

ANTIBIOTICS THERAPY



ANTIBIOTICS- generalities

► Definition

- large group of chemical substances with selective and specific action, having the capacity to inhibit the growth of or to destroy bacteria and other microorganisms that can cause infectious diseases, without harming the host cells
- they are produced by living cells or they can be synthetically obtained

MODE OF ACTION

- Bacteriostatic antibiotics : they work by stopping germs from multiplying
use: mild/medium infections
- Bactericidal antibiotics: they work by killing germs
use: severe/generalized infections
(bronchopneumonia, meningitis, sepsis)

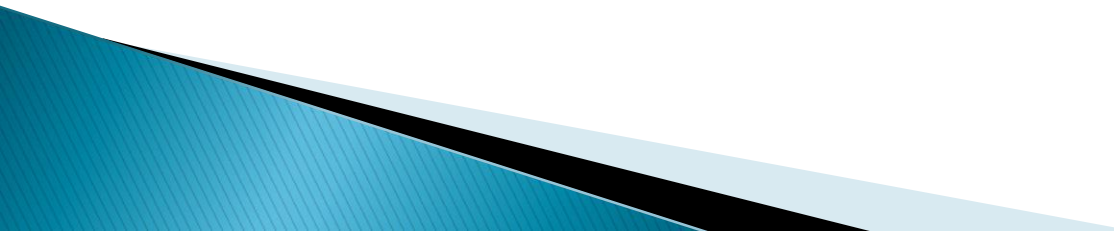
infection outbreaks hard sterilized

(endocarditis, osteomyelitis, tuberculosis)

chronic infections or infections that tend to become chronic

(angiocolitis, pyelonephritis, metro-anexitis)

MECHANISM OF ANTIBIOTICS ACTION

- ▶ **Inhibitors of bacterial cell wall synthesis** (penicillins, cephalosporins, vancomycin)
 - ▶ **Inhibitors of bacterial protein synthesis –cytoplasmatic membrane**(polypeptides)
 - ▶ **Inhibitors of bacterial protein synthesis - intracytoplasmatic:**
 - Inhibitors of protein synthesis with modification of ribosomal activity
(aminoglycosides, erythromycin, lincomycin, tetracyclines, chloramphenicol);
 - Inhibitors of nucleotides synthesis (sulfoamids, naldixin acid)
 - Inhibitors of Folic acid synthesis(sulfoamids);
 - Inhibitors of DNA-gyrase(quinolones)
- 

ANTIMICROBIAL RESISTANCE

- ▶ **Antimicrobial resistance** -the ability of some germs to survive at a given concentration of an antimicrobial agent at which the normal population of the germs would be killed;
MIC—the lowest concentration of antibiotic that inhibits the growth of microbial.
MBC—the minimum bactericidal concentration of antibiotic required to kill microbial inoculum
 - It can be manifested to an antibiotic or to a family of antibiotics;
 - almost invariably follows the widespread use of antibiotics

ANTIMICROBIAL RESISTANCE

The resistance can be:

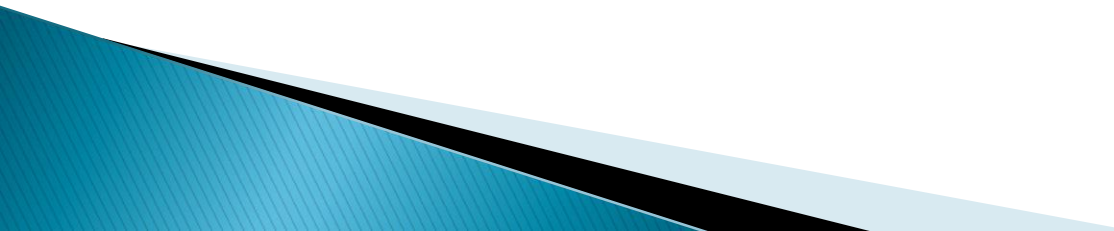
- ▶ natural— ex. b. Koch is naturally insensitive to penicillin
- ▶ acquired— endogenous (the selection of resistant mutants)
 - exogenous (transfer of resistance genes from other species, naturally resistant)

The mechanisms of antimicrobial resistance :

