Antimicrobials Used In Veterinary Medicine

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Classifications of Antimicrobials :

1. According to Origin :

(1) Antibiotics : natural antimicrobials obtained from microorganisms
e.g. Penicillin, Aminoglycosides, Macrolides, Tetracyclinees, lincosamides, Aminocyclitols, Peptides.

(2) Antibacterial : synthetic antimicrobials made in laboratory
e.g. Sulfonamides, Nitrofurans, Chloramphenicol.

2. According to Action :

(1) Bacteriostatic : inhibit the growth of microbe.
e.g. Sulfanomides, Tetracyclines, Chloramphenicol, Macrolides, Aminocyclitols.

(2) Bacteriocidal : Kill the microbe.
e.g. Penicillin, Cephalosporines, Nitrofurans, Aminoglycosides, Bacitracins, etc..

3. According to Spectrum :

(1) Broad-Spectrum : effects on G +ve & G -ve microbes .
e.g. Tetracycline, Quinolones, Ampicillin & Amoxicillin, Chloramphenicol, Sulfonamides.

(2) Narrow-Spectrum : effect either on

a) G +ve : Penicillin G .

b) G -ve : Streptomycine.

Note : Some products contain two antimicrobials (e.g Penicillin-Streptomycin) and thus they will be consider as a Broad-Spectrum.

4. According to Degree of absorption :

(1) Slow : For enteric infection e.g. Streptomycin.

(2) Moderate : For enteric & systemic infection e.g. Sulfonamides.

(3) Rapid : For systemic infection e.g. Quinolones.

5. According to Mode of action :

(1) Inhibit Synthesis Of Cell Wall : Penicillins, Cephalosporines, Carbapenems, Vancomycine, Bacitracins

(2) Damage Outer Membrane: Polymixins.

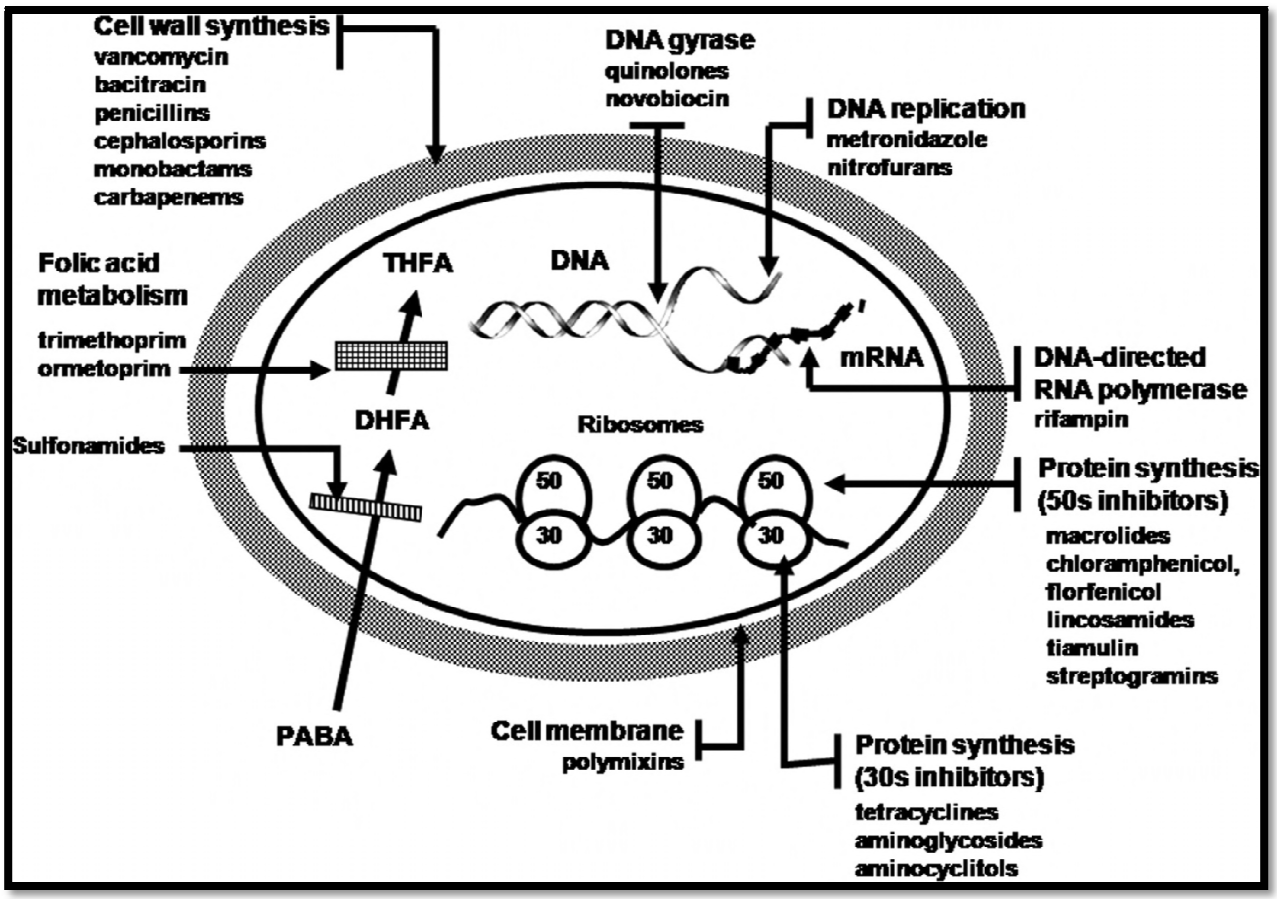
(3) Modify Nucleic Acid/DNA Synthesis:

