

REPORT OF THE MEETING OF THE OIE AD HOC GROUP ON ANTIMICROBIAL RESISTANCE¹
Paris, 3-5 July 2018

1. Opening

The OIE *ad hoc* Group on Antimicrobial Resistance (hereafter referred to as ‘the Group’) met from 3 to 5 July 2018 at the OIE Headquarters in Paris, France.

2. Adoption of the agenda and appointment of the chairperson and rapporteur

The adopted Agenda and List of Participants are presented in Appendices I and II of this report, respectively. The Group elected Dr Herbert Schneider as the chair, and Drs Chris Teale and Carolee Carson as rapporteurs.

3. Roundtable from the participants on any new issues of interest for the Group

Information was shared within the Group on antimicrobial use and antimicrobial resistance topics of common interest.

4. Revision of the OIE List of antimicrobial agents of veterinary importance in animals including ionophores

The Group focussed primarily on a technical review of the OIE List (herein designated the ‘List’), with the intent of proposing updates taking into consideration the 2016 WHO Critically Important Antimicrobials for Human Medicine, and improving coherence between the WHO and OIE Lists with respect to terminology used for antimicrobial classification. The Group also consulted the OIE Global Database on Antimicrobial Agents Intended for Use in Animals, utilising the information to inform the technical review of the List.

The Group reviewed the List and addressed specific aspects as follows:

1. **Novobiocin:** The Group discussed whether the class name ‘aminocoumarin’ vs. ‘coumarin’ would be more appropriate. The Group noted variable naming of this class in the literature and suggested using ‘aminocoumarin’ to align with the WHO List.
2. **Aminocyclitols:** The Group discussed whether aminocyclitols should be a sub-class of aminoglycosides or a separate class. The Group proposed that the aminocyclitol spectinomycin should be in a separate class from the aminoglycosides and that spectinomycin should not be grouped together with streptomycin and dihydrostreptomycin. The Group proposed that ‘Aminocyclitols’ would come before ‘Aminoglycosides’ in the List. For streptomycin and dihydrostreptomycin they would fall under the heading ‘Aminoglycosides’ and before ‘Aminoglycosides +2 deoxystreptamine’. For aminocyclitols, the Group noted that there was a need to add text in the column ‘Specific comments’ and proposed ‘Used

¹ Note: This ad hoc Group report reflects the views of its members and may not necessarily reflect the views of the OIE. This report should be read in conjunction with the September 2017 report of the Scientific Commission for Animal Diseases because this report provides its considerations and comments. It is available at: <http://www.oie.int/en/international-standard-setting/specialists-commissions-groups/scientific-commission-reports/meetings-reports/>

for respiratory infections in cattle and enteric infections in multiple species'. The Group suggested to retain the same categorization for the aminocyclitols and aminoglycosides (VCIA)².

3. **Fusidic acid:** The Group reviewed the classification of fusidic acid. The Group suggested using the class "fusidane" as per information in recent text books (*Antimicrobial Therapy in Veterinary Medicine*, 4th edition, S. Giguère and al., Blackwell Publishing, 2006) and the OIE Rev sci tech (2012) keeping "fusidic acid" as the example.
4. **Ionophores:** The Group reviewed the classification of ionophores. The Group noted that ionophores are classified as 'Polyethers/Ionophores' by the WHO. The Group noted that not all ionophores are polyethers. Hence, the Group decided to leave the current OIE classification of the antimicrobial class as "ionophores".

The Group also reviewed the status of the ionophores which are included in the List, but not included in the data collection template, following Resolution 38 of the 85th General Session (May 2017) and acknowledged that there is published information including risk assessments and peer reviewed literature on this topic³. The Group will regularly review the classification of ionophores as new information becomes available. The Group suggested that the OIE maintain its current decision not to capture data on consumption of ionophores in the Global Database, but maintain ionophores in the List as they are important antimicrobials in veterinary medicine. The OIE will review this status when more information becomes available.

