

# β-lactam Antibiotics

**β-lactam antibiotics** are a broad class of antibiotics all of which contain a β-lactam ring in their molecular structure.

Most β-lactam antibiotics work by inhibiting bacterial cell wall biosynthesis by targeting and binding to penicillin binding proteins (PBP's) making them unable to perform their role in cell wall synthesis.

This then leads to the death of the bacterial cell due to osmotic instability or autolysis.

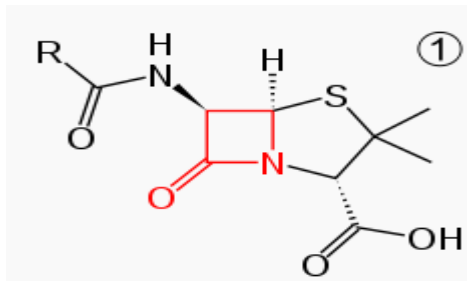
**Bacteria often develop resistance to β-lactam antibiotics by synthesising β-lactamase**, a bacterial enzyme that attacks the β-lactam ring in the antibiotic. To help overcome and neutralise this bacterial resistance mechanism, β-lactam antibiotics can also be given with β-lactamase inhibitors such as clavulanic acid (e.g. coamoxy-clav, 'Augmentin').

β-lactams are the most widely used group of antibiotics.

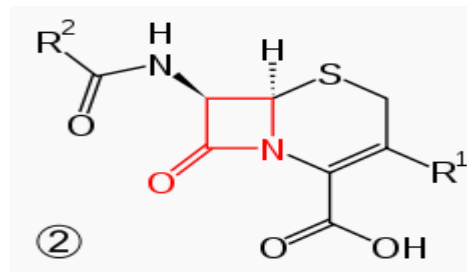
<b>β-lactams</b> <small>(affect cell envelope)</small>	<b>Penicillins</b> (penams)	<b>Narrow spectrum</b>	<b>β-lactamase sensitive</b> e.g. penicillin	
			<b>β-lactamase resistant</b> e.g. cloxacillin flucloxacillin oxacillin	
		<b>Moderate spectrum</b>	e.g. ampicillin	
		<b>Broader spectrum</b>	e.g. co-amoxycylav	
		<b>Extended spectrum</b>	e.g. carbenicillin, ticarcillin e.g. piperacillin e.g. mecillinam	
	<b>Carbapenem</b>	e.g. imipenem meropenem		
	<b>Cephalosporins/ cephamycins</b>	<b>"1<sup>st</sup> generation":</b> e.g. cefazolin, cefalexin, cephalothin  <b>2<sup>nd</sup> generation:</b> cefaclor, cefamandole, cefuroxime, cefoxitin  <b>3<sup>rd</sup> generation:</b> ceftriaxone, ceftazidime, cefoperazone, cefotaxime, cefpodoxime  <b>4<sup>th</sup> generation:</b> cefepime		
	<b>Monobactams</b>	e.g. aztreonam		
	<b>β-lactamase inhibitors</b>	Penam: (sulbactam, tazobactam) Clavan: (clavulanic acid)		
	<b>Combinations</b> i.e. antibiotic + β-lactamase inhibitor	e.g. amoxicillin/clavulanic acid imipenem/cilastin ampicillin/sulbactam piperacillin/tazobactam		

# Beta lactam antibiotic core structure

$\beta$ -lactam ring in red



Penicillins



Cephalosporins

# Bacterial cell structure

