Report of the Meeting of the WOAH Working Group on Antimicrobial Resistance

Original: English (EN)

29-31 October 2024
Paris

World Organisation for Animal Health

Antimicrobial Resistance and
Veterinary Products Department
amrvp.dept@woah.org

12, rue de Prony
75017 Paris, France

T. +33 (0)1 44 15 18 88
F. +33 (0)1 42 67 09 87
woah@woah.org
www.woah.org

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1. Welcome and opening of the meeting – Dr Montserrat Arroyo

Dr Montserrat Arroyo welcomed the AMRWG, especially those joining the group. She congratulated the AMRWG for all the work accomplished since 2019 in progressing their workplan, based on the recommendations of the 2nd OIE Global Conference on Antimicrobial Resistance. Dr Montserrat Arroyo provided an overview of the role of the AMRWG and emphasised the importance of AMRWG members' function in serving WOAH independently from their respective affiliations, without receiving any instructions from any government or authority external to WOAH, for the effective and equitable implementation of WOAH's Strategy on antimicrobial resistance and prudent use of antimicrobials.

1.1. Adoption of the agenda

The AMRWG adopted the agenda, which is presented in Annex 1, alongside the List of Participants in Annex 2.

1.2. Appointment of rapporteur

Dr Tomoko Ishibashi chaired the AMRWG and Dr Stephen Page acted as rapporteur.

2. Providing Recommendations and Feedback – UNGA HLM 2024 and Impact on WOAH's Activities – Dr Javier Yugueros-Marcos

The AMRWG was updated on the second political declaration on antimicrobial resistance (AMR), which, was adopted during the High-Level Meeting (HLM) at the 79th United Nations General Assembly (UNGA), on September 26 2024. The declaration contains 44 commitments, four of which directly relate to animal health, and an additional 17 that are partially related to animal health (Annex 3).

The AMRWG was asked to review commitments related to animal health and advise on the impact of the second political declaration on WOAH activities, synergies with commitments in other sectors and how WOAH can support countries/regions when implementing the commitments of the political declaration.

2.1. Discussion

The AMRWG was informed that Members will have five years to implement the UNGA political declaration. WOAH has outlined its own actions for each of the UNGA recommendations and has also prepared a series of recommended actions for Members, which have been endorsed by WOAH's council at its last meeting in October 2024. These recommended actions will be communicated to Delegates via letter, alongside WOAH's plans to support Members in their implementation.

2.2. Decision

The AMRWG welcomed WOAH's initiative to provide guidance to Members for the implementation of the UNGA political declaration on AMR and provided feedback on the draft document, prior to circulation to Delegates (Annex 3).

3. Informing Members of wider WOAH activities – WHO Update – Priority Bacterial Pathogens List – Dr Jorge Matheu

Dr Matheu gave updates on three key WHO AMR activities. The WHO Member States have adopted the resolution on the strategic and operational priorities to address drug-resistant bacterial infections in the human health sector (2025-2035), during the World Health Assembly in May 2024. The WHO Strategic Technical Advisory Group (STAG) meeting was held in June 2024 and the WHO Bacterial Priority Pathogen List was updated in May 2024, with changes in classification of some pathogens.

3.1. Discussion

Dr Matheu emphasised that the WHO Bacterial Priority Pathogens List needs to be adapted to national contexts, taking into account the variation of burden of disease across countries and regions. The list will be updated every 5-7 years, based on the weight given to criteria by experts, which will be used to analyse and identify which pathogens

should be included in the next version of the list. The AMRWG asked about treatability and preventability criteria and how it is used in the evaluation of bacteria, which depends on the objectives; less easily treatable pathogens like *Acinetobacter baumannii* are classified as 'critical'.

Dr Matheu informed the AMRWG that WHO has started to assess how countries are implementing the WHO AWaRe List and treatment guidelines to monitor the appropriateness of antimicrobial use (AMU).

Dr Matheu explained that the STAG-AMR is a strategic technical advisory group that was established many years ago. Advisory groups are composed of 18-22 experts, ensuring both geographical and gender balance, with memberships renewed every three years. Members meet annually at WHO headquarters and remotely every three months. WOAH, FAO and UNEP are invited to participate virtually as observers. WHO regional advisers are also invited to attend in person.

Dr Matheu clarified that the WHO Medically Important Antimicrobial (MIA) List was developed through an advisory group that involved FAO, UNEP and WOAH, as members of the WHO advisory group. WHO would like to continue to collaborate with WOAH and FAO on the WHO MIA List related activities to improve communication and increase awareness of the List with countries.

3.2. Decision

For information only, no decision required of the AMRWG.

4. Informing Members of wider WOAH activities – FAO Update – RENOFARM – Dr Alejandro Dorado Garcia

The AMRWG was updated on FAO's RENOFARM programme, which works to reduce the Need for Antimicrobials on Farms for Sustainable Agrifood Systems Transformation. Since the February 2024 AMRWG meeting, pilot studies were launched in Indonesia, Nigeria and Uganda and the open call for data to the International FAO AMR Monitoring (InFARM) System has been launched. Governance initiatives included the launch of AMR-LEX and the Quadripartite One Health Legislative Assessment Tool for AMR, as well as the FAO's Progressive Management Pathway (PMP) for AMR. Future plans include expanding the overarching RENOFARM initiative to 100 countries over the next decade and focusing on sustainable production practices. Collaboration within the Quadripartite Joint Secretariat (QJS) on AMR will continue through technical work on integrated surveillance and other technical areas and the AMR Multi-Stakeholder Partnership Platform (MSPP), the coordination team hosted by FAO, which will drive broader engagement and coordination. Additionally, the AMR Multi Partner Trust Fund (MPTF) will support additional country programmes and technical initiatives globally, using a One Health Approach.

4.1. Discussion

Dr Dorado-Garcia invited AMRWG members to join the RENOFARM initiative (RENOFARM Membership application form) and updated the AMRWG on the progress of ongoing initiatives to collect data on plants and crops. FAOSTAT is collecting information on fungicides and herbicides, recently through disaggregated questions from Members, whilst the International Plant Protection Convention (IPPC) is conducting a qualitative survey to understand the pattern of AMU in plant and crop production. FAOSTAT and IPPC results will be used to support the development of a survey which will be submitted to FAO focal points in Ministries of Agriculture. In the next open call for InFARM data, FAO may be able to start collecting AMU in plants through this survey. Dr Dorado Garcia clarified to the AMRWG that ornamental plants and flower production are not being specifically addressed by FAO's InFARM, but may be included at a later stage. Dr Page noted that flower bulbs have been associated with the presence of azole-resistant *Aspergillus fumigatus* (for example, https://pubmed.ncbi.nlm.nih.gov/34870333/).

4.2. Decision

For information only, no decision required of the AMRWG.

5. Informing Members of wider WOAH activities – AMR in companion animals – Dr Stephen Page and Dr Ana Mateus

The AMRWG was informed of WSAVA's Essential Medicines List (EML) for cats and dogs (last updated in 2023) by the Therapeutics Committee. The EML was developed following a similar methodology to that of the World Health Organization (WHO)'s EML and provides countries with a blueprint that can be adapted to national contexts to improve accessibility to veterinary medicinal products for systemic and topical use. The EML considers a variety of essential medicines, categorised according to the type of agent: anaesthetic, analgesics, immunomodulators, oncology drugs, sedatives, vaccines, antiparasitic drugs and antimicrobials, including antibacterial, antifungal, antiprotozoal and antiviral drugs. For the scope of this mapping exercise, only antimicrobials with antibacterial activity were considered, taking into consideration the expertise of the AMRWG.

The AMRWG was asked to advise if guidance is fit for purpose and useful to improve access to veterinary medicinal products (VMPs) containing antimicrobial agents in animals, as well as if WOAH should endorse the EML, based on its quality and relevance to Members

5.1. Discussion

Dr Mateus clarified that WOAH's endorsement will increase the visibility and credibility of the WSAVA EML to veterinary services/competent authorities. Furthermore, as it is complementary to the WOAH technical reference documents for antimicrobial agents of veterinary importance for specific species (TRDs) and the WOAH list of antimicrobial agents of veterinary importance (WOAH List), the WSAVA EML can be used by Members to develop national guidelines for responsible antimicrobial use (AMU) and improve access to alternative essential veterinary medicines to ensure animal health and welfare.

5.2. Decision

The AMRWG considered that whilst the WSAVA EML is focused on principles of use for priority and common diseases in cats and dogs, it does not include public health considerations for AMU in these species. Although the AMRWG recognised the EML's relevance as a tool to improve accessibility to essential medicines including antimicrobials, the AMRWG did not think that the WSAVA EML is fully aligned with WOAH standards and guidance at this stage.

The AMRWG recommended considering the WSAVA EML when assessing access to Veterinary Medicinal Products and developing treatment guidelines for cats and dogs. The AMRWG also recommended WSAVA to include the following points in the next revision of their list:

- Considerations on the potential public health risks associated with antimicrobial use in cats and dogs.
- Use of critically important antimicrobials for animals and humans to be aligned with the latest versions of WOAH standards and guidance.

6. Providing recommendations and feedback - Antimicrobial growth promoters (AGP) systematic review – technical report findings – Dr Floriane Etienne

The AMRWG was updated on the findings of the systematic review of antimicrobial growth promoters, investigating the link between antimicrobial growth promoters (AGPs) and the emergence of antimicrobial resistance (AMR) in livestock. 7,000 studies were screened (out of which, 10 were deemed eligible) and quality assessments and narrative analyses were conducted. Seven out of the 10 selected studies reported increased levels of resistance to antibiotics, including HPCIAs when AGPs were used in livestock. Next steps include publication in a peer-reviewed journal, after which, these findings, including considerations on the quality of existing evidence and knowledge gaps, will be disseminated through WOAH's website and social media.

The AMRWG was asked to advise on the follow up work on AGPs to inform WOAH recommendations and standards.

6.1. Discussion

Dr Etienne confirmed that certain reviews were excluded because they did not fit within the scope of the review. The AMRWG noted that many of the studies investigating the causal relationship between AMU and the development of AMR are not of high quality. Moreover, although all of the eligible studies had comparator groups of untreated animals, it was difficult to assess how much more resistant a microorganism becomes after AGP use.

6.2. Decision

The AMRWG noted that although relevant, the limited number of studies and the high risk of bias score means the findings of this review are not sufficient to make changes in policy making. Furthermore, the recommendations of the review must also be aligned with its findings. Despite this, the review did identify gaps in knowledge and the AMRWG encourages more research in this area. To support the development of more evidence-based policies, the AMRWG recommended the development of a research agenda for AMR in animals to increase knowledge of producers and Members.

The AMRWG recommended that WOAH carries out a mapping exercise on existing risk analyses conducted by different competent authorities, to inform the preparation of guidance on risk analysis of AGP use, AMR and public health, that could be adapted for implementation in national contexts. FAO is conducting a study to develop practical guidance on how to phase out the use of AGPs; WOAH should also explore synergies with FAO.

The AMRWG recommended that the next systematic review on AGPs conducted by WOAH should be expanded to focus on Gram positive bacteria (for example, *Enterococcus* spp.).

7. Providing recommendations and feedback – Updates from other departments – Terrestrial Code Commission update and Chapter 6.8 from Standards Dept – Dr Francisco D'Alessio & Ana Mateus

The AMRWG was informed of the current workplan of the Terrestrial Code Commission (TCC) by Dr D'Alessio.

At its September 2024 meeting, the TCC approved the AMRWG's recommendation to revise Chapter 6.8 of the Terrestrial Animal Health Code (TAHC) '*Harmonisation of national antimicrobial resistance surveillance and monitoring programmes*', (last updated in 2018), based on a mapping exercise conducted by WOAH with the assistance of its Collaborating Centres (CC). This revision follows the adoption of the revised Chapter 6.10 at the General Session in May 2025.

The proposed review aims to harmonise Chapter 6.8 with current advancements in sector-specific surveillance programmes at global, regional and national levels. The remit of the chapter will also be extended to companion animals and animal-related environments within sector-specific surveillance programmes and will include considerations on data requirements for cross-sectoral integrated surveillance programmes.

The TCC has requested that the AMRWG submits the ToRs for the *ad hoc* group that will be responsible for the revision of the chapter at the next TCC meeting in February 2025.

The AMRWG was asked to advise on the *ad hoc* group membership and the timescale of work – start date/meeting formats/deadline for submission of first draft to Commissions

7.1. Discussion

The AMRWG welcomed the TCC's decision to revise Chapter 6.8 and considered the expertise needed to revise the Chapter and the potential involvement of CCs in the revision process. The AMRWG was reminded that it can also be involved in the revision process and that the ToRs for the *ad hoc* group will need to be approved by the Director General.

7.2. Decision

The AMRWG will submit the ToRs for the *ad hoc* group for consideration of the TCC by 17th January 2025. Work on Chapter 6.8 will start in Q1-Q2 2025, pending approval of ToRs by the DG and *ad hoc* group availability. Dr Carson

and Dr Moodley from the AMRWG will be part of the *ad hoc* group for the revision of Chapter 6.8 and will engage with CCs, as well as external experts and partner organisations, if further expertise is required.

8. Providing Recommendations and Feedback – Update on Chapter 2.1.1 from BSC Secretariat – Dr Mariana Delgado

The AMRWG was updated on the suggested revisions for Chapter 2.1.1, for which the AMRWG has provided ongoing support to the Biological Standards Commission (BSC). Revisions are currently with Members for comments, which will be sent back to WOAH by December 2024 and addressed by the BSC in February 2025, after which, the AMRWG may be further consulted for feedback.

8.1. Discussion

The AMRWG welcomed the feedback on the progress of the revision of Chapter 2.1.1.. The BSC Secretariat informed the AMRWG that it will seek its input if any comments from Members need to be considered at the next BSC meeting in February 2025.

8.2. Decision

For information only, no decision required of the AMRWG.

9. Providing Recommendations and Feedback – Apramycin use in animals – Dr Christelle Schaffer, Dr François Franceschi, Dr Jovana Albig and Dr Peter Beyer (GARDP)

The Global Antibiotic Research & Development Partnership (GARDP) updated the AMRWG on GARDP's activities in exploring the use of apramycin for humans, to replace some of the current use of aminoglycosides. GARDP's tentative development plan was shared with the AMRWG for their comments.

The AMRWG was asked to assess the veterinary importance of apramycin, and animal health considerations if apramycin becomes authorised for use in human medicine.

