ANTIMICROBIAL CLASSIFICATION BASED ON MODE OF ACTION

Veterinary antimicrobials are extensively used for therapeutic application in food producing animals. These antimicrobials could be bacteriostatic or bactericidal based on their mechanism of action. Proper insight on antimicrobial classification will widen our understanding on the mechanism adopted by microbes to acquire antimicrobial resistance (AMR).

S.No	Antimicrobial class & mechanism of action		Antimicrobial subclass	Antimicrobial agent	
1.	Inhibition of bacterial cell wall synthesis	Beta lactams A.Penicillins	a.Benzylpenicillins	Peniciliin G	
			b.Aminobenzylpenicillins	Ampicillin Amoxicillin	
			c.Phenoxypenicillins (oral penicillins)	Propicillin Penicillin V	
			d.Ureidopencillins (broad-spectrum penicillins)	Piperacillin Mezlocillin	
			e.Penicillinase resistant penicillins (anti-staphylococcal penicillins)	Dicloxacillin Flucloxacillin Oxacillin	
			f.Beta lactamase inhibitors	Amoxacillin/clavulanate Ampicillin/sulbactam Piperacillin/tazobactam	
		B.Cephalosporins	First Generation	Cephalexin Cephradine Cefadroxil	Cephapirin Cephalothin
			Second Generation	Cefazolin Cefamandole Cefonicid	Cefmetazole Cefuroxime
			Third Generation	Cefaclor Cefoperazone Ceftizoxime	Ceftazidime Ceftriaxone Cefixime
			Fourth & Fifth Generation	Cefepime Cefozopran Cefpirome	Cefquinome Ceftobiprole Ceftaroline
		C.Carbapenems		Biapenem Imipenem Meropenem	Doripenem Ertapenem
		D.Monobactams		Aztreonam Nocardicin A	Tigemonam
2.	Inhibition of protein synthesis	30S ribosome site	a.Tetracyclines	Tetracycline Doxycycline	Minocycline
			b.Aminoglycosides	Gentamicin Streptomycin	Amikacin Neomycin
		50S ribosome site	a.Macrolides	Erythromycin Azithromycin Clarithromycin	Roxithromycin Spiramycin
			b.Lincosamides c.Chlorampenicol	Clindamycin	
3.	Alterations in Cell membrane permeability	Polymyxins		Colistin Polymyxin B	
4.	Inhibition of Nucleic acid synthesis	DNA	Fluroquinolones	Norfloxacin Ciprofloxacin Enrofloxacin	Ofloxacin Danofloxacin Marbofloxacin
		RNA	Ansamycin-Rifamycin	Rifampicin	Rifaximin
		Antimetabolite	Sulfonamides	Sulfadiazine Sulfadimidine Sulfadoxine	Sulfamethoxine Sulfadimerazin Sulfaguanidine
			Diaminopyrimidines	Trimethoprim	Baquiloprim

Major mechanism adopted by microbes to attain AMR:

1. Exclusion of antimicrobial (efflux pump mediated resistance)
2. Inactivation of antimicrobial agent through enzymes
3. Replacement of sensitive pathway
4. Altered target site for the antimicrobial agent
5. Altered permeability for the antimicrobial agent

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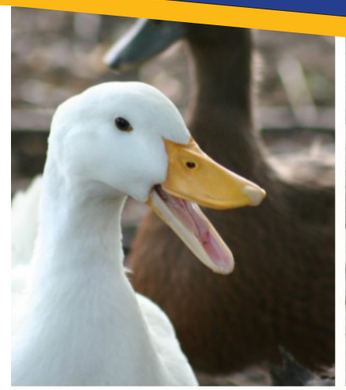
ANTIMICROBIALS OF VETERINARY IMPORTANCE
CLASSIFICATION AND MODE OF ACTION



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OIE CLASSIFICATION OF ANTIMICROBIAL AGENTS OF VETERINARY IMPORTANCE:

Antimicrobials are essential in veterinary medicine for treating and controlling infectious diseases in food producing animals. There are claims that veterinary antimicrobial usage has often been considered to contribute to the emergence of antimicrobial resistance (AMR) which may be transferred to humans. AMR remains as a leading public health issue. Selection of most appropriate antimicrobial agent at a correct dose, route and duration of treatment is important for a positive clinical outcome. Therefore, veterinary oversight must be enhanced for a responsible and prudent use of antimicrobials of veterinary importance in order to prevent emergence of AMR and also to preserve its effectiveness for future use. The antimicrobials are classified as VCIA, VHIA, VIA by OIE (office international des epizooties) based on its essentiality for the treatment against specific infections with an absolute number of respondents identified its importance and also on the availability of therapeutic alternatives if any.

S.NO	CATEGORY	ANTIMICROBIAL CLASS		
A	**Veterinary Critically Important Antimicrobial Agents (VCIA)**	Aminoglycosides	Streptomycin Dihydrostreptomycin Framycetin Kanamycin Neomycin	Paromomycin Apramycin Gentamicin Tobramycin Amikacin
		Aminocyclitol	Spectinomycin	
		Cephalosporins	**Cephalosporin 1G** Cefacetrile Cephalexin Cefalotin Cefazolin Cefalonium	**Cephalosporin 2G** cefuroxime **Cephalosporin 3G** Cefoperazone Ceftiofur Ceftriaxone **Cephalosporin 4G** cefquinome
		Macrolides	Azalide Tulathromycin **Macrolides C14** Erythromycin **Macrolides C16** Josamycin	Kitasamycin Spiramycin Tilmicosin Tylosin Mirosamycin terdecamycin
		Penicillins	**Natural penicillins** Benzylpenicillin Penicillin procaine **Amdinopenicillins** Mecillinam Aminopenicillins Amoxicillin Ampicillin Hetacillin **Aminopenicillin plus betalactamase inhibitor** Amoxicillin clavulanic acid	Carboxypenicillin Ticarcillin Tobicillin **Ureido penicillin** Aspoxicillin Phenoxypenicillins Phenoxymethylpenicillin Phenethicillin **Antistaphylococcal penicillins** Cloxacillin Dicloxacillin Nafcillin oxacillin
		Phenicols	Florphenicol	Thiamphenicol
		Quinolones	**Quinolones 1G** Flumequin Miloxacin Nalidixic acid Oxolinic acid **Quinolones 2G (Fluoroquinolones)**	Ciprofloxacin Danofloxacin Difloxacin Enrofloxacin Marbofloxacin Norfloxacin Ofloxacin Orbifloxacin
		Sulfonamides	Sulfachlorpyridazine Sulfadiazine Sulfadimerazin Sulfadimethoxine Sulfadimidine Sulfadoxin Sulfafurazole	Sulfaguanidine Sulfamethazine Sulfadimethoxazole Sulfamethoxine Sulfamonomethoxine Sulphanilamide Sulfaquinoxaline
		Sulphonamides plus diaminopyrimidines	Sulfamethoxypyridazine Trimethoprim+sulfonamide	
		Diaminopyrimidines	Baquiloprim Trimethoprim	
		Tetracyclines (bacterial & chlamydial diseases, anaplasmosis)	Chlortetracycline Doxycycline	Oxytetracycline Tetracycline
B	**Veterinary Highly Important Antimicrobial Agents (VHIA)**	Ansaycin-Rifamycins	Rifampicin rifaximin	
		Fosfomycin	fosfomycin	
		Ionophores	Lasalocid Maduramycin Monensin Narasin Salinomycin Semduramicin	
		Lincosamides	Pirlimycin Lincomycin	
		Pleuromutilins	Tiamulin Valnemulin	
		Polypeptides	Enramycin Gramicidin Bacitracin	
		Polypeptides cyclic	Colistin Polymixin	
C	**Veterinary Important Antimicrobial Agents (VIA)**	Bicyclomycin	Bicozamycin	
		Fusidic acid	Fusidic acid	
		Novobiocin	Novobiocin	
		Orthosomycins	Avilamycin	
		Quinoxalines	Carbadox	
		Streptogramins	Virginiamycin	