5. **Macrolides:** The Group considered whether the macrolide category should be sub-categorized by the different chemical structures (i.e., C14, C16); noting that the WHO List does not split the macrolides into different chemical structures. The Group indicated there is a difference in resistance mechanism and use practices between the different chemical structures of macrolides; hence there is potential value to subdivide the macrolides. The Group additionally recommended re-naming these sub-categories as per their 'Membered ring'. For example the new recommended naming would be '13-Membered ring' instead of C13. The Group noted in particular that C15 is technically inaccurate, and while 'azalides' might encompass this sub-class, the Group felt that 15-Membered ring was more consistent with the proposed naming convention for macrolides in the List.
6. **Phosphonic acid:** The Group noted that the OIE List includes this class as 'Phosphonic acid'; whereas the WHO label these 'Phosphonic acid derivatives'. The Group noted that fosfomycin is a derivative of phosphonic acid. The Group suggested aligning the terminology with the WHO and label this class 'Phosphonic acid derivatives'.
7. **Polypeptides:** The Group considered the nomenclature of this class. The Group noted that it was important to include a heading of 'Polymyxins' and to have 'Polymyxin B' and 'Polymyxin E (colistin)' specified under the heading. The Group recommended to remove 'Cyclic polypeptides' and just to include 'Polymyxins' under the larger heading 'Polypeptides'. Under the column 'Specific comments' the Group suggested the following minor text change for clarity and accuracy: "Polymyxin E (colistin) is used against Gram-negative enteric infections." The Group discussed whether there should be different categorization of Polymyxin B and Polymyxin E (i.e., VCIA/VHIA/VIA). With this in mind, the Group reviewed the information from the OIE Global database on Antimicrobial Agents Intended for Use in Animals regarding polypeptides and colistin and suggested no change for the categorization of different classes of polypeptides.
8. **Different categorizations of sub-classes of penicillins:** The Group noted that the WHO List has different categorizations for different sub-classes of penicillins. The Group reviewed the current OIE List of penicillins as a class, and considered that the categorisation as VCIA was still appropriate, in the veterinary medical context.

² According with the OIE List of Antimicrobial Agents of Veterinary Importance, antimicrobial agents are classified in three categories: Veterinary Critically Important Antimicrobial Agents (VCIA), Veterinary Highly Important Antimicrobial Agents (VHIA) and Veterinary Important Antimicrobial Agents (VIA).

³ <https://crwad.org/wp-content/uploads/2017/11/CRWAD-2017-Author-Index-and-Abstracts.pdf>

9. The Group considered the potential inclusion of the following specific antimicrobial agents in the List.
 - a. **Cefovecin:** The Group recommended not adding this to the List, as it is only used in companion animals (and the List currently excludes companion animals).
 - b. **Clindamycin:** The Group recommended not adding this to the List, as it is only used in companion animals.
 - c. **Ibaflroxacin and pradofloxacin:** The Group did not recommend adding these to the List because these products are not used in food-producing animals.
 - d. **Sulfacetamide:** The Group recommended adding this to the List because this product is used in food-producing animals.
 - e. As part of this review of specific classes, the Group noted that **avilamycin** is also used in pigs and recommended adding these to the list of species for avilamycin.
 - f. **Bambermycin:** The Group did not suggest adding phosphoglycolipids to the List because bambermycin is only used as a growth promoter.
10. The Group suggested for ease of use of the List that it be re-ordered alphabetically by antimicrobial class, then by sub-class and then by substances.
11. The Group discussed the formatting of the text of the List, as there were some words that were underlined, and some words that were underlined and in bold. The Group proposed that antimicrobials only used in animals would be in bold. The Group reviewed the entire list to update this formatting.
12. The Group noted that it would enhance the clarity of the List if a ‘Scope’ section was included. Using primarily existing text the Group highlighted the scope of the List, as follows:

The OIE List of Antimicrobial Agents of Veterinary Importance:

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

Regarding Growth promoters, the Group confirmed the position adopted for the OIE List not to include antimicrobial agents used only as growth promoters as the List is a positive list highlighting the molecules of importance that need to be used for specific disease purposes.

The Group considered possible future developments of the List and suggested the following:

- **Reformatting existing information by species**
 - Based on existing information contained within the List, the Group proposed presentation of the List in a format that would be useful for each animal species sector. Details regarding the content and format (potentially as an appendix of the List) of such a document would be decided at a later date.
- **Adding a section on companion animals to the List**
 - The Group discussed the benefits to extend the scope of the List, by including non-food animal species such as dogs and cats. The Group noted that this would involve future decisions on what animal species (dogs, cats, pet birds, etc.) could be included and what antimicrobial agents would be included (authorized products, extra label use).

- The Group was of the opinion that an initial step could be to review the data already provided in the OIE Global Database on Antimicrobial Agents Intended for Use in Animals regarding companion animals to inform next steps to explore what is potentially feasible.

5. Presentation of the preliminary results of the third phase of the collection of data on antimicrobial agents intended for use in animals

The preliminary results of the third phase of the collection of data on antimicrobial agents intended for use in animals were presented. The Group congratulated the OIE for these preliminary results, and the continued general improvement of the data collection over the years, and the increased engagement of Member Countries. The target year for the third phase of reporting was 2015. 155 Member Countries (86% of all OIE Member Countries) responded for this third phase, which increased from 130 and 146 in the first and second phase, respectively.