9.1. Discussion

The AMRWG commented that for those countries without sufficient alternatives to apramycin for use in animals (e.g. pigs), it is a valuable antimicrobial. Furthermore, assessing AMU in terms of quantities used in animal health does not provide insight into its importance in animal health. The AMRWG and GARDP agreed that the authorisation of apramycin for human use would lead to increased scrutiny for the use in animals, as was shown with colistin, with potential exclusive use for humans in the future. Alternatively, apramycin could be the subject of specific recommendations for appropriate use in the WOAH List, instead of being banned for veterinary use, which would have potential adverse impacts on animal health and welfare. If the use of apramycin in humans is reserved for priority pathogens, its use in animals may change from first line (as other aminoglycosides) to second line treatment option, placing it at the same level as fluoroquinolones and 3rd and 4th generation cephalosporins. The AMRWG also considered the risk of new mechanisms of resistance that could emerge from human use and impact animal health. Dr Matheu confirmed that apramycin is not currently included in the WHO MIA List as it is currently only used for animals. GARDP envisions that it will be used for critical patients in emergency services or niche patients with cystic fibrosis but not for tuberculosis. It may still take 6-7 years until clinical trials are finalised and apramycin becomes authorised for human use.

9.2. Decision

The AMRWG recommended that GARDP and WHO discuss, when necessary, how apramycin will be classified under WHO's AWaRE List, which could impact the consideration of its importance for human and animal health.

The AMRWG welcomed being consulted on this topic, particularly as it is an example of effective implementation of the One Health approach, and requested to be updated regularly.

10. Providing Recommendations and Feedback – ANIMUSE – Dr Delfy Góchez, Dr Morgan Jeannin, Dr Dante Mateo

The AMRWG was informed on:

- Feedback from the first Electronic Technical Group (ETG) on ANIMUSE
- Update on the 10th round of the AMU data collection
- Guidelines for data collection of aquatic species at field level

The AMRWG were requested to provide advice on:

- Inclusion of inventory of field level AMU data collection projects into the ANIMUSE interface
- Member engagement on the 10th round of the AMU data collection

10.1. Discussion

Members are provided with animal biomass estimations by WOAH and are encouraged to submit their animal population figures through the World Animal Health Information System (WAHIS) Annual Report for refined calculations of their animal biomass.

FAO congratulated WOAH for ANIMUSE and suggested that in the future, InFARM and ANIMUSE may be able to form an integrated surveillance system for AMU and AMR in animals. Dr Yugueros-Marcos commented that WOAH is encouraging Members to use their data to produce their own national surveillance reports. WOAH and WHO recently explored how to conduct integrated AMU surveillance in animals and humans in a recent workshop in Senegal. This kind of capacity building activities could be expanded in the future to AMR data, as those get consolidated via InFARM.

WOAH's inventory of field level AMU data collection projects was built based on the AACTING database, in response to a recommendation made during the 2nd OIE Global Conference on AMR in Marrakesh (2018). The AMRWG was consulted on including a dashboard for the inventory of AMU studies at field data level in the ANIMUSE portal. The inventory will be used as a complementary source of AMU data but it will not replace ANIMUSE data collection or reporting. There are currently 94 projects in the inventory and the inventory can also be used to collate information on companion animal projects. The survey to identify additional projects has currently only been circulated during ANIMUSE workshops, but it will be shared publicly through ANIMUSE if the AMRWG considers it to be relevant for collating information on AMU field level studies. The value of the inventory is still to be determined, based on engagement with the questionnaire and the repository itself. The main objective of the inventory is to facilitate awareness by competent authorities of studies conducted in their countries and territories. This will be useful for competent authorities with a high turnover of focal points for veterinary products (FP-VP).

The AMRWG noted that AMU study data may not be publicly available in some countries for research, although it is reported to competent authorities. Moreover, in some countries, the data collated through projects cannot be shared or made publicly available without authorisation of governments.

The AMRWG noted that the European Medicines Agency (EMA) will publish their first report on AMU field level data in poultry, turkeys and pigs next year. FAO is conducting AMU field studies as part of RENOFARM, which can be shared with WOAH.

Dr Dorado Garcia offered to provide feedback on the guidelines for AMU at farm level for aquaculture, as FAO will be implementing these guidelines at field level.

10.2. Decision

The AMRWG recommended countries share their data publicly with ANIMUSE for transparency, and to avoid the risk of biased estimations AMU from mathematical modelling studies.

The AMRWG supported the inclusion of the inventory dashboard in the ANIMUSE interface and recommended that the questionnaire be renamed to better reflect its purpose.

11. Providing Recommendations and Feedback – VSAFE – Dr Andrés García Campos

VSAFE is WOAH's pilot Veterinary Monitoring & Surveillance system for Substandard & Falsified Products (SFVP). The system aims to collect and monitor suspicious incidents of SFVP reported by Members and provide alerts to Members with recommendations to prevent, detect and respond to SFVP circulating in different countries. Since the February 2024 AMRWG meeting, VSAFE participants have increased to 64 (including a significant increase in Members from the Asia and Pacific Region) and a new VSAFE platform has been launched (open to enrolled Members only). There is also an ongoing selection process for the tender of the new VSAFE IT system.

The AMRWG was asked to advise:

- If raw materials should also be included in the reporting system. If so, how (same vs separate reporting form, communication modalities to members)?
- If the information provided in the dashboard in VSAFE is useful, or how to use VSAFE data to be most helpful to Members (any other content to be included in the dashboard)?
- Criteria to be decided for disseminating global alert
- How to Enrol all EU MS in VSAFE – should EMA be considered?

11.1. Discussion

The AMRWG discussed why WOAH does not have a set of criteria for an alert system like WHO. Dr Yugueros-Marcos informed the AMRWG that WOAH is currently only reporting on the dashboard of identified SFVPs for information and does not currently have an alert system as such. The EU has rules for reporting SFVPs and an alert system for competent authorities to alert each other, which, could help inform WOAH on creating a rapid alert system. Dr Yugueros-Marcos informed the AMRWG that WOAH wants to provide VSAFE to countries and regions that currently do not have any mechanisms in place for identification or reporting of SFVPs, whilst recognising that some regions have already implemented very advanced systems. Dr Yugueros-Marcos reminded the AMRWG that WOAH is piloting VSAFE with voluntary Members contributing and providing feedback. The dashboard still needs to be refined but it has potential for use by Members in its current form. Dr Yugueros-Marcos informed the AMRWG that WOAH will likely use the Animal Health Forum during the next General Session in May 2025 to inform about VSAFE.

11.2. Decision

More detailed information should be provided on the Veterinary Medicinal Products (VMP) data (e.g. antimicrobial agent in formulation) in the VSAFE dashboard, without sharing confidential information from Members reporting SFVPs. WOAH's VSAFE team will explore the synergies on VSVPs with the Quality of Veterinary Products team at EMA.

12. Key Activities – AAHC Chapter revision 6.2 – Dr Dante Mateo

Following the adoption of the updated Chapter 6.10 Responsible and Prudent Use of Veterinary Products at the 2024 General Session, the AMRWG's recommendation to update the equivalent chapter (Chapter 6.2) in the Aquatic Animal Health Code (AAHC) was given to the Aquatic Animal Health Standards Commission (AAHSC). This request has been made to the AMR&VP Department and to WOAH's Collaborating Centre: Centre for Antimicrobial Stewardship for Aquaculture (CASA, Chile). The AAHSC has requested a gap analysis of Chapter 6.2 of the AAHC and other chapters of Section 6, to inform them of the modifications needed and the timelines for the revision.

The AMRWG was asked to advise on the gap analysis approach, and the timescales of work – start date/meeting formats/deadline for submission of first draft to Commissions)

12.1. Discussion

The AMRWG commented that in some countries and regions, antimicrobials for ornamental fish do not require a prescription and can be purchased over the counter, which makes monitoring AMU difficult. Considering that there is a large trade of ornamental fish globally, there is a considerable gap in knowledge in AMU in this area..

12.2. Decision

The AMRWG recommended that WOAH continues the mapping of relevant chapters of the AAHC related to AMR for future revision and information of AAHCC feedback at the next AMRWG meeting in April 2025.

13. Key activities – Technical Reference Documents (TRD) for bovine animals and cats and dogs

Following recommendations at the 2nd OIE Global Congress for AMR and Prudent Use of Antimicrobials for WOAH in 2018, WOAH has started to develop species-specific technical reference documents (TRD) of antimicrobial agents of veterinary importance, including companion animals. The TRDs provide additional, species-specific information without serving as a treatment guideline and will be used to update the WOAH List. To date, TRDs have been developed for aquatic species, poultry and swine. Since February 2024, the TRDs for 1) bovine animals (Annex 4) and 2) cats and dogs (Annex 5) were finalised by the *ad hoc* groups and have been revised by the AMRWG, WOAH CCs and external experts.

The AMRWG was asked to advise if the TRDs should be endorsed based on technical quality.

13.1. Discussion

The AMRWG welcomed the two latest TRDs and thanked the *ad hoc* groups for their work. The AMRWG requested clarification on how the *ad hoc* groups defined 'well-established combinations' of antimicrobials, as some older antimicrobial combinations may be perceived as well-established but are not included in the TRDs. Dr Mateus clarified that well-established combinations are relevant where there is evidence of a synergistic or useful additive antimicrobial activity when used in a given concentration. It was noted that EMA has a concept note for well-established antimicrobial combinations that has been shared with the Secretariat for cross-referencing and alignment.

13.2. Decisions

The AMRWG endorsed the TRDs with minor amendments. The TRDs will be published as annexes in this report and will be published on the WOAH website, with other existing technical documents to increase its visibility to Members. Furthermore, a new section on purpose will also be added to provide clarity to Members on the usability of the TRDs (see point 14.2. 'Decisions').

14. Key activities - Brainstorming session for major review of WOAH List of Antimicrobial Agents of Veterinary Importance (WOAH List)

The WOAH List of Antimicrobial Agents of Veterinary Importance (the WOAH List) was first published in 2007. The development of the WOAH List was informed by a survey conducted with Members and partner organisations (i.e. European Commission, Federation of Veterinarians of Europe, International Dairy Federation, IFAH now HealthforAnimals). The categorisation criteria of the WOAH List were: 1) Response rate of the questionnaire regarding Veterinary Important Antimicrobial Agents (> 50% of participants in the survey identified the importance of the antimicrobial class) and 2) Treatment essential against specific infections and lack of sufficient therapeutic alternatives. Since its inception, there have been several lists published at international level from standard-setting organisations and regional agencies (e.g. WHO, EMA) promoting antimicrobial stewardship by categorisation of antimicrobials, taking into consideration the risk of AMR and its implications for public and/or animal health. Considerations regarding risks of AMR and potential implications for animal and/or human health are currently missing from the WOAH List.

The categorisation criteria for the WOAH List has not been revised since 2007; revising the categorisation criteria would allow for alignment with existing Lists of other organisations (e.g., WHO) and international recommendations to promote more responsible AMU in animals.

The AMRWG undertook a brainstorming activity in preparation for the major review of the WOAH List and were asked to advise on the process to follow for the revision of the WOAH List, including factors to consider in the categorisation criteria for the list

14.1. Discussion

Following recommendations from the 2nd OIE Global Conference, WOAH Members have requested that the WOAH List is updated, new TRDs are produced and that the usability and visibility of both are increased. Although EMA has used both the WHO MIA and the WOAH List to inform the revision of the EU legislation on veterinary products, the WHO MIA List is often used more by Members. To help combat this, the AMRWG suggested that the WOAH List should include a section on purpose and instructions for use, as featured in the WHO MIA List. The AMRWG agreed that the WOAH List categorisation criteria would be different to the WHO MIA List as the purposes of both lists are different (the WOAH's List focuses on animal health and will include non-food producing animals in the near future, whilst the WHO MIA List focuses on human health and the Codex focus focuses on food safety).

14.2. Decision

The AMRWG proposed the below two -stage process to begin the gradual revision of the WOAH List:

Stage one

The first stage of the revision process will focus on the update of the electronic booklet, by adding the TRDs developed to the WOAH List and other standards and guidelines, so accessibility and visibility are improved for Members. The AMRWG secretariat will also:

- Propose a 'purpose section' for the WOAH list and the TRDs
- Propose a diagram explaining synergies and the different purposes of the WOAH List and future vet AWaRe List and different existing lists
- Prepare a list of minor amendments to the WOAH List based on the content of existing TRDs
- Arrange the posting of all documents (once validated by the AMRWG) on the WOAH website for access by Members and stakeholders

This work will take place via email exchange and will be approved in a virtual AMRWG meeting in Q4 2024.

Stage two

At the next AMRWG meeting in April 2025, the AMRWG will validate a questionnaire to send to Members and other stakeholders identified in Chapter 6.10 in the TAHC to receive feedback on:

- The utility of the WOAH List and TRDs package
- Three new categorisation criteria: 1) authorised by the competent authority, 2) seriousness of the infectious diseases, and 3) availability of alternative treatment
- Actions WOAH should be taking to increase the value of WOAH materials that promote responsible and prudent use of antimicrobials in animals (animal health, animal welfare, food security)

Furthermore, the AMRWG will also oversee the formation of a group which will explore an 'AWaRe-like' classification, initially for companion animals in collaboration with WSAVA.

15. AMRWG Membership – Recruitment and Appointments

Dr Tomoko Ishibashi informed the group that her term will be ending in June 2025, after the 92nd General Session, following six years in her role as Chair of the AMRWG.

Dr Stephen Page informed the group that his term will be ending in October 2025 after the AMRWG meeting, following six years in his role. Dr Page offered to continue to support the AMRWG with his expertise if requested in different areas of the AMRWG.

The AMRWG was asked to decide the preferred methods for future appointment/recruitment

15.1. Discussion

The Secretariat proposed to conduct an open call for expressions of interest for new AMRWG members representing the Asia and the Pacific region. The AMRWG's ToRs were used to inform the most recent selection process for the AMRWG recruitment in 2024 and will be updated again to inform the upcoming appointment of a new Chair, with the potential to also create a co-chair role.

15.2. Decision

The AMRWG agreed with the open call procedure, as it increases the transparency of the process.

16. Any other business

None.

17. Date of next meeting

1 – 3 April 2025.