- Quinolones, metronidazole, Nitrofurans.
- Rifampin.

(4) Modify Protein Synthesis:

- Macrolides, Chloramphenicol, Florfenicol,Lincosamide,Streptogramins.
- Tetracyclines, Aminoglycosides, Aminocyclitols.

(5) Modify Energy Metabolism In The Cytoplasm : Sulfonamide.


Cell wall synthesis
vancomycin
bacitracin
penicillins
cephalosporins
monobactams
carbapenems
DNA gyrase
quinolones
novobiocin
DNA replication
metronidazole
nitrofurans
Folic acid metabolism
trimethoprim
ormetoprim
THFA
DNA
mRNA
DNA-directed RNA polymerase
rifampin
DHFA
Ribosomes
Sulfonamides
50
30
Protein synthesis (50s inhibitors)
macrolides
chloramphenicol, florfenicol
lincosamides
tiamulin
streptogramins
PABA
Cell membrane
polymixins
Protein synthesis (30s inhibitors)
tetracyclines
aminoglycosides
aminocyclitols

SULFONAMIDES : Bacteriostatic .

Potentiated sulfonamides are fixed combinations of a sulfonamide with **trimethoprim** or **ormetoprim** to to prevent renal precipitation and thus reduce toxicity.

Note: When Sulfonamides mixed with Trimethoprim , it become **Bacteriocidal**.

Interaction :

- Antagonism with Chloramphenicol, Antacid, Macrolides, Tetracyclines.Penicillin.

Therapeutic uses: Sulfonamides were widely used in the prevention and treatment of local and systemic infections in all species but now resistance is common.

1. **Sulfamethazine**
2. **Sulfadimethoxine**
3. **Sulfachlorpyridazine is a rapidly absorbed and rapidly excreted sulfonamide used orally in calves under 1 month of age and in swine for the treatment of respiratory and enteric infections**
4. **Sulfamethoxazole is used to treat urinary tract infections in small animals**
5. **Sulfacetamide is the only sulfonamide that can be prepared as the sodium salt at neutral pH and thus can be used in ophthalmic preparations.**
6. **Sulfasalazine is an "enteric" sulfonamide employed in the therapy of colitis and inflammatory bowel disease in dogs and cats.**
7. **Other sulfonamides used in veterinary medicine are** sulfathiazole and sulfaquinoxaline.

Adverse effects

1. Renal crystalluria
2. Keratoconjunctivitis sicca (KCS) may be observed in dogs treated with sulfonamides,
3. Hypoprothrombinemia, thrombocytopenia, and anemia occur

FLUOROQUINOLONES : Bactericidal

Activity: G- bacilli and cocci (Pseudomonas aeruginosa, Klebsiella sp, E. coli, Enterobacter, Campylobacter, Shigella, Salmonella, Aeromonas, Haemophilus, Proteus, Yersinia, Serratia, Vibrio) other generally susceptible organisms: Chlamydia trachomatis, Staphylococci, Brucella sp, mycoplasma, and Mycobacterium sp.

