WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future

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REPORT OF THE MEETING OF THE OIE *AD HOC* GROUP ON ANTIMICROBIAL RESISTANCE[1]

Paris, 22-24 January 2018

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1. Opening

The OIE *ad hoc* Group on Antimicrobial Resistance (hereafter referred to as 'the Group') met from 22 to 24 January 2018 at the OIE Headquarters in Paris, France.

Dr Matthew Stone, Deputy Director General, thanked the participants for their continued support and indicated that there is much international activity ongoing on this topic. He commented on consumer demand for antibiotic free products and reaffirmed the OIE position that antimicrobials are essential tools for protecting and maintaining animal health when used responsibly and prudently. Dr Stone addressed the progress of the Second OIE Annual Report on Antimicrobial Agents Intended for Use in Animals, while also advising caution for the use of quantitative data presented in the report for development of indicator thresholds for antibiotic use. He stressed the continued progress of countries in development of their data collection.

Dr Stone discussed the ongoing coordination and work of the Tripartite, including work on the programme on global stewardship and surveillance. Later in February, the work program and future direction will be considered at the Tripartite Executive Meeting that will take place from 21 to 22 February 2018 at the OIE Headquarters. The 4th meeting of the Inter-Agency Coordination Group on Antimicrobial Resistance (AMR) was also hosted by OIE in October 2017. During this meeting, six subgroups were created, of which Subgroup five addresses global governance mechanisms. Following the World Health Organization's recently published guidelines on use of medically important antimicrobials in food-producing animals, Dr Stone emphasised the role of the OIE in representing the critical perspective of animal health and welfare in this issue, and the importance of the planned update to the recommendations of the OIE List of Antimicrobial Agents of Veterinary Importance.

Dr Stone also addressed the significance of the Group's finalisation of definitions and consolidation of country comments on relevant chapters of the *Code*, with the goal of endorsement at the upcoming General Assembly.

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, including a summary from Dr Carson regarding a systematic review of ionophore use in animals.

[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 February 2018 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/

4. Presentation of the second OIE Annual Report on Antimicrobial Agents Intended for Use in Animals: Better Understanding of the Global Situation

The Second OIE Annual Report, published at the end of December 2017, was presented to the Group. There were substantial improvements in the number of participating countries and the option of reporting between the two phases of the report. For example, the number of country responses to the request for data increased (130 to 146 respondents) and the number of countries reporting quantitative data increased (89 countries in the first year to 107 countries in the second year). If a country did not report quantitative data to the OIE, they were asked to provide a reason why they were unable to do so at this time. Most of these countries reported a lack of regulatory framework for veterinary antimicrobials.

The report newly included a quantitative analysis adjusted for animal biomass focusing on 2014. Bovines represented the majority of the animal biomass for the 60 countries reporting quantitative data. Currently, the OIE estimated that 47% of the animal biomass in the 4 OIE Regions was included in the data presented. There was substantial regional disparity between the biomass represented by the data with relatively high coverage in the Americas and Europe and only 6% coverage in the Asia and the Pacific region. The global indicator of antimicrobial quantities intended for use in animals was estimated to be between 98-134 mg antimicrobial/kg animal biomass, with the upper level adjusted for country estimates of data coverage. It was nevertheless recognised that data coverage estimates are made subjectively by each country.

The Group strongly supported the OIE efforts to support Member Countries and to strengthen awareness, by providing feedback and where requested, analysis of their own country's data.

5. Overview 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 data collection were presented. The current deadline for Member Countries to provide data to the OIE is January 31, 2018. Seventy-eight Member Countries have responded already. One non-OIE Member Country has also responded. Most countries that have responded have provided quantitative data.

Regarding legislation for growth promotion, countries may be reporting whether legislation/regulation of growth promoters exists at the time of data submission (i.e., in 2018), though this legislation/regulation may not have existed or been applicable for the year the data on antimicrobial agents was being requested for (i.e., 2015).

For the third phase of data reporting, the OIE compared preliminary results for antimicrobial growth promoters with respect to legislation vs. use. Some countries indicated they will create or modify their regulatory framework for growth promotion during 2018.

In terms of other preliminary findings, the data sources and animal species covered by the data are similar to previous years. The OIE and Group noted that the availability of more recent population data may have implications for the calculation of the biomass denominator for 2015.

The Group discussed the need to develop a plan for next steps for reporting of the third phase of data collection, which will be on the agenda of the next meeting of the Group when the data collection will be complete.