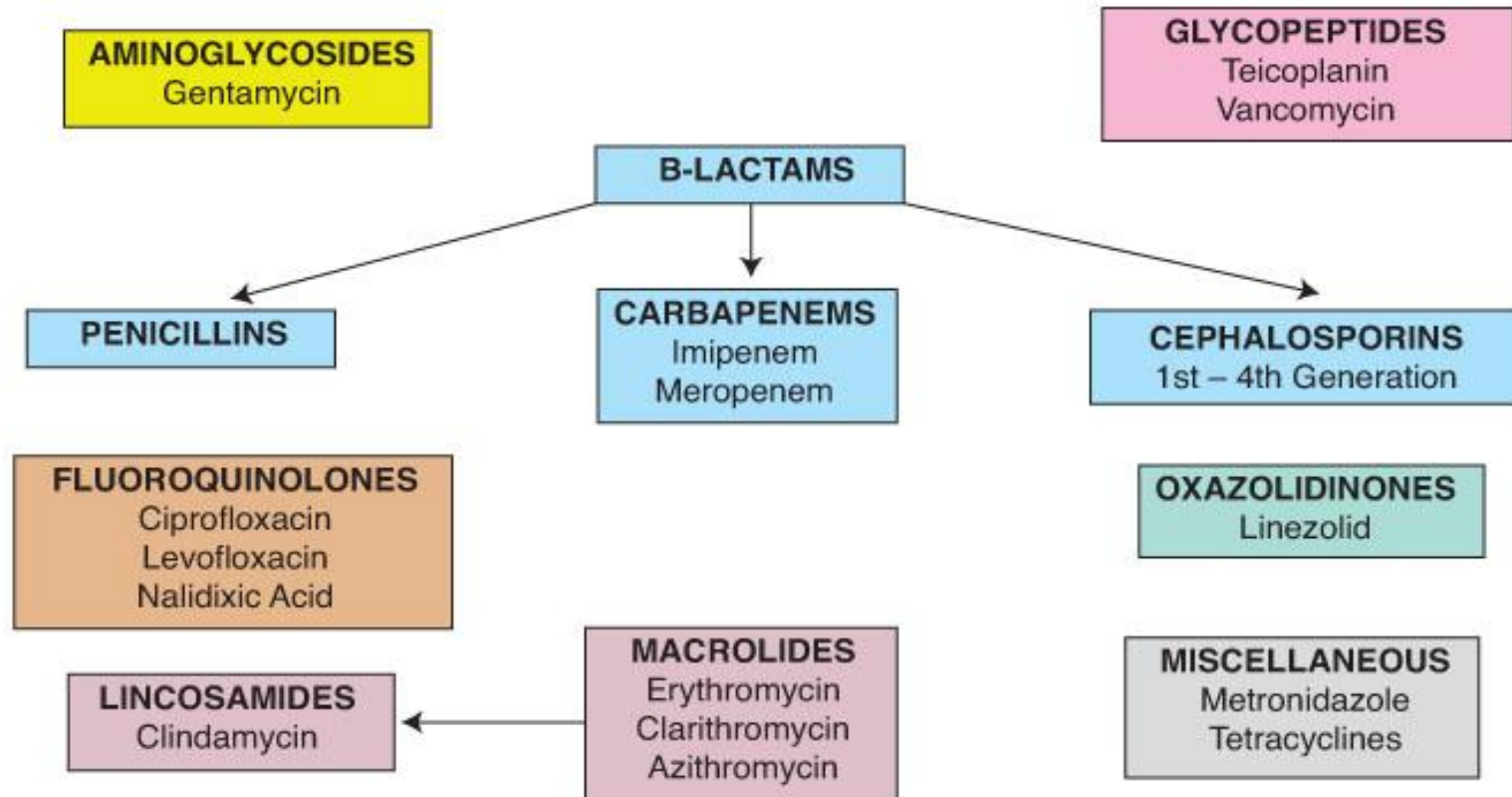
- Genetic : genetic mutation, R plasmids transfer between strains and different species
- Biochemical :
 - production of inactivating enzymes
 - antibiotics target alteration
 - reducing the transport of antibiotics ▶
reducing intracellular accumulation

ANTIMICROBIAL RESISTANCE

► Risk factors:

- abusive use(misuse) of antibiotics long term
 - socio-economic issues that favor repeated illness and antibiotics administration
 - therapeutic or prophylactic use of antibiotics in zootechnics and agriculture
 - microbes ability to exchange genetic material
 - dissemination of resistant microbes over large areas, deficiencies in the organization and operation of hospitals
- 

CLASSIFICATION OF ANTIBIOTICS



CLASSIFICATION OF ANTIBIOTICS

- ▶ **PENICILLINS**- natural antibiotics or semisynthetic produced by fungi in the genus *Penicillium*; their structure includes a beta-lactam ring which can be opened by some microbial enzymes(**penicillinase**)

