

WOAH List of Antimicrobials for Use in Aquatic Animals

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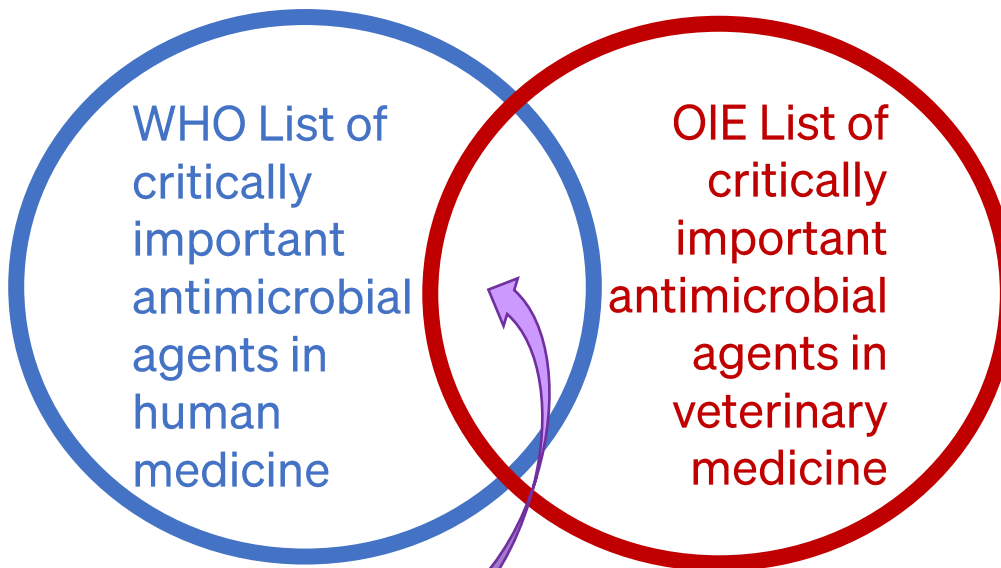
Résistance aux antimicrobiens (RAM) en aquaculture

11 - 12 juillet 2024 Tunis, Tunisie



Background

FAO/OIE/WHO Expert Workshops on Non-Human Antimicrobial Usage and Antimicrobial Resistance (Geneva, 2003 and Oslo 2004) recommendation:



Considered for risk management options (balance between animal health and welfare, and public health)

- OIE list assigned to an *ad hoc* Group on antimicrobial resistance and supported by a Collaborating Centre in Veterinary Medical Products
- Adopted by the OIE International Committee at its 75th General Session in May 2007 (Resolution No. XXVIII)

[WOAH's list of antimicrobials agents of veterinary importance](#)



Scope



➤ [Criteria used for categorisation](#)

➤ [List of antimicrobial agents](#)

OIE LIST OF ANTIMICROBIAL AGENTS OF VETERINARY IMPORTANCE (June 2021)

The OIE¹ International Committee unanimously adopted the List of Antimicrobial Agents of Veterinary Importance at its 75th General Session in May 2007 ([Resolution No. XXVII](#)).

Background

Antimicrobial agents are essential drugs for human and animal health and welfare. Antimicrobial resistance is a global public and animal health concern that is influenced by both human and non-human antimicrobial usage. The human, animal and plant sectors have a shared responsibility to prevent or minimise antimicrobial resistance selection pressures on both human and non-human pathogens.

The FAO²/OIE/WHO³ Expert Workshop on Non-Human Antimicrobial Usage and Antimicrobial Resistance held in Geneva, Switzerland, in December 2003 (Scientific Assessment) and in Oslo, Norway, in March 2004 (Management Options) recommended that the OIE should develop a list of critically important antimicrobial agents in veterinary medicine and that WHO should also develop such a list of critically important antimicrobial agents in human medicine.

Conclusion No. 5 of the Oslo Workshop is as follows:

5. The concept of 'critically important' classes of antimicrobials for humans should be pursued by WHO. The Workshop concluded that antimicrobials that are critically important in veterinary medicine should be identified, to complement the identification of such antimicrobials used in human medicine. Criteria for identification of these antimicrobials of critical importance in animals should be established and listed by OIE. The overlap of critical lists for human and veterinary medicine can provide further information, allowing an appropriate balance to be struck between animal health needs and public health considerations.