/Annexes…

Annex 1. Adopted Agenda

MEETING OF THE WOAH WORKING GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 29–31 October 2024

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Day 1 (Tuesday 29 October – 09:00-17:00 CET)

Time	Activity Type	Item	Speaker(s)
09:00	N/A	Welcome and introduction to new AMRWG Members	Javier Y. Marcos / Tomoko Ishibashi
09:30	Providing recommendations and feedback	UNGA HLM 2024 and impact on WOAH's activities	Javier Yugueros-Marcos
11:00	Break		
11:15	Informing Members of wider WOAH activities	WOAH's AMR&VP roadmap 2024-2026	Javier Yugueros-Marcos
12:15	Lunch		
14:45	Informing Members of wider WOAH activities	WHO Update - Priority Bacterial Pathogens List STAG – AMR Meeting	Jorge Matheu
15:15	Informing Members of wider WOAH activities	FAO Update - Renofarm	Alejandro Dorado Garcia
15:45	Break		
16:00	Informing Members of wider WOAH activities	**AMR in Companion Animals** - WSAVA Congress 2024 - WSAVA Therapeutics Committee (TC) - WSAVA Essential Medicines List (EML)	Stephen Page Ana Mateus
17:00	Close		

Day 2 (Tuesday 30 October – 09:00-17:00 CET)

Time	Activity Type	Item	Speaker(s)
09:00	Providing recommendations and feedback	Antimicrobial Growth Promoters (AGP) systematic review technical report– findings	Floriane Etienne
09:45	Informing Members and providing feedback	Updates on the work of The Code Commission TAHC revision- Chapter 6.8	Francisco D'Alessio Ana Mateus
10:30	Providing recommendations and feedback	Update on Chapter 2.1.1 from BSC	Mariana Delgado

11:00	Break		
11:15	Providing recommendations and feedback	Apramycin use in humans	Peter Beyer (GARDP)
12:00	Lunch		
13:30	Informing Members	ANIMUSE	Delfy Góchez Morgan Jeannin
14:15	Key activities	Technical Reference Documents (TRDs) for Antimicrobial Agents of Veterinary Importance for bovine animals and cats and dogs	Ana Mateus Stephen Page
15.15	Providing recommendations and feedback	VSAFE	Andrés García Campos
15:45	Informing Members	Rest of SFVP Programme	Andrés García Campos
16:00	Key activities	AAHC Section 6 – Revision plan	Dante Mateo
16:30	Meet and Greet	Deputy Director General International Standards and Science	Dr Montserrat Arroyo
17:00	Close		

Day 3 (Tuesday 31 October – 09:00-17:00 CET)

Time	Activity Type	Item	Speaker
09:00	Key activities	Background of review of WOAH list	Ana Mateus
10:00	Key activities	Brainstorming session for major review of WOAH List of Antimicrobial Agents of Veterinary Importance	Ana Mateus
12:00	Lunch		
13:15	Key activities	Continued – Brainstorming session for major review of WOAH List of Antimicrobial Agents of Veterinary Importance	Ana Mateus
15:15	Break		
15:30	N/A	AMRWG Membership	Tomoko Ishibashi
16:00	N/A	AMRWG Workplan validation	Javier Yugueros-Marcos
16:30	N/A	AOB and date of next AMRWG	Tomoko Ishibashi
17:00	Close		

Annex 2. List of Participants

MEETING OF THE WOAH WORKING GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 29–31 October 2024

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MEMBERS

Dr Tomoko Ishibashi
(Chair)
Project Researcher
Graduate School of Agricultural and Life Science
The University of Tokyo
JAPAN

Ms Barbara Freischem
AMR Senior Specialist
Veterinary Medicines Division
European Medicines Agency
THE NETHERLANDS

Dr Stephen Page
Director
Advanced Veterinary Therapeutics
AUSTRALIA

Dr Fajur Sabah Al Saloom
Director, Animal Health
Ministry of Works, Municipalities Affairs and Urban Planning
KINGDOM OF BAHRAIN

Dr Arshnee Moodley
AMR Team Leader and CGIAR AMR Hub Leader
ILRI
KENYA

Dr Jalusa Deon Kich
Researcher Leader
Swine Health Research Group
EMBRAPA
BRAZIL

Dr Carolee Carson
Surveillance Manager
Canadian Integrated Program for AMR Surveillance (CIPARS)
Public Health Agency of Canada
CANADA

OBSERVERS

Dr Jorge Matheu
Team Lead
Department of Global Coordination and Partnership
WHO
SWITZERLAND

Dr Alejandro Dorado Garcia
Animal Health Officer
AMR Surveillance Coordination
FAO
ITALY

WOAH PARTICIPANTS

Dr Javier Yugueros-Marcos
Head of Department
Antimicrobial Resistance and Veterinary Products Department (AMR-VP)

Dr Morgan Jeannin
Chargé de mission
AMR-VP Department

Dr Ana Luisa Pereira Mateus
Scientific Coordinator
AMR-VP Department

Dr Delfy Góchez
Data Management Officer - AMU
AMR-VP Department

Dr Andrés Garcia Campos
Project Officer
AMR-VP Department

Dr Francisco D'Alessio
Deputy Head
Standards Department

Dr Mariana Delgado
Scientific Secretariat Officer
Science Department

Dr Dante Mateo
Scientific Coordinator
AMR-VP Department

Ms Laura Davis
Scientific Coordinator
International Standards

Dr Floriane Etienne
Disease Status Officer
Status Department

Annex 3. UNGA political declaration: recommendations for and related to the animal health sector and actions proposed for Members and WOAH

MEETING OF THE WOAH WORKING GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 29–31 October 2024

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Summary: Following negotiations and final adoption of the second political declaration on AMR during the High-Level Meeting (HLM) carried out on the sides of the 79th United Nations General Assembly (UNGA), on September 26th 2024, we hereby inform the AMRWG about major outcomes related to animal health and AMR Quadripartite Joint Secretariat (QJS) activities.

We provide some recommendations for WOAH and its Members for its successful implementation during the following five years, **requesting the AMRWG Members to review and comment**.

Background: Following a 2022 UNGA resolution establishing a HLM on AMR for September 2024, negotiations to generate a second political declaration on AMR started in May 2024. This process was led by the President of the General Assembly office, who appointed Ambassadors Frazier (Malta) and Jackman (Barbados) to co-facilitate writing and negotiations with Member States. The QJS on AMR acted as a support entity. Therefore, WOAH has been directly involved in supporting this process, setting four key priority areas[1] to focus on to close the gaps in animal health, proactively disseminating them to all Delegates and key Partners. During negotiations, WOAH engaged with a selected series of Members and discussion fora to properly inform Member States and promote the inclusion of the four priorities previously mentioned. Negotiations were overall tense, especially in regards to animal health matters, such as setting targets for reduction of antimicrobial use in animals and phasing out the use of antimicrobials as growth promoters.

The final version of the political declaration was presented and adopted on September 26, during the HLM on AMR. It is structured in ten sections[2], and contains 44 commitments and four follow-up paragraphs. Seventeen commitments are related to animal health matters. Following a first level of analysis, Table 1 lists main commitments from the agriculture and animal health section, including recommended actions for Members as well as WOAH's proposed support. Table 2 lists all other 14 commitments related to animal health.

Thirteen commitments and three follow-up actions concern the AMR QJS, which formalisation is requested by the political declaration. Other commitments in which AMR QJS must contribute are, among others, to set the independent panel on evidence, third body still missing from the IACG[3] 2019 report; to facilitate sustainable funding from international cooperation enabling at least 60% of countries having funded national action plans on AMR; to update the Global Action Plan on AMR, include biennial public reports; and to report progress to UNGA by 2026. Table 3 lists those commitments and follow up actions concerning the AMR QJS.

AMRWG Action: We requested the AMRWG to review, comment and make proposals, during the AMRWG meeting in October 29-31, 2024, for all these commitments (tables 1 to 3), previously presented to the Council during their 8 - 9 October 2024 meeting.

Next steps: Consolidated analysis is captured in tables below, and will be then presented to the Director General for approval, and subsequent dissemination and implementation, engaging with WOAH Members (i.e., letter to Delegates, presentation & discussion during Regional Commission meetings, interactive webinars with focal points for veterinary products or during planned capacity building trainings), and our Quadripartite partners.

[1] Implementation of effective cross-sectoral coordination, resource surveillance systems, prioritise prevention and set adequate funding

[2] 1) Governance, 2) Financing, 3) Access, 4) Coordinated Multisectoral Response, 5) Human Health, 6) Agriculture & Animal Health, 7) Environment, 8) R&D, innovation & manufacturing, 9) Surveillance & monitoring and 10), Follow up

[3] Inter-Agency Coordination Group on AMR

Table 1. Agriculture & animal health section commitments concerning animal health

Version for HLM (Sep.09.2024)	Member's actions	WOAH's actions
*69. **Strive to meaningfully reduce, by 2030, the quantity of antimicrobials used globally in the agri-food system from the current level,** taking into account national contexts, by, inter alia, investing in animal and plant health to prevent and control infections, reducing the need for and inappropriate use of antimicrobials, including through investing in and promoting alternatives to antimicrobials and increasing implementation of stewardship guidance, taking into account the Codex Alimentarius and standards, guidance and recommendations of the World Organisation for Animal Health;*	1. Maintain or increase reporting level to ANIMUSE 2. Members to write national reports (ideally public) to be used for decision making, at cross-sectoral coordination committee, when set 3. Members to set targets to work towards optimal use	1. Maintain basic level of training enabling good quality reporting to ANIMUSE (i.e., video tutorials, hotline support, webinars for new focal points) 2. Build capacity in targeted countries for report writing and use to inform interventions and policies 3. Advise Members leveraging on Collaborating Centers network and experts advice 4. ***AMRWG suggested to*** explore setting an additional question around the 'quality of antimicrobial use' so it can be measured. Link this to GAP update and the concept of 'optimal use' 5. ***AMRWG suggested to*** consider ways to improve AMU feedback to Members (i.e., red flags, areas to prioritise actions)
*70. **Commit to ensure that the use of antimicrobials in animals and agriculture is done in a prudent and responsible manner** in line with the Codex Alimentarius Antimicrobial Resistance Standards and the standards, guidance and recommendations of the World Organisation for Animal Health;*	1. Update regulations/legislation etc. to better align with WOAH international standards, guidelines and recommendations for aquatic and terrestrial animals 2. Engage, raise awareness and educate relevant stakeholders in the value chain of antimicrobials on responsible AMU and AMR 3. ***AMRWG suggested to*** implement One Health Legal Assessment Tool on AMR, with technical guidance and support from Quadripartite	1. Disseminate recently updated chapter 6.10 (terrestrial), and update chapter 6.2 (aquatics) 2. Continue building capacity through e-modules, focal point trainings 3. Advocate responsible use using EcoAMR report results engaging with relevant authorities & stakeholders 4. ***AMRWG suggested to*** *engage with other associations (WVA, WSAVA, IVSA…), so responsible use is also a priority of their agendas*
*72. **Ensure, by 2030, that animal vaccination strategies are defined with an implementation plan**, including with international cooperation, taking into account WOAH's list of priority diseases for which vaccines could reduce antimicrobial use, and FAO guidance on vaccine quality control and field implementation, according to national contexts and based on scientific evidence;*	1. Get knowledge of WOAH list of priority diseases where vaccination could reduce antimicrobial use in animals and map current situation and gaps 2. Implement vaccination programs where possible 3. Maintain or upgrade to align with standards on vaccine manufacturing and quality control	1. Conduct a global survey to map current situation of vaccination against WOAH's list of priority diseases where vaccination could reduce antimicrobial use in animals 2. Update list of priority animal diseases where vaccination could reduce antimicrobial use in animals, providing recommendations for implementation of vaccination plans 3. Update standards for vaccine manufacturing and quality control on a regular basis
*73. **Invest in animal health systems to support equitable access to essential veterinary services, improve animal health and appropriate management practices to prevent infections,** and promote the timely supply of quality and affordable essential veterinary medicines, vaccines and diagnostics, and improve veterinary oversight of antimicrobial use in animals at national level*	1. Advocate between relevant government services & ministries for prioritisation of investments in animal health and veterinary services 2. Conduct PVS, or utilise recommendations from PVS, including targeted PVS components, to prioritise interventions by cost-effectiveness 3. Consider develop national Essential Veterinary Medicine Lists (EVMLs) to improve access to medicines 4.Explore, at national or regional level, PPPs with pharmaceutical companies and commercial lab companies and/or incentives for harmonisation of regulatory frameworks for marketing authorisations of veterinary medicines and diagnostic tests 5. ***AMRWG suggested to*** *leverage EcoAMR report results in the advocacy for higher investments in animal health systems*	1 & 2). Conduct PVS missions upon Members request; 3. Support development of Global EVML 4. Facilitate/support establishment of Private-Public Partnerships, including pharmaceuticals and diagnostics companies and other relevant private stakeholders 5. Advocate through upcoming Animal Health Forum topic during 92nd WOAH General Session dedicated to vaccines & vaccination in animals

