Antibiotics

Dr . Rania Yahya

Antibiotics: Substances derived from one living organism to kill other one.

Classification

1. According to activity (action)

1. **Bactericidal:** death of the organism without the aid of body defense
2. **Bacteriostatic:** stasis of bacterial cell growth and removed by the aid of body defense.

2. According to spectrum

1. **Broad:** acting on both gram positive and gram negative (**Chloramphenicol**– **Tetracycline - Ampicillin** – **Amoxicillin**)
2. **Narrow** affecting on small number of organisms (**Penicillin** – **Streptomycin)**

3. According to mode of action

1. **Inhibit cell wall synthesis** (Penicillins – Cephalosporins)
2. **Inhibit Protein synthesis** (Chloramphenicol – Tetracyclines – Aminoglycosides).
3. **Impairment of cell membrane function** (Polymyxin).
4. **Inhibit DNA synthesis & replication :** Novobiocin
5. **Impairment of Nucleic acid function** (Sulphonamides & trimethoprim)

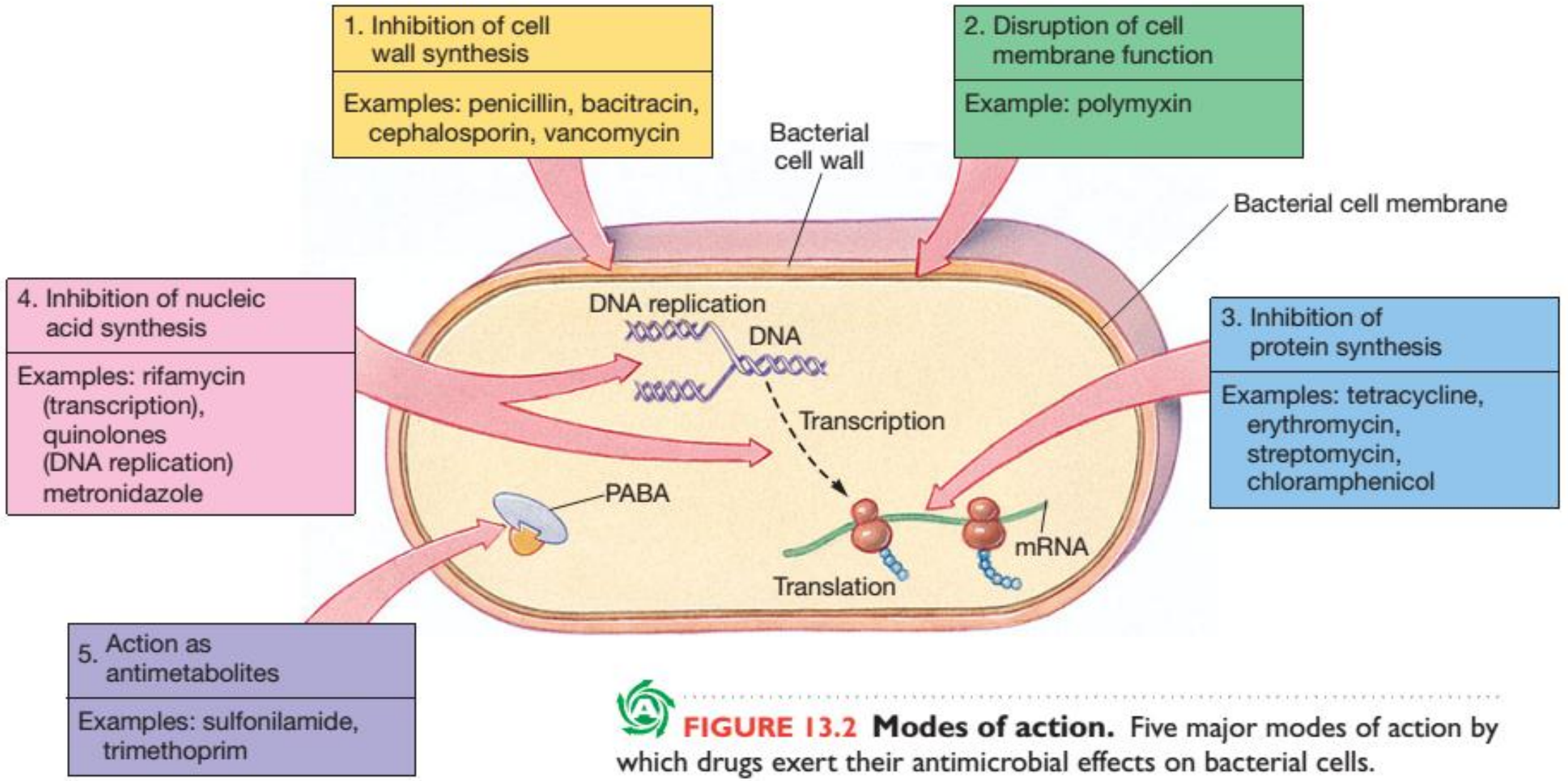


FIGURE 13.2 Modes of action. Five major modes of action by which drugs exert their antimicrobial effects on bacterial cells.