Responding to this recommendation, the OIE decided to address this task through its existing ad hoc Group on antimicrobial resistance. The terms of reference, aim of the list and methodology were discussed by the ad hoc Group since November 2004 and were subsequently endorsed by the Biological Standards Commission in its January 2005 meeting and adopted by the International Committee in May 2005. Thus, the work was officially undertaken by the OIE.

Scope

The OIE List of Antimicrobial Agents of Veterinary Importance:

- Addresses antimicrobial agents authorised for use in food-producing animals
- Does not include antimicrobial classes/sub classes only used in human medicine
- Does not include antimicrobial agents only used as growth-promoters
- Focuses currently on antibacterials and other important antimicrobials agents used in veterinary medicine

¹ OIE: World Organisation for Animal Health

² FAO: Food and Agriculture Organization of the United Nations

³ WHO: World Health Organization

- Addresses antimicrobial agents authorised for use in food-producing animals
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Categorisation Criteria

Criterion 1: Response rate of a questionnaire regarding Veterinary Important Antimicrobial Agents (more than 50% identified the importance of the antimicrobial class)

Criterion 2: Treatment essential against specific infections and lack of sufficient therapeutic alternatives

VCIA (Veterinary Critically Important Antimicrobial)
Both Criteria (1 & 2) are met

VHIA (Veterinary Highly Important Antimicrobial)
One Criterion (1 or 2) is met

VIA (Veterinary Important Antimicrobial)
No Criteria (1 nor 2) are met

June 2021

Introduction

Criteria used for categorization

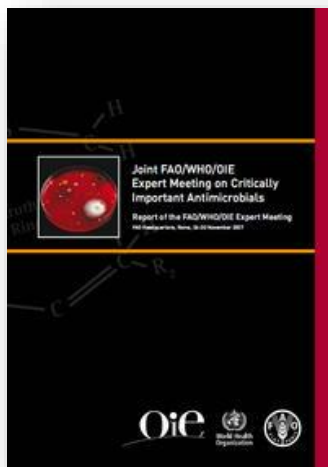
CATEGORISATION OF VETERINARY IMPORTANT ANTIMICROBIAL AGENTS FOR FOOD-PRODUCING ANIMALS

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
AMINOGLUCOSAMINE Neomycin	AVI, BOV, CAP, OVI, PIG	Neomycin is used in the local treatment of mastitis and in septicemia. This class is currently only used in animals.			X
AMINOGLUCOSIDES Spectinomycin	AVI, BOV, CAP, EQU, LEP, OVI, PIG, SWI	Used for respiratory infections in cattle and enteric infections in multiple species.	X		
AMINOGLUCOSIDES Chlortetracycline	AVI, BOV, CAP, EQU, LEP, OVI, SWI	The wide range of applications and the nature of the diseases treated make aminoglycosides extremely important for veterinary medicine.			
AMINOGLUCOSIDES + 2 DEOXYSTREPTAMINE Amikacin	EQU	Aminoglycosides are of importance in septicemia, digestive, respiratory and urinary diseases.	X		
Apramycin	AVI, BOV, LEP, OVI, SWI				
Fransiyazin	BOV, CAP, OVI	Gentamicin is indicated for Pseudomonas aeruginosa infections with few alternatives.			
Gentamicin	AVI, BOV, CAP, EQU, LEP, OVI, SWI				
Kanamycin	AVI, BOV, EQU, PIG, SWI	Apramycin and Fransiyazin are currently only used in animals.			
Neomycin	AVI, AVI, BOV, CAP, EQU, LEP, OVI, SWI	Few economic alternatives are available.			
Paromomycin	AVI, BOV, CAP, OVI, LEP, SWI				
Tobramycin	EQU				
AMPHENICOLS Florfenicol	AVI, BOV, CAP, EQU, LEP, OVI, PIG, SWI	The wide range of applications and the nature of the diseases treated make phenicols extremely important for veterinary medicine.			
Thiarnphenicol	AVI, BOV, CAP, OVI, PIG, SWI	This class is of particular importance in treating some fish diseases, in which there are currently no or very few treatment alternatives. This class also represents a useful alternative in respiratory infections of cattle, swine and poultry. This class, in particular florfenicol, is used to treat pasteurellosis in cattle and pigs.	X		
ANSAMYCIN - RIFAMYCINS Rifampin	EQU BOV, CAP, EQU, LEP, OVI, SWI	This antimicrobial class is authorised only in a few countries and with a very limited number of indications (mastitis) and few alternatives. Rifampin is essential in the treatment of Rhodococcus equi infections in foals. However it is only available in a few countries, resulting in an overall classification of VHIA.			X
ARSENICAL Nitarsone	AVI, SWI				X
Roxarsone	AVI, SWI	Arsenicals are used to control intestinal parasitic coccidiosis. (Emame spp.)			X