6. Review comments from the OIE Member Countries on the proposed updated version of the Chapter 6.7 on "Harmonisation of national antimicrobial resistance surveillance and monitoring programmes"

6.1. General comments

The Group noted that a wide range of comments were provided for Chapter 6.7. by Member Countries regarding the environment. The Group recognised that in addition to animals, food, and humans, the environment is also important for AMR surveillance and should be identified as such within Chapter 6.7. Thus, the Group harmonised language about the environment throughout Chapter 6.7, ensuring that the environment should be taken into consideration in accordance with national priorities.

Taking into account opposing comments by Member Countries about the environment, the Group noted that 'environment' in this Chapter could be related to animals' immediate environments (e.g. pen floor) or wider environments (e.g. surface waters such as rivers and lagoons).

The Group noted several comments by Member Countries requesting different text additions stating that aspects of surveillance and monitoring of AMR should take into account national priorities, and one or more of: risk assessment, risk management, resources, new scientific knowledge and/or surveillance objectives. Suggestions for these text additions were primarily, though not solely, provided by Member Countries for aspects of the Chapter 6.7 related to animal feed and the environment. The Group was of the opinion that 'national priorities' is an overarching term which encompasses risk and available resources, and that national priorities should be based on science. Hence, the Group felt that 'national priorities' was sufficient to address the concepts raised. With that in mind, the Group proposed to add text about national priorities to a general overview statement in one area (see later in report) and only added it specifically to areas addressing feed and the environment.

6.2. Detailed comments:

- Regarding proposed changes to Article 6.7.3.1 (General Aspects)

  The Group noted opposing comments on the initial sentence with respect to animal feed and the environment; with some Member Countries wanting a reduced priority for surveillance in these areas and other Member Countries wanting an increased priority. The Group was of the opinion not to change 'should' to 'may', as animal feed and the environment should be considered according to national priorities. The Group was of the opinion that this provided a good balance between opposing Member Country comments on the importance of animal feed and the environment.

  One Member Country suggested adding text to indicate that surveillance would 'provide data on potential public health exposure'; the Group did not agree to make this change because this concept is already covered in 6.7.2.

- Regarding proposed changes to Article 6.7.4

  One Member Country suggested adding 'representativeness/appropriateness of the sample (e.g. does caeca sample represent farm, consumer exposure, etc.)' under *Sampling Strategies*. The Group agreed that text was needed to indicate that collected samples should meet the objectives of surveillance. As such, the Group proposed to modify Article 6.7.4, Sampling strategies under bullet a) to include that 'the sample is representative of the population of interest and meets the objectives of surveillance.'

- Regarding proposed changes to Table 1

  The Group took note of a Member Country proposal to add text to the first column as follows 'expected prevalence of antimicrobial resistance'. The Group did not support this addition because the table was designed to provide sample size estimates for either antimicrobial resistance or for the prevalence of bacteria in the animal population. The Group also noted that this concept is already addressed in paragraph 2 of Article 6.7.4.2 (*Sample size*).

  The Group agreed to include the lower expected prevalence levels in Table 1 as per Member Country comments. The Group agreed to update Table 1 (under the lead of Drs Chris Teale and Carolee Carson) for these lower expected prevalences, ensuring consistency with the rest of the table. This updated table would be shared electronically with the Group for consultation in the coming weeks.

- Article 6.7.4.3 Section a) *Food-producing animals*

  The Group proposed to modify Article 6.7.4.3 Section *Food-producing animals* as per Member Country comments to add flexibility to the text with regarding the approach to guiding resource allocation. The new proposed text would be 'Resource allocation should be guided by criteria such as production volume…'

- Article 6.7.4.3. Section b) *Food*

  A Member Country provided comments regarding adding 'taking a risk-based approach' to considering food products for inclusion in surveillance. The Group noted that more information would become available through the Codex Task Force discussions about application of a 'risk-based approach' to AMR surveillance in the coming years. Hence, the Group suggested not to add the proposed text addition at this time. The Group proposed to not make the suggested deletion of '…produced locally or imported' in this section, as no rationale was provided for this suggested deletion. The Group did not suggest adding 'although the extent of this is still unknown', at this stage, because this is a new comment on text already agreed upon during this round of Chapter revision; hence this was considered a new topic. This proposal was noted by the OIE Headquarters and will be kept on hold for future revisions of the Chapter.

- Article 6.7.4.4. Section c) *Animal Feed*

  The Group acknowledged the comments provided by Member Countries about animal feed. The Group agreed with the Member Country comment with the inclusion of 'national priorities' for animal feed. The Group suggested to keep 'should' and not change it to 'may' because the decision will be based on national priorities. National priorities should inherently take into consideration available resources and species; hence 'available resources' and 'species' are not needed in the sentence.