There was also an increase in Member Countries providing quantitative data (118 in the third phase from 89 and 107 in the first and second phase). The sources of data reported were similar to previous phases, where the main sources were sales data (from wholesalers and marketing authorisation) and import data; some ‘other’ data sources indicated by reporting countries were information from border control points, importer’s reports, permits issued by registration authorities, and manufacturer’s reports (production data). Member Countries providing only baseline information noted barriers to providing quantitative data, such as lack of regulatory framework (primary reason), lack of cooperation between national authorities and private sector, lack of tools and human resources, and insufficient regulatory enforcement.

Forty-five of reporting countries (29%, out of 155) indicated use of antimicrobials as growth promoters, 15 countries indicated they will create or modify their regulatory framework for growth promotion during 2018. The Group discussed that there may be non-legislative approaches that effectively end the uses of growth promoters and the OIE indicated that the report will reflect this.

The Group discussed that having a section in the report describing data quality would be beneficial from the purpose of drawing the attention of donors for future resources to improve data collection, validation and analysis.

6. Presentation of the template for the fourth phase of the collection of data on antimicrobial agents intended for use in animals

Based on challenges identified by the OIE during the analysis of the third phase of data reporting, the Group discussed and agreed on the following changes:

The template and guidance will be updated to reflect the terminology decisions arising from the OIE 86th General Session in May 2018, Resolution No. 34 (e.g., definitions for veterinary medical use).

The template will clarify that the questions related to growth promoters apply to the current situation of the country and not to the year of reported quantitative data.

Q14 asks “Please provide a list of antimicrobial agents authorised as growth promoters, if any”: A few countries where the use of growth promoters is known to occur but legislation on growth promoters does not exist, did not provide a list of the molecules used. However, in previous years, these countries did provide a list of antimicrobial growth promoters. To address this, the Group agreed to add the word ‘used’ to this question in the template as follows: “Please provide a list of antimicrobial agents used or authorised as growth promoters, if any.”

Some countries consider *Equidae* as companion animals, as food-producing animals or both. There is a need for clarity on how countries are categorising *Equidae* for the reporting of quantitative data (i.e., terrestrial food-producing animal or companion animals). To address this, the Group agreed with a suggestion to add two

questions related to companion animals as follows: “Q27. Companion animal species covered by antimicrobial quantities, if any” (options being canines, felines, and other) and “Q28. Clarification of other species considered to be companion animals, if your response to Question 27 is “other” (free text field).

The OIE informed the Group of the timelines for reporting and the next phase of data collection: the data collection template will be distributed in September 2018 to Member Countries for the fourth phase of data collection and the deadline will be the first Friday in December 2018.

7. OIE AMU database: conversion from the spreadsheet format to a database system

The OIE presented considerations for moving data collection from spreadsheet format to a semi-automated software. The Group noted that there could be several objectives for the proposed automated database: to help countries to complete the questionnaire (Module 1), to assist with data validation and provide immediate feedback to the data provider (Module 2), to assist in data analysis for quantitative data reported and to link with other databases such as WAHIS (Module 3), to facilitate reporting of the data (Module 4), and to allow countries to better utilise their data (Module 2 and 4) to have a dynamic interface to facilitate use and analysis of the data (similar to the European ESVAC System).

The OIE also identified four additional objectives: (1) to make data submission easier for the Member Countries, (2) to facilitate analysis and data validation and communication with the Member Countries, (3) to have a centralized data repository that could be updated for past years, or submitted for the current phase of data collection; and (4) to have an ‘intelligent’ software which could facilitate calculations for e.g. conversion of active ingredients in kilograms.

The Group acknowledged that during database development, thought needs to be put into the architecture of the model and future data provision (i.e., will the database be able to accommodate data submissions by animal species or account for other metrics of reporting antimicrobial use, such as DDDvet).

The Group discussed that there needs to be consideration of controls for access to the database. The OIE currently uses TIGER which has all the names of the Delegates and Focal Points for Veterinary Products and suggested that this could be linked with either WAHIS+ or the Global Database on Antimicrobial Agents Intended for use in Animals.

The Group identified (amongst their members) a small working group to assist the OIE regarding database development. The Group suggested inviting the WHO staff member responsible for the data collection on human use.

The Group noted that there may need to be two separate, but linked, activities, focusing on different users: development of a database (data collection, storage, feedback, analysis, and some reporting) which aids submission of the data and development of an interactive data display (data reporting and feedback and visualization) for end-users.

The Group noted that attention needs to be paid to the different versions of spreadsheets (i.e., Excel spreadsheet versions) as this can cause incompatibility issues within the database in the future and to a good traceability of the data submitted.

8. Update on annual biomass and analysis planned for third phase

The Group was updated on the animal biomass analysis planned for the third phase of data collection. Following the analysis of 2014 quantitative data adjusted for animal biomass published in last year’s report, the report from the third phase will include a similar analysis for 2015 quantitative data.