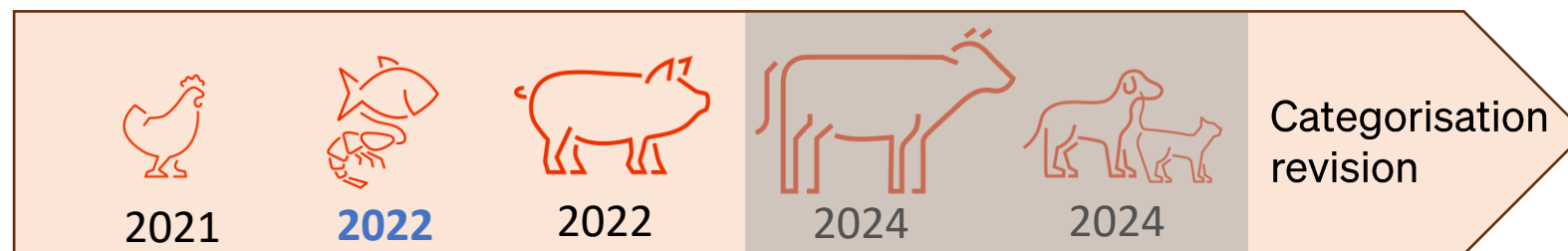


Recommendations

- Joint FAO/WHO/OIE Expert Meeting on Critically Important Antimicrobials (Rome, 2007): **Revise on a regular basis and further refine the categorisation** of antimicrobial agents with respect to their importance in the treatment of specific animal diseases.
 - Updates (not in categorization): May 2012, 2018, 2019, 2021 and 2024
- Global Conference on Antimicrobial Resistance (Marrakesh, 2018): *‘To continue to develop the list... considering... b) the sub-division of the List in the different animal species...’*
 - Working Group on AMR with support of “Sub-Groups” and *ad hoc* Group of experts – list sub-division by species



[Working Group on Antimicrobial Resistance - WOA](#)



Ad hoc Group	Reviewers
Dr Donald Prater (chair) FDA – USA	Dr Victoria Alday-Sanz Naqua – KINGDOM OF SAUDI ARABIA
Dr Gérard Moulin ANSES – FRANCE	Dr Aihua Li Chinese Academy of Sciences – CHINA
Prof Moritz van Vuuren Ministerial Advisory Committee on AMR – SOUTH AFRICA	Dr Hamish Rodger VAI Consulting – IRELAND
Dr Ruben Avendaño-Herrera U. Andres Bello & INCAR – CHILE	Dr Nobuyuku Takahashi Ministry of Agriculture, Forestry and Fisheries – JAPAN
Dr Siow Foong Chang National Parks Board – SINGAPORE	Dr Gillian Taylor U. of Pretoria – SOUTH AFRICA
Dr Kevin Christisson Dep. Forestry, Fisheries & Scientific Services – SOUTH AFRICA	HealthforAnimals Rick Clayton (Technical Secretariat)
Dr Nelly Isyagi AU-IBAR – KENYA	World Veterinary Association Dr Dušan Palić (Technical Representative)
Dr Eduardo Leañó NACA – Thailand	
Dr Carl Umland Public Health Agency of Canada – CANADA	
Dr David Verner-Jeffreys CEFAS – UK	

Aquatic list, focused on:

- ✓ Antibiotics only
- ✓ Those used in fish and crustacean aquaculture only
- ✓ Antibiotics used in food-producing species (no ornamental)
- ✓ Well established combinations
- ✓ Off-label use not considered