Interactions:

- Antagonism with Nitrofurantoin , Sulonamides, Tetracyclines.
- Synergism Aminoglycosides, Macrolides,

Therapeutic uses

1. Enrofloxacin is used in the treatment of dermal, respiratory, and urinary tract infections. (including prostatitis) in dogs, cats, and birds and in respiratory infections in cattle.

2. Danofloxacin is used for the treatment of bovine respiratory infections including *Mannheimia* species.

3. Difloxacin is used for treatment of dermal, respiratory, and urinary tract infections in dogs.

4. Orbifloxacin and Marbofloxacin are used for the treatment of dermal, respiratory, and urinary tract infections of dogs and cats. Orbifloxacin is used for susceptible Gram(–) infections in horses.

Adverse effects.

1. **Erosion of articular cartilage** in young dogs and foals,
2. **Seizures** in dogs on phenobarbital for epilepsy
3. **Retinal degeneration** in cats.

PENICILLINS (β-lactam): Bactericidal

Rapidly growing bacteria are most susceptible to the bactericidal effect of penicillin. The penicillins are primarily effective against Gram(+) aerobes and anaerobes. The broad-spectrum, semisynthetic penicillins are also effective against some Gram(–) pathogens.

Interactions:

- Synergism with Aminoglycosides, Cephalosporins .
- Antagonism with Tetracyclines, Macrolides, Chloramphenicol, Sulfonamides.

Therapeutic uses

1. Natural penicillins

a. **Penicillin G (benzylpenicillin)** is used in all species for the treatment of infections caused by Gram(+), nonpenicillinase producing pathogens.
b. **Penicillin V** now used infrequently for long-term oral therapy of Gram(+) bacterial infections in dogs, cats, and horses.

2. Penicillinase-resistant penicillins include **methicillin**, **oxacillin**, and **cloxacillin**. Their use is suited for severe staphylococcal infections but they are less effective against *Streptococcus* than the natural penicillins.

3. Broad-spectrum penicillins

a. **Aminopenicillins.: Ampicillin** and **Amoxicillin** are active against many Gram(–) aerobes (*E. coli*, *Proteus*, *Haemophilus* spp.) as well as Gram(+) pathogens. They are used in all species for the treatment of susceptible infections. They are acid stable but are not penicillinase stable.
b. **Carbenicillin and ticarcillinhave** antipseudomonal actions They are useful for ear and skin infections in dogs caused by *Pseudomonas* spp.
c. **Piperacillin** is an ureidopenicillin that has an extended Gram(–) spectrum including *Pseudomonas*, *Enterobacter*, and *Klebsiella* spp.

Adverse effects:

- Allergic reactions to penicillin may occur in animals, especially cattle.
- Signs include skin eruptions, angioedema, and anaphylaxis.
- Procaine salts of penicillin should not be used in birds, snakes, turtles, guinea pigs, or chinchillas because these species are sensitive to procaine.
- Procaine penicillin G should not be used in race horses 30 days before racing.
- Release of procaine due to high levels of plasma esterases in horses may produce CNS effects.
- Hyperkalemia and cardiac arrhythmias may result from IV administration of potassium penicillin in all species.

CEPHALOSPORINS (β-lactam) : Bactericidal.

Therapeutic uses. Cephalosporins may be used in penicillin-intolerant patients, but this should be done with caution since cross-reactivity can occur.

1. **First generation cephalosporins** include :
    - Cephalexin (Oral).
    - Cefadroxil (Oral).
    - **Cephapirin** (Parenteral).
    - Cephalothin (Parenteral).

They are effective against Gram(+) aerobes.
Cephalosporins are frequently employed for antibiotic prophylaxis because of their ability to penetrate tissues.
They are a first alternate to penicillins in the treatment of many infections caused by Gram(+) pathogens.

2. **Second-generation cephalosporins** include :
    - Cefaclor (Oral) .
    - **Cefoxitin (Parenteral).**

Their antibacterial spectrum is broader than that of first-generation cephalosporins and includes some Gram(–) pathogens.

