

This station will explore your knowledge of bacteria and anti-bacterial agents. How do bacteria differ from the majority of normal human cells (eukaryotes)?

“How do bacteria differ from a majority of normal human cells?”

single celled organisms
nucleus is not membrane bound
less organelles, usually limited to ribosomes for protein production
contain plasmids which contain genetic material and facilitate diversification of bacteria
reproduce asexually by producing genetic material before dividing

“How are antibacterial agents classified?”

by their spectrum of action narrow or broad, gram negative or gram positive
chemical structure (eg aminoglycosides by the position of the amino group)
mechanism of action

“Describe some common antibiotic classes with examples and their mechanism of action?”

inhibit cell wall synthesis
betalactams
 penicillins - penicillin G, ampicillin
 cephalosporins - ceftriaxone
carbapenems - meropenem
glycopeptides - vancomycin
Inhibit protein synthesis
macrolides - binds 50S -erythromycin
aminoglycosides -binds 30S - gentamicin
tetracycline - binds 30S
inhibit nucleic acid synthesis
quinolones - acts on DNA gyrase - ciprofloxacin
sulphonamides - folic acid synthesis - sulfazidine
metronidazole - DNA strand breakage

“Describe mechanisms of bacterial resistance to antibiotics?”

Mutation in the cell wall
 MRSA and the mutation of penicillin binding proteins
Enzyme production
 staphylococcal production of beta lactamases
Point mutations in ribosomal proteins
 aminoglycosides and the 30S ribosome
Oxygen rich environments are changed to anaerobic
 aminoglycosides and penetration into the inner membrane
modifications in the cell outer layers to prevent porin access
 aminoglycosides require access via porins
efflux mechanisms which pump the antibiotic out of the bacteria
 tetracyclines and staph aureus
bypassing the mechanism of action
 trimethoprim and alternative folate production pathways by haemophilus influenza

“How does resistance develop?”

Sub optimal dosing and natural selection
Transfer of DNA material via plasmids
Between bacteria by conjugation, transduction and transformation