It was noted that the OIE Regions of Africa and of Asia and the Pacific have significantly increased the number of Member Countries reporting quantitative data for 2015, and accordingly, their biomass coverage increased as well. There were also new contributions from the Middle East for 2015 which will allow for a regional analysis of this quantitative data adjusted for animal biomass in the upcoming report.

There has been continued engagement with OIE Regional/Sub-Regional offices to verify calculated average weights, cycle factors, and carcass conversion factors, where possible.

9. Update on Second OIE Global Conference on Antimicrobial Resistance, Putting Standards into Practice and poster selection

The Group reviewed a preliminary draft of the Conference programme and agreed that the programme covered a range of important topics. They provided suggestions for inclusions into the programme, including increased representation of aquaculture and companion animals, reflecting the range of animals addressed in the OIE List and Global Database. The Group similarly emphasised the importance of highlighting public-private partnerships. The significance of anti-parasitical resistance was also discussed.

The Group will act as the Scientific Committee for the Conference. In this capacity, they reviewed abstracts submitted for poster presentations and provided their feedback to the OIE.

10. Any other business

The Group proposed that a next meeting could be held from 16-18 January 2019.

11. Adoption of report

The Group adopted the report.

.../Appendices

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Provisional agenda

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 3. Roundtable from the participants on new issues of interest for the Group
 4. Revision of the OIE List of antimicrobial agents of veterinary importance in animals including ionophores
 5. Presentation of the preliminary results of the third phase of the collection of data on antimicrobial agents intended for use animals
 6. Presentation of the template for the fourth phase of the collection of data on antimicrobial agents intended for use animals
 7. OIE AMU database: conversion from the spreadsheet format to a database system
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 10. Any other business
 11. Adoption of the report
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Appendix II

MEETING OF THE OIE AD HOC GROUP ON ANTIMICROBIAL RESISTANCE Paris, 3 – 5 July 2018

Provisional List of Participants

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July 2018

OIE LIST OF ANTIMICROBIAL AGENTS OF VETERINARY IMPORTANCE

The OIE⁴ International Committee unanimously adopted the List of Antimicrobial Agents of Veterinary Importance at its 75th General Session in May 2007 ([Resolution No. XXVIII](#)).

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 FAO⁵/OIE/WHO⁶ 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 authorized 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

⁴ OIE: World Organisation for Animal Health

⁵ FAO: Food and Agriculture Organization of the United Nations

⁶ WHO: World Health Organization

Preparation of the draft list

The Director General of the OIE sent a questionnaire prepared by the *ad hoc* Group accompanied by a letter explaining the importance of the task to OIE Delegates of all Member Countries and international organisations having signed a Co-operation Agreement with the OIE in August 2005.

Sixty-six replies were received. This response rate highlights the importance given by OIE Member Countries from all regions to this issue. These replies were analysed first by the OIE Collaborating Centre for Veterinary Drugs, then discussed by the *ad hoc* Group at its meeting in February 2006. A list of proposed antimicrobial agents of veterinary importance was compiled together with an executive summary. This list was endorsed by the Biological Standards Commission and circulated among Member Countries aiming for adoption by the OIE International Committee during the General Session in May 2006.

Discussion at the 74th International Committee in May 2006

The list was submitted to the 74th International Committee where active discussion was made among Member Countries. Concerns raised by Member Countries include: 1) the list includes substances that are banned in some countries; 2) some of the substances on the list are not considered “critical”; 3) nature of the list – is this mandatory for Member Countries?; and 4) the use of antimicrobial agents as growth promotor is included. While many Member Countries appreciated the work, it was considered appropriate to continue refinement of the list. The list was adopted as a preliminary list by [Resolution No. XXXIII](#).

Refinement of the list

The *ad hoc* Group was convened in September 2006 to review the comments made at the 74th General Session of the OIE International Committee, and Resolution No. XXXIII adopted at the 74th General Session. Based on the further analysis provided by the OIE Collaborating Centre for Veterinary Medicinal Products, the *ad hoc* Group prepared its final recommendations of the list of antimicrobial agents of veterinary importance together with an executive summary. Once again, this was examined and endorsed by the Biological Standards Commission in its January 2007 meeting and circulated among Member Countries.

Adoption of List of antimicrobial agents of Veterinary Importance

The refined list was submitted to the 75th International Committee during the General Session in May 2007 and adopted unanimously by Resolution No. XXVIII.

This list was further updated and adopted in May 2013, May 2015 and May 2018 by the World Assembly of OIE Delegates.