3. **Third-generation cephalosporins** include
    - **Ceftiofur.**
    - Cefoperazone.
    - **Cefotaxime**.
    - Cefixime.
    - Cefpodoxime.

They have an extended spectrum of action against Gram(–) organisms, are resistant to β-lactamases cephalosporinases), and penetrate the blood–brain barrier.

- Ceftiofur is used in the treatment of respiratory disease in cattle, horses, sheep, and swine following IM injection and for intramammary treatment of mastitis in cattle. It is also used for treating urinary tract infections and soft tissue infections in dogs and cats.
- Cefoperazone is used in dogs to treat soft tissue infections and Gram(–) bacteremia.
- Cefotaxime is used in dogs, cats, and foals to treat Gram(–) sepsis, soft tissue infections meningitis, and CNS infections.

- Cefpodoxime proxetil is the prodrug marketed for use in the treatment of skin infections in dogs and cats.
- Cefixime is used in the treatment of urinary tract infections and respiratory infections in dogs and cats and for bacterial endocarditis in dogs.

4. **Fourth-Generation cephalosporins** include
    - **Cefepime.**
    - Cefquinone.

Have more activity against bacteria, particularly *Pseudomonas*, Systemic infections , Meningitis (foals), Mastitis (cattle).

Adverse effects.

- Side effects are rare and **cephaolsporins are considered to be among the safest antimicrobials in use.**
- Prolonged treatment or high doses may produce **hemopoietic effects with anemia and bone marrow depression**.
- **Hypersensitivity and allergic reactions** may occur.

CARBAPENEMS (β-lactam) : Bacterocidal. Including :

- **Ertapenem**
- **Doripenem**
- **Imipenem-Cilastatin**

Drug Interactions:

- Synergy with aminoglycosides, Trim/Sulfa .
- Antagonism with other beta lactam antibiotics, Chloramphenicol.
-

Therapeutic uses.

The carbapenems are used to treat very serious infections like peritonitis associated with ruptured GI tract or intestinal spillage during surgery. They are effective against Gram(+) and Gram(–) aerobic and anaerobic bacteria including *Pseudomonas* and *Enterobacteriaciae*.

Adverse effects.

Side effects may include anorexia, vomiting, and diarrhea; CNS toxicity including seizures and tremors; and hypersensitivity reactions including pruritis, fever, and rarely, anaphylaxis.

AMINOGLYCOSIDES : Bactericidal.

Interactions:

- Use caution with other nephrotoxic, ototoxic, and neurotoxic drugs including: amphotericin B, other aminoglycosides, acyclovir, bacitracin (parenteral), cisplatin, methoxyflurane, polymyxin B, vancomycin;
- Concurrent use with loop (furosemide) or osmotic (mannitol) diuretics may increase nephrotoxic potential.
- Antagonism with Macrolides, Aminocyclitols.
- Synergism with Penicillin.

Therapeutic uses:

The aminoglycosides are used in the treatment of Gram(–) infections in all species.

1.Streptomycin and dihydrostreptomycin are the oldest members of this class of antibiotics.

Their use has declined with the advent of broader spectrum aminoglycosides such as gentamicin and amikacin.

2. Neomycin is used orally for the treatment of enteric infections and topically for treating skin, ear, and eye infections.

3. Gentamicin and amikacin are expanded spectrum aminoglycosides with activity against *Pseudomonas*, *Proteus*, *Staphylococcus*, and *Corynebacterium* spp., as well as Gram(–) aerobes. They are used in all species for the treatment of susceptible infections of the skin, respiratory tract, ear, eye, urinary tract, and septicemia.

4.Tobramycin is similar to gentamicin but has more potent antipseudomonal activity and reduced nephrotoxicity.

5. Kanamycin has an antimicrobial spectrum similar to gentamicin except it is not effective against *Pseudomonas* spp.

Adverse effects

- The aminoglycosides are relatively more toxic than other classes of antimicrobials.
- Ototoxicity
- Nephrotoxicity
- Neuromuscular blockade.

