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Doctor 2021 - رَوْح - medicine - MU

pharmacology sheet

Doctor:

Dr. Nashwa Abo- Rayah

DONE BY:

Raneem Al- Jaafreh

Razan Al- Bayaydah

Reem Ghabayen

corrected BY:

Emran Younis

Antimicrobial therapy

The use of chemical substances to treat diseases. chemotherapy

Chemotherapy can be used to eliminate microorganisms e.g: Bacteria, virus, fungi, helminthes (worms) and malignant tumors.

kills or inhibits the growth of microorganisms such as bacteria, fungi, viruses or protozoa.

ANTIMICROBIAL AGENT drug

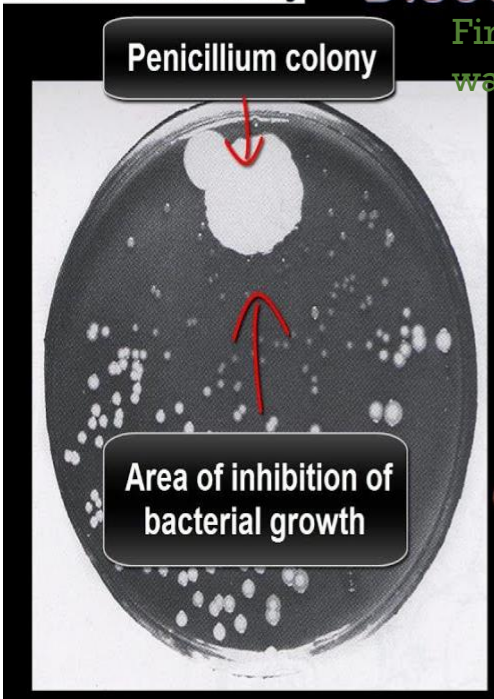
is any chemical substance which kills the organism or inhibits its growth e.g: Sulphonamides, quinolones antimicrobial therapy

ANTIBIOTIC

is a substance produced by living microorganisms to inhibit or kill another living microorganisms e.g: Penicillins, cephaloporins , tetracylcines and chloramphicol. Nowdays, many antibiotics are synthetic not produced from living microorganism

MSJChem
Tutorials for IB Chemistry

Discovery of penicillin



First antibiotic used in 2nd world war

Fleming came to the conclusion that something in the fungus was inhibiting the growth of the bacteria.

Despite Flemings' discovery, it wasn't until the 1940s that the true potential of penicillin was realized when it was used to save thousands of lives in World War Two.

To be effective and safe, antimicrobial agent must have

selective toxicity

Toxic to bacteria but not toxic to host cell harming

SELECTIVE TOXICITY

- The ability to kill or inhibit the growth of a microorganism without harming the host cells.

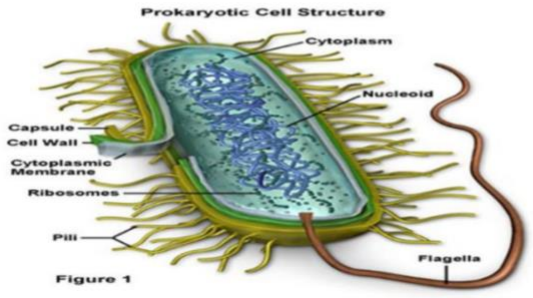


Figure 1

C

The drug must be toxic to the pathogen more than toxic to the host.

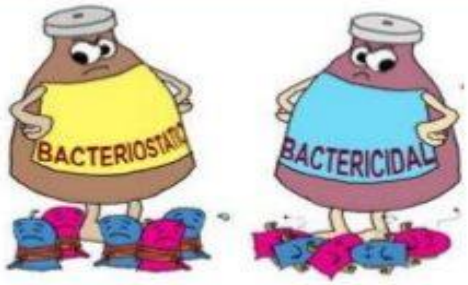
Why ?

Selective toxicity is due to the difference in structure or metabolism between the pathogen and the host.

Classification of Antibiotics

Based on mode of Action

- Bacteriostatic
- Bactericidal



Based on their spectrum of action

- Broad-spectrum
- Narrow Spectrum

No antibiotics bacteria multiply

Bacteriostatic antibiotics prevent bacteria multiplying

Bactericidal antibiotics kill the bacteria

CLASSIFICATION OF ANTIMICROBIAL AGENTS ACCORDING TO THEIR MODE OF ACTION:

BACTERICIDAL

Kill microorganisms by direct effect e.g. B- lactam antibiotics, Aminoglycosides, Quinolones, Rifampicin.