CRITERIA USED FOR CATEGORISATION OF VETERINARY IMPORTANT ANTIMICROBIAL AGENTS

In developing the list, the *ad hoc* Group agreed that any antimicrobial agent authorised for use in veterinary medicine according to the criteria of quality, safety and efficacy as defined in the *Terrestrial Animal Health Code* (Chapter 6.9. Responsible and prudent use of antimicrobial agents in veterinary medicine) is important. Therefore, based on OIE Member Country contributions, the Group decided to address all antimicrobial agents used in food-producing animals to provide a comprehensive list, divided into critically important, highly important and important antimicrobial agents.

In selecting the criteria to define veterinary important antimicrobial agents, one significant difference between the use of antimicrobial agents in humans and animals has to be accounted for: the many different species that have to be treated in veterinary medicine.

The following criteria were selected to determine the degree of importance for classes of veterinary antimicrobial agents.

Criterion 1. Response rate to the questionnaire regarding Veterinary Important Antimicrobial Agents

This criterion was met when a majority of the respondents (more than 50%) identified the importance of the antimicrobial class in their response to the questionnaire.

Criterion 2. Treatment of serious animal disease and availability of alternative antimicrobial agents

This criterion was met when compounds within the class were identified as essential against specific infections and there was a lack of sufficient therapeutic alternatives.

On the basis of these criteria, the following categories were established:

- Veterinary **Critically Important Antimicrobial Agents (VClA)**: are those that meet **BOTH** criteria **1 AND 2**
- Veterinary **Highly Important Antimicrobial Agents (VHIA)**: are those that meet criteria **1 OR 2**
- Veterinary **Important Antimicrobial Agents (VIA)**: are those that meet **NEITHER** criteria **1 OR 2**

Revision of the list of antimicrobial agents of Veterinary Importance

The Joint FAO/WHO/OIE Expert Meeting on Critically Important Antimicrobials held in Rome, Italy, in November 2007, recommended that the list of antimicrobial agents of Veterinary Importance should be revised on a regular basis and that the OIE further refine the categorisation of antimicrobial agents with respect to their importance in the treatment of specific animal diseases.

The OIE *ad hoc* Group on Antimicrobial Resistance met in July 2012 to review and update the OIE List of antimicrobial agents of veterinary importance (OIE List) taking into account the top three critically important antimicrobial agents of the WHO list of Critically Important Antimicrobials for Human Medicine.

The OIE *ad hoc* Group on Antimicrobial Resistance met in January 2018 to review and update the OIE List taking into account:

- the Global Action Plan on Antimicrobial Resistance supporting the phasing out of use of antibiotics for animal growth promotion in the absence of risk analysis;
- the Resolution N°38 adopted by the OIE World Assembly of Delegates in May 2017;
- the fifth revision of the WHO list of Critically Important Antimicrobials for Human Medicine (2016) moving Colistin among the Highest Priority Critically Important Antimicrobials; and
- the OIE report on antimicrobial agents intended for use in animals (Second Report), in particular the antimicrobial agents used as growth promoters (english version, page 30, figure 5)

The Group made recommendations for the use of the updated OIE List.

Recommendations

Any use of antimicrobial agents in animals should be in accordance with the OIE Standards on the responsible and prudent use laid down in the Chapter 6.9. of the *Terrestrial Animal Health Code* and in the Chapter 6.3. of the *Aquatic Animal Health Code*.

The responsible and prudent use of antimicrobial agents does not include the use of antimicrobial agents for growth promotion in the absence of risk analysis.

According to the criteria detailed above, antimicrobial agents in the OIE List are classified according to three categories, Veterinary Critically Important Antimicrobial Agents (VCIA), Veterinary Highly Important Antimicrobial Agents (VHIA) and Veterinary Important Antimicrobial Agents (VIA).

However, a specific antimicrobial/class or subclass may be considered as critically important for the treatment of a specific disease in a specific species (See specific comments in the following table of categorisation of veterinary important antimicrobial agents for food-producing animals).

For a number of antimicrobial agents, there are no or few alternatives for the treatment of some specified disease in identified target species as it is indicated in the specific comments in the OIE List. In this context, particular attention should be paid to the use of VCIA and of specific VHIA.

Among the VCIA in the OIE List, some are considered to be critically important both for human and animal health; this is currently the case for Fluoroquinolones and for the third and fourth generation of Cephalosporins. Colistin has been moved in 2016 to the WHO category of Highest Priority Critically Important Antimicrobials. Therefore these two classes and Colistin should be used according to the following recommendations:

- Not to be used as preventive treatment applied by feed or water in the absence of clinical signs in the animal(s) to be treated;
- 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; and
- Extra-label/off label use should be limited and reserved for instances where no alternatives are available. Such use should be in agreement with the national legislation in force; and
- Urgently prohibit their use as growth promoters.

The classes in the WHO category of Highest Priority Critically Important Antimicrobials should be the highest priorities for countries in phasing out use of antimicrobial agents as growth promoters.

The OIE List of antimicrobial agents of veterinary importance is based on expert scientific opinion and will be regularly updated when new information becomes available.

Antimicrobial classes / sub classes used only in human medicine are not included in this OIE List. Recognising the need to preserve the effectiveness of the antimicrobial agents in human medicine, careful consideration should be given regarding their potential use (including extra-label/off-label use) / authorisation in animals.

Abbreviations:

Animal species in which these antimicrobial agents are used are abbreviated as follows:

AVI:	avian	EQU:	Equine	VCIA:	Veterinary Critically Important Antimicrobial Agents
API:	bee	LEP:	Rabbit	VHIA:	Veterinary Highly Important Antimicrobial Agents
BOV:	bovine	OVI:	Ovine	VIA:	Veterinary Important Antimicrobial Agents
CAP:	caprine	PIS:	Fish		
CAM:	camel	SUI:	Swine		

**CATEGORISATION OF VETERINARY IMPORTANT ANTIMICROBIAL AGENTS
FOR FOOD-PRODUCING ANIMALS**

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
AMINOCOUMARIN Novobiocin	BOV, CAP, OVI, PIS	Novobiocin is used in the local treatment of mastitis and in septicaemias in fish This class is currently only used in animals			X
AMINOCYCLITOL Spectinomycin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI	Used for respiratory infections in cattle and enteric infections in multiple species	X		
AMINOGLYCOSIDES Dihydrostreptomycin Streptomycin	AVI, BOV, CAP, EQU, LEP, OVI, SUI API, AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI	The wide range of applications and the nature of the diseases treated make aminoglycosides extremely important for veterinary medicine.			
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE Amikacin Apramycin Fortimycin Framycetin Gentamicin Kanamycin Neomycin Paromomycin Tobramycin	EQU AVI, BOV, LEP, OVI, SUI AVI, BOV, LEP, OVI, SUI BOV, CAP, OVI AVI, BOV, CAM, CAP, EQU, LEP, OVI, SUI AVI, BOV, EQU, PIS, SUI API, AVI, BOV, CAP, EQU, LEP, OVI, SUI AVI, BOV, CAP, OVI, LEP, SUI EQU	Aminoglycosides are of importance in septicaemias; digestive, respiratory and urinary diseases. Gentamicin is indicated for <i>Pseudomonas aeruginosa</i> infections with few alternatives. Apramycin and Fortimycin are currently only used in animals. Few economic alternatives are available.	X		
AMPHENICOLS Florfenicol Thiamphenicol	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI AVI, BOV, CAP, OVI, PIS, SUI	The wide range of applications and the nature of the diseases treated make phenicols extremely important for veterinary medicine. 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 Rifampicin Rifaximin	EQU BOV, CAP, EQU, LEP, OVI, SUI	This antimicrobial class is authorised only in a few countries and with a very limited number of indications (mastitis) and few alternatives. Rifampicin is essential in the treatment of <i>Rhodococcus equi</i> infections in foals. However it is only available in a few countries, resulting in an overall classification of VHIA.		X	
ARSENICAL Nitarsone Roxarsone	AVI, SUI AVI, SUI	Arsenicals are used to control intestinal parasitic coccidiosis. (<i>Eimeria</i> spp.).			X

