How Antibiotics Work - Mechanisms of Action

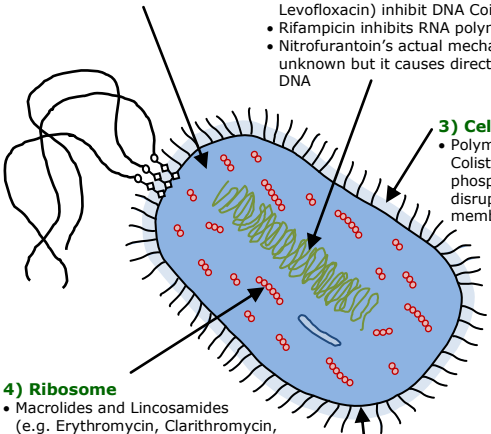
Essentially there are only 5 basic mechanisms of action or sites where the antibiotic works, either in the bacterium's cytoplasm, on its chromosome, at its cell membrane, on its ribosome or at its cell wall. The flagella and plasmid have no role in antibiotic mechanisms of action.

1) Cytoplasm

- Nitroimidazoles (e.g. Metronidazole) produce oxygen free radicals which damage proteins and DNA
- Lipopeptides (e.g. Daptomycin) depolarise cell membranes inside cell

2) Chromosome

- Diaminopyramidine (e.g. Trimethoprim) interferes with folic acid synthesis
- Quinolones (e.g. Ciprofloxacin, Levofloxacin) inhibit DNA Coiling
- Rifampicin inhibits RNA polymerase
- Nitrofurantoin's actual mechanism is unknown but it causes direct damage to DNA



3) Cell Membrane

- Polymyxin (e.g. Colistin) binds to phospholipids disrupting the cell membrane

4) Ribosome

- Macrolides and Lincosamides (e.g. Erythromycin, Clarithromycin, Azithromycin, Clindamycin) prevent protein elongation and inhibits ribosome formation
- Aminoglycosides (e.g. Gentamicin, Amikacin, Tobramycin) interfere with translation and protein formation
- Tetracyclines and Glycylcyclines (e.g. Doxycycline, Tigecycline) prevent protein synthesis
- Oxazolidinones (e.g. Linezolid) prevent ribosome formation
- Fusidic Acid blocks elongation factor G, preventing protein formation
- Chloramphenicol inhibits protein synthesis
- Nitrofurantoin's actual mechanism is unknown but it interferes with translation

5) Cell Wall

- Beta-Lactams (e.g. Penicillins, Cephalosporins, Carbapenems) inhibit cell wall formation
- Glycopeptides (Vancomycin, Teicoplanin) prevent peptidoglycan cross-linkage