Effective in immunosupressed host.

BACTERIOSTATIC

Chloramph-enicols & tetra-cyclins are used Topically due to high side effect

Inhibit growth of microorganism. e.g. Sulphonamides , chloramphenicol & tertacyclines

Host immune system does the killing

Not effective in immunosuupressed host.
cuz the immune system is the one that completes the defense

Bacteriostatic and cidal

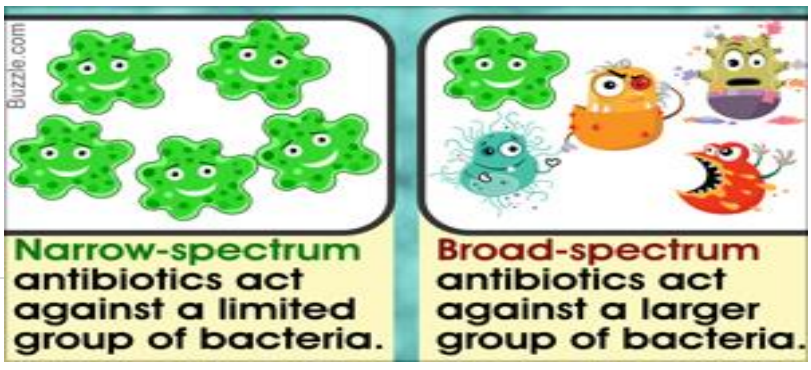
according to concentration e.g: Erythromycin and Isoniazide. isoniazide --> treat TB

Location and severity of infection affect choice of antibiotic: High conc. → cidal
low conc. → static

Once stopped bacterial multiplication resumed

E.g. CNS infection calls for bactericidal treatment

CLASSIFICATION OF ANTIMICROBIAL AGENTS ACCORDING TO THE SPECTRUM:



BROAD SPECTRUM ANTIBIOTICS

Effective against multiple gram +ve & -ve organisms e.g: Emepenem, tetracycline, quinolones ,chloramphicol.

Used as initial empirical treatment till culture and sensitivity results appear.

Give right antibiotic

Give right antibiotic
with gastroenteritis and idk what us the microorganism if the infection severe
pt. cants wait

We give antibiotic until the result of test appear (empirical therapy)

MODERATE SPECTRUM ANTIBIOTICS

Some gram -ve , gram + ve

Moderate spectrum: e.g: Macrolids

Extended-spectrum

Extended spectrum is the term applied to antibiotics that are modified to be effective against gram-positive (it was narrow spectrum)

organisms and also against a significant number of gram-negative bacteria.

For example, *ampicillin,* *ampicillin*

Narrow spectrum

Effective against specific organisms e.g: Antimicrobial against gram +ve bacteria: vancomycin and Penicillin G.

Antimicrobial against gram -ve bacteria: polymixine, bacitracin and aminoglycosides.

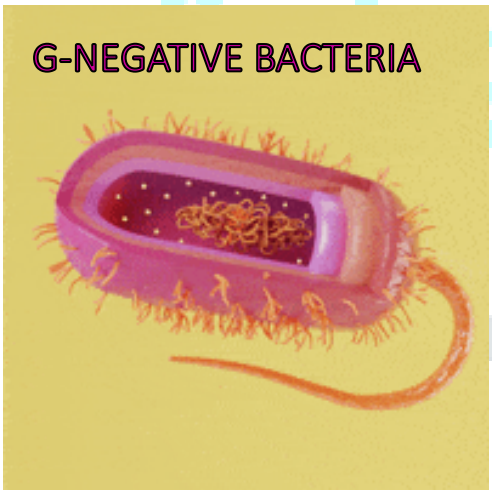
narrow spectrum

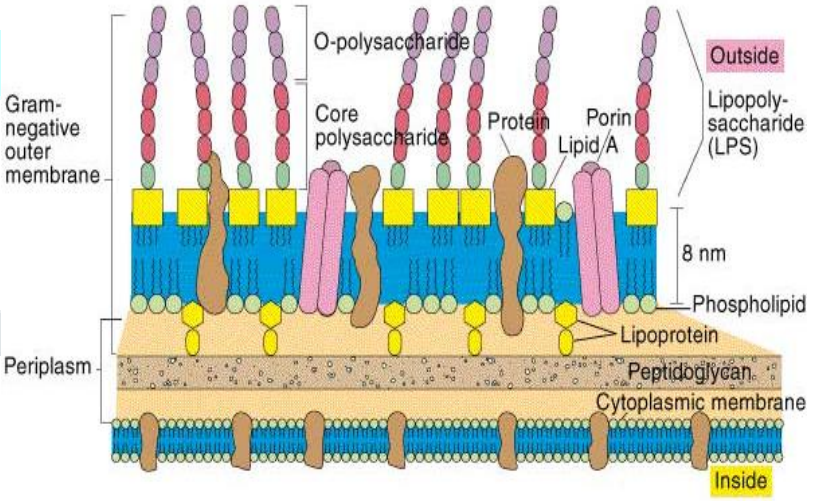
Used in treatment of susceptible organisms based on culture and sensitivity results.