Table 2. Other commitments related to animal health

Tag	Version for HLM (Sep.09.2024)
Governance	24. **Ensure, by 2030, that all countries have developed or updated and are implementing multisectoral national action plans on antimicrobial resistance with national targets informed** by analysis of existing capacities and priorities, with inclusive and effective national functioning multisectoral coordination mechanisms, and appropriate and sustainable human and financial resources, according to national contexts and priorities,
	29. **Promote participatory, inclusive and transparent approaches to health governance for antimicrobial resistance** at local, national, regional, and global levels, including by exploring modalities for enhancing a meaningful whole-of-society approach and social participation, by involving all relevant stakeholders, such as local communities, health workers and care workers in the health sector, patients, survivors of antimicrobial resistant infections, **farmers, animal health** and environmental and ecosystem sector professionals, academia, volunteers, civil society organizations, humanitarian personnel, faith-based organizations, private sector and youth in the design, implementation and review of national action plans on antimicrobial resistance, to systematically inform decisions that affect health so that policies, programmes and plans better respond to needs, while fostering trust in health systems;
Financing	34. **Commit to sustainable financing and budgeted activities**, as identified in the national action plans on antimicrobial resistance, for their effective implementation, in accordance with national contexts;
	35. **Strengthen sustainable financing through existing funding structures and promote the mobilization of financial resources and investments** through national, bilateral and multilateral channels, in particular for developing countries, especially low- and middle-income countries, to support implementation of national action plans on antimicrobial resistance, as well as their monitoring and surveillance, in accordance with national contexts;
	37. **Encourage existing financing mechanisms**, including but not limited to the World Bank, Global Fund to Fight AIDS, Tuberculosis and Malaria, Gavi, the Vaccine Alliance, Green Climate Fund, Pandemic Fund, Climate Health Fund, Global Environment Facility, Nature4Health, and the Global Biodiversity Framework Fund, to facilitate access to existing relevant funding sources or expand, as appropriate, their scope to include investments to increase access to effective antimicrobials, prevention of infections through vaccines, research and development of new antimicrobials, diagnostic tools or technologies, water, hygiene and sanitation, and infection prevention and control, surveillance, and **support implementation of multisectoral national action plans** on antimicrobial resistance and leverage procurement and market-shaping instruments such as Stop TB Partnership's Global Drug Facility and UNITAID;
Access	42. **Accelerate efforts** to achieve universal health coverage as a means to ensure access to essential health services as well as **to strengthen veterinary services for the optimal prevention, diagnosis, and appropriate treatment of infections and antimicrobial stewardship measures;** **AMRWG suggested Members to** request PVS or targeted support modules, as well as implement the One Health Legal Assessment Tool for AMR. **AMRWG suggested WOAH to** conduct analysis of PVS CC II-9 and advocate the importance of improving veterinary service on this issue.
	43. **Ensure equitable and timely access to and greater supply of antimicrobials, vaccines and diagnostics in developing countries**, especially in low- and middle-income countries, in line with global lists of essential medicines, including WHO Model List of Essential Medicines and the **Global Essential Veterinary Medicines List**, taking into account national contexts and updating country-aligned lists and treatment needs, as appropriate;
Multi Response	51. **Enhance and sustain targeted efforts**, including through a One Health approach, **to promote awareness** of antimicrobial resistance and the **appropriate use and disposal of antimicrobials**, through education and training, social science approaches, communication and information campaigns, including through the media, behavioural change initiatives, the sharing of best practices and strengthening stewardship competencies and programmes across all relevant workforce sectors by integrating antimicrobial resistance modules in primary, secondary and tertiary education and training curricula through systematic public, private, stakeholder and community engagement, and in this regard acknowledge the importance of engaging patients and families as partners in promoting safe care, and working towards locally meaningful and sustainable solutions; **AMRWG suggested WOAH to** develop warning material with concrete examples noting negative consequences in the environment.
	52. **Promote the alignment of national action plans on antimicrobial resistance and national vaccination and immunization strategies, both in the human and animal health sectors;** **AMRWG suggested WOAH to** develop some example plans
	53. **Enhance the appropriate, prudent and responsible use of antimicrobials across sectors through better valuation of and investment in innovative, rapid, effective, validated and affordable diagnostics and laboratory systems, ensure the accessibility of quality testing, and promote the optimal utilization of these diagnostics across sectors**; **AMRWG suggested WOAH to** engage with Diagnostics companies to promote further investments in animal health (identification and antimicrobial susceptibility testing)
Environment	77. **Strengthen health systems** through comprehensive primary and secondary antimicrobial resistance prevention strategies, such as stewardship programmes and environmental management of air, water, plants, soil, food and vectors **for improved** human, **animal** and plant **health** and the environment, taking into account the adverse effects that climate change may have on increased antimicrobial use; **AMRWG suggested WOAH to** remind Members that farm hygiene management comes first.
Surveillance	98. **Strengthen national capacities for sustainable, sector-specific, integrated and interoperable surveillance systems** for antimicrobial resistance and antimicrobial use, standards of diagnostics, laboratory information systems and networks, and other infrastructure to support collection of nationally representative data on prevalence, antimicrobial resistance patterns, re-emerging disease surveillance, mortality and morbidity attributable to antimicrobial resistance, data on antimicrobial use across sectors and monitoring of water, sanitation and hygiene in healthcare facilities and community settings and the environment, and to share relevant information on emerging trends to inform decision making at all levels; **AMRWG suggested WOAH to** consider the QJSAMR guidance documents on Integrated Surveillance when available
	99. **Encourage all countries to report quality surveillance data** on antimicrobial resistance and antimicrobial use by 2030, through existing global surveillance systems, including the Global Antimicrobial Resistance and Use Surveillance System (GLASS), Global Database for Antimicrobial Use in Animals (**ANIMUSE**), and International FAO Antimicrobial Resistance Monitoring (InFARM) platform, for use in the Quadripartite Global Integrated System for Surveillance of Antimicrobial Resistance and Antimicrobial Usage (GISSA); **AMRWG suggested Members to** continue reporting and progressing towards more accurate data reporting, as well as to use the date in their policy making **AMRWG suggested WOAH to** continue support to Members, as indicated in commitment #69 in Table 1

Table 3. AMR QJS related commitments

Tag	Version for HLM (Sep.09.2024)
Governance	25. Request the Quadripartite organizations, in consultation with Member States, to **update the Global Action Plan on Antimicrobial Resistance by 2026** to ensure a robust and inclusive multisectoral response, through a One Health approach, that aligns with current realities to drive greater impact against antimicrobial resistance, and request the Quadripartite to report biennially on progress made towards their specific and joint commitments;
	26. Request the Quadripartite organizations to **formalize the standing Quadripartite Joint Secretariat on Antimicrobial Resistance** as the central coordinating mechanism to support the global response to antimicrobial resistance, according to the mandates and roles of the respective organizations;
	27. Invite the Quadripartite Joint Secretariat **to facilitate cooperation and exchange with relevant multilateral organizations**, including the United Nations Development Programme (UNDP), the World Bank, the United Nations Children's Fund (UNICEF), and the World Customs Organization (WCO), on aspects of their mandates related to antimicrobial resistance;
	28. **Enhance existing frameworks and mechanisms, including but not limited to the Multistakeholder Partnership Platform**, biennial ministerial conferences on antimicrobial resistance and other relevant conferences, in order to facilitate the multisectoral exchange of experiences and best practices and assessment of Member States' progress in implementing national action plans on antimicrobial resistance, and which could also be an opportunity to promote the voluntary expansion of the donor base of the Antimicrobial Resistance Multi-partner Trust Fund;
	30. Invite the Quadripartite organizations to **establish an independent panel for evidence for action against antimicrobial resistance in 2025** to facilitate the generation and use of multisectoral, scientific evidence to support Member States in efforts to tackle antimicrobial resistance, making use of existing resources and avoiding duplication of on-going efforts, after an open and transparent consultation with all Member States on its composition, mandate, scope, and deliverables;
Financing	36. **Facilitate sustainable funding from international cooperation** to support the implementation of national action plans on antimicrobial resistance, with the target of achieving US$ 100 million to catalyse the achievement of **at least 60 per cent of countries having achieved funded plans by 2030**, through, inter alia, diversifying funding sources and increasing the number of contributors to the Antimicrobial Resistance Multi-Partner Trust Fund;
	38. Request the Quadripartite Joint Secretariat, in collaboration with relevant financial institutions, to **map existing and catalytic funding**, including from the private sector, philanthropic organizations, and development banks, in order to improve access to resources and leverage capacity-building and implementation of national action plans on antimicrobial resistance;
Access	44. Encourage the Quadripartite organizations, in collaboration with relevant entities of the United Nations development system, within their respective mandates, and other stakeholders as appropriate, **to coordinate efforts and take actionable steps to support global and regional access initiatives**, to ensure effective infectious disease management including enhancing timely and equitable access to and affordability of quality antimicrobials, diagnostics, vaccines, and alternatives to the use of antimicrobials, while promoting their prudent, responsible, and sustainable manufacturing, appropriate use and disposal;
	45. Call on the Quadripartite organizations, in collaboration with Member States upon their request and other stakeholders including private sector and partnerships, such as Global Antibiotic Research and Development Partnership (GARDP), through the SECURE initiative, and the Global Drug Facility, as applicable, to take steps **to increase global access to and appropriate use of antimicrobials in settings with the highest unmet need**, including by aligning regional and subregional medicine registration and reforming regulatory and policy pathways, as necessary, to accelerate authorization of safe and effective products, especially for new antimicrobials, and to consider implementing new, sustainable procurement models, such as pooled procurement, tiered pricing and by supporting measures to ensure the resilience of supply chains for health products;
R&D	93. Promote the **development of research strategies and innovation programmes** and their integration into national action plans on antimicrobials resistance, taking into consideration national contexts, as well as the Quadripartite One Health Priority Research Agenda and the WHO Global Research Agenda for Antimicrobial Resistance in Human Health;
	94. **Strengthen national capacities by investing in the training, development, recruitment and retention of a competent and skilled workforce in human, animal, and plant health and the environment,** as relevant, especially in low- and middle-income countries, as well as through capitalizing on antimicrobial resistance expertise from the Quadripartite organizations and their regional offices, collaborating centers, and relevant Secretariat departments, as well as the WHO Academy;
Surveillance	101. Invite the Quadripartite organizations to consider, within existing resources, the **development of a science- and risk-based system to analyse antimicrobial residues and resistance in the environment,** complementary to, and, where appropriate, interacting with existing global surveillance systems,
	102. **Improve monitoring and evaluation of the implementation** of multisectoral national action plans on antimicrobial resistance by building country-level technical capacity and ensure that 95 per cent of countries participate in the annual Tracking Antimicrobial Resistance Country Self- Assessment Survey (TrACSS) by 2030 **AMRWG suggested QJS to** empower visibility and value of TrACSS as it is not well known.
Follow-up	103. Request that the Quadripartite organizations (FAO, UNEP, WHO, WOAH) **continue to provide, in a timely manner, quality and effectively disseminated normative guidance and technical support** to countries for building sector-specific and joint, coordinated responses to antimicrobial resistance in collaboration with partners, including funding entities, private sector, civil society and affected communities, and to lead biennial global reviews of the response to antimicrobial resistance, including national capacities for antimicrobial resistance prevention, surveillance and response;
	105. Request the Secretary-General to provide, in consultation with the Quadripartite organizations and other relevant agencies, a **progress report on the implementation of the Political Declaration on antimicrobial resistance during the eighty-first session of the General Assembly,** which will serve to inform the high-level meeting to be convened in 2029;
	106. Decide to convene a high-level meeting on antimicrobial resistance in 2029 in New York, aimed to undertake a comprehensive review on the implementation of the present declaration to identify gaps and solutions to accelerate progress on addressing antimicrobial resistance by 2030, the scope and modalities of which shall be decided no later than the eighty-third session of the General Assembly, taking into consideration the outcomes of other existing health-related processes

Annex 4. Technical Reference Document Listing Antimicrobial Agents of Veterinary Importance for Bovine Animals
(An appendix to the WOAH List of antimicrobial agents of veterinary importance)

MEETING OF THE WOAH WORKING GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 29–31 October 2024

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Scope

The objective of this *Technical Reference Document Listing Antimicrobial Agents of Veterinary Importance for Bovine Animals* (hereafter, the Technical Reference Document) is to provide additional, species-specific information without serving as a treatment guideline. By identifying antimicrobial agents authorised for use in cattle and/or water buffaloes, the technical reference document can aid in evaluating accessibility to veterinary medicinal products needed to treat common infectious diseases in these species, contribute to the development and update of national treatment guidelines and essential medicines lists, inform stewardship programs, as well as risk management and prioritisation actions to minimise and contain antimicrobial resistance (AMR).

It should be borne in mind that the antimicrobial agents listed in this technical reference document may not be available in all countries or be appropriate for use in all types of production systems. This technical reference document acknowledges that extra-label/off-label use of antimicrobial agents is not common in bovine animals but may still occur in some countries and regions where access to antimicrobials may be problematic or when managing infectious diseases in high-value animals. It is recognised that the legal frameworks and contexts in which veterinarians and other animal health professionals operate vary across regions, countries and territories regarding licensing, drug access, off-label/extra-label use of veterinary medicinal products, antimicrobial resistance patterns and public health engagement; therefore, the general information provided in this document should be interpreted in light of the local context.

Relevant recommendations for bovine animals described in the World Organisation for Animal Health (WOAH) Standards and the WOAH List of Antimicrobial Agents of Veterinary Importance should be considered alongside this document. Furthermore, the technical reference document can be used by countries' competent authorities to identify antimicrobial agents to be considered as part of national surveillance systems for antimicrobial use (AMU) and AMR in animals and in the reporting of AMU data for bovine animals to WOAH's ANIMUSE in alignment with the WOAH's Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials.

Methodology used to prepare this document

Ad hoc group recruitment process

Experts participating in the *ad hoc* group for bovine animals were selected through an open call process and were nominated by the Director General of WOAH. The *ad hoc* group was chaired by a member from the WOAH's Antimicrobial Resistance Working Group (AMRWG). The experts represented geographical areas with sizeable bovine populations and different areas of expertise in bovine medicine and veterinary microbiology and pharmacology.

The members of the *ad-hoc* group were:

- Prof Moritz van Vuuren (Chair, ex-AMRWG), South Africa
- Dr Guilherme de Souza, Brazil
- Prof Yang Wang, China
- Dr Damien Bouchard, France (ANSES, WOAH Collaborating Centre)
- Dr Grace Murilla, Kenya
- Dr Claire Burbick, USA

As a first step, an evidence-guided rapid literature review was undertaken by the *ad hoc* group to prepare a preliminary table of important bacterial and protozoal pathogens of bovine animals and the antimicrobial agents used to treat infections caused by these pathogens. The table compiled from this rapid review included 44 pathogens of bovine animals, including 43 bacteria at genus and strain levels and one protozoal genus. Furthermore, the experts conducted searches of regulatory approvals of veterinary medicinal products containing antimicrobial agents in their respective countries and regions to identify from the existing WOAH list of antimicrobial agents of veterinary importance (hereafter, the WOAH List) which antimicrobial agents were authorised for use in cattle and/or water buffaloes.

Antimicrobial agents were only included in the technical reference document if they were included in formulations as the sole antimicrobial agent with antibacterial action or as part of well-established combinations (e.g., trimethoprim-sulphonamides) and were authorised for use in at least one country or region. Antimicrobial agents and classes not included in the WOAH List but identified as authorised for use in bovine animals were added to the technical reference document. The importance of antimicrobial classes and subclasses was retained as per the WOAH List.

The end product was a table presenting the following information:

- Antimicrobial class;
- Antimicrobial sub-class;
- Antimicrobial agent and/or well-established combination of two or more antimicrobial agents;
- Authorisation status for bovine animals (stated as “Used” or “Not used”) in one or more countries;
- Comments and other considerations regarding the importance of the antimicrobial class for animal and/or public health based on current scientific evidence and recommendations of the WOAH List.

Once this table was established by the *ad hoc* group, the technical reference document was developed by the group and shared with the AMRWG for feedback. After consolidation, the technical reference document was shared with a panel of external experts, WOAH Collaborating Centres and stakeholder organisations with whom the WOAH has established a cooperation agreement. External experts were identified through the shortlist of experts that had been created during the recruitment process of the *ad hoc* group. The external experts, Collaborating Centres and stakeholder organisations were asked to address gaps in knowledge identified by the *ad hoc* group and to provide feedback concerning the tables of antimicrobial agents authorised for use, list of major pathogens and diseases and the proposed indications for use of antimicrobial groups against common infectious diseases in bovine animals.

The group took into consideration the feedback provided by external experts to consolidate the technical reference document. The final version of the technical reference document was submitted for consideration and endorsement by the AMRWG and WOAH hierarchy prior to publication in the WOAH website.

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Abbreviations:

VCIA: Veterinary Critically Important Antimicrobial Agents
VHIA: Veterinary Highly Important Antimicrobial Agents
VIA: Veterinary Important Antimicrobial Agents

Note: more information on the categorisation of antimicrobial agents according to importance to veterinary medicine can be found in the WOAH List of Antimicrobial Agents of Veterinary Importance.

Appendices:

Appendix 1: List of major pathogens and diseases affecting bovine animals.
Appendix 2: Antimicrobial classes used in veterinary medicine for infections in bovine animals.
Appendix 3: List of external experts involved in the revision of the TRD
Appendix 4: List of Collaborating Centres involved in the revision of the TRD
Appendix 5: List of organisations and professional associations involved in the revision of the TRD

Table 1. Antimicrobial agents authorised for use in bovine animals per class and sub-class and their relative importance to bovine medicine.

ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS)	Categorisation			Molecules	Species	Authorised for use in cattle and/or water buffaloes	Specific comments by class
	VCIA	VHIA	VIA				
AMINOCOUMARIN			x	Novobiocin	AVI, ~~**BOV**~~, CAP, OVI, PIS	No	
AMINOCYCLITOL	x			Spectinomycin	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	Aminocyclitol is used to treat infections of the respiratory system a caused by *Mannheimia haemolytica*, *Mycoplasma* spp., and *Pasteurella* spp.
AMINOGLYCOSIDES	x			Dihydrostreptomycin	AVI, **BOV**, CAP, EQU, LEP, OVI, SUI	Yes	Oral aminoglycosides are used to treat bacterial gastrointestinal infections in cattle. Aminoglycosides are used via intramammary route for the treatment of subclinical and subacute mastitis due to *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, *Streptococcus uberis* and *Escherichia coli.* Parenteral and intramammary veterinary medicinal products containing aminoglycosides should be used with caution due to their extensive withdrawal periods.
				Streptomycin	API, AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE	x			Amikacin (Synonym: amikacillin, amicacin)	~~**BOV**~~**,** EQU	Yes	
				Apramycin	AVI, **BOV**, LEP, OVI, SUI	Yes	
				Astromycin (Synonyms: Fortimycin)	~~**BOV,**~~ LEP, OVI	No	
				Framycetin	~~**BOV,**~~ CAP, OVI	No	
				Gentamicin	AVI, **BOV**, CAM, CAP, EQU, LEP, OVI, SUI	Yes	
				Kanamycin	AVI, **BOV**, EQU, PIS, SUI	Yes	
				Neomycin	API, AVI, **BOV**, CAP, EQU, LEP, OVI, SUI	Yes	
				Paromomycin	AVI, **BOV**, CAP, OVI, LEP, SUI	Yes	
				Tobramycin (Synonym: Tobramicin)	EQU	No	
AMPHENICOLS	x			Florfenicol (vet only)	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	Amphenicols are used to prevent and treat respiratory disease caused by *Actinobacillus pleuropneumoniae*, *Histophilus somni, Mannheimia haemolytica*, *Mycoplasma bovis* and *Pasteurella multocida;* to treat foot rot, acute interdigital necrobacillosis, infectious pododermatitis associated with *Fusobacterium necrophorum* and *Prevotella melaninogenica.*
				Thiamphenicol	AVI, **BOV**, CAP, OVI, PIS, SUI	Yes	
ANSAMYCINS - RIFAMYCINS		x		Rifampicin (synonym: rifampin)	EQU	No	Ansamycins are used via intramammary route to treat subclinical and clinical mastitis due *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae* and *Streptococcus uberis*.
				Rifaximin*	**BOV**, CAP, EQU, LEP, OVI, SUI	Yes	
ARSENICALS			x	Nitarsone (vet only)	AVI, SUI	No	
				Roxarsone (vet only)	AVI, SUI	No	
BICYCLOMYCIN			x	Bicozamycin (Synonym: Bicyclomycin)	~~**BOV**~~, PIS, SUI	No	
CEPHALOSPORINS		x					
Cephalosporin 1st generation				Cefacetrile* (Synonyms: Cephacetrile, Cefacetril, Cephacetril)	**BOV**	Yes	First and second generation cephalosporins are used to treat clinical and subclinical mastitis caused by, *Corynebacterium* spp., *Pasteurella* spp., *Staphylococcus* spp., *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, *Streptococcus uberis, Trueperella pyogenes.*
				Cefalexin* (Synonyms:	AVI, **BOV**, CAP, EQU, OVI,	Yes	

				Cephalexin, Cephacillin, Cephalexine, Cefalexine)	SUI		
				Cefalonium* (vet only) (Synonyms: Cephalonium, Cefalonum)	**BOV**, CAP, OVI	Yes	
				Cefalotin*	**BOV**, EQU	Yes	
				Cefapirin* (Synonyms: Cephapirin, Cefapyrin)	**BOV**	Yes	
				Cefazolin* (Synonyms: Cephazolin, Cephazoline, Cephazolidin)	**BOV**, CAP, OVI, SUI	Yes	
Cephalosporin 2nd generation				Cefuroxime	**BOV**	Yes	
Cephalosporin 3rd generation	x			Cefoperazone*	**BOV**, CAP, OVI	Yes	Third and fourth generation cephalosporins are considered as critically important for both animal and human health and subject to specific recommendations in the WOAH List of Antimicrobial Agents of Veterinary Importance. Third and fourth generation cephalosporins are used in bovine animals to treat respiratory disease caused by *Histophillus somni*, *Mannheimia haemolytica*, *Pasteurella multocida*; acute interdigital necrobacillosis caused by *Fusobacterium necrophorum* and *Prevotella melaninogenica*; post-partum metritis caused by *Trueperella pyogenes*, *E. coli*, and *Fusobacterium necrophorum*; septicaemia in calves caused by *Escherichia coli*. Third and fourth generation cephalosporins are also used topically to treat clinical mastitis caused by: *Escherichia coli*, *Klebsiella* spp., *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, *Streptococcus uberis*, *Trueperella pyogenes*.
				Ceftiofur (vet only)	AVI, **BOV**, CAP, EQU, LEP, OVI, SUI	Yes	
				Ceftriaxone	**BOV**, OVI, SUI	Yes	
Cephalosporin 4th generation				Cefquinome (vet only)	**BOV**, CAP, EQU, LEP, OVI, SUI	Yes	
FUSIDANE			x	Fusidic acid	~~**BOV**~~, EQU	No	
IONOPHORES		x		Lasalocid (vet only)	AVI, **BOV**, LEP, OVI	Yes	Ionophores are used to prevent and treat coccidiosis (e.g., *Eimeria* spp.) in bovine animals.
				Maduramicin (vet only)	AVI	No	
				Monensin (vet only)	API, AVI, **BOV**, CAP	Yes	
				Narasin (vet only)	AVI, ~~**BOV**~~	No	
				Salinomycin (vet only)	AVI, LEP, ~~**BOV**~~	No	
				Semduramicin (vet only)	AVI	No	
LINCOSAMIDES		x		Lincomycin	API, AVI, **BOV**, CAP, OVI, PIS, SUI	Yes	Lincosamides are used to treat pyelonephritis caused by *Corynebacterium renale*; enterotoxaemia caused by *Clostridium perfringens*; *Clostridium tetani*; mastitis caused by *Trueperella pyogenes, Staphylococcus aureus* and *Nocardia asteroides*.
				Pirlimycin (vet only)	**BOV**	Yes	
MACROLIDES	x						Macrolides are very important antimicrobials for bovine medicine. Macrolides are used to treat respiratory infections caused by *Histophilus somni*, *Mannheimia haemolytica*, *Mycoplasma bovis*, *Pasteurella multocida*; infectious keratoconjunctivitis (IBK) associated with *Moraxella bovis*; necrobacillosis in calves. Macrolides are also used topically to treat mastitis caused by *Staphyloccus aureus*, *Streptococcus uberis*, *Streptococcus agalactiae* and *Streptococcus dysgalactiae*.
Macrolides 14-membered ring				Erythromycin	API, AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				Oleandomycin	~~**BOV**~~	No	
Macrolides 15-membered ring				Gamithromycin (vet only)	**BOV**, SUI	Yes	
				Tulathromycin (vet only)	**BOV**, SUI	Yes	
Macrolides 16-membered ring				Carbomycin	AVI	No	
				Josamycin	PIS, SUI	No	
				Kitasamycin (vet only)	AVI, PIS, SUI	No	

				Mirosamicin (Synonyms: Mirosamycin, Miporamicin)	API, AVI, PIS, SUI	No	
				Spiramycin	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				~~Terdecamycin~~	~~SUI~~	~~No~~	
				Tildipirosin (vet only)	**BOV**, SUI	Yes	
				Tilmicosin (vet only)	AVI, **BOV**, CAP, LEP, OVI, SUI	Yes	
				Tylosin (vet only)	API, AVI, **BOV**, CAP, LEP, OVI, SUI	Yes	
				Tylvalosin (vet only)	AVI, SUI	No	
Macrolides 17-membered ring				Sedecamycin (Synonym: Lankacidin A)	SUI	No	
				Terdecamycin	SUI	No	
ORTHOSOMYCINS			x	Avilamycin (vet only)	AVI, LEP, SUI	No	
PENICILLINS	x						
Natural penicillins (including esters and salts)				Benethamine penicillin	~~**BOV**~~	No	The wide range of applications and the nature of the diseases treated make penicillins extremely important for bovine medicine. Penicillins are used to treat arthritis, skin infections, gastrointestinal infections, ocular infections, peritonitis, pododermatitis, respiratory infections, urogenital infections; septicaemia, tetanus, omphalophlebitis and joint-ill infections in calves caused by *Actinomyces bovis*, *Bacillus anthracis*, *Bacteroides* spp., *Clostridium* spp., *Corynebacterium* spp., *Erysipelothrix rhusiopathiae*, *Fusobacterium necrophorum*, *Leptospira* spp., *Listeria* spp., *Mannheimia haemolytica*, *Moraxella* spp., *P. multocida*, *Staphylococcus* spp., *Streptococcus* spp.. Penicillins are used via intramammary route to treat subclinical and clinical mastitis caused by *Clostridium* spp., *Corynebacterium* spp., *Pasteurella* spp., *Staphylococcus* spp. and *Streptococcus uberis*, *Streptococcus dysgalactiae, Trueperella pyogenes*.
				Benzylpenicillin (Synonym: Penicillin G, Benzylpenicillin G, Benzopenicillin, Benzyl Penicillin)	AVI, **BOV**, CAM, CAP, EQU, LEP, OVI, SUI	Yes	
				Procaine Benzylpenicillin (Synonyms: Benzylpenicillin procaine, Procaine G penicillin) Benzathine Benzylpenicillin (Synonyms: Benzathine penicillin, Benzathine Penicillin G)	**BOV**, CAM, CAP, EQU, OVI, SUI	Yes	
				Penethamate hydriodide (vet only)	**BOV**, SUI	Yes	
				Tobicillin	PIS	No	
Amidinopenicillins				Mecillinam (Synonyms: Amdinocillin, Hexacillin, Penicillin HX)	~~**BOV**~~	No	
Aminopenicillins				Amoxicillin (Synonym: Amoxycillin)	AVI, **BOV**, CAP, EQU, OVI, PIS, SUI	Yes	
				Ampicillin	AVI, **BOV**, CAP, EQU, OVI, PIS, SUI	Yes	
				Hetacillin (Synonym: Phenazacillin)	**BOV**	Yes	
Aminopenicillin plus betalactamase inhibitor				Amoxicillin + clavulanic acid	AVI, **BOV**, CAP, EQU, OVI, SUI	Yes	
				Ampicillin + sulbactam	**BOV**	Yes	
Carboxypenicillins				Ticarcillin	EQU	No	
				~~Tobicillin~~	~~PIS~~	~~No~~	
Ureidopenicillins				~~Aspoxicillin~~	~~**BOV**~~	~~No~~	
Phenoxypenicillins				Pheneticillin (Synonyms: phenethicillin, Penicillin B)	EQU	No	
				Phenoxymethylpenicillin	AVI, SUI	No	

				(Synonyms: Penicillin V, Pen V, Penicillin phenoxymethyl, Phenoxymethyl penicillin, Beromycin, Oraxillin)			
Antistaphyloccocal penicillins				Cloxacillin* (Synonym: Methocillin S)	**BOV**, CAP, EQU, OVI	Yes	
				Dicloxacillin (Synonym: Dicloxacycline)	**BOV**, CAP, EQU, OVI	Yes	
				Nafcillin (Synonym: Naphcillin)	~~**BOV**~~, CAP, OVI	No	
				Oxacillin (Synonyms: Oxazocillin, MPI-Penicillin)	**BOV**, CAP, EQU, OVI	Yes	
Penicillins anti-pseudomonal				Aspoxicillin	~~**BOV**~~	No	
PHOSPHONIC ACID DERIVATIVES		x		Fosfomycin (Synonyms: Phosphomycin, Phosphonomycin)	AVI, **BOV**, PIS, SUI	Yes	Fosfomycin is used in some countries to treat *Escherichia coli* diarrhoea and salmonellosis in bovine animals
PLEUROMUTILINS		x		Tiamulin (vet only) (Synonym: Thiamutilin)	AVI, CAP, LEP, OVI, SUI	No	
				Valnemulin (vet only)	SUI	No	
POLYPEPTIDES		x		Bacitracin	AVI, **BOV**, LEP, OVI, SUI	Yes	Polypeptides are used to reduce incidence of liver abscesses in cattle caused by bacteria such as *Fusobaterium necrophorum* and *Trueperella pyogenes*.
				Enramycin	AVI, SUI	No	
				Gramicidin	EQU	No	
Polymyxins				Polymyxin B (Synonym: Polymixin B)	~~**BOV**~~, CAP, EQU, LEP, OVI, SUI	No	Colistin is subject to specific recommendations in the WOAH List of Antimicrobial Agents of Veterinary Importance. Colistin is used to treat intestinal infections caused by *Escherichia coli* in bovine animals.
				Colistin (Synonym: Polymyxin E)	AVI, **BOV**, CAP, EQU, LEP, OVI, SUI	Yes	
QUINOLONES							
Quinolones 1st generation		x		Flumequine (Synonym: Flumequin)	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	Quinolones are important antimicrobials for bovine medicine and are used to treat respiratory and gastrointestinal infections in bovine animals caused by *Campylobacter* spp., *Escherichia coli*, *Histophilus somni*, *Mannheimia haemolytica*, *Pasteurella multocida* and *Salmonella* spp.
				Miloxacin	PIS	No	
				Nalidixic acid (Synonyms: Nalixidate, Nalidixinic acid, Nalidic acid)	~~**BOV**~~	No	
				Oxolinic acid	AVI, **BOV**, LEP, PIS, OVI, SUI	Yes	
Quinolones 2nd generation (Fluoroquinolones)	x			Ciprofloxacin	AVI, **BOV**, SUI	Yes	Fluoroquinolones are critically important for both animal and human health and subject to specific recommendations in the WOAH List of Antimicrobial Agents of Veterinary Importance. Fluoroquinolones are used to treat respiratory, gastrointestinal, urogenital system infections, septicaemia, arthritis and mastitis in bovine animals associated with *Campylobacter* spp., *Escherichia coli*, *Histophilus somni*, *Klebsiella* spp., *Mannheimia haemolytica*, *Mycoplasma* spp., *Pasteurella* spp., *Salmonella* spp., *Staphyloccus aureus, Yersinia* spp.
				Danofloxacin (vet only)	**BOV**, CAP, LEP, OVI, SUI	Yes	
				Difloxacin	AVI, ~~**BOV**~~, LEP, SUI	No	
				Enrofloxacin (vet only)	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				Marbofloxacin (vet only)	**BOV**, EQU, LEP, SUI,	Yes	
				Norfloxacin	AVI, **BOV**, CAP, LEP, OVI, SUI	Yes	
				Ofloxacin	AVI, SUI	No	
				Orbifloxacin (vet only)	**BOV**, SUI	Yes	
				Sarafloxacin	PIS	No	
				Pradofloxacin (NEW-ADDED)	**BOV**	Yes	
QUINOXALINES			x	Carbadox (vet only)	SUI	No	
				Olaquindox (vet only) (Synonym: Olachindox)		No	
SULFONAMIDES	x			Phthalylsulfathiazole (vet only) (Synonyms: Sulfathalidine,	SUI	No	The wide range of applications and the nature of the diseases treated make sulfonamides very important for bovine animals.