  The Group considered a Member Country comment to delete 'and should be linked to pathogen surveillance programs' and decided that the sentence should be changed to 'and should be linked to a pathogen surveillance program if available' to provide the flexibility for Member Countries to make this linkage should this pathogen surveillance program exist.

- Article 6.7.4.4 Section d) *Environment* (New)

  The Group considered comments to add specific information regarding the inclusion of the environment under 6.7.4.4, as this addition provides consistency with the text in Article 6.7.3.1. The Group proposed additional modifications for consistency and clarity. The Group was of the opinion that by highlighting the need to take into account national priorities, the differing positions of Member Countries could all be accommodated. The proposed revised text is as follows:

  > 'Member Countries should consider including the environment (the animal-immediate-environment or the animal-wider-environment), in surveillance and monitoring programmes based on national priorities, as the environment of animals can be an important route for transfer or persistence of antimicrobial resistance'.

- Table 2

  One Member Country suggested to add 'prior to any antimicrobial intervention' to the section on Table 2 addressing outputs from carcass sampling. The Group thought that this addition was too detailed, given the more general nature of the other examples in the Table. The Group did not agree with this text addition.

  As the environment was added to Article 6.7.4.4, the Group agreed with the proposal of a Member Country for text additions of examples of sampling sources for the animal-immediate-environment to Table 2. This addition would become a new row at the bottom of Table 2, as follows:

  > Column 1 'various origins', Column 2 'environment', and Column 3 'occurrence of resistant bacteria originating from the animal-immediate-environment'.

- Article 6.7.5.1. *Animal bacterial pathogens relevant to the countries priorities*

  One Member Country suggested softening the language in 6.7.5.1.c to use 'may' instead of 'should' and to add 'one or more of the following criteria'. The Group proposed to keep 'should' and add 'one or more' to indicate the importance of surveillance of animal bacterial pathogens and at the same time including necessary flexibility for decision making, but still contributing to harmonization of the approach for selection of animal bacterial pathogens.

- Table 3

  A Member Country suggested including zoonotic and commensal bacteria in Table 3. The Group decided not to include commensals and zoonotic bacteria, as the intent of this table was only to include examples of animal bacterial pathogens. The Group indicated that zoonotic and commensal bacteria are covered later in the Chapter (Articles 6.7.5.2 and 6.7.5.3).

- Article 6.7.5.2.a) *Salmonella*

  Regarding zoonotic bacteria and *Salmonella*, the Group proposed changes and additional text, based on a Member Country comment, to allow flexibility for the design of the surveillance and monitoring program in accordance with national priorities. The proposal of the Member Country also included issues regarding the inclusion of animal feed. The Group suggested an amendment of the text accordingly and with consistency to previous amendments as follows:

  > '*Salmonella* should be sampled from food-producing animals and animal-derived food products. For the purpose of consistency and harmonization, animal samples should preferably be taken at the slaughterhouse/abattoir from healthy animals. When resources are adequate and animal feed samples are considered a national priority, *Salmonella* from animal feed should be sampled.'

  Another Member Country requested the addition of the environment to this section. As such and to ensure consistency with other amendments to the text, the Group proposes to add a statement about the environment as follows:

  > 'Surveillance and monitoring programmes may also include sampling of the environment at places where animals are kept or housed'.

  The Group did not agree with the suggestion proposed by one Member Country to add that Salmonella isolates should be 'phagetyped'. The Group's proposal was in accordance with previous in-depth discussions about this method and the views received by other Member Countries.

- Article 6.7.5.2.b) *Campylobacter*

  The Group considered one Member Country's suggestion to alter the text about *Campylobacter* to add 'based on national priorities and the surveillance system objectives'. The Group noted that the proposed addition could be made for each bacterial species listed in the Chapter. For simplicity, the Group agreed to make this addition at the beginning of Article 6.7.5 as follows:

  > 'The following categories of bacteria may be included in surveillance and monitoring programs as determined by national priorities'

- Article 6.7.5.3. *Commensal bacteria*

  The Group accepted a Member Country's suggestion for adding sampling of the environment under Commensal bacteria for consistency with earlier changes to the document. The new text is as follows '…may be sampled from animal feed, food-producing animals, their environment, and products of …'

  Regarding a Member Country's suggestion to add 'meat' to the document with respect to where samples are collected for commensal *E. coli*, the Group noted that this was a proposal on text already agreed upon during this round of Chapter revision; hence this was considered a new topic. This proposal was noted by the OIE Headquarters and it was proposed to keep it on hold for future revisions of the Chapter.

- Article 6.7.7.

  One Member Country proposed the following two deletions: '…not only qualitatively (susceptible or resistant), but also…' and 'or inhibition zone diameters'). The Group did not accept this suggestion for three reasons: not all surveillance systems can provide quantitative data at this point in time, not all audiences can correctly interpret quantitative data, and the quantitative data can be misinterpreted. Therefore the Group decided to keep the original text; maintaining the emphasis on both qualitative and quantitative data.