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
BICYCLOMYCIN Bicozamycin	AVI, BOV, PIS, SUI	Bicyclomycin is listed for digestive and respiratory diseases in cattle and septicaemias in fish.			X
CEPHALOSPORINS					
CEPHALOSPORINS FIRST GENERATION					
Cefacetile	BOV				
Cefalexin	BOV, CAP, EQU, OVI, SUI				
Cefalonium	BOV, CAP, OVI				
Cefalotin	EQU				
Cefapyrin	BOV				
Cefazolin	BOV, CAP, OVI				
CEPHALOSPORINS SECOND GENERATION					
Cefuroxime	BOV				
CEPHALOSPORINS THIRD GENERATION					
Cefoperazone	BOV, CAP, OVI	The wide range of applications and the nature of the diseases treated make cephalosporin third and fourth generation extremely important for veterinary medicine.			
Ceftiofur	AVI, BOV, CAP, EQU, LEP, OVI, SUI				
Ceftriaxone	AVI, BOV, OVI, SUI				
CEPHALOSPORINS FOURTH GENERATION					
Cefquinome	BOV, CAP, EQU, LEP, OVI, SUI	Cephalosporins are used in the treatment of septicemias, respiratory infections, and mastitis. Alternatives are limited in efficacy through either inadequate spectrum or presence of antimicrobial resistance.	X		
FUSIDANE Fusidic acid	BOV, EQU	Fusidic acid is used in the treatment of ophthalmic diseases in cattle and horses.			X
IONOPHORES					
Lasalocid	AVI, BOV, LEP, OVI	Ionophores are essential for animal health because they are used to control intestinal parasitic coccidiosis (<i>Eimeria</i> spp.) where there are few or no alternatives available.			
Maduramycin	AVI				
Monensin	API, AVI, BOV, CAP				
Narasin	AVI, BOV	Ionophores are critically important in poultry.			
Salinomycin	AVI, LEP, BOV, SUI				
Semduramicin	AVI	<u>This class is currently only used in animals.</u>			
LINCOSAMIDES					
Lincomycin	API, AVI, BOV, CAP, OVI, PIS, SUI	Lincosamides are essential in the treatment of Mycoplasmal pneumonia, infectious arthritis and hemorrhagic enteritis of pigs.			X
Pirlimycin	BOV, SUI, AVI				
MACROLIDES					
MACROLIDES 14-MEMBERED RING					
Erythromycin	API, AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI	The wide range of applications and the nature of the diseases treated make macrolides extremely important for veterinary medicine.			
Oleandomycin	BOV				
MACROLIDES 15-MEMBERED RING					
Gamithromycin	BOV	Macrolides are used to treat Mycoplasma infections in pigs and poultry, haemorrhagic digestive disease in pigs (<i>Lawsonia intracellularis</i>) and liver abscesses (<i>Fusobacterium necrophorum</i>) in cattle, where they have very few alternatives.			
Tulathromycin	BOV, SUI				
MACROLIDES 16-MEMBERED RING					
Carbomycin	AVI				
Josamycin	AVI, PIS, SUI				
Kitasamycin	AVI, SUI, PIS				
Mirosamycin	API, AVI, SUI, PIS	This class is also used for respiratory infections in cattle			

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
Spiramycin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Terdecamycin	AVI, SUI				
Tildipirosin	BOV, SUI				
Tilmicosin	AVI, BOV, CAP, LEP, OVI, SUI				
Tylosin	API, AVI, BOV, CAP, LEP, OVI, SUI				
Tylvalosin	AVI, SUI				
MACROLIDES C17					
Sedecamycin	SUI				
ORTHOSOMYCINS					X
Avilamycin	AVI, LEP, SUI	Avilamycin is used for enteric diseases of poultry, swine and rabbit. This class is currently only used in animals.			
PENICILLINS					
NATURAL PENICILLINS (including esters and salts)					
Benethamine penicillin	BOV				
Benzylpenicillin	AVI, BOV, CAM, CAP, EQU, LEP, OVI, SUI				
Benzylpenicillin procaine / Benzathine penicillin	BOV, CAM, CAP, EQU, OVI, SUI				
Penethamate (hydroiodide)	BOV	Penethamate (hydroiodide) is currently only used in animals			
AMINOPENICILLINS					
Mecillinam	BOV, SUI				
AMINOPENICILLINS					
Amoxicillin	AVI, BOV, CAP, EQU, OVI, PIS, SUI				
Ampicillin	AVI, BOV, CAP, EQU, OVI, PIS, SUI				
Hetacillin	BOV				
AMINOPENICILLIN + BETALACTAMASE INHIBITOR					X
Amoxicillin + Clavulanic Acid	AVI, BOV, CAP, EQU, OVI, SUI	The wide range of applications and the nature of the diseases treated make penicillins extremely important for veterinary medicine.			
Ampicillin + Sulbactam	AVI, BOV, SUI	This class is used in the treatment of septicaemias, respiratory and urinary tract infections.			
CARBOXYOPENICILLINS					
Ticarcillin	EQU				
Tobicillin	PIS				
UREIDOPENICILLIN					
Aspoxicillin	BOV, SUI	This class is very important in the treatment of many diseases in a broad range of animal species.			
PHENOXYOPENICILLINS					
Phenethicillin	EQU	Few economical alternatives are available.			
Phenoxyethylpenicillin	AVI, SUI				
ANTISTAPHYLOCOCCAL PENICILLINS					
Cloxacillin	BOV, CAP, EQU, OVI, SUI				
Dicloxacillin	BOV, CAP, OVI, AVI, SUI				
Nafcillin	BOV, CAP, OVI				
Oxacillin	BOV, CAP, EQU, OVI, AVI, SUI				