				Phthalazol, Phthalylsulphathiazole, Phthalylsulfonazole)			Sulfonamides can be used topically or systematically and are often used (± trimethoprim) to control infections of the respiratory tract, gastrointestinal system, urogenital system, skin (including pododermatitis), soft tissues, wounds and sepsis caused by: *Corynebacterium* spp., *Escherichia coli*, *Listeria* spp., *Pasteurella* spp., *Salmonella* spp., *Staphylococcus* spp. and *Streptococcus* spp. Sulfonamides are also used to treat mastitis caused by *Corynebacterium bovis*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus uberis*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, *Streptococcus pyogenes*. In calves, sulfonamides (± trimethoprim) are used to treat coccidiosis (e.g., *Eimeria bovis*, *E. zuernii*) and *Escherichia coli* infections.
				Sulfacetamide (Synonyms: Sulphacetamide, Acetosulfamine, Acetosulfamin, N-Acetylsulfanilamide)	AVI, **BOV**, OVI, SUI	Yes	
				Sulfachlorpyridazine (Synonym: Sulfachloropyridazine)	AVI, **BOV**, SUI	Yes	
				Sulfadiazine (Synonyms: Sulphadiazine, Sulfapyrimidine, Sulfadiazin, Sulfazine, Sulfadiazene)	AVI, **BOV**, CAP, OVI, SUI	Yes	
				Sulfamethoxazole (Synonyms: Sulfadimethoxazole Sulphamethoxazole, Sulfisomezole)	AVI, **BOV**, SUI	Yes	
				Sulfadimethoxine (Synonyms: Sulphadimethoxine, Sulfadimethoxin, Sulfadimethoxydiazine)	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				Sulfadimidine (Synonyms: sulfamethazine, Sulfadimethyldiazine, Sulfamezathine, Sulphamethazine, Sulfadimerazine)	AVI, **BOV**, CAP, EQU, LEP, OVI, SUI	Yes	
				Sulfadoxine (Synonyms: Sulphadoxine, Sulforthomidine, Sulphormethoxine, Sulfadoxin)	AVI, **BOV**, EQU, OVI, SUI	Yes	
				Sulfafurazole (Synonyms: sulfisoxazole, Sulphafurazole, Sulfisoxazol, Sulfafurazol)	~~**BOV**~~, PIS	No	
				Sulfaguanidine (Synonyms: Sulfaguanidin, Sulphaguanidine, Sulfanilguanidine, Sulfoguanidine)	AVI, **BOV**, CAP, OVI, SUI	Yes	
				Sulfamerazine (Synonyms: Sulphamerazine, Sulfamerazin, Sulfamethyldiazine)	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				Sulfamethoxydiazine (Synonyms: Sulfamethoxine, sulfameter, Sulfamethoxydiazine, Sulfamethoxypyrimidine)	AVI, PIS	No	
				Sulfamonomethoxine (Synonyms: Sulfamonomethoxin, Sulfamonmethoxine)	AVI, **BOV**, PIS, SUI	Yes	

				Sulfanilamide (Synonyms: Sulphanilamide, Sulfamine, Sulfonylamide)	**BOV**, CAP, OVI, SUI	Yes	
				Sulfapyridine (Synonym: Sulphapyridine)	**BOV**, SUI	Yes	
				Sulfaquinoxaline (Synonyms: Sulfabenzpyrazine, Sulphaquinoxaline)	AVI, **BOV**, CAP, LEP, OVI, SUI	Yes	
				Sulfamethoxypyridazine (Synonyms: Sulphamethoxypyridazine, Sulfapyridazine, Sulfametoxipiridazine)	AVI, **BOV**, EQU, SUI	Yes	
Sulfonamides + diaminopyrimidines				Ormetoprim (Synonyms: Ormethoprim, Ormetorprim) + Sulfonamide	AVI, **BOV**, PIS, SUI	Yes	
				Trimethoprim (synonym: Trimetoprim) + sulfonamide	AVI, **BOV**, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
DIAMINOPYRIMIDINES				Baquiloprim	~~**BOV**~~	No	
				Ormetoprim (Synonyms: Ormethoprim, Ormetorprim)	AVI	No	
				Trimethoprim (Synonym: Trimetoprim)	AVI, **BOV**, CAP, EQU, LEP, OVI	Yes	
STREPTOGRAMINS			x	Virginiamycin (vet only) (Synonym: Pristinamycin)	AVI, **BOV**, OVI, SUI	Yes	Streptogramins are used to reduce incidence of liver abscesses in cattle caused by bacteria such as *Fusobaterium necrophorum* and *Trueperella pyogenes*.
TETRACYCLINES	x			Chlortetracycline	AVI, **BOV**, CAP, EQU, LEP, OVI, SUI	Yes	The wide range of applications and the nature of the diseases treated make tetracyclines extremely important for bovine medicine. Tetracyclines are used to treat navel-ill/joint-ill, infectious keratoconjunctivitis, intestinal, respiratory and genital infections, pododermatitis and septicaemia caused by *Anaplasma* spp., *Babesia* spp., *Bacillus anthracis*, *Campylobacter* spp., *Chlamydia* spp., *Corynebacterium* spp., *Erysipelothrix* spp., *E. coli*, *Fusobacterium nechrophorum*, *Histophilus somni*, *Leptospira* spp., *Mycoplasma* spp., *Pasteurella multocida*, *Rickettsia* spp., *Salmonella* spp., *Staphylococcus* spp. and *Streptococcus* spp. Tetracyclines are used topically to treat ophthalmic infections and digital dermatitis and to prevent or treat infections of traumatic or surgical wounds.
				Doxycycline (Synonyms: Doxytetracycline, Doxycyclin)	AVI, **BOV**, CAM, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				Oxytetracycline (Synonyms: Oxyterracine, Oxytetracyclin, Oxitetracyclin) Oxyterracyne)	API, AVI, **BOV**, CAM, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
				Tetracycline (Synonym: Tetracyclin)	API, AVI, **BOV**, CAM, CAP, EQU, LEP, OVI, PIS, SUI	Yes	
THIOPEPTIDES			x	Nosiheptide	**BOV**	Yes	Thiopeptides are used to treat *Enterococcus* spp. and *Staphylococcus* spp. infections in bovine animals.
HALOGENATED HYDROXYQUINOLINES			x	Halquinol	SUI	No	

*These antimicrobial agents are authorised for topical use in cattle and/or water buffaloes.

API: Bee; AVI: Poultry; BOV: Bovine; CAM: Camel; CAN: Canid; CAP: Caprine; EQU: Equine; FEL: Feline; LEP: Rabbit; OVI: Ovine; PIS: Fish; SUI: Swine.

Appendix 1: List of major pathogens and diseases affecting bovine animals commonly treated with antimicrobials.

Pathogen	Examples of diseases and conditions
Actinomyces bovis	Actinomycosis (lumpy jaw)
Bacillus anthracis	Anthrax
Bibersteinia trehalosi	Pneumonia, Bovine Respiratory Disease (BRD)
Borrelia burgdorferi	Lyme disease, polysynovitis, lymphadenopathy, emaciation, interstitial myocarditis, nephritis, meningoencephalitis
Clostridium novyi type A	Malignant oedema
Clostridium novyi type B	Black disease
Clostridium novyi type D	Bacillary haemoglobinuria
Clostridium perfringens type A	Wound infections, enterotoxaemia in calves and water buffalo
Clostridium perfringens type B, *Clostridium perfringens* type C	Haemorrhagic enteritis
Clostridium chauvoei	Black quarter, myonecrosis of skeletal or cardiac muscles, severe toxaemia and high case fatality rate.
Campylobacter jejuni	Mastitis, diarrhoea, infertility and abortion
Campylobacter fetus venerealis	Bovine genital campylobacteriosis, infertility and abortion
Corynebacterium spp.	Mastitis, skin lesions
Corynebacterium pseudotuberculosis	Cutaneous granulomas, lymphangitis, mastitis
Corynebacterium renale	Cystitis and pyelonephritis
Dichelobacter (Bacteroides) nodosus	Interdigital necrobacillosis (foot rot), interdigital dermatitis and heel erosion
Dermatophilus congolensis	Senkobo disease (Dermatophilosis)
Enterococcus faecalis	Mastitis
Escherichia coli	Endometritis, enterotoxigenic infections, enteropathogenic infections, colisepticaemia
Fusobacterium necrophorum	Acute pneumonia (calves and young cattle), oral and laryngeal necrobacillosis, liver abscesses, metritis, necrobacillosis of the liver, interdigital necrobacillosis (foot rot), interdigital dermatitis and heel erosion
Histophilus somni (*Haemophilus somnus*)	Bacteriaemia, myocardial abscesses, pleuritis, Bovine Respiratory Disease (BRD), meningitis, septicaemia
Klebsiella pneumoniae	Acute pneumonia (calves and young cattle), mastitis, endometritis
Leptospira spp.	Abortion, infertility, interstitial nephritis
Listeria monocytogenes	Abortion, encephalitis, meningitis
Mannheimia haemolytica	Bacteraemia, pleuritis, pneumonia, pneumonic pasteurellosis (i.e., BRD or 'shipping fever' in young animals), septicaemia, mastitis
Moraxella bovis	Infectious keratoconjunctivitis
Mycoplasma mycoides subspecies *mycoides*	Contagious bovine pleuropneumonia or CBPP
Mycoplasma spp. (*M. bovis, M. bovocculi, M. bovigenitalium, M. californicum, M. canadense, M. dispar, M. (Eperythrozoon) wenyonii)*	Anaemia, arthritis, otitis media, conjuntivitis, infertility, lymphadenopathy, mastitis, Bovine Respiratory Disease (BRD) (calves)
Pasteurella multocida serotype B	Haemorrhagic septicaemia in cattle and water buffalo (*Bubalus bubalis*)
Pasteurella multocida serotype E	East African haemorrhagic fever
Pasteurella multocida	Bacteraemia, mastitis, Bovine Respiratory Disease (BRD), septicaemia
Prevotella melaninogenica	Interdigital necrobacillosis (foot rot), interdigital dermatitis and heel erosion
Salmonella Enterica (e.g., S. Dublin*)*	Sepsis, pneumonia, severe diarrhoea in calves
Serratia spp.	Mastitis
Staphylococcus aureus, coagulase-negative Staphylococcus	Endometritis, mastitis, skin infections
Streptococcus spp.	Mastitis, endometritis
Streptococcus agalactiae	Mastitis
Streptococcus dysgalactiae	Joint infections (calves), mastitis
Streptococcus uberis	Mastitis
Trueperella (*Arcanobacterium) pyogenes*	Numerous pyogenic or suppurative conditions; Bovine Respiratory Disease (BRD)
Yersinia pseudotuberculosis	Abscesses, enterocolitis and haemorrhagic diarrhoea

Pathogen	Examples of diseases and conditions
Rickettsial diseases	
Anaplasma marginale	Bovine anaplasmosis
Ehrlichia ruminantium	Heartwater
Coccidia	
Eimeria spp. (e.g., *E. zuernii*, *E. bovis*, *E. ellipsoidalis*, *E. alabamensis*, *E. auburnensis* and *E. wyomingensis*)	Coccidiosis

Pathogens not included in the above list fulfil <u>at least one</u> of the following criteria:

1) Pathogens cause infections that are deemed very rare in bovine animals
2) Pathogens for which antimicrobials are not indicated for the control of disease

Pathogens and diseases not commonly treated with antimicrobials:

- *Actinobacillus lignieresii*
- *Babesia* spp. (Babesiosis)
- *Brucella* spp. *(e.g. Brucella abortus)*
- *Ehrlichia ondiri*
- *Coxiella burnettii*
- *Mycobacterium* spp*. (including M. bovis)*
- *Mycoplasma mycoides subspecies mycoides*
- *Proteus* spp.
- *Pseudomonas* spp.
- *Theileria annulata* (Tropical Theileriosis)
- *Theileria orientalis* (Bovine Infectious Anaemia)
- *Theileria parva* (East Coast Fever)
- *Trypanosoma spp.* (Trypanosomiasis)
- *Ureoplasma diversum*
- *Yersinia enterocolitica*

Appendix 2: Antimicrobial classes authorised for use for the treatment of bacterial and protozoal infections in bovine animals.

Table a. Antimicrobial classes authorised for use in bacterial and protozoal infections and by body system/organ.

Antimicrobial Agents (CLASS)	Mastitis		Endometritis metritis	Respiratory disease	Intestinal disease	Actinomyces spp.	Anaplasma spp.	Bacillus anthracis	Campylobacter jejuni	Clostridium novyi (type A, Type B, Type C)	Clostridium chauvoei	Corynebacterium renale	Dermatophilus congolensis	Dichelobacter (Bacteroides) nodosus	Enterococcus faecalis	Escherichia coli	Fusobacterium necrophorum	Histophilus somni	Leptospira spp.	Listeria monocytogenes	Mannheimia haemolytica	Moraxella bovis	Mycoplasma spp.	Pasteurella multocida (serotype B, Serotype E)	Prevotella melaninogenica	Salmonella spp.	Staphylococcus aureus	Trueperella (Arcanobacterium) pyogenes	Eimeria spp.
	Gram +	Gram -																											
	S. aureus, coagulase-negative Staphylococcus, S. agalactiae, S. dysgalactiae, S. uberis, Corynebacterium spp.	Klebsiella pneumoniae, Serratia spp. Pseudomonas spp.	Campylobacter fetus venerealis, E. coli, Fusobacterium necrophorum, Pseudomonas aeruginosa, S. aureus, coagulase-negative Staphylococus	Bibersteinia trehalosi, Fusobacterium necrophorum, Histophilus somni, Klebsiella spp., Mannheimia haemolytica, P. multocida, Streptococcus spp.	Clostridium perfringens, Campylobacter jejuni, E. coli, Salmonella Enterica, Yersinia pseudotuberculosis																								
AMINOCYCLITOL				x	x																x		x	x					
AMINOGLYCOSIDES ± 2 DEOXYSTREPTAMINE	x																										x		
AMPHENICOLS																	x	x			x		x	x	x				
ANSAMYCINS-RIFAMYCINS	x																										x		
CEPHALOSPORINS	x											x				x	x	x			x			x	x		x	x	
IONOPHORES																													x
LINCOSAMIDES	x											x																	
MACROLIDES	x																	x			x	x	x	x					
PENICILLINS	x					x		x		x	x	x					x		x	x	x	x					x	x	
POLYPEPTIDES (including.																x													

Antimicrobial Agents (CLASS)	Mastitis		Endometritis metritis	Respiratory disease	Intestinal disease	Actinomyces spp.	Anaplasma spp.	Bacillus anthracis	Campylobacter jejuni	Clostridium novyi (type A, Type B, Type C)	Clostridium chauvoei	Corynebacterium renale	Dermatophilus congolensis	Dichelobacter (Bacteroides) nodosus	Enterococcus faecalis	Escherichia coli	Fusobacterium necrophorum	Histophilus somni	Leptospira spp.	Listeria monocytogenes	Mannheimia haemolytica	Moraxella bovis	Mycoplasma spp.	Pasteurella multocida (serotype B, Serotype E)	Prevotella melaninogenica	Salmonella spp.	Staphylococcus aureus	Trueperella (Arcanobacterium) pyogenes	Eimeria spp.
	Gram +	Gram -																											
	S. aureus, coagulase-negative Staphylococcus, S. agalactiae, S. dysgalactiae, S. uberis, Corynebacterium spp.	Klebsiella pneumoniae, Serratia spp. Pseudomonas spp.	Campylobacter fetus venerealis, E. coli, Fusobacterium necrophorum, Pseudomonas aeruginosa, S. aureus, coagulase-negative Staphylococcus	Bibersteinia trehalosi, Fusobacterium necrophorum, Histophilus somni, Klebsiella spp., Mannheimia haemolytica, P. multocida, Streptococcus spp.	Clostridium perfringens, Campylobacter jejuni, E. coli, Salmonella Enterica, Yersinia pseudotuberculosis																							
POLYMYXINS)																													
QUINOLONES									x						x		x			x		x	x		x	x		
SULFONAMIDES (± TRIMETHOPRIM)	x											x				x			x				x		x	x		x
STREPTOGRAMINS																	x										x	
TETRACYCLINES							x	x	x			x				x	x	x	x				x	x					
THIOSTREPTON															x														

Appendix 3: External expert involved in the revision of the TRD

Dr Jing Li
CHINA

Appendix 4: List of Collaborating Centres involved in the revision of the TRD

National Institute of Animal Health (NIAH)
JAPAN

National Veterinary Assay Laboratory (NVAL)
JAPAN

École Inter-Etats des Sciences et Médecine Vétérinaires (EISMV)
SENEGAL

Centre National de Veille Zoosanitaire (CNVZ)
TUNISIA

Food and Drug Administration (FDA)
UNITED STATES OF AMERICA

Appendix 5: List of stakeholder international non-governmental organisations involved in the revision of the TRD

Brooke
UNITED KINGDOM
https://www.thebrooke.org/

HealthforAnimals
BELGIUM
https://www.healthforanimals.org/

International Dairy Federation (IDF)
BELGIUM
https://fil-idf.org/

World Veterinary Association (WVA)
BELGIUM
https://worldvet.org/

Annex 5. Technical Reference Document Listing Antimicrobial Agents of Veterinary Importance for Cats and Dogs
(An appendix to the WOAH List of antimicrobial agents of veterinary importance)

MEETING OF THE WOAH WORKING GROUP ON ANTIMICROBIAL RESISTANCE

Paris, 29–31 October 2024

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Scope

The objective of the *Technical Reference Document Listing Antimicrobial Agents of Veterinary Importance for Cats and Dogs* (hereafter, the technical reference document) is to provide species-specific information about antimicrobials authorised for use in cats and dogs worldwide, without serving as a treatment guideline. By identifying antimicrobial agents authorised for use in cats and dogs, the technical reference document can help evaluate the accessibility to veterinary medicinal products needed to treat common infectious diseases in these species, contribute to the development and update of national treatment guidelines, and inform stewardship programs at practice level, as well as risk management and prioritisation actions to minimise and contain antimicrobial resistance (AMR) in companion animal medicine.

It should be kept in mind that the antimicrobials listed in this technical reference document may not all be available in all countries and/or territories or be appropriate for use in all animal health settings. This technical reference document acknowledges that extra-label/off-label use of antimicrobial agents is common and allowed in these species in some countries, territories and/or regions; further consideration of this topic has been included in this technical reference document in Appendix 1. It is recognised that the legal frameworks and contexts in which veterinarians and other animal health professionals operate are very diverse in terms of licensing, access, and extra- or off-label use of human and/or veterinary medicinal products, and antimicrobial resistance patterns of bacteria of animal and public health interest. Therefore, the general information provided in this document should be interpreted in light of the local context.

Recommendations in the World Organisation for Animal Health (WOAH) Standards and the WOAH List of Antimicrobial Agents of Veterinary Importance (hereafter, the WOAH list) that are relevant for cats and dogs should be considered alongside this document. Furthermore, the technical reference document can be used by competent authorities to identify antimicrobial agents to be included in national essential medicines lists as recommended by the World Small Animal Veterinary Association (WSAVA) and to be considered for inclusion in national surveillance systems for antimicrobial use (AMU) and AMR in animals and in the reporting of AMU data for cats and dogs to WOAH's ANIMUSE in alignment with the WOAH's Strategy for Antimicrobial Resistance and Prudent Use of Antimicrobials.

Methodology to prepare this document

Ad hoc group recruitment process

Experts participating in the *ad hoc* group were identified through an open call process and shortlisted candidates were nominated by WOAH's Director General. The *ad hoc* group was chaired by a member from the WOAH's Antimicrobial Resistance Working Group (AMRWG). The experts represented geographical areas with sizeable canine and feline populations kept as companion animals and different areas of expertise in veterinary medicine and veterinary microbiology and pharmacology.

The members of the *ad-hoc* group were:

- Dr Jennifer Granick, USA
- Dr Kazuki Harada, Japan
- Dr Stephen Page (Chair, AMRWG), Australia
- Dr Rodrigo Rabelo, Brazil
- Dr Delphine Urban, France (ANSES, WOAH Collaborating Centre)
- Dr Barbara Willi, Switzerland

As a first step, an evidence-guided rapid review was undertaken by the *ad hoc* group to prepare a preliminary table of important bacterial and protozoal pathogens of cats and dogs and the antimicrobial agents used to treat infections caused by these pathogens (Appendices 2 and 3). The table compiled from this rapid review included 54 pathogens of cats and dogs, including 41 bacteria at genus and species levels and 13 protozoa. Furthermore, the experts conducted searches of regulatory approvals of veterinary medicinal products in their respective countries and regions

to identify from the existing WOAH list which antimicrobial agents were authorised for use in cats and dogs. Antimicrobial agents were only included in the technical reference document if they were present in formulations as the sole antimicrobial agent with antibacterial action or as part of well-established combinations (e.g., amoxicillin-clavulanic acid and trimethoprim-sulfonamides), or as part of topical formulations with other non-antibacterial antimicrobials (e.g., antifungal agents) or active principles (anti-inflammatory agents) for the treatment and management of mixed infections, and authorised for use in at least one country, territory or region.

Antimicrobial agents and classes not included in the WOAH List but identified as authorised for use in cats and dogs were added to the technical reference document. Importance of antimicrobial classes and subclasses was kept as per WOAH List. One class (nitroimidazole) and 11 new antimicrobial agents (chloramphenicol, cefixime, cefovecin, cefpodoxime, clindamycin, ibafloxacin, pradofloxacin, thiostrepton, metronidazole, ornidazole and tinidazole) were identified as authorised for use in cats and dogs that are currently not included in the WOAH List. Newly added antimicrobial classes and subclasses were not classified at this stage according to veterinary importance in this technical reference document.

The end product of this review was a table presenting the following information:

- Antimicrobial class;
- Antimicrobial sub-class;
- Antimicrobial agent and/or well-established combination of two or more antimicrobial agents;
- Comments and other considerations regarding the indications for use of the antimicrobial class and its relevance for animal and/or public health based on current scientific evidence and recommendations of the WOAH List, if applicable.

Once this table was established by the *ad hoc* group, the technical reference document was developed by the *ad hoc* group and shared with WOAH's AMRWG for feedback. After consolidation, the technical reference document was shared with a panel of external experts, WOAH Collaborating Centres and stakeholder organisations with whom the WOAH has established cooperation agreements (Appendices 4-6). External experts were identified through the shortlist of experts that had been created during the recruitment process of the *ad hoc* group. The experts, Collaborating Centres and stakeholder organisations were asked to address gaps in knowledge identified by the *ad hoc* group and to provide feedback concerning the tables of antimicrobials, list of major pathogens and diseases and the proposed indications for use of antimicrobial groups.

The *ad hoc* group took into consideration the feedback provided to consolidate the technical reference document. The final version of the technical reference document was submitted for consideration and endorsement by the AMRWG and WOAH hierarchy prior to publication in the WOAH website.

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Abbreviations:

VCIA: Veterinary Critically Important Antimicrobial Agents
VHIA: Veterinary Highly Important Antimicrobial Agents
VIA: Veterinary Important Antimicrobial Agents

Note: more information on the categorisation of antimicrobial agents according to importance to veterinary medicine can be found in the WOAH List of Antimicrobial Agents of Veterinary Importance.

Appendices:

Appendix 1: Antimicrobial agents commonly used off-label/extra-label in cats and dogs.

Appendix 2: List of major pathogens and diseases affecting cats and dogs.

Appendix 3: Antimicrobial classes authorised for use in veterinary medicine for bacterial and parasitic infections in cats and dogs.

Appendix 4: List of external experts involved in the revision of the TRD

Appendix 5: List of organisations and professional associations involved in the revision of the TRD

Appendix 6: List of Collaborating Centres involved in the revision of the TRD

Table 1. Antimicrobial agents authorised for use in cats and dogs in one or more countries per class and sub-class and relative importance to companion animal medicine.

ANTIMICROBIALS by CLASS and SUB-CLASS	Categorisation			Antimicrobial Agents	Species	Authorised for use in CATS	Authorised for use in DOGS	Specific comments by class
	VCIA	VHIA	VIA					
AMINOCOUMARIN			x	Novobiocin	AVI, BOV, CAP, OVI, PIS	No	No	
AMINOCYCLITOL	x			Spectinomycin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN**, **FEL**	Yes	Yes	Aminocyclitol (Spectinomycin) is rarely used to treat systemic infections but can be used to treat respiratory, gastrointestinal, urinary infections, skin infections caused by susceptible bacteria such as *Staphylococcus* spp., *Clostridium* spp., *Mycoplasma* spp.
AMINOGLYCOSIDES	x			Dihydrostreptomycin	AVI, BOV, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	Aminoglycosides can be used to treat severe systemic bacterial infections caused by susceptible microorganisms such as: *Escherichia coli* (*E. coli*), *Proteus* spp. and *Pseudomonas* spp. Aminoglycosides are also used topically to treat ophthalmic conditions in cats and dogs and otitis externa involving bacteria such as, *Pseudomonas aeruginosa* and *E. coli.*
				Streptomycin	API, AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
AMINOGLYCOSIDES + 2 DEOXYSTREPTAMINE				Amikacin (Synonym: amikacillin, amicacin)	EQU, **CAN, FEL**	Yes	Yes	
				Apramycin	AVI, BOV, LEP, OVI, SUI	No	No	
				Astromycin (Synonyms: fortimycin)	BOV, LEP, OVI	No	No	
				Framycetin*	BOV, CAP, OVI, **CAN, FEL**	Yes	Yes	
				Gentamicin	AVI, BOV, CAM, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Kanamycin	AVI, BOV, EQU, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Neomycin	API, AVI, BOV, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Paromomycin*	AVI, BOV, CAP, OVI, LEP, SUI, **CAN, FEL**	Yes	Yes	
				Tobramycin (Synonym: tobramicin)	EQU, **CAN, FEL**	Yes	Yes	
AMPHENICOLS	x			Florfenicol (vet only)	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	Amphenicols are used systemically to treat infections of the skin and respiratory tract caused by susceptible microorganisms such as *E. coli, Pasteurella* spp. and *Staphylococcus* spp. Long-term use is discouraged due to haematologic toxicity. In dogs, amphenicols are also used topically to treat eye infections and otitis externa associated with amphenicol-susceptible microorganisms, including *Staphylococcus* spp. and *Staphylococcus pseudintermedius.*
				Thiamphenicol	AVI, BOV, CAP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
	x			**Chloramphenicol (NEW- ADDED)**	**CAN, FEL**	Yes	Yes	
ANSAMYCINS - RIFAMYCINS		x		Rifampicin (Synonym: rifampin)	EQU	No	No	Ansamycins are used topically in cats and dogs for the treatment and prevention of skin and other integumental infections.
				Rifaximin*	BOV, CAP, EQU, LEP,	Yes	Yes	

					OVI, SUI, **CAN, FEL**			
ARSENICALS			x	Nitarsone (vet only)	AVI, SUI	No	No	
				Roxarsone (vet only)	AVI, SUI	No	No	
BICYCLOMYCIN			x	Bicozamycin (Synonym: Bicyclomycin)	BOV, PIS, SUI	No	No	
CEPHALOSPORINS		x		Cefacetrile (Synonyms: Cephacetrile, Cefacetril, Cephacetril)	BOV	No	No	First and second generation cephalosporins are very important in companion animal practice. First and second generation cephalosporins are used to treat skin, respiratory and urinary tract infections, caused by bacteria such as *E. coli, Klebsiella* spp., *Staphylococcus aureus* and *Streptococcus* spp.
Cephalosporin 1st Generation				Cefalexin (Synonyms: Cephalexin, Cephacillin, Cephalexine, Cefalexine)	AVI, BOV, CAP, EQU, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Cefalonium* (vet only) (Synonyms: Cephalonium, Cefalonum)	BOV, CAP, OVI, **CAN**	No	Yes	
				Cefalotin	EQU, **CAN**	No	Yes	
				Cefapirin (Synonyms: Cephapirin, Cefapyrin)	BOV	No	No	
				Cefazolin (Synonyms: Cephazolin, Cephazoline, Cephazolidin)	BOV, CAP, **OVI, SUI**	No	No	
Cephalosporin 2nd Generation				Cefuroxime	BOV	No	No	
Cephalosporin 3rd Generation	x			Cefoperazone	BOV, CAP, OVI	No	No	Third and fourth generation cephalosporins are critically important for animal and human health and subject to specific recommendations in the WOAH List of Antimicrobial Agents of Veterinary Importance. Their use in cats and dogs should only occur when the pathogen is resistant to the first choice antimicrobial; its use should be supported by antimicrobial susceptibility testing whenever possible. Extra-label/off label use should be limited and reserved for instances where no alternatives are available and in agreement with national legislation. Third generation cephalosporins are used in cats and dogs for the treatment of skin and soft tissue infections and urinary tract infections associated with bacteria such as *E. coli* , *Staphylococcus* spp. and *Proteus* spp..
				Ceftiofur (vet only)	AVI, BOV, CAP, EQU, LEP, OVI, SUI, **CAN**	No	Yes	
				Ceftriaxone	BOV, OVI, SUI, **CAN**	No	Yes	
				Cefixime (NEW- ADDED)	**CAN, FEL**	Yes	Yes	
				Cefovecin (NEW-ADDED) (vet only)	**CAN, FEL**	Yes	Yes	
				Cefpodoxime (NEW- ADDED)	**CAN**	No	Yes	
Cephalosporin 4th Generation				Cefquinome (vet only)	BOV, CAP, EQU, LEP, OVI, SUI	No	No	
FUSIDANE			x	Fusidic acid*	BOV, EQU, **CAN, FEL**	Yes	Yes	Topical treatment of ophthalmic and skin infections caused by bacteria such as *Staphylococcus* spp.
IONOPHORES		x		Lasalocid (vet only)	AVI, BOV, LEP, OVI	No	No	
				Maduramicin (vet only)	AVI	No	No	
				Monensin (vet only)	API, AVI, BOV, CAP	No	No	
				Narasin (vet only)	AVI, BOV	No	No	
				Salinomycin (vet only)	AVI, LEP, BOV	No	No	
				Semduramicin (vet only)	AVI	No	No	
LINCOSAMIDES		x		Lincomycin	API, AVI, BOV, CAP,	Yes	Yes	Lincosamides are used for the treatment of dental

					OVI, PIS, SUI, **CAN, FEL**			infections, osteomyelitis and skin infections caused by susceptible bacteria such as *Clostridium* spp., *Staphylococcus* spp., and infections caused by anaerobic bacteria such as *Bacteroides* spp.. Lincosamides can also be used to treat infections of the central nervous system caused by pathogens such as *Mycoplasma* spp., *Neospora* spp. and *Toxoplasma* spp..
				Pirlimycin (vet only)	BOV	No	No	
				Clindamycin (NEW- ADDED)	**CAN, FEL**	Yes	Yes	
MACROLIDES	x							
Macrolides 14-membered ring				Erythromycin	API, AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	Macrolides are used to treat respiratory tract and skin infections caused by bacteria such as *Bordetella* spp., *Mycoplasma* spp., *Pasteurella* spp., *Streptococcus* spp. and *Staphylococcus* spp.,
Macrolides 15-membered ring				Oleandomycin	BOV	No	No	
				Gamithromycin (vet only)	BOV, SUI	No	No	
				Tulathromycin (vet only)	BOV, SUI	No	No	
				Azithromycin (NEW-ADDED)	**CAN**	No	Yes	
Macrolides 16-membered ring				Carbomycin	AVI	No	No	
				Josamycin	PIS, SUI	No	No	
				Kitasamycin (vet only)	AVI, PIS, SUI	No	No	
				Mirosamicin (Synonyms: Mirosamycin, Miporamicin)	API, AVI, PIS, SUI	No	No	
				Spiramycin	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI	No	No	
				~~Terdecamycin~~	~~SUI~~	~~No~~	~~No~~	
				Tildipirosin (vet only)	BOV, SUI	No	No	
				Tilmicosin (vet only)	AVI, BOV, CAP, LEP, OVI, SUI	No	No	
				Tylosin (vet only)	API, AVI, BOV, CAP, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Tylvalosin (vet only)	AVI, SUI	No	No	
Macrolides 17-membered ring				Sedecamycin (Synonym: Lankacidin A)		No	No	
				Terdecamycin	SUI	No	No	
ORTHOSOMYCINS			x	Avilamycin (vet only)	AVI, LEP, SUI	No	No	
PENICILLINS	x							
Natural penicillins (including esters and salts)				Benethamine penicillin	BOV	No	No	Penicillins are extremely important for canine and feline medicine and are recommended as first choice for the treatment of gastrointestinal, respiratory tract infections, skin infections, and urinary tract infections caused by
				Benzylpenicillin (Synonym: Penicillin G, Benzylpenicillin G, Benzopenicillin, Benzyl Penicillin)	AVI, BOV, CAM, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	

				Procaine Benzylpenicillin (Synonyms: Benzylpenicillin procaine, Procaine G penicillin) Benzathine Benzylpenicillin (Synonyms: Benzathine penicillin, Benzathine Penicillin G)	BOV, CAM, CAP, EQU, OVI, SUI, **CAN, FEL**	Yes	Yes	bacteria such as *E. coli*, *Klebsiella* spp., *Pasteurella* spp., *Proteus* spp., *Pseudomonas* spp., *Staphylococcus* spp., and *Streptococcus* spp.
				Penethamate hydriodide (vet only)	BOV, SUI, **CAN**	No	Yes	
				Tobicillin	PIS	No	No	
Amidinopenicillins				Mecillinam (Synonyms: Amdinocillin, Hexacillin, Penicillin HX)	BOV	No	No	
Aminopenicillins				Amoxicillin (Synonym: Amoxycillin)	AVI, BOV, CAP, EQU, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Ampicillin	AVI, BOV, CAP, EQU, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Hetacillin (Synonym: Phenazacillin)	BOV	No	No	
Aminopenicillin plus betalactamase inhibitor				Amoxicillin + clavulanic acid	AVI, BOV, CAP, EQU, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Ampicillin + sulbactam	BOV	No	No	
Carboxypenicllins				Ticarcillin	EQU	No	No	
				~~Tobicillin~~	~~PIS~~	~~No~~	~~No~~	
Ureidopenicillins				~~Aspoxicillin~~	~~BOV~~	~~No~~	~~No~~	
Phenoxypenicillins				Pheneticillin (Synonyms: phenethicillin, Penicillin B)	EQU	No	No	
				Phenoxymethylpenicillin (Synonyms: Penicillin V, Pen V, Penicillin phenoxymethyl, Phenoxymethyl penicillin, Beromycin, Oraxillin)	AVI, SUI, **CAN**	No	Yes	
Antistaphyloccocal penicillins				Cloxacillin* (Synonym: Methocillin S)	BOV, CAP, EQU, OVI, **CAN, FEL**	Yes	Yes	
				Dicloxacillin (Synonym: Dicloxacycline)	BOV, CAP, EQU, OVI	No	No	
				Nafcillin (Synonym: Naphcillin)	BOV, CAP, OVI	No	No	
				Oxacillin (Synonyms: Oxazocillin, MPI-Penicillin)	BOV, CAP, EQU, OVI	No	No	
Penicillins anti-pseudomonal				Aspoxicillin	BOV	No	No	
PHOSPHONIC ACID DERIVATIVES		x		Fosfomycin (Synonyms: Phosphomycin,	AVI, BOV, PIS, SUI	No	No	

				Phosphonomycin)				
PLEUROMUTILINS		x		Tiamulin (vet only) (Synonym: Thiamutilin)	AVI, CAP, LEP, OVI, SUI	No	No	
				Valnemulin (vet only)	SUI	No	No	
POLYPEPTIDES		x		Bacitracin*	AVI, BOV, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	Polypeptides are used topically in the treatment of ear, eyes and skin infections caused by bacteria such as *E. coli*, *Staphylococcus* spp. and *Streptococcus* spp. in cats and dogs. Systemic use should be avoided due to toxicity.
				Enramycin	AVI, SUI	No	No	
				Gramicidin	EQU	No	No	
Polymyxins				Polymyxin B* (Synonym: Polymixin B)	BOV, CAP, EQU, LEP, OVI, SUI **CAN, FEL**	Yes	Yes	Colistin is critically important for animal and human health and subject to specific recommendations in the WOAH List of Antimicrobial Agents of Veterinary Importance. Its use in cats and dogs should only occur when the pathogen is resistant to the first choice antimicrobial; its use should be supported by antimicrobial susceptibility testing whenever possible. Extra-label/off label use should be limited and reserved for instances where no alternatives are available and in agreement with national legislation. Colistin is authorised for topical use for the treatment of otitis externa. Polymyxin B is used in cats and dogs mainly for the topical treatment of otitis and skin infections caused by Gram-positive bacteria such as *Staphylococcus aureus* and *Streptococcus* spp. and Gram-negative bacteria such as *E. coli* and *Klebsiella* spp.
				Colistin* (Synonym: Polymyxin E)	AVI, BOV, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	
QUINOLONES								
Quinolones 1st Generation		x		Flumequine (Synonym: Flumequin)	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	Quinolones of the 1st generation are used in the treatment of therapy of gastrointestinal, skin, respiratory and urinary infections involving bacteria such as *E. coli*, *Enterobacter* spp., *Klebsiella* spp., *Proteus* spp., Pseudomonas spp. and Staphylococcus spp..
				Miloxacin	PIS	No	No	
				Nalidixic acid (Synonyms: Nalixidate, Nalidixinic acid, Nalidic acid)	BOV	No	No	
				Oxolinic acid	AVI, BOV, LEP, PIS, OVI, SUI	No	No	
Quinolones 2nd Generation (Fluoroquinolones)	x			Ciprofloxacin	AVI, BOV, SUI	No	No	Fluoroquinolones are critically important for animal and human health and subject to specific recommendations in the WOAH List of Antimicrobial Agents of Veterinary Importance. Their use in cats and dogs should only occur when the pathogen is resistant to the first choice antimicrobial; its use should be supported by antimicrobial susceptibility testing whenever possible. Extra-label/off label use should be limited and reserved for instances where no alternatives are available and in agreement with national legislation. Fluoroquinolones are used as first choice for treatment of prostatitis and meningitis due to their ability to penetrate the blood/prostate and blood/brain barriers, respectively.
				Danofloxacin (vet only)	BOV, CAP, LEP, OVI, SUI	No	No	
				Difloxacin	AVI, BOV, LEP, SUI	No	No	
				Enrofloxacin (vet only)	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Marbofloxacin (vet only)	BOV, EQU, LEP, SUI, **CAN, FEL**	Yes	Yes	
				Norfloxacin	AVI, BOV, CAP, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Ofloxacin*	AVI, SUI, **CAN, FEL**	Yes	Yes	
				Orbifloxacin (vet only)	BOV, **SUI, CAN, FEL**	Yes	Yes	
				Sarafloxacin	PIS	No	No	

				Ibafloxacin (NEW- ADDED)	**CAN, FEL**	Yes	Yes	Fluoroquinolones may be used for the treatment of infections of the gastrointestinal, respiratory and urogenital tracts, skin and soft tissue infections, and otitis (externa/media) caused by bacteria such as *E. coli*, *Staphylococcus* spp. and *Pseudomonas* spp.
				Levofloxacin (NEW-ADDED)	**CAN**	No	Yes	
				Pradofloxacin (NEW- ADDED) (vet only)	**CAN, FEL**	Yes	Yes	
QUINOXALINES			x	Carbadox (vet only)	SUI	No	No	
				Olaquindox (vet only) (Synonym: Olachindox)		No	No	
SULFONAMIDES	x			Phthalylsulfathiazole (vet only) (Synonyms: Sulfathalidine, Phthalazol, Phthalylsulphathiazole, Phthalylsulfonazole)	SUI, **CAN, FEL**	Yes	Yes	The wide range of applications and the nature of the diseases treated make sulfonamides (sulfas) extremely important for cats and dogs. Sulfonamides are often used in combination with trimethoprim to treat infections of the gastrointestinal tract, of the respiratory tract, urinary tract, skin, and sepsis in cats and dogs caused by bacteria such as *E. coli*, *Pasteurella* spp., *Proteus* spp., *Salmonella* spp., *Staphylococcus* spp. and *Streptococcus* spp..
				Sulfacetamide (Synonyms: Sulphacetamide, Acetosulfamine, Acetosulfamin, N-Acetylsulfanilamide)	AVI, BOV, **OVI, SUI, CAN, FEL**	Yes	Yes	
				Sulfachlorpyridazine (Synonym: Sulfachloropyridazine)	AVI, BOV, SUI	No	No	
				Sulfadiazine (Synonyms: Sulphadiazine, Sulfapyrimidine, Sulfadiazin, Sulfazine, Sulfadiazene)	AVI, BOV, CAP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Sulfamethoxazole (Synonyms: Sulfadimethoxazole Sulphamethoxazole, Sulfisomezole)	AVI, BOV, SUI, **CAN, FEL**	Yes	Yes	
				Sulfadimethoxine (Synonyms: Sulphadimethoxine, Sulfadimethoxin, Sulfadimethoxydiazine)	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Sulfadimidine (Synonyms: sulfamethazine, Sulfadimethyldiazine, Sulfamezathine, Sulphamethazine, Sulfadimerazine)	AVI, BOV, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Sulfadoxine (Synonyms: Sulphadoxine, Sulforthomidine, Sulphormethoxine, Sulfadoxin)	AVI, BOV, EQU, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Sulfafurazole (Synonyms: sulfisoxazole, Sulphafurazole, Sulfisoxazol, Sulfafurazol)	BOV, PIS, **CAN**	No	Yes	
				Sulfaguanidine (Synonyms: Sulfaguanidin, Sulphaguanidine, Sulfanilguanidine, Sulfoguanidine)	AVI, CAP, OVI, **SUI, CAN, FEL**	Yes	Yes	
				Sulfamerazine (Synonyms:	AVI, BOV, CAP, EQU,	No	Yes	

				Sulphamerazine, Sulfamerazin, Sulfamethyldiazine)	LEP, OVI, PIS, SUI, **CAN, FEL**			
				Sulfamethoxydiazine (Synonyms: Sulfamethoxine, sulfameter, Sulfamethoxydiazine, Sulfamethoxypyrimidine)	AVI, PIS	No	No	
				Sulfamonomethoxine (Synonyms: Sulfamonomethoxin, Sulfamonmethoxine)	AVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Sulfanilamide* (Synonyms: Sulphanilamide, Sulfamine, Sulfonylamide)	BOV, CAP, OVI, SUI, **CAN, FEL**	Yes	Yes	
				Sulfapyridine (Synonym: Sulphapyridine)	BOV, SUI, **CAN, FEL**	Yes	Yes	
				Sulfaquinoxaline (Synonyms: Sulfabenzpyrazine, Sulphaquinoxaline)	AVI, BOV, CAP, LEP, OVI, SUI	No	No	
				Sulfamethoxypyridazine (Synonyms: Sulphamethoxypyridazine, Sulfapyridazine, Sulfametoxipiridazine)	AVI, BOV, EQU, SUI, **CAN, FEL**	Yes	Yes	
Sulfonamides + diaminopyrimidines				Ormetoprim (Synonyms: Ormethoprim, Ormetorprim) + Sulfonamide	AVI, PIS, SUI	No	No	
				Trimethoprim (Synonym: Trimetoprim) + sulfonamide	AVI, BOV, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
DIAMINOPYRIMIDINES				Baquiloprim	BOV	No	No	
				Ormetoprim (Synonyms: Ormethoprim, Ormetorprim)	AