Beta Lactams

Beta-lactam antibiotics are used in the management and treatment of bacterial infections.

Beta-lactam antibiotics are one of the most commonly prescribed drug classes with numerous clinical indications.

From a biochemical point of view, these drugs have a common feature, which is the 3-carbon and 1-nitrogen ring (beta-lactam ring) that is highly reactive. This class includes:

- **Penicillins**. These antibiotics (most of which end in the suffix *-cillin*) contain a nucleus of 6-animopenicillanic acid (lactam plus thiazolidine) ring and other ringside chains. The group includes natural penicillins, beta-lactamase-resistant agents, aminopenicillins, carboxypenicillins, and ureidopenicillins.
- **Cephalosporins**. They contain a 7-aminocephalosporanic acid nucleus and side-chain containing 3,6-dihydro-2 H-1,3- thiazane rings. Cephalosporins are traditionally divided into five classes or generations, although acceptance of this terminology is not universal.
- **Carbapenems**. Their defining structure is a carbapenem coupled to a beta-lactam ring that confers protection against most beta-lactamases, although resistance to these compounds is a significant issue and occurs mainly among gram-negative pathogens (e.g., *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii)*, which produce different classes of beta-lactamases termed as carbapenemase.
- **Monobactams**. The beta-lactam ring stands alone and not fused to another ring.
- Beta-lactamase inhibitors. They work primarily by inactivating serine beta-lactamases, which are enzymes that hydrolyze and inactivate the beta-lactam ring (especially in gram-negative bacteria). These agents include the first-generation beta-lactamase inhibitors (clavulanic acid, sulbactam, and tazobactam) and the newer avibactam and vaborbactam