
Static	Clindamycin
Cidal	Nitrofurantoin
Cidal	Synercid
Static	Chloramphenicol
Cidal	Fosfomycin

Beta Lactam Antibiotics

Beta Lactam Antibiotics

All contain a beta lactam ring.
Work to inhibit cell wall synthesis.
The beta lactam ring is the active functional group where antibiotic activity resides.



Beta Lactam Antibiotics



Resistant bacteria produce a lactamase which can break this ring.
Penicillin G is the prototype for all antibiotics and all the beta lactam antibiotics.

•Oldest antibiotics, but still growing and new agents are still discovered and added to the group.



Source: Katzung BG, Masters SB, Trevor AJ: *Basic & Clinical Pharmacology,* 11th Edition: http://www.accessmedicine.com

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 Are the most widely used antibiotics.
 Penicillin G was found very effective against the most common and important Gram positive bacteria like Staph, Strept, Pneumococcus, and many others.

 Natural produced from the fermentation medium used to culture Penicillium such as Penicillin G which is the only natural penicillin used clinically

Semisynthetic= Modified natural.Synthetic.

susceptibility of the resulting compounds that alter the (**B-lactamases**) added to inactivate enzymes can be Side chains

Penicillinase, produced by resistant bacteria, inactivates penicillins by breaking the beta lactam ring.
Clavulanic acid inhibits this enzyme, so combined with ampicillin to give good combination" Augmentin".

penicillin nucleus

Semisynthetic

Structure of penicillins and products of their enzymatic hydrolysis



penicillin amidase has two substrates are penicillin and H2O, whereas its two products are carboxylate and 6aminopenicillanate.

Penicillin Actions



•The cell walls of bacteria are essential for their normal growth and development

•Peptidoglycan provides rigid mechanical stability

Penicillin Actions



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•In gram-positive microorganisms, the cell wall is 50 to 100molecules thick, • but it is only 1 or 2 molecules thick in gram-negative bacteria

Penicillin Actions



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last step in
peptidoglycan
synthesis
that is inhibited by
the β-lactam
antibiotics

Penicillin-binding proteins (PBPs) are a group of proteins that are characterized by their affinity for and binding of penicillin. They are a normal constituent of many bacteria

β-Lactamase inhibitors.



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Benzyl penicillin (Penicillin G):
Deep IM injection.
Highly active against sensitive strains of gram-positive cocci
hydrolyzed by penicillinase

■ ineffective *S. aureus*

Procain benzylpenicillin: Painless, prolonged action injection. Phenoxymethyl penicillin: Oral, not destroyed by gastric juice. Cloxacillin, Dicloxacillin, and Fluclocillin : Penicillinase resistant, for Staphylococcus.