The natural penicillins: Penicillin V, G; procaine-, benzathine- penicillin

Penicillinase resistant penicillins: Oxacillin, Nafcillin, Cloxacillin, Methicillin;

Penicillins with large spectrum: Ampicillin, Amoxicillin;

Antipseudomonal penicillins:

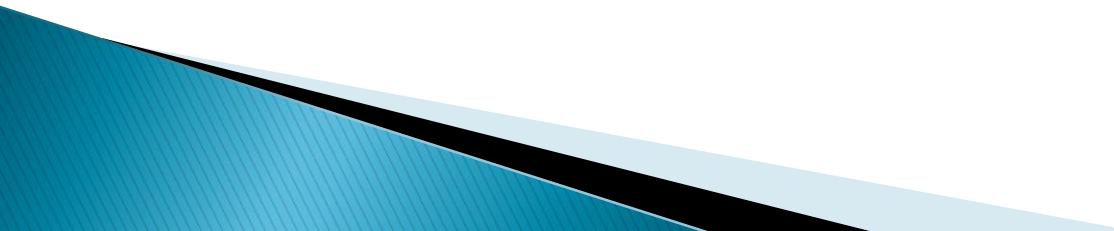
carboxipenicillin (**carbenicillin** – no longer used, increased toxicity,**ticarcillin**)

ureidopenicilline (piperacillin, mezlocillin)

CLASSIFICATION OF ANTIBIOTICS

- ▶ CEPHALOSPORINS: orally – ex. Cefaclor (Ceclor), Ceftibuten (Cedax)
:injected
 - First generation: ex. Cephalotin
 - Second generation: ex. Cefuroxime(Zinat), Cefamandole (Mandol);
 - Third generation: ex. Ceftriaxone(Rocephin /Cefort /Novosef),
Cefotaxime (Claforan)
 - Fourth generation: ex. Cefepime(Maxipim), Cefpirome(Cefrom)
- ▶ CARBAPENEMS:
 - Imipenem (Tienam)
 - Meropenem (Meronem)
 - Ertapenem (Invanz)
 - Doripenem (Doribax)
- ▶ MONOBACTAM
 - Aztreonam

CLASSIFICATION OF ANTIBIOTICS

- ▶ **MACROLIDES:** -Erytromycin
-Spiromycin
-Rovamycin
-Clarithromycin (Klacid, Klabax, Lekoklar sau Fromilid)
-Azithromycin (Sumamed)
 - ▶ **LINCOSAMIDE** -Lincomycin
-Clindamycin
 - ▶ **AMINOGLYCOSIDES** -Streptomycin
-Kanamycin
-Gentamicin
- Amikacin
-Tobramycin
-Neomycin
-Netromicin (Netilmicina)
- 

CLASIFICAREA ANTIBIOTICELOR

- ▶ CYCLINES: - Tetracycline
 -Doxycycline
 -Minocycline
- CHLORAMPHENICOL
- GLYCOPEPTIDE: - Vancomycin
 - Teicoplanin
- OXAZOLIDINONE: -Linezolid (Zyvoxid)
- RIFAMPIN : - Rifampin
 - Rifabutin
 - Rifaximin
- POLYPEPTIDES : - Colimycin
 - Polymyxin B

CLASSIFICATION OF ANTIBIOTICS

➤ **QUINOLONES:** 1st generation: Nalidixic acid (Negram)

New generations (orally and injected) Ciprofloxacin(Ciprinol)

Norfloxacin(Nolicin)

Ofloxacin(Zanocin)

Moxifloxacin(Avelox)

Levofloxacin(Tavanic)

Pefloxacin(Peflacin)

➤ **OTHERS ANTIBIOTICS**

Sulfonamides

Biseptol (Trimethoprim + Sulfamethoxazole)

Furazolidone, Nitrofurantoin

Metronidazole, Tinidazole

Dapsone (treatment of Leprosy).

► Antibiotics combination:

Amoxicillin + Clavulanic acid = Augmentin (Amoxiclav,
Amoxiplus or Medoclav)