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
PHOSPHONIC ACID DERIVATIVES Fosfomycin	AVI, BOV, PIS, SUI	Fosfomycin is essential for the treatment of some fish infections with few alternatives however it is only available in a few countries, resulting in an overall classification of VHIA.		X	
PLEUROMUTILINS Tiamulin Valnemulin	AVI, CAP, LEP, OVI, SUI AVI, SUI	The class of pleuromutilins is essential against respiratory infections in pigs and poultry. This class is also essential against swine dysentery (<i>Brachyspira hyodysenteriae</i>) however it is only available in a few countries, resulting in an overall classification of VHIA.		X	
POLYPEPTIDES Bacitracin Enramycin Gramicidin	AVI, BOV, LEP, SUI, OVI AVI, SUI EQU	Bacitracin is used in the treatment of necrotic enteritis in poultry. This class is used in the treatment of septicaemias, colibacillosis, salmonellosis, and urinary infections.		X	
POLYMYXINS Polymixin B Polymixin E (colistin)	BOV, CAP, EQU, LEP, OVI, AVI AVI, BOV, CAP, EQU, LEP, OVI, SUI	Polymyxin E (colistin) is used against Gram negative enteric infections.			
QUINOLONES					
QUINOLONES FIRST GENERATION Flumequin Miloxacin Nalidixic acid Oxolinic acid	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI PIS BOV AVI, BOV, LEP, PIS, SUI, OVI	Quinolones of the 1st generations are used in the treatment of septicaemias and infections such as colibacillosis.		X	
QUINOLONES SECOND GENERATION (FLUOROQUINOLONES) Ciprofloxacin Danofloxacin Difloxacin Enrofloxacin Marbofloxacin Norfloxacin Ofloxacin Orbifloxacin Sarafloxacin	AVI, BOV, SUI AVI, BOV, CAP, LEP, OVI, SUI AVI, BOV, LEP, SUI AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI AVI, BOV, EQU, LEP, SUI AVI, BOV, CAP, LEP, OVI, SUI AVI, SUI BOV, SUI PIS	The wide range of applications and the nature of the diseases treated make fluoroquinolones extremely important for veterinary medicine. Fluoroquinolones are critically important in the treatment of septicaemias, respiratory and enteric diseases.	X		
QUINOXALINES Carbadox Olaquindox	SUI SUI	Quinoxalines (carbadox) is used for digestive disease of pigs (e.g. swine dysentery). This class is currently only used in animals.			X

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
SULFONAMIDES					
Phthalylsulfathiazole	SUI				
Sulfachlorpyridazine	AVI, BOV, SUI				
Sulfadiazine	AVI, BOV, CAP, OVI, SUI				
Sulfadimethoxazole	AVI, BOV, SUI				
Sulfadimethoxine	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Sulfadimidine (Sulfamethazine, Sulfadimerazin)	AVI, BOV, CAP, EQU, LEP, OVI, SUI				
Sulfadoxine	BOV, EQU, OVI, SUI				
Sulfafurazole	BOV, PIS				
Sulfaguanidine	AVI, CAP, OVI				
Sulfamerazine	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Sulfamethoxine	AVI, PIS, SUI				
Sulfamonometroxine	AVI, PIS, SUI				
Sulfanilamide	AVI, BOV, CAP, OVI				
Sulfapyridine	BOV, SUI				
Sulfaquinoxaline	AVI, BOV, CAP, LEP, OVI				
Sulfacetamide	AVI, BOV, OVI				
SULFONAMIDES+ DIAMINOPYRIMIDINES					
Ormetoprim+ Sulfadimethoxine	PIS				
Sulfamethoxyypyridazine	AVI, BOV, EQU, SUI				
Trimethoprim+ Sulfonamide	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
DIAMINOPYRIMIDINES					
Baqiloprim	BOV, SUI				
Ormetoprim	AVI				
Trimethoprim	AVI, BOV, CAP, EQU, LEP, OVI, SUI				
STREPTOGRAMINS					
Virginiamycin	AVI, BOV, OVI, SUI	Virginiamycin is an important antimicrobial in the prevention of necrotic enteritis (<i>Clostridium perfringens</i>)			X
TETRACYCLINES					
Chlortetracycline	AVI, BOV, CAP, EQU, LEP, OVI, SUI	The wide range of applications and the nature of the diseases treated make tetracyclines extremely important for veterinary medicine			
Doxycycline	AVI, BOV, CAM, CAP, EQU, LEP, OVI, PIS, SUI				
Oxytetracycline	API, AVI, BOV, CAM, CAP, EQU, LEP, OVI, PIS, SUI	This class is critically important in the treatment of many bacterial and chlamydial diseases in a wide range of animal species.			
Tetracycline	API, AVI, BOV, CAM, CAP, EQU, LEP, OVI, PIS, SUI	This class is also critically important in the treatment of animals against heartwater (<i>Ehrlichia ruminantium</i>) and anaplasmosis (<i>Anaplasma marginale</i>) due to the lack of antimicrobial alternatives.			X
THIOSTREPTON					
Nosiheptide	AVI, SUI	This class is currently used in the treatment of some dermatological conditions.			X