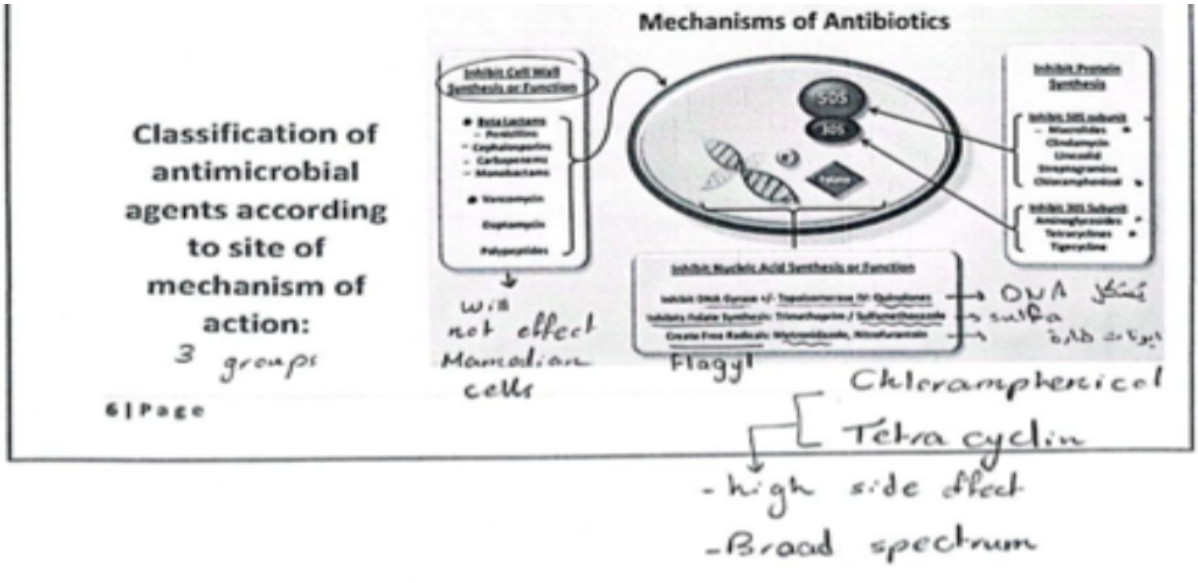
antibiotics

Gram positive & Gram Negative (different in call wall structure)

- ✖ Gram positive bacteria have a thick cell wall
  - + Peptidoglycan directly accessible from environment
- ✖ Gram negative bacteria have a different wall
  - + Thin layer of peptidoglycan
  - + Surrounded by an outer membrane composed of lipopolysaccharide, phospholipids, and proteins
  - + Outer membrane is a barrier to diffusion of molecules including many antibiotics
    - ✕ Some hydrophobic antibiotics may diffuse in.
    - ✕ Porins allow passage of only some antibiotics



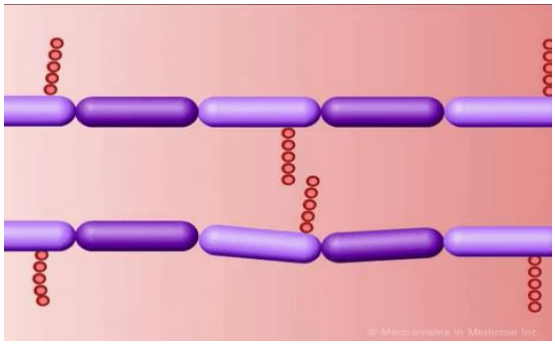




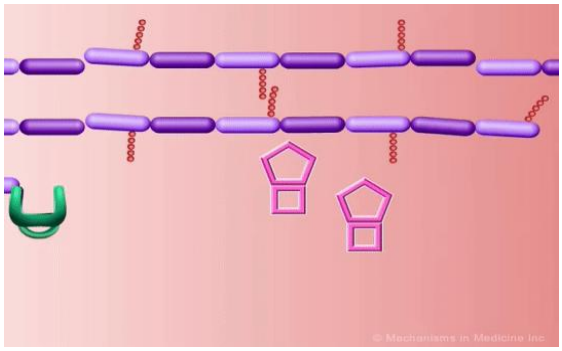
Classification of antimicrobial agents according to site of mechanism of action:

Will not affect mammalian cells

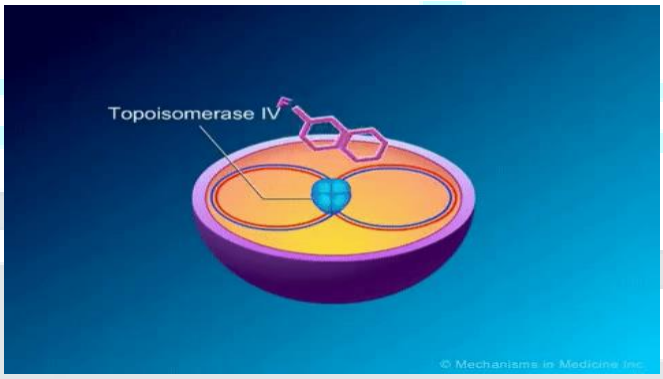
Cell wall synthesis in bacteria



Chloramphenicol + tetracyclin → high side effect / broad spectrum



Mechanism of quinolones action



Antimicrobial resistance

The ability of a microbe (germ) to resist the effects of a drug.

Antimicrobial-resistant germs are not killed by the drugs that are typically used against them and may continue to multiply.

Antimicrobial resistance includes antibacterial, antifungal, and antiviral resistance.
antiprotozoa --> ameoba,giardia --> diarrhea

Drug resistance may be present before treatment is given or may occur during or after treatment with the drug.

What is drug resistance type

Antimicrobial resistance mechanisms fall into four main categories:

(1) limiting uptake of a drug --> can't enter easily

(2) modifying a drug target

(3) inactivating a drug --> degradation of drug by enzyme

(4) active drug efflux

Causes of the ATB resistance

1- Overuse

2- Antibiotics are unregulated and available over the counter without a prescription

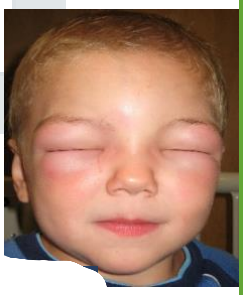
3- Incorrectly prescribed antibiotics

4- Extensive Agricultural Use, antibiotic effect is transferred through milk & meat

5- Availability of Few New Antibiotics

Extensve agriculture use causes antibiotic effect is transferred throughout milk & meat

What is resistance types drug?



MAIN SIDE EFFECTS OF CHEMOTHERAPEUTIC AGENTS & ANTIBIOTICS:

Cross-allergy → if you have allegry from penicillin, all B-lactam I have allergy from it

Hypersensitivity

Fever, skin rash, angioedema (if it reaches RS, it will cause R.failure+ bronchoconstriction and death) **and anaphylactic reactions** (severe hypotension/ massive vasodilation due to release of histamine in large amounts pouring ofblood to capillaries so vital organs doesnt have blood)**e.g. penicillins &cephalosporins**

- adrenaline IV --> contraindicated IV --> arrest , used local / Systemic use of Ad. emergency anaphylactic shock cardiac resuscitation.
- antihistamine --> Ca+2 ions (influx of mediators)

✖ DIRECT TOXICITY

(According to age, sex, genetic background, hepatic & renal status).

1. Hemopoietic disorders: (chloramphenicol) **Anemia / aplastic anemia**
2. G-6-PD: (sulphonamide,
3. Hepatic toxicity: (ketoconazole).
4. Renal toxicity: (outdated tetracyclines). failure
5. Dental discoloration (tetracyclines).
6. Taste disturbances (metronidazole) flagyl of amoeba --> metalic taste
7. Pseudomembranous colitis (tetracyclines)
8. Ototoxicity (aminoglycosides).
9. Peripheral neuropathy (INH). TB --> treatment of TB

Specific toxicity:

توضيح للنقطة الثانية

ممنوعين هدول الادوية

2) Anemial → aspirin /malaria drugs/ legumes/ sulfa drug
cuz They have G-6-PD deficiency