- Article 6.7.8.

  One Member Country suggested adding clinical breakpoints in addition to microbiological breakpoints under bullet number 9. The Member Country also suggested deleting the last sentence in this paragraph.

  The Group noted that there are not always clinical breakpoints available for all antimicrobial/bacterial species combinations and that clinical breakpoints might differ between countries. The Group noted that the microbiological breakpoints do not differ between the countries. Human AMR surveillance is based on the microbiological breakpoint and hence if a desire for the surveillance program is to compare with human AMR, then the microbiological breakpoint would be preferable. The Group agreed that both types of breakpoints can provide useful information.

  As a result of this discussion, the Group agreed to maintain the original text and add the concept of clinical breakpoints as a new sentence to maintain the original intent of the paragraph, yet add the new information. The new sentence at the end was added as follows: 'Clinical breakpoints (where available) should also be reported'. The group did not delete the last sentence of the paragraph because no rational was provided by the Member Country for the deletion. The Group did not accept the change to 'microbiological cut off' because the standard terminology is "microbiological breakpoint" or "epidemiological cut-off value" based on EUCAST[2] and CLSI[3].

  One Member Country suggested a modification on bullet number 10 which addresses collecting data at the individual isolate level and including data on uses of antimicrobials. The Member Country's suggestion was to replace 'along with' with 'may'. The Group agreed with this change to allow for greater flexibility in reporting, as not all countries will be able to collect data on antimicrobial use or management practices.

7. Review comments from the OIE Member Countries on the proposed updated version of the Chapter 6.8 on "Monitoring of the quantities and usage patterns of antimicrobial agents used in food-producing animals" (definitions)

7.1. Definitions

- Therapeutic Use

  One Member Country suggested replacing 'therapeutic' with 'infectious disease-related' and 'nontherapeutic' with 'not related to infectious diseases'. The Group discussed retaining the original language of 'therapeutic use' and 'non-therapeutic use' because this is the language used in the data capture template for the global database on antimicrobial agents intended for use in animals.

  However, the Group did recall their previously agreed upon language in the Figure submitted in the last Group meeting report. In this Figure, there was reference to therapeutic being related to 'disease' vs. non-therapeutic being related to 'production'. In addition, the Group highlighted that therapeutic use is under veterinary supervision. As a compromise between the proposal by the Member Country,

1 The European Committee on Antimicrobial Susceptibility Testing
3 The Clinical & Laboratory Standards Institute

the original text, and previous Group's comments, the Group proposed adding to the second paragraph of 6.8.1 the following '…type of use [therapeutic (to treat, control or prevent infection or disease) or nontherapeutic (production use including growth promotion)]'.

One Member Country suggested adding 'according to a country's resources and priorities' to the second paragraph about 'evaluating antimicrobial exposure in food-producing animals'. The Group noted that implementation of OIE standards is always in accordance with a country's resources and priorities and therefore, this text addition was not considered necessary.

One Member Country suggested harmonisation between the G7 CVO Forum definitions and the OIE definitions for treatment, control/metaphylaxis, preventive use/prophylaxis, and growth promotion. The Group noted that the G7 and the OIE processes are different and that the representation of the two groups is very different. As part of the review of the two sets of definitions, the Group recalled that at their previous meeting (and documented in the meeting report), that 'control' had the same meaning as 'metaphylaxis' and that 'preventive' had the same meaning as 'prophylaxis'. The Code Commission took note of the Group's meeting report and decided to adopt the most well understood terms of 'control' and 'preventive use' for inclusion in the Chapter. The Group also noted that in human medicine, 'metaphylaxis' is not well understood worldwide and hence 'metaphylaxis' is not the preferred word for the OIE. With all this in mind, the Group recommended keeping the OIE definitions.

- Control

One Member Country noted concern with the OIE definition of control; in which a herd has a mixture of sick and healthy animals in which there would be animals that need to be treated (sick) and those that need antimicrobials for control (healthy). This concept is different than applying antimicrobials to the entire group for control.

The Group recognized that the sick animals in the group could be classified as receiving treatment; however it is the treatment of a group of animals that contain healthy individuals that is the defining feature of control. An outbreak is dynamic and categorising healthy, infected, incubating and sick animals is difficult in field conditions. The Group recalled that the terms 'control' and 'metaphylaxis' were understood to have the same meaning and this was documented in the last meeting report. Therefore, the Group was of the opinion that the current OIE definition of control should not be changed.