WOAH “Aquatic List” main table



Class/Sub-class	Molécules	PIS	CRU	Specific comments for aquatic species by class	VCIA	VHIA	VIA
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE	Neomycin	X	X	The aminoglycoside + 2 deoxystreptamine neomycin is used to treat infections caused by Aeromonas, Edwardsiella and Vibrio in fish and crustaceans.	X		
AMPHENICOLS	Florfenicol	X	X	Amphenicols are broad spectrum antibiotics used for treatment of a wide range of bacterial diseases of freshwater and marine fish	X		
	Thiamphenicol	X					
LINCOSAMIDES	Lincomysin	X		Lincosamides are mainly used for infections caused by Streptococcus spp. and Lactococcus spp.		X	
MACROLIDES	Erythromycin	X		Macrolides are broad spectrum antibiotics for treatment and control of bacterial diseases in aquatic animals, both for marine and freshwater species. They are used for infections with Streptococcus spp., Lactococcus spp., intracellular bacteria such as Renibacterium salmoninarum and Francisella sp., and against Chlamydia sp.	X		
	Kitasamycin	X					
	Tilmicosin	X					
AMINOPENICILLINS	Amoxicillin	X		Semi-synthetic penicillins (amoxicillin and ampicillin) are widely used in aquaculture for treatment of bacterial diseases in most species of farmed fish, particularly for infections with Aeromonas spp., Photobacterium sp., and Streptococcus spp.	X		
	Ampicillin	X					
PHOSPHONIC ACID DERIVATIVES	Fosfomycin	X		Fosfomycin, a Phosphonic acid derivatives, are used to treat infections with Photobacterium damsela and Edwardsiellosis in marine fish, and infections with Streptococcus iniae in Tilapia		X	
PLEUROMUTILINS	Tiamulin	X		Pleuromutilins such as tiamulin are used to treat infections with Tenacibaculum dicentrarchi in salmon		X	





WOAH “Aquatic List” main table



Class/Sub-class	Molécules	PIS	CRU	Specific comments for aquatic species by class	VCIA	VHIA	VIA																																															
QUINOLONES 1G	Flumequine	X		First generation quinolones such as flumequine and oxolinic acid, and second-generation fluoroquinolones, such as enrofloxacin, and ciprofloxacin, are used to treat a wide variety of bacterial infections in marine and freshwater species, and crustaceans. Fluoroquinolones are subject to specific recommendations in the OIE List of Antimicrobial Agents of Veterinary Importance		X																																																
	Oxalinic acid	X						FLUROQUINOLONES	Ciprofloxacin	X		Enrofloxacin	X	X	SULFONAMIDES	Sulfadiazine	X		Sulfonamides are used typically in combination with diaminopyrimidines in infections caused by a wide range of bacterial diseases in freshwater and marine fish	X			Sulfadimethoxine	X		Sulfamerazine	X		Sulfamonomethoxine	X		Sulfisozole sodium	X		SULFONAMIDES + DIAMINOPYRIMIDINE	Ormetoprim + sulfonamide	X		TETRACYCLINES	Chlortetracycline	X		Tetracyclines are broad spectrum antibiotics used for treatment of a wide range of bacterial diseases of freshwater and marine fish, and crustaceans	X			Doxycycline	X		Oxytetracycline	X	X	Tetracycline	X
FLUROQUINOLONES	Ciprofloxacin	X																																																				
	Enrofloxacin	X	X																																																			
SULFONAMIDES	Sulfadiazine	X						Sulfonamides are used typically in combination with diaminopyrimidines in infections caused by a wide range of bacterial diseases in freshwater and marine fish	X																																													
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SULFONAMIDES + DIAMINOPYRIMIDINE	Ormetoprim + sulfonamide	X																																																				
TETRACYCLINES	Chlortetracycline	X		Tetracyclines are broad spectrum antibiotics used for treatment of a wide range of bacterial diseases of freshwater and marine fish, and crustaceans	X																																																	
	Doxycycline	X																																																				
	Oxytetracycline	X	X																																																			
	Tetracycline	X																																																				