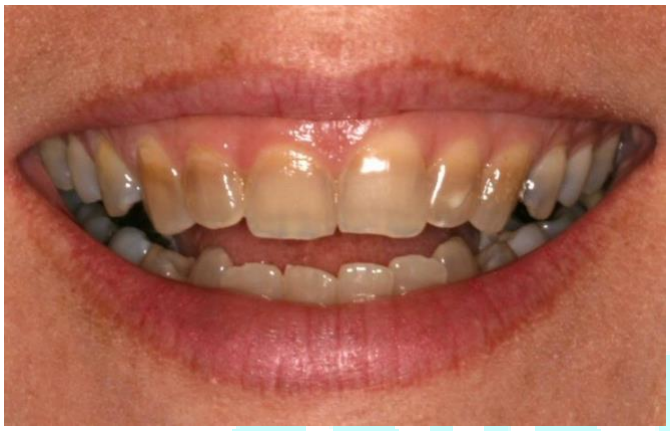
Antioxidant → so prevent oxidant factors to effect RBC (prevent rupture)

But due to deficiency if this enzyme so any oxidant agent will rupture RBC → hemolysis, hemolytic anemia

Streptomycin (type of aminoglycoside): Deafness & vertigo (8th nerve affection)

Chloramphenicol: Bone marrow depression (anemia), Grey baby syndrome (ashen grey vomiting / while breastfeeding (?)) circulatory collaps and dystensia , flaccidity death.

Tetracyclines : Teratogenic & G.I.T. irritation (nausea, vomiting) Teeth (enamel hypoplasia, yellow discolouration)



positive outcomes OF ANTIBIOTIC THERAPY

- **Early recognition and treatment of infection**
- **Selection of appropriate antibiotic**
- **Use the wright DOSE using Pharmacodynamic principles**
- **Use the wright dosing that would allow for the minimization of drug resistance**

How to select an antibiotic?

THROUGH ANSWERING THE FOLLOWING QUESTIONS:

1-Is an antibiotic indicated on the bases of clinical findings?

pt. with pharyngitis →examination (pus / 41C / as it may be viral, irritation)

2-A clinical specimen has been obtained, examined and cultured?

By clinical finding culture sensitivity (sensitivity teest →forearm small amount by insulin syringe makes a circle and injected ID, let it for 5 mins and it may cause redness and induration, induration is more valiable)

3-What pathogens are most likely to be causing the infection?

4-If multiple antibiotics are available to treat this organism, which agent is best for a given patient? (This question involves such factors as drug of choice, pharmacokinetics of agents, toxicology, cost and bactericidal compared with bacteriostatic agents.)

5-Is an antibiotic combination good? Depends on the case cuz it may cause side effects ot it could be useful (synergism)

6-Does the patient have any of the following conditions or other specific conditions?

- **Renal diseases?**
- **Liver dysfunction?**
- **Allergies?**
- **Pregnancy?**
- **Lactation**
- **……?**

7-What is the best route of administration?

8-What is the appropriate dose?

9-Will initial therapy require modification after culture data are returned? Empirical → then change / right treatment.

10-What is the optimal duration of treatment? Pharyngitis → 10 days

Empiric antibiotic therapy

- Empiric antibiotic therapy is antibiotic therapy started before the identification of the causative micro-organism.
- Identification and susceptibility testing of bacteria from clinical specimens is not available for 48-72 hours after collection of the specimen from the patient
- **Empiric antibiotic therapy should be initiated only if there is clear clinical reason, otherwise therapy should be postponed until susceptibility testing of bacteria from clinical specimens is available**

EXAMPLES

Bacterial (tonsilo)pharyngitis

- ✖ **Group A beta-hemolytic streptococcus**
- ✖ **a throat culture or a rapid antigen detection test (RADT) if clinical signs are not sufficient to exclude other conditions**
- ✖ **Drug of choice penicillin (V p.o., G i.v.)**
- ✖ **Macrolides are alternative drugs for patients who are allergic to penicillin**
- ✖ **10-day course**

Acute sinusitis, Otitis media

Steptococcus pneumoniae, Hemophilus influnsae, Moraxella catarrhalis	Drug of choice - Amoxicillin/clavulanic acid, ampicillin/ sulbactam	Alternative agents – macrolides, clindamycin

دائمًا..

التَّعب يرحل، يزول.. وتبقى كلّ بذرةٍ غرستها وأنتَ مُتعب، تلك الثمرة التي كُنتَ تقول لها؛ ذاتَ يومٍ نَصِل

- قصي العسيلي.