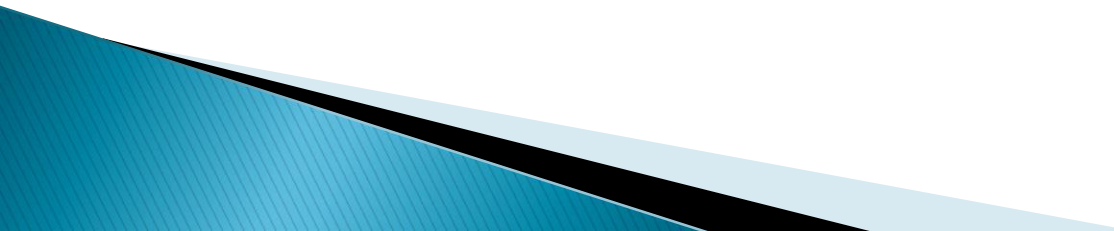
Piperacillin + Tazobactam = Tazocin

Ticarcillin + Clavulanate = Timentin

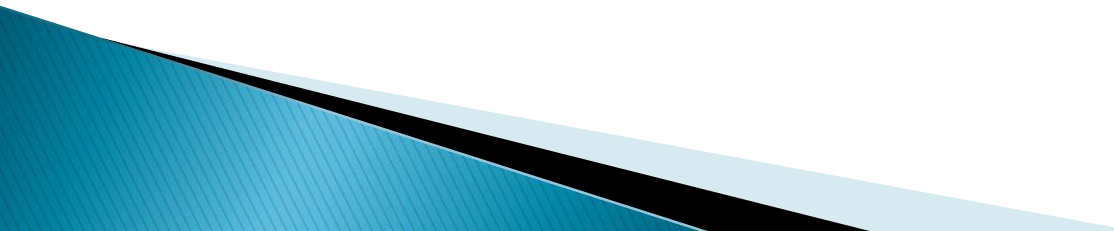
Ampicillin + Sulbactam = Unasyn

Cefoperazone + Sulbactam = Sulperazona

PRINCIPLES OF ANTIMICROBIAL THERAPY

- ▶ Choose by:
 - setting up a genuine antibiotic treatment
 - pathogen properties
 - host-related factors that may influence the effectiveness and toxicity of the antibiotic
 - antimicrobial and pharmacokinetic properties of the antibiotic
- 

PRINCIPLES OF ANTIMICROBIAL THERAPY

- ▶ Infectious diseases that **do not require** antibiotic treatment (viral respiratory infections ,without bacterial overgrowth, acute enterocolitis noninvasive pattern)
 - ▶ Infectious diseases **requiring** antibiotic treatment (after clinic exam and laboratory investigations) **without needing the antibiogram**, ex. Streptococcal infections (angina, scarlet fever, erysipelas); typhoid fever, brucellosis, leptospirosis, syphilis , diphtheria, tetanus; mycoplasma infections, chlamydia, rickettsii;
 - ▶ Infectious diseases **requiring** antibiotic treatment and **involve testing germs chemosensitivity** ex. sepsis, urinary infections, bacterial meningitis, endocarditis, bacterial pneumonia, acute enterocolitis invasive pattern
- 



SPECIAL SITUATIONS

▶ **Pregnant**

- **Banned** : aminoglycosides, polymyxin, cotrimoxazol, quinolones, metronidazol, rifampin

- **Allowed** : penicillin G and every semisynthesis penicillin (without ticarcilin), cephalosporins,

Avoid using any drug in the first trimester (banned self-medication).

Newborn and infant


- particularities of age (immature renal function, low GFR, Increased intestinal resorption capacity, immaturity of some enzymatic systems)

➤ **Kidney failure**

- modifying therapy

SIDE EFFECTS

- **Local intolerance**

- orally: nausea, vomiting, diarrhea, hemoragical gastroduodenitis
 - intramuscularly: pain, inflammation, node, necrosis, Hoigne syndrome
 - intravenous: chemical thrombophlebitis
 - intrathecal: convulsive encephalopathy
 - intraperitoneal: cardiopulmonary arrest
- 

SIDE EFFECTS

- **Hypersensibility and allergic symptoms**
 - Immediate allergic reactions : erythema , pruritus , angioedema , wheezing , hypotension, shock
 - delayed allergic reactions : rash, local allergic reaction, arthralgia , serum sickness
 - Other reactions : hemolytic anemia , thrombocytopenia , vasculitis, Stevens- Johnson syndrome



SIDE EFFECTS

➤ Toxic effects

Nephrotoxicity - aminoglycosides, polymyxin, rifampin

Ototoxicity - aminoglycosides, polypeptide

Neurotoxicity— sulphamide, vancomycin, nalidixic acid

Liver toxicity- izoniazida, sulphamide

Marrow toxicity – chloramphenicol

➤ Ecological and biological disturbances

Dismicrobism— candidosis , enterocolitis with Clostridium difficile, mycoses

➤ Others side effects

Dismetabolism- malabsorbtion syndrome

Avitaminosis – Vitamin deficiency

Thank you!!!