- Prevention

One Member Country referred to the WHO guidelines, and wanted to have the phrase 'that have not yet been clinical diagnosed' added to the definition to guide interpretation of the WHO guidelines. The Group was of the opinion that this proposal was outside the Group's agenda for this meeting.

One Member Country provided a comment indicating that specific aspects of the definition for prevention ('using an appropriate dose and for a limited, defined duration') was not for the purpose of surveillance, but rather more appropriate for conditions of responsible and prudent use. They were of the opinion that this would be better placed in Chapter 6.9. The Group noted that indeed, this aspect of the definition (the principles) should be further discussed when Chapter 6.9 is under revision. However, the Group was of the opinion that the full definition also needed to be included in Chapter 6.8 to meet the intent of the Chapter.

One Member Country asked for a revision to the prevention definition to change the word of 'developing' to 'acquiring'. The Group agreed to replace the word 'developing' with 'acquiring', as these animals are healthy and should not be developing an infection; hence the suggested revision is more correct than the original text.

One Member Country noted that 'prophylaxis' is a synonym for 'prevention'. The Group noted that in the last meeting report 'For the purpose of these definitions, prevention is understood to have the same meaning as prophylaxis and preventative use', and that 'prevention' was the preferred term. As such, the Group made no suggestions for text revisions based on this Member Country comment.

The Group considered a suggestion by a Member Country to delete 'using an appropriate dose and for a limited, defined duration'. As per the response by the Group at the last meeting to a similar comment, this phrase needs to be retained to distinguish preventive use from growth promotion; hence the Group did not agree with the proposal to delete this phrase.

- Growth Promotion

The Group noted that in the instructions for the global database data collection template, the full Codex definition for growth promotion was referenced. The Group previously agreed with a Member Country's proposal of adding 'in feed or water' and 'efficiency of feed' to the Codex definition. The Group discussed the need to have international harmonisation of definitions, and that in the future, Codex may take note of the OIE definition. The Group therefore proposed to use the Codex definition for the purposes of alignment between international organisations and the proposed definition would be:

> 'Growth promotion means the use of antimicrobial agents to increase the rate of weight gain or the efficiency of feed utilisation in animals by other than purely nutritional means.'

The Group also suggested that the second sentence of the Codex definition needed to be added because there was an important concept regarding incidental growth that was missing. This sentence is as follows:

'The term does not apply to the use of antimicrobials for the specific purpose of treating, controlling, or preventing infectious diseases, even when an incidental growth response may be obtained.'

One Member Country suggested to remove the words 'in the feed or water' from the OIE growth promotion definition. This comment was addressed by the proposal of the Group to adopt the Codex definition for growth promotion (in which this phrase is not included).

- Antibiotic vs. antimicrobial agent/antimicrobials

One Member Country suggested that the Group consider clarifying the definition of 'antibiotic' vs. 'antimicrobial agents/antimicrobials'. The Group noted that 'antimicrobial agents' is a term harmonized with Codex and 'antimicrobial agents' is the term used in the OIE's global database. The Group noted that the term 'antibiotic' is not used in OIE *Terrestrial Animal Health Code*; hence the Group did not make any further distinctions of these terms.

One Member Country provided comments about the definition of 'antimicrobial agent' and whether further exclusions should be provided in the definition regarding chlorine and organic acids. The Group took note that the current definition of antimicrobial agent in the OIE glossary excludes disinfectants and antiseptics. The Group requests clarity around this proposal from the Member Country and additionally requested a proposal for amendments to the text if needed. The definition of 'antimicrobial agent' was currently outside the scope of current discussions and further refinements of this definition could happen in future discussions when appropriate.

8. Revision of the OIE List of antimicrobial agents of veterinary importance in animals

The Group noted that an in depth review of the published literature on ionophores was being conducted in Canada and the USA; this was expected to provide further useful information and the Group would await the outcome. Accordingly, the Group also considered that the categorisation of ionophores in the OIE List of antimicrobial agents of veterinary importance should remain unchanged.

The Group agreed that there was a clear rationale for focusing on colistin taking account of the Global Action Plan (which refers to phasing out of use of antibiotics for animal growth promotion in the absence of risk analysis), Resolution N° 38 adopted by the OIE World Assembly of Delegates in May 2013 and the WHO list of Critically Important Antimicrobials for Human Medicine (5th Revision, updated in 2016) and in particular the change of category of polymyxins (including colistin) to the highest priority critically important antimicrobials. The Group also noted the latest responses received from OIE Member Countries when compiling the OIE Annual report on antimicrobial agents intended for use in animals (2nd Report, Figure 5, page 30), where some OIE Member Countries reported use of colistin for growth promotion purposes while no OIE Member Countries reported used of polymyxin B for growth promotion. The Group added

recommendations to the OIE List of antimicrobials of veterinary importance extending the recommendations for fluoroquinolones and third and fourth generation cephalosporins to colistin. The Group addressed the use of highest priority critically important antimicrobials in human medicine for growth promotion in animals, and added a specific comment that any use of cephalosporins, fluoroquinolones or colistin for growth promotion purposes should be urgently ceased.

The Group took note of the WHO List and noted the categorisation of highest priority antimicrobials in particular the classification of macrolides in this category. The class has numerous indications in veterinary medicine and is classified in the OIE List as veterinary critically important antimicrobials. The Group further noted that the macrolides are sub-categorised in the OIE List according to their chemical structure but are currently not sub-categorised in the WHO List. The Group proposed that the sub-categories of macrolides be reviewed in the OIE List at its next meeting.

In addition to the macrolides, the Group took note of the other classes of antimicrobial agents in the WHO category of Highest Priority Critically Important Antimicrobials. The Group recommended that all these classes should be the highest priorities for countries in phasing out use of antimicrobials as growth promoters and added this recommendation to the OIE List.

The Group proposed that a small review team, with members selected from the Group and including WHO and FAO experts, will review the OIE List within a short time-frame, and prepare feedback on their findings for consideration by the full Group. Review of the List will take account of recent developments, including those relating to macrolides and colistin mentioned above, as well as comments which may be received from the upcoming OIE General Session.

The updated OIE List is in Appendix III.

9. Second OIE Global Conference on Antimicrobial Resistance and Prudent Use of Antimicrobial Agents in Animals

The 2nd OIE Global Conference on Antimicrobial Resistance and Prudent Use of Antimicrobial Agents in Animals will be held in Marrakech, Morocco from 29 to 31 October 2018. The conference programme will focus on issues relevant to OIE Delegates and OIE National Focal Points for Veterinary Products and will be developed to ensure continuity with OIE initiatives on antimicrobial resistance. The Group agreed to provide support to the conference by acting as the scientific committee. Posters will be invited from OIE Member Countries on national developments and the Group will act as the scientific scrutineers for posters and abstracts.

The Group discussed a broad range of relevant topics for inclusion in the meeting which will be considered by the OIE.

10. Any other business

The Group proposed the following dates for the next meeting: from 3 to 5 July 2018, back to back with a meeting of the small team reviewing the OIE List.

11. Adoption of report

The Group adopted the report.

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…/Appendices

Appendix I

MEETING OF THE OIE *AD HOC* GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 22 – 24 January 2018

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Agenda

1. Opening
2. Adoption of agenda and appointment of chairperson and rapporteur
3. Roundtable from the participants on new issues of interest for the Group
4. Presentation of the second OIE Annual Report on Antimicrobial Agents Intended for Use in Animals: Better Understanding of the Global Situation
5. Overview of the preliminary results of the third phase of the collection of data on antimicrobial agents intended for use animals
6. Review comments from the OIE Member Countries on the proposed updated version of the Chapter 6.7. on "Harmonisation of national antimicrobial resistance surveillance and monitoring programmes"
7. Review comments from the OIE Member Countries on the proposed updated version of the Chapter 6.8. on "Monitoring of the quantities and usage patterns of antimicrobial agents used in food-producing animals" (definitions)
8. Revision of the OIE List of antimicrobial agents of veterinary importance in animals
9. Second OIE Global Conference on Antimicrobial Resistance and Prudent Use of Antimicrobial Agents in Animals
10. Any other business
11. Adoption of report

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MEETING OF THE OIE *AD HOC* GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 22-24 January 2018

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Appendix III

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OIE LIST OF ANTIMICROBIAL AGENTS OF VETERINARY IMPORTANCE

The OIE[4] 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 FAO[5]/OIE/WHO[6] 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.

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 Dugs, 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.

4 OIE: World Organisation for Animal Health

5 FAO: Food and Agriculture Organization of the United Nations

6 WHO: World Health Organization

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, ~~and~~ 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 (VCIA)**: 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 ~~(July 2012)~~

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 promotors (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 promotors.

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 promotors.

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 is used in the local treatment of mastitis and in septicaemias in fish			X
Novobiocin	BOV, CAP, OVI, PIS				
AMINOGLYCOSIDES		The wide range of applications and the nature of the diseases treated make aminoglycosides extremely important for veterinary medicine. Aminoglycosides are of importance in septicaemias; digestive, respiratory and urinary diseases. **Gentamicin is indicated for *Pseudomonas aeruginosa* infections with few alternatives.** **<u>Apramycin and Fortimycin are currently only used in animals.</u>** Few economic alternatives are available.	X		
AMINOCYCLITOL					
Spectinomycin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Streptomycin	API, AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Dihydrostreptomycin	AVI, BOV, CAP, EQU, LEP, OVI, SUI				
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE					
Kanamycin	AVI, BOV, EQU, PIS, SUI				
Neomycin	API, AVI, BOV, CAP, EQU, LEP, OVI, SUI				
Framycetin	BOV, CAP, OVI				
Paromomycin	AVI, BOV, CAP, OVI, LEP, SUI				
Apramycin	AVI, BOV, LEP, OVI, SUI				
Fortimycin	AVI, BOV, LEP, OVI, SUI				
Gentamicin	AVI, BOV, CAM, CAP, EQU, LEP,OVI, SUI				
Tobramycin	EQU				
Amikacin	EQU				
AMPHENICOLS		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		
Florphenicol	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Thiamphenicol	AVI, BOV, CAP, OVI, PIS, SUI				
ANSAMYCIN – RIFAMYCINS		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 *Rhodococcus equi* infections in foals. However it is only available in a few countries, resulting in an overall classification of VHIA.**		X	
Rifampicin	EQU				
Rifaximin	BOV, CAP, EQU, LEP, OVI, SUI				
ARSENICAL		Arsenicals are used to control intestinal parasitic coccidiosis. (*Eimeria* spp.).			X
Roxarsone	AVI, SUI				
Nitarsone	AVI, SUI				
BICYCLOMYCIN		Bicyclomycin is listed for digestive and respiratory diseases in cattle and septicaemias in fish.			X
Bicozamycin	AVI, BOV, PIS, SUI				

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
CEPHALOSPORINS		Cephalosporins are used in the treatment of septicemias, respiratory infections, and mastitis.		X	
CEPHALOSPORINS FIRST GENERATION					
Cefacetrile	BOV				
Cefalexin	BOV, CAP, EQU, OVI, SUI				
Cefalotin	EQU				
Cefapyrin	BOV				
Cefazolin	BOV, CAP, OVI				
Cefalonium	BOV, CAP, OVI				
CEPHALOSPORINS SECOND GENERATION					
Cefuroxime	BOV				
CEPHALOSPORINS THIRD GENERATION		The wide range of applications and the nature of the diseases treated make cephalosporin third and fourth generation extremely important for veterinary medicine. 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		
Cefoperazone	BOV, CAP, OVI				
Ceftiofur	AVI, BOV, CAP, EQU, LEP, OVI, SUI				
Ceftriaxone	AVI, BOV, OVI, SUI				
CEPHALOSPORINS FOURTH GENERATION					
Cefquinome	BOV, CAP, EQU, LEP, OVI, SUI				
FUSIDIC ACID		Fusidic acid is used in the treatment of ophthalmic diseases in cattle and horses.			X
Fusidic acid	BOV, EQU				
IONOPHORES		Ionophores are essential for animal health because they are used to control intestinal parasitic coccidiosis (*Eimeria* spp.) where there are few or no alternatives available. **Ionophores are critically important in poultry.** **<u>This class is currently only used in animals.</u>**		X	
Lasalocid	AVI, BOV, LEP, OVI				
Maduramycin	AVI				
Monensin	API, AVI, BOV, CAP				
Narasin	AVI, BOV				
Salinomycin	AVI, LEP, BOV, SUI				
Semduramicin	AVI				
LINCOSAMIDES		Lincosamides are essential in the treatment of Mycoplasmal pneumonia, infectious arthritis and hemorrhagic enteritis of pigs.		X	
Pirlimycin	BOV, SUI, AVI				
Lincomycin	API, AVI, BOV, CAP, OVI, PIS, SUI				
MACROLIDES (C refers to the chemical structure)		The wide range of applications and the nature of the diseases treated make macrolides extremely important for veterinary medicine. **Macrolides are used to treat Mycoplasma infections in pigs and poultry, haemorrhagic digestive disease in pigs (*Lawsonia intracellularis*) and liver abscesses (*Fusobacterium necrophorum*) in cattle, where they have very few alternatives**. This class is also used for respiratory infections in cattle	X		
MACROLIDES C14					
Erythromycin	API, AVI, BOV,CAP, EQU, LEP, OVI, PIS, SUI				
Oleandomycin	BOV				
MACROLIDES C15					
Gamithromycin	BOV				
Tulathromycin	BOV, SUI				
MACROLIDES C16					
Carbomycin	AVI				
Josamycin	AVI, PIS, SUI				
Kitasamycin	AVI, SUI, PIS				
Spiramycin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Tilmicosin	AVI, BOV, CAP, LEP, OVI, SUI				
Tylosin	API, AVI, BOV, CAP, LEP, OVI, SUI				
Mirosamycin	API, AVI, SUI, PIS				

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
Terdecamycin	AVI, SUI				
Tildipirosin	BOV, SUI				
Tylvalosin	AVI, SUI				
MACROLIDES C17					
Sedecamycin	SUI				
ORTHOSOMYCINS		Avilamycin is used for enteric diseases of poultry and rabbit. **<u>This class is currently only used in animals.</u>**			X
Avilamycin	AVI, LEP				
PENICILLINS			X		
NATURAL PENICILLINS (including esters and salts)					
Benethamine penicillin	BOV				
Benzylpenicillin	AVI, BOV, CAM, CAP, EQU, LEP, OVI, SUI				
Penethamate (hydroiodide)	BOV	**<u>Penethamate (hydroiodide) is currently only used in animals</u>**			
Benzylpenicillin procaine / Benzathine penicillin	BOV, CAM, CAP, EQU, OVI, SUI				
AMDINOPENICILLINS					
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		The wide range of applications and the nature of the diseases treated make penicillins extremely important for veterinary medicine. This class is used in the treatment of septicaemias, respiratory and urinary tract infections. This class is very important in the treatment of many diseases in a broad range of animal species. Few economical alternatives are available.			
Amoxicillin + Clavulanic Acid	AVI, BOV, CAP, EQU, OVI, SUI				
Ampicillin + Sulbactam	AVI, BOV, SUI				
CARBOXYPENICILLINS					
Ticarcillin	EQU				
Tobicillin	PIS				
UREIDOPENICILLIN					
Aspoxicillin	BOV, SUI				
PHENOXYPENICILLINS					
Phenoxymethylpenicillin	AVI, SUI				
Phenethicillin	EQU				
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				
PHOSPHONIC ACID		**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	
Fosfomycin	AVI, BOV, PIS, SUI				

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
PLEUROMUTILINS		**The class of pleuromutilins is essential against respiratory infections in pigs and poultry.**			
Tiamulin	AVI, CAP, LEP, OVI, SUI				
Valnemulin	AVI, SUI	**This class is also essential against swine dysentery (*Brachyspira hyodysenteriae*) however it is only available in a few countries, resulting in an overall classification of VHIA.**		X	
POLYPEPTIDES		Bacitracin is used in the treatment of necrotic enteritis in poultry.			
Enramycin	AVI, SUI				
Gramicidin	EQU	This class is used in the treatment of septicaemias, colibacillosis, salmonellosis, and urinary infections.			
Bacitracin	AVI, BOV, LEP, SUI, OVI			X	
POLYPEPTIDES CYCLIC					
Colistin	AVI, BOV, CAP, EQU, LEP, OVI, SUI	Cyclic polypeptides are widely used against Gram negative enteric infections.			
Polymixin	BOV, CAP, EQU, LEP, OVI, AVI				
QUINOLONES					
QUINOLONES FIRST GENERATION					
Flumequin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI	Quinolones of the 1st generations are used in the treatment of septicaemias and infections such as colibacillosis.		X	
Miloxacin	PIS				
Nalidixic acid	BOV				
Oxolinic acid	AVI, BOV, LEP, PIS, SUI, OVI				
QUINOLONES SECOND GENERATION (FLUOROQUINOLONES)					
Ciprofloxacin	AVI, BOV, SUI	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		
Danofloxacin	AVI, BOV, CAP, LEP, OVI, SUI				
Difloxacin	AVI, BOV, LEP, SUI				
Enrofloxacin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI				
Marbofloxacin	AVI, BOV, EQU, LEP, SUI				
Norfloxacin	AVI, BOV, CAP, LEP, OVI, SUI				
Ofloxacin	AVI, SUI				
Orbifloxacin	BOV, SUI				
Sarafloxacin	PIS				
QUINOXALINES		Quinoxalines (carbadox) is used for digestive disease of pigs (e.g. swine dysentery). **<u>This class is currently only used in animals</u>.**			X
Carbadox	SUI				
Olaquindox	SUI				
SULFONAMIDES					
Sulfachlorpyridazine	AVI, BOV, SUI	The wide range of applications and the nature of the diseases treated make sulfonamides extremely important for veterinary medicine. **These classes alone or in combination are critically important in the treatment of a wide range of diseases (bacterial, coccidial and protozoal infections) in a wide range of animal species.**	X		
Sulfadiazine	AVI, BOV, CAP, OVI, 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				
Sulfadimethoxazole	AVI, BOV, SUI				
Sulfamethoxine	AVI, PIS, SUI				
Sulfamonomethoxine	AVI, PIS, SUI				
Sulfanilamide	AVI, BOV, CAP, OVI				

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