Requirements for successful antimicrobial therapy
Guidelines during use of antimicrobial drugs

1. Well clinical diagnosis of disease.
2. Culture and sensitivity to detect Drugs of choice.
3. Corrects dose and route – Spectrum and activity should be known
4. Bactericidal and bacteriostatic drugs not used together
5. Bactericidal drugs used in severe septicemic case
6. Supportive therapy to support body for overcoming infection
7. Compound antibacterial can be used
    A. For mixed infection.
    B. Overcome drug resistant strains of MO
    C. Prevent inactivation of antibiotic produced by other MO

Failure of Antimicrobial Therapy

1. False diagnosis of disease
2. Organism may be not sensitive to selective agent.
3. Using of inappropriate dose & route.
4. Using of expired antibiotics.
5. Combination of incompatible drug.
6. Superinfection by drug resistant strains.
7. Impairment of profusion & penetration of antibiotics by tissue debris & body fluid.
8. Inadequate Supportive therapy to support body for overcoming infection

Common antibiotics used in veterinary field

- Penicillins
- Cephalosporins
- Aminoglycosides
- Chloramphenicol
- Sulphonamides
- Tetracycline
- Macrolides

1.Penicillin

I - Indications:

- Locally for ear and eye infections – Mastitis
- The most widely used antimicrobial in equine medicine primarily due its effect on streptococcus spp. & clostridia.

II- Action: Bactericidal

III- Mode of action: inhibit cell wall synthesis

IV- Spectrum:

- Narrow spectrum on gram positive microbes.

V- Standard dose rate:

- **Sodium penicillin G** → 10,000 : 20,000 IU/kg I/M
- **Potassium penicillin G** → 25,000 IU/kg orally
- **Procaine penicillin G** → 10,000 : 30,000 IU/kg I/M or I/V

- **Cloxacillin** → 10 - 25 mg/kg orally
- **Ampicillin** → 5 - 10 mg/kg I/M
- **Amoxicillin** → 4 - 10 mg/kg I/M or I/V

VI - Adverse effects:

- **Allergy**
- **Pain** at site of intramuscular injection.
- **Hyperkalemia** in neonatal animals (⇑ K)
- Large doses lead to CNS effects "**Neural toxicity**"
- **Skin Rash**
- **Diarrhea** (oral dose) interfere with intestinal microflora

2. Cephalosporins

I - Indications:

- Used in treatment of staphylococcus infection.
- Bovine respiratory disease
- Urinary tract infections & arthritis of dogs.
- Dry cow mastitis.

II- Action: Bactericidal

III- Mode of action: inhibit cell wall synthesis

IV- Spectrum:

- 1st generation: → Gram +
- 2nd generation: → Gram -
- 3rd generation: → Gram - ** Penetrate CNS
- 4th generation: → Gram +

V - Dose Rate:

- 1st generation (Cephalexine) → 25 - 30 mg/kg
- 2nd generation (Cefuroxime) → 10 - 15 mg/kg
- 3rd generation (Ceftiofur) → 2.2 mg/kg
- 4th generation (Cefquinome) → 1 - 2 mg/kg

VI- Adverse effects:

- Allergy
- Pain at site of I/M injection.
- Skin Rash
- Diarrhea

3. Tetracycline

I - Indications:

- Respiratory –Urinary– Genital tract infections .
- Enteritis & Skin affections.
- Food additive
- Anaplasmosis & actinobacillosis.

II- Action: Bacteriostatic

III- Mode of action: : inhibit protein synthesis

IV- Spectrum:

- broad spectrum against many of gram negative and gram positive bacteria,
- Rickettsia, mycoplasma and chlamydia organisms.

V. Dose & rate: 5-10 mg/kg, b/w

short acting → every 12-24h,

long acting → day after day

should be diluted and administered slowly I/V, I/M.

VI. Adverse effects:

- Diarrhea due to alteration of intestinal flora.
- I/M injections abscessate
- Nephrotoxicity & cardiovascular dysfunction.
- Teeth discoloration
- Long acting not used in equines due to it causes rapid death.

4. Chloramphenicol

I - Indications:

- Tissue abscess due to mixed bacterial infection.
- Respiratory – Skin and eye infection

II- Action: Bacteriostatic

III- Mode of action: : inhibit protein synthesis

IV- Spectrum:

- broad spectrum against gram positive and anaerobic bacteria

V. Dose & rate

- Chloramphenicol → 45 : 60 mg/kg
- Florfenicol → 20 mg/kg

VI. Adverse effects:

bone marrow suppression - aplastic anemia.

5. Aminoglycosides

I - Indications:

- **Osteoarthritis-** Tracheobronchitis.
- **Endometritis** in mare (gentamycin).
- **Mastitis**.

II- Action: Bactericidal

III- Mode of action: : inhibit protein synthesis

IV- Spectrum:

- narrow spectrum against gram negative bacteria
- It commonly used in combination with penicillin G to provide synergistic broad-spectrum bactericidal action,

V. Dose & rate

Gentamicin	**3 - 6**	**mg/kg**	**IM, SC**
Neomycin	**15**	**mg/kg**	**PO**
Streptomycin	**7.5 - 12.5**	**mg/kg**	**IM, SC**
Kanamycin	**12 - 15**	**mg**	**IM, SC**
Amikacin	**5 - 7.5**	**mg/kg**	**IM, SC**

Amikacin: is the newest aminoglycosides used in **equine**, has a **broad** spectrum activity, used mainly in treatment of **gram negative** infections that are **non responsive to gentamicin** therapy,

VI. Adverse effects:

- **Nephrotoxicity** "concentrated **in renal cortex" gentamycin**

6. Sulphonamides

I - Indications:

- The most widely used antibacterial agents in the veterinary medicine
- Digestive – Respiratory –Urinary – Mastitis
- Actinobacillosis, coccidiosis, Colibacillosis.

II- Action: have bacteriostatic action and bactericidal action at a high concentration

III- Mode of action: : inhibit folic acid synthesis

IV- Spectrum:

- broad spectrum against both gram negative and gram positive bacteria.

V. Dose & rate

Sulphonamides alone: 100 - 200 mg/kg → initial dose

50 - 100 mg/kg → maintenance doses

Sulphonamides + Trimethoprim: 30 mg/kg → initial dose

15 mg/Kg → maintenance doses

VI. Adverse effects:

- **GIT disturbance**
- **Nephrotoxicity**
- **Hypersensitivity and skin rash**
- **I/V injections must be given very slowly to avoid collapse or anaphylaxis**

7. Macrolides (Erythromycin)

I - Indications:

- Synergistic combination of erythromycin and rifampin consider the treatment of choice for *rhodococcus equi* pulmonary infections in foals.
- Alternative in treatment of *staphylococcus* & *streptococcal* infections

II- Action: have bacteriostatic action & bactericidal action at a high concentration

III- Mode of action: : inhibit protein synthesis

IV- Spectrum:

- against gram positive bacteria.

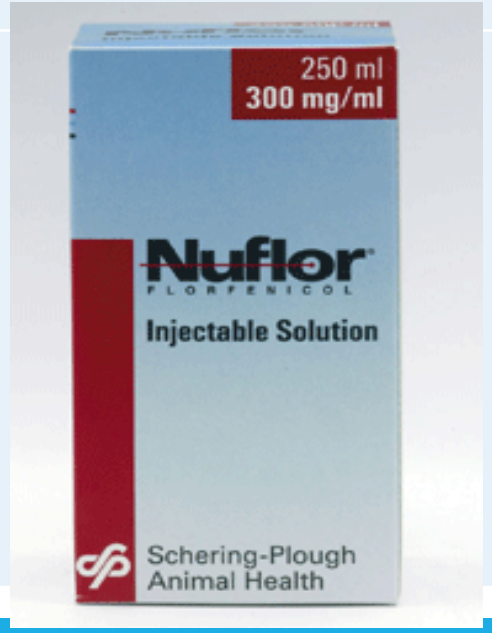
V. Dose & rate: 8- 10 mg/Kg B.W

VI. Adverse effects: diarrhea due to alteration of intestinal flora.

Scientific and commercial names of common antibiotics

Commercial name	Scientific name	Indication & dose
1- Synulox ® 	Amoxicillin + Clavulanic acid	Indications: Broad (Skin – Respiratory – Mastitis – Abscesses – Metritis - Urinary) Dose: 1ml / 20 kg once daily for 3-5 days Route: I/M
2. E-Mox® 	Amoxicillin	Indications: Broad (Skin – Respiratory – Mastitis – Abscesses – Metritis - Urinary) Dose: Vial / 12 hrs for 3-5 days Route: I/M

Commercial name	Scientific name	Indication & dose
3-Pen & Strep® 4-Vetrocin ®	Penicillin + Streptomycin	Indication: Broad (Skin – Respiratory – Mastitis – Abscesses – Metritis - Urinary) Dose: 1ml / 25 kg once daily for 3-5 days for pen & strep Vial / 120 kg for vetrocin. Route: I/M

Commercial name	Scientific name	Indication & dose
5- Gentacure® 	Gentamicin	Dose: 1 ml / 20 kg once daily for 3-5 days Route: I/M Indications: Urinary – Genital - Respiratory
6- Nuflor® 	Florfenicol	Dose: 1 ml / 15 kg once daily for 3-5 days Route: IM Indications: Respiratory – Digestive

Commercial name	Scientific name	Indication & dose
5-Borgal® 	Sulphadoxin + Trimethoprim	Dose: 1 ml / 15 kg once daily for 3-5 days Route: I/M – Slowly I/V Indications: Digestive - Respiratory - Mastitis
6-Avicycline® 	Oxytetracyclin HCl	Dose: 1 ml / 10 kg /12 hr for 3-5 days Route: Deep IM Indications: Broad (Respiratory – Digestive – Urinary – Mastitis - Genital) + Anaplasmosis

Commercial name	Scientific name	Indication & dose
7- **Alamycin LA®** 	Oxytertacyclin Hcl	Dose: 1 ml / 10 kg Once day after day for 3-5 days Route: Deep IM Indications: Broad (Respiratory – Digestive – Urinary – Mastitis - Genital) + Anaplasmosis


Thank
You