PDB-101

PDB101.RCSB.ORG

ANTIBIOTICS IN ACTION

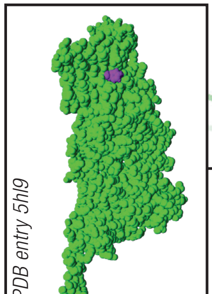
ANTIBIOTICS allow us to fight infections by pathogenic bacteria. They attack essential molecular machines in bacteria, stopping or slowing their action, ultimately slowing growth or killing the cell. Shown here are some classes of antibiotics and their target protein/molecule organized by the biochemical pathway they interrupt.

ANTIBIOTICS THAT INHIBIT THE SYNTHESIS OF THE CELL WALL

CELL WALL is an essential layer protecting bacteria from exploding under osmotic pressure. The building blocks (peptidoglycan monomers) are first connected into chains, and then crosslinked to form a tough peptidoglycan matrix.

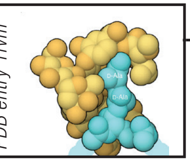
BETA-LACTAM ANTIBIOTICS such as Penicillins, Cephalosporins, and Carbapenems, disable penicillin binding proteins (green), enzymes responsible for crosslinking the peptidoglycan chains.

Example:
Ampicillin (purple)



PDB entry 5hl9

VANCOMYCIN (orange-yellow) is a short peptide that sequesters the building blocks of the peptidoglycan (aqua) so that the chains can no longer be crosslinked.

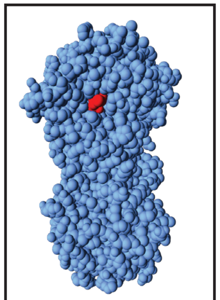


PDB entry 1fvm

ANTIBIOTICS THAT INHIBIT BACTERIAL METABOLISM

SULFONAMIDES inhibit the dihydropteroate synthase enzyme (blue) which is essential for synthesis of vitamin B9. This causes the bacteria to stop growing.

Example:
Sulfamethoxazole (red)

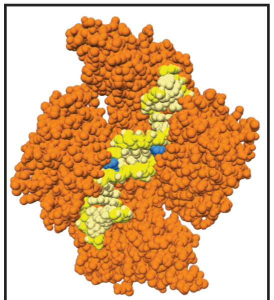


PDB entry 3tzf

ANTIBIOTICS THAT INHIBIT DNA SYNTHESIS

QUINOLONES inhibit the DNA gyrase (orange), an enzyme essential in unwinding the DNA double helix, preventing the bacteria from replicating.

Example:
Ciprofloxacin (blue)



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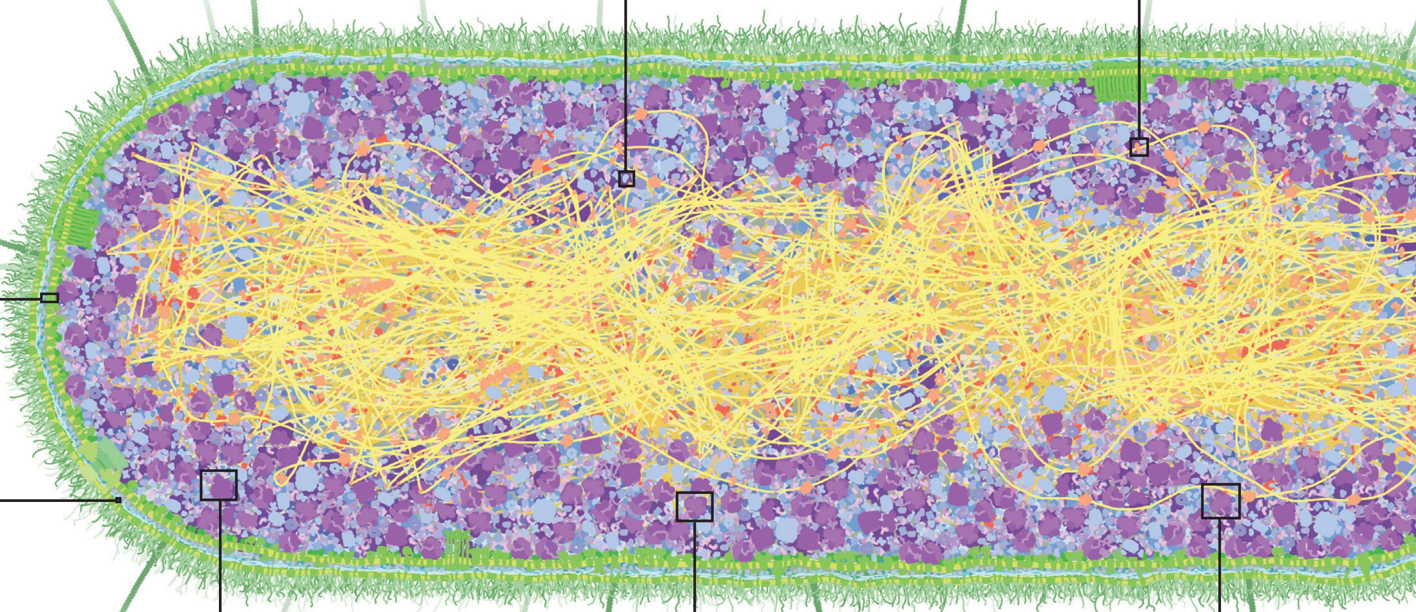
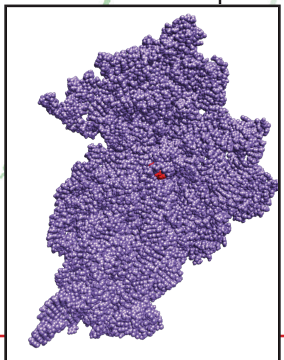


ANTIBIOTICS THAT INHIBIT PROTEIN SYNTHESIS

AMINOGLYCOSIDES bind to the small subunit of ribosomes (purple) causing the enzyme to build erroneous protein chains that ultimately kill the cell.

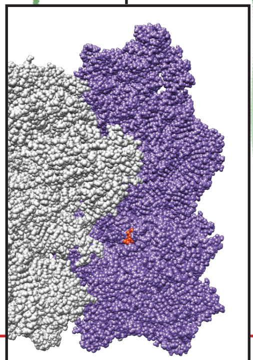
Example:
Paromomycin (red)



PDB entry 1ibk

TETRACYCLINES bind to the small subunit of ribosomes (purple) preventing the addition of new amino acids to the nascent peptide chain.

Example:
Tetracycline (red)



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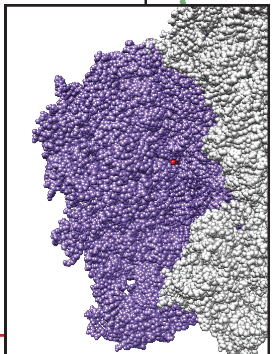
LINCOSAMIDES bind to the large subunit of ribosomes (purple) causing premature dissociation of the growing protein chain.

Example:
Clindamycin (red)



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