TETRACYCLINES : Bacteriostatic

Interaction :

- Should not be given with other antibiotics (penicillins, cephalosporins, and aminoglycosides)

Therapeutic uses

- **Large animals.** Tetracycline, chlortetracycline, and oxytetracycline are used in the treatment of local and systemic bacterial, chlamydial, rickettsial, and protozoal infections in cattle, sheep, horses, and swine and as feed additive/growth promoters in cattle and swine.
- **Small animals.** Doxycycline, minocycline, and tetracycline are used in the treatment of respiratory and urinary tract infections in dogs and cats and as specific therapy for *Borrelia* (Lyme disease), *Brucella*, *Haemobartonella*, and *Ehrlichia* spp. infections.
  They are also effective in the treatment of psittacosis in birds.

Adverse effects

1. **The tetracyclines (except doxycycline and minocycline) are potentially nephrotoxic** .
2. **Permanent staining of unerupted teeth may occur in young .**
3. **Suprainfections of fungi, yeast, or resistant bacteria** may occur in the GI tract with prolonged administration of broad-spectrum antibiotics such as the tetracyclines.
4. **Oral tetracyclines should not be used with herbivores because of serious effects on ruminant digestion.**

CHLORAMPHENICOL : Bacteriostatic.

Therapeutic uses:

- **Chloramphenicol** is not allowed for use in food-producing animals because the potential danger of residue-induced toxicity in humans .

It is used in dogs, cats, horses, and birds for local and systemic infections, inducing respiratory, CNS, and ocular infections, and infections caused by anaerobes and *Salmonella* spp.

- **Florfenicol** is approved for use only in cattle for the treatment of bovine respiratory disease (BRD) caused by *Pasteurella* spp. and *Haemophilus somnus*.

It is used in dogs and cats for treating susceptible infections when the myelotoxic potential of chloramphenicol must be avoided.

Adverse effects

1. Aplastic Anemia
2. Anorexia and diarrhea
3. Florfenicol is not known to produce aplastic anemia and its use is permitted in beef cattle.

MACROLIDES : Bacteriostatic

Therapeutic uses

1. **Erythromycin** is an alternate to penicillin for infections caused by Gram(+) aerobes and anaerobes in dogs, cats, and horses. It is a drug often chosen for the treatment of enteritis caused by *Campylobacter jejuni* in dogs and foals and for *Rhodococcus equi* pneumonia in foals.
2. **Tylosin** is used in cattle, sheep, and swine for the treatment of local and systemic infections caused by *Mycoplasma* and Gram(+) bacteria. It is also added to feed as a growth promotant in these species. Tylosin is used in dogs and cats for the treatment of chronic colitis.
3. **Tilmicosin** is used in cattle for the treatment of respiratory disease caused by *Pasteurella* spp. It has potentially fatal toxic effects in horses and humans.
4. **Azithromycin** is used in dogs, cats, and horses and is effective against *Staphylococcus*, *Streptococcus*, and *Mycoplasma*. It is used as an alternative for erythromycin for *R. equi* pneumonia in foals
5. **Tulathromycin** is used for the treatment of bovine and swine respiratory diseases. It is effective against *Mannheimia*, *Mycoplasma*, and *Haemophilus*; it is concentrated in leucocytes and lung tissue.
6. **Clarithromycin** is used in dogs and cats for the treatment of mycobacterial infections including canine leproid granuloma, feline leprosy, and for *Helicobacter* spp. in cats and ferrets, and for *R. equi* in foals.

LINCOSAMIDES : Bacteriostatic

Interaction :

Antagonism with Macrolides and Chloramphenicol.

Therapeutic uses : Active against Gram(+) aerobes and obligate anaerobes, *Toxoplasma* spp. *Neospora canis*, and *Mycoplasma* spp.

- **Lincomycin** is used in swine for the control and treatment of swine dysentery, and the treatment of staphylococcal, streptococcal, and mycoplasmal infections.
- **Clindamycin** is used in dogs and cats for periodontal disease, osteomyelitis, dermatitis, and deep soft tissue infections caused by Gram(+) organisms. It is used for treating toxoplasmosis in dogs and cats and neosporosis in dogs.
- **Pirlimycin** is prepared and used for the treatment of bovine mastitis.

Adverse effects:

- Lincosamides are contraindicated in horses, rabbits, hamsters, and guinea pigs because they may produce a severe, often fatal, diarrhea due to altered GI flora.

MISCELLANEOUS ANTIBACTERIAL DRUGS

1.Aminocyclitols : Chemically related to the aminoglycosides but are **Bacteriostatic**, not bactericidal.
Therapeutic uses: They are active primarily against Gram(–) aerobes and *Mycoplasma* infections.

- **Spectinomycin** is used in dogs, cats, horses, swine, calves, and poultry for the treatment of enteric and respiratory infectious disease.
- **Apramycin** is used to treat enteric infections, especially colibacillosis in swine and calves.

2. Metronidazole: It is **Bactericidal** against most obligate anaerobes and is active against protozoa, including *Giardia* and *Trichomonas* spp.
Therapeutic uses.

- Metronidazole is used in dogs, cats, and horses for the treatment of severe infections caused by anaerobic pathogens, especially brain abscesses and pelvic, genitourinary tract, and respiratory infections.
- Metronidazole is also used to treat protozoal infections such as giardiasis and trichomoniasis in dogs and cats.

3. Rifampin : Bactericidal.
Therapeutic uses:

- Mycobacteria and Gram(+) pathogens.
- Rifampin is combined with erythromycin in the treatment of *R. equi* infections in foals.
- Rifampin is also used in combination with other antifungal agents to treat fungal infections such as aspergillosis or histoplasmosis in dogs and cats when infection involves the CNS.

4. Vancomycin: It is **Bactericidal** for Gram(+) organisms..
Therapeutic uses

- For methicillin-resistant staphylococcal infections of bone and soft tissue in dogs and cats.
- In dogs for the treatment of multidrug-resistant enteric infection.

Adverse effects: ototoxicity and nephrotoxicity occur with large or prolonged dosage.

5. Bacitracin: Bactericidal for Gram(+) bacteria and *Spirochetes*.

Therapeutic uses:

- Bacitracin is used in topical ointments and solutions and is frequently combined with polymixin B and/or neomycin in these preparations.
- It is also added to swine and poultry rations for the prevention and treatment of clostridial enteritis and as a growth promotant.

6. Polymyxin B (Peptides) : Bactericidal to Gram(–) organisms.

Therapeutic uses:

- Polymyxin B is used topically to treat Gram(–) bacterial infections of the skin, eye, and ear in all species.
- It is usually combined with bacitracin for broad-spectrum antibacterial effects.
- Polymyxin B is administered orally to cattle and swine for the treatment of Gram(–) enteric infections.

7.Nitrofurans: They are broad spectrum and **Bacteriostatic**.

Therapeutic uses:

- Nitrofurantoin is occasionally used in the treatment of lower urinary tract infections in dogs and cats.
- Nitrofurazone is used topically as an antibacterial ointment, powder, and water-soluble wound dressings in all species.

Adverse effects : Nitrofurans may not be used in food-producing animals (include topically) because they have been shown to be potential carcinogens in laboratory animals.

8. Streptogramins : Bactericidal against Gram(+) aerobic and anaerobic bacteria.

Therapeutic uses:

- **Virginiamycin** is administered as a medicated feed additive in broiler chickens and swine as a growth promotant and for the prevention of necrotic enteritis in broiler chickens and for the control of swine dysentery in pigs.
- It is also used as a feed additive in cattle to increase feed efficiency and to reduce the incidence of liver abscesses.

9.Tiamulin : It is active against Gram(+) cocci, *Mycoplasma*, *spirochetes*, and some Gram(–) pathogens such as *Haemophilus* spp.

Therapeutic uses:

Tiamulin is administered in medicated feed or water in swine for the control and treatment of *Haemophilus* pneumonia and swine dysentery.

10. Novobiocin : Bacteriostatic for Gram(+) cocci, especially *S. aureus*.

Therapeutic uses: Novobiocin is used for wound treatment and the treatment of mastitis particularly *Staphylococcus* infections. It is less potent against *Streptococcus* infections.

11. Ionophore antibiotics : Derived from *Streptomyces* used primarily in poultry and swine for feed efficiency and anticoccidial activity.

They include **monensin**, **lasalocid**, **laidlomycin**, **salinomycin**, and **narasin**.

Therapeutic uses:

- **Monensin**, **lasalocid**, and **laidlomycin** are administered as premixes or medicated feed for growth promotion, feed efficiency, and control of coccidiosis in cattle and broiler chickens.
- **Salinomycin** and **narasin** are administered as medicated feed to broiler chickens for prevention of coccidiosis.