Pathogens ⁹	Examples of diseases	Examples of susceptible host species
Fish		
<i>Aeromonas</i> spp. (<i>A. caviae</i> , <i>A. hydrophila</i> , <i>A. veronii</i>)	Motile <i>Aeromonas septicaemia</i>	Cyprinids (carps), Salmonids (salmon, trout), Siluriformes (catfish)
<i>Aeromonas salmonicida</i>	Furunculosis	Cichlids (tilapia), marine fish (various species), Salmonids (salmon, trout)
<i>Chlamydia</i> sp.	Epitheliocystis	Cichlids (tilapia), Siluriformes (catfish)
<i>Edwardsiella ictaluri</i>	Enteric septicaemia of catfish	Siluriformes (catfish)
<i>Edwardsiella piscicida</i> (formerly <i>E. tarda</i>)	Edwardsiellosis	Anguilliformes (eel), Cichlids (tilapia), marine fish (various species), Plecoglossids (ayu), Salmonids (trout), Siluriformes (catfish)
<i>Flavobacterium branchiophilum</i>	Bacterial gill disease	Salmonids (salmon, trout)
<i>Flavobacterium columnare</i> (formerly <i>Flexibacter columnaris</i>)	Columnaris disease	Cichlids (tilapia), Cyprinids (carp), Salmonids (salmon, trout), Siluriformes (catfish)
<i>Flavobacterium psychrophilum</i>	Bacterial cold water disease, rainbow trout fry syndrome	Plecoglossids (ayu), Salmonids (salmon, trout)
<i>Francisella</i> spp.	Francisellosis	Cichlids (tilapia), marine fish (various species), Siluriformes (catfish)
<i>Lactococcus garvieae</i> , <i>L. petauri</i>	Piscine Lactococcosis	Cichlids (tilapia), marine fish (various species), Salmonids (trout)
<i>Nocardia</i> spp.	Nocardiosis	Cichlids (tilapia), marine fish (various species)
<i>Photobacterium damselae</i> subsp. <i>piscicida</i> (formerly <i>Pasteurella piscicida</i>), <i>P. damselae</i> subsp. <i>damselae</i>	Pseudotuberculosis, pasteurellosis, photobacteriosis	Cichlids (tilapia), marine fish (various species), Salmonids (salmon, trout),
<i>Piscirickettsia salmonis</i>	Piscirickettsiosis	Salmonids (salmon, trout)
<i>Pseudomonas</i> spp.	Pseudomoniasis, <i>Pseudomonas septicaemia</i>	Siluriformes (catfish)

Pathogens ⁹	Examples of diseases	Examples of susceptible host species
<i>Pseudomonas anguilliseptica</i>	Red spot disease, Pseudomoniasis	Anguilliformes (eel)
<i>Renibacterium salmoninarum</i>	Bacterial kidney disease	Salmonids (salmon, trout)
<i>Streptococcus</i> spp. (<i>S. iniae</i> , <i>S. agalactiae</i>)	Streptococcosis	Cichlids (tilapia), marine fish (various species), Salmonids (salmon, trout), Siluriformes (catfish)
<i>Tenacibaculum dicentrarchi</i>	Tenacibaculosis	Salmonids (salmon, trout)
<i>Tenacibaculum maritimum</i> (formerly <i>Flexibacter maritimus</i>)	Marine flexibacteriosis, tenacibaculosis	Marine fish (various species), Salmonids (salmon, trout)
<i>Vibrio anguillarum</i> (formerly <i>Listonella anguillarum</i>)	Classical vibriosis	Cichlids (tilapia), Plecoglossids (ayu), marine fish (various species), Salmonids (salmon, trout), Siluriformes (catfish)
<i>Vibrio</i> spp. (<i>V. harveyi</i> , <i>V. ordalii</i>)	Atypical vibriosis	Marine fish (various species), Salmonids (salmon)
<i>Aliivibrio salmonicida</i> (formerly <i>Vibrio salmonicida</i>)	Cold water vibriosis	Plecoglossids (ayu), Salmonids (salmon, trout)
<i>Yersinia ruckeri</i>	Enteric redmouth disease, yersiniosis	Salmonids (salmon, trout)
Crustaceans		
<i>Aeromonas</i> spp.	<i>Aeromoniasis</i>	Penaeid shrimp/prawn
<i>Aerococcus viridans</i>	Gaffkemia, red tail	American lobster
<i>“Candidatus hepatobacter penaei”</i>	Necrotising hepatopancreatitis	Penaeid shrimp/prawn
<i>Rickettsia</i> spp.	Rickettsiosis	Penaeid shrimp/prawn
<i>Vibrio</i> spp. (<i>V. harveyi</i> , <i>V. alginolyticus</i>)	Vibriosis	Penaeid shrimp/prawn

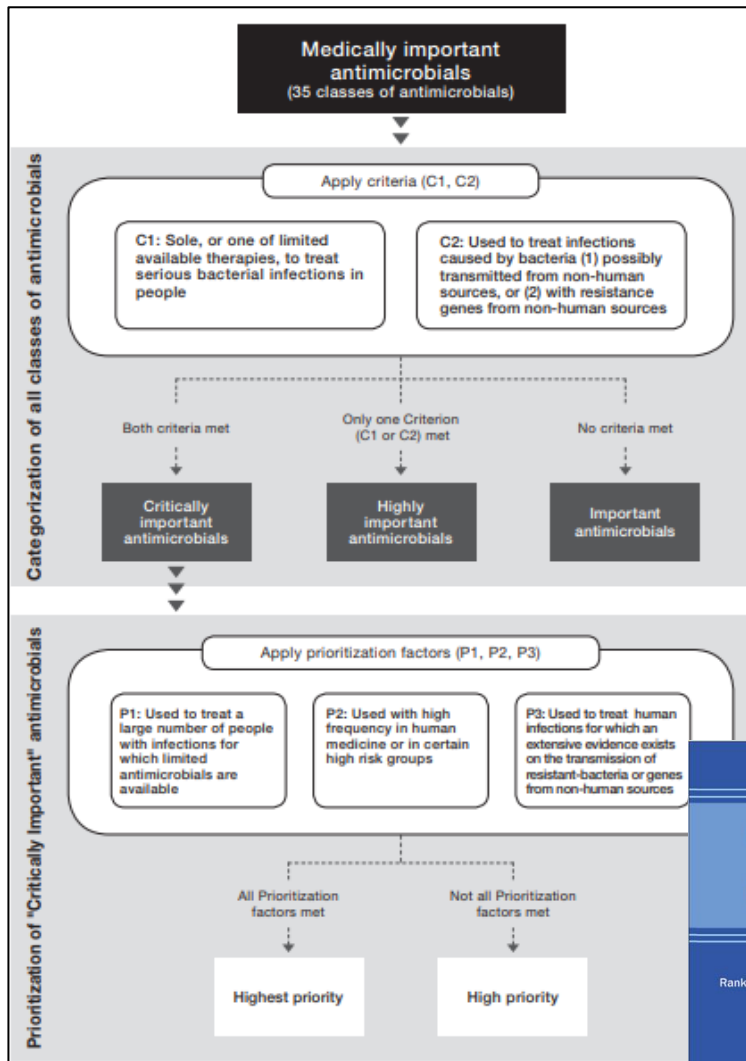
Antimicrobial agents

Antimicrobial agents	Aeromonas spp. (A. caviae, A. hydrophila, A. veronii) – Mobile aeromonas septicaemia	Aeromonas salmonicida - Furunculosis	Chlamydia sp. - Epitheliocystis	Edwardsiella ictalurid – Enteric septicaemia of catfish	Edwardsiella piscida - Edwardsiellosis	Flavobacterium branchiophilum – Bacterial gill disease	Flavobacterium psychrophilum – Cold water disease, rainbow trout fry syndrome	Francisella spp. – Francisellosis	Lactococcus garvieae, L. petauri – Lactococcosis	Nocardia sp. – Nocardiosis	Photobacterium damsela piscicida, P. damselae damselae – Photobacteriosis, pseudotuberculosis, pasteurellosis
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE: Neomycin	X	X		X	X						
AMPHENICOLS: Florfenicol, thiamphenicol	X	X		X	X	X	X	X	X		X
LINCOSAMIDES: Lincomysin									X		
MACROLIDES: Erythromycin, Kitasamycin, Tilmicosin			X			X	X	X	X		
PENICILLINS: Amoxicillin, Ampicillin	X	X			X						X
PHOSPHONIC ACID DERIVATIVES: Fosfomycin											X
PLEUROMUTILINS: Tiamulin	X	X			X						
QUINOLONES 1st Gen: Flumequine, Oxalinic acid	X	X			X						X
QUINOLONES 2ND G (FLUOROQUINOLONES): Ciprofloxacin, Enrofloxacin	X	X					X		X		X
SULFONAMIDES: Sulfadiazine, Sulfadimethoxine, Sulfamerazine, Sulfamonomethoxine, Sulfisozole sodium	X	X					X			X	X
SULFONAMIDES + DIAMINOPYRIMIDINES: Ormetoprim + sulfonamide	X	X		X	X		X				X
TETRACYCLINES: Chlortetracycline, Doxycycline, Oxytetracycline, Tetracycline	X	X	X		X	X	X	X	X		X

Antimicrobial agents

Antimicrobial agents	Piscirickettsia salmonis – Piscirickettsiosis	Pseudomonas spp. – Pseudomoniasis, Pseudomonas septicaemia	Pseudomonas anguilliseptica – Red spot disease, pseudomoniasis	Renibacterium salmoninarum – Bacterial kidney disease	Streptococcus spp. (S. agalactiae, S. iniae) – Streptococcosis	Tenacibaculus dicentrarchi – Tenacibaculosis	Tenacibaculum maritimum – Marine flexibacteriosis, tenacibaculosis	Vibrio anguillarum – Vibriosis	Vibrio spp. (V. harveyi, V. ordalii) – Atypical vibriosis	Aliivibrio salmonicida – Cold water vibriosis	Yersinia ruckeri – Redmouth disease
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE: Neomycin								X			
AMPHENICOLS: Florfenicol, thiamphenicol	X			X	X		X	X	X	X	X
LINCOSAMIDES: Lincomysin					X						
MACROLIDES: Erythromycin, Kitasamycin, Tilmicosin				X	X						
PENICILLINS: Amoxicillin, Ampicillin					X						
PHOSPHONIC ACID DERIVATIVES: Fosfomycin					X						
PLEUROMUTILINS: Tiamulin						X					
QUINOLONES 1st Gen: Flumequine, Oxalinic acid	X		X				X	X	X		X
QUINOLONES 2ND G (FLUOROQUINOLONES): Ciprofloxacin, Enrofloxacin		X		X	X		X	X		X	X
SULFONAMIDES: Sulfadiazine, Sulfadimethoxine, Sulfamerazine, Sulfamonomethoxine, Sulfisozole sodium					X			X	X	X	
SULFONAMIDES + DIAMINOPYRIMIDINES: Ormetoprim + sulfonamide					X		X	X			X
TETRACYCLINES: Chlortetracycline, Doxycycline, Oxytetracycline, Tetracycline	X	X		X	X		X	X	X	X	X

Antimicrobial agents	Aeromonas spp. – Aeromoniasis	Aerococcus viridans – Gaffkemia, red tail	Candidatus Hepatobacter vanamei – Necrotising hepatopancreatitis	Rickettsia spp. – Rickettsiosis	Vibrio spp. – Vibriosis
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE: Neomycin	X				X
AMPHENICOLS: Florfenicol, thiamphenicol			X		X
QUINOLONES 2ND G (FLUOROQUINOLONES): Ciprofloxacin, Enrofloxacin	X			X	X
TETRACYCLINES: Chlortetracycline, Doxycycline, Oxytetracycline, Tetracycline	X	X	X	X	X



6th Revision – 2018

Résistance aux antimicrobiens (RAM) et

11 - 12 juillet 2024 Tunis, Tunisie

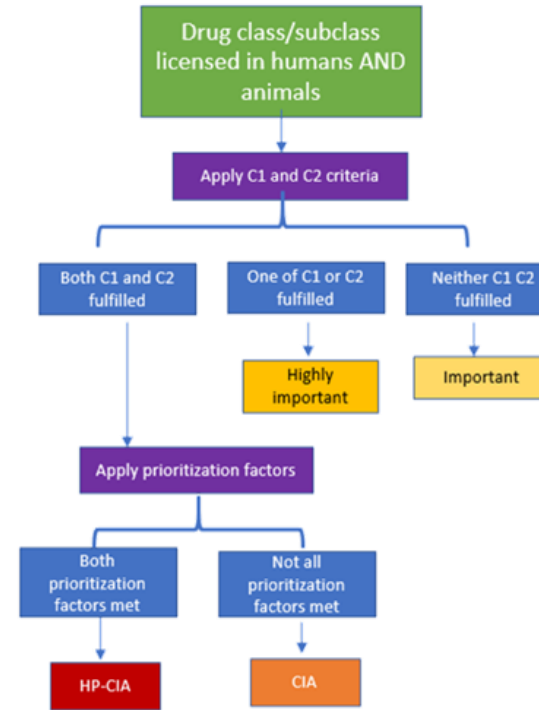
Drug class/subclass licensed only in humans

Authorized only for use in humans



Critically Important Antimicrobials for Human Medicine

6th Revision 2018
Ranking of medically important antimicrobials for risk management of antimicrobial resistance due to non-human use



Drug class/subclass licensed only in animals

Is there evidence of co-selection for resistance to a medically important antimicrobial?

Yes
Categorize as per the drug class to which co-selection can occur.

No
Not medically important

Prioritization factors:

Pf1: One or more members of the drug class are classified as Watch or Reserve on the AWARe list (Access, Watch, Reserve, based on impact for AMR)

Pf2: The antimicrobial class is used to treat infections in people for which there is already extensive evidence of transmission of resistant bacteria or resistance genes for the particular antimicrobial from non-human sources, and these infections are frequent causes of invasive and life-threatening infections.

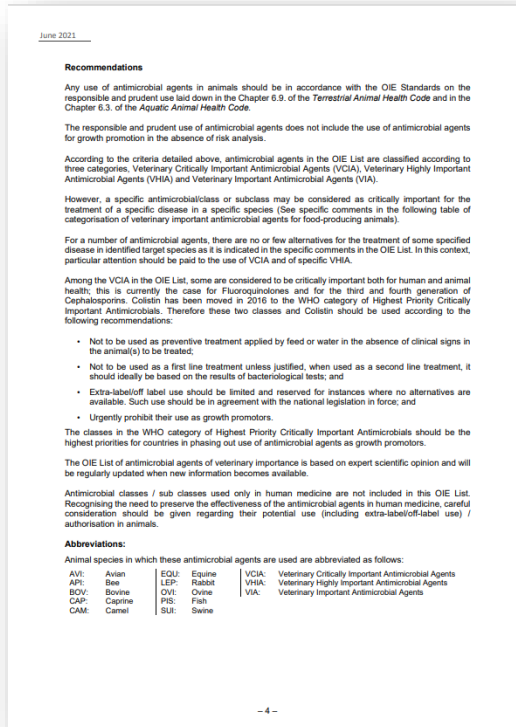


WHO list Categorization

Highest Priority Critically Important Antimicrobials –HPCIA-	
6 th Revision 2018	7 th Revision 2023
Cephalosporins (3rd, 4th generation)	
Quinolones/fluoroquinolones	
Polymyxins	
Macrolides	Phosphonic acid derivatives
Glycopeptides	
Critically Important Antimicrobials –CIA-	
Aminoglycosides	
Ansamycins	
Other classes moved to “authorized for use in human only”	Macrolides



Updated recommendations of the WOAHL List of Antimicrobials of Veterinary Importance



- Some antimicrobial agents are considered to be **highest priority critically important** by WHO (ex. Fluoroquinolones, Phosphonic acid derivatives). Recommendations for their use:
 - **Not to be used for prevention** in individual or group of animals at risk of acquiring a specific infection or in a specific situation where infectious diseases is likely to occur if the drug is not administered;
 - **Not to be used as a first line treatment** unless justified, when used as a second line treatment, it should ideally be based on the results of bacteriological tests;
 - **Extra-label/off label use should be limited** and reserved for instances where no alternatives are available, and in agreement with the national legislation in force;
 - Urgently **prohibit their use as growth promoters**.



Thank you

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