ANTIFUNGAL AGENTS

Griseofulvin : Fungistatic.

Therapeutic uses : Griseofulvin is used in dogs, cats, and horses for multifocal dermatophyte Infections ringworm)

Nystatin and Natamyci: Fungicidal to yeast infections caused by *Candida* spp. and *Malassezia* spp

Therapeutic uses:

- They are administered topically for yeast infections of the eye, ear, and skin, and administered orally for treating mucosal yeast infections of the mouth and GI tract.
- Nystatin is used as a feed additive in poultry to prevent crop mycosis and mycotic diarrhea.
- Nystatin is a component of topical proprietary preparations such as Panalog R _ , which also include thiostrepton, a polypeptide antibiotic, and triamcinolone, a glucocorticoid.

Note: Nystatin and natamycin are too toxic for parenteral use.

Azoles : Fungistatic.

Ketoconazole, **itraconazole**, and **fluconazole** are **imidazole** antifungals for systemic use.

Other imidazoles used only topically for dermatophyte, *Aspergillus* or yeast infections include **miconazole** and **clotrimazole**.

Therapeutic uses:

- Ketoconazole is used in dogs, cats, horses, and birds for systemic mycoses and for severe yeast infections.
- It is also used in dogs and cats at high dosage for the treatment of hyperadrenocorticism .
- Fluconazole and itraconazole have replaced ketoconazole in most treatment regimens for the systemic mycoses because of their longer *t* 1/2 , greater activity, and lower toxicity.
- Clotrimazole and miconazole are used topically in the treatment of *Candida*, *Aspergillus*, and dermatophyte infections.
- fungistatic for most pathogenic fungi causing systemic infections such as*Blastomyces*, *Coccidioides*, *Cryptococcus*, and *Histoplasma* spp.
- They are also effective against candidiasis and griseofulvin-resistant dermatophytes.

Amphotericin B : Fungicidal against most organisms causing systemic mycoses, including *Aspergillus*, *Blastomyces*, *Coccidioides*, *Cryptococcus*, and *Histoplasma* spp.

Therapeutic uses:

- Amphotericin B is used to treat systemic fungal infections in dogs, cats, horses, and birds.
- Combined therapy with ketoconazole, fluconazole, itraconazole (to reduce toxicity), or flucytosine (for CNS, bone, or ocular infections) is common.

Flucytosine : Fungicidal against *Cryptococcus*, *Candida*, and *Aspergillus* spp.

Therapeutic uses.:

- Flucytosine is combined with amphotericin B for synergistic action in the treatment of cryptococcosis (especially meningeal cryptococcosis) in dogs and cats.
- It is used alone in treating aspergillosis and candidiasis in psittacine birds.

Terbinafine : Fungicidal against dermatophytes and **Fungistatic** against yeast

Therapeutic uses:

- When administered orally (30 mg/kg/day) or topically, terbinafine is useful for treating dermatophytic infections in dogs and cats.
- It is also useful for treating birds for systemic mycotic infections such as aspergillosis.

ANTIVIRAL AGENTS

Amantadine :

Therapeutic uses:

- The primary use of amantadine in veterinary medicine is as an adjunct to NSAIDs for the treatment of chronic pain in dogs and cats.
- It is effective for treating some, but not all, influenza viruses.
- Because oral absorption in horses is variable, it has been used IV to treat equine-2 influenza but its potential for inducing seizures when administered by this route limits its use.

Acyclovir :

Therapeutic uses:

Acyclovir is used to treat ocular and respiratory infections of herpes virus 1 of cats.

Zidovudine (AZT) :

Therapeutic uses.:

- Zidovudine may be used in cats to treat FIV infection where it produces temporary alleviation of the clinical signs and increase in quality of life and survival time in most cats, particularly when clinical signs of immunodeficiency are evident.
- It does not inhibit the viremia. Clinical improvement occurs 14 days after the start of treatment.
- Zidovudine is not effective against feline leukemia virus at nontoxic doses.

Cat omega interferon :

Therapeutic uses.:

Feline omega interferon can be used to treat cat viral infections, including calci virus, FeLF, FIV, and other feline viral infections as well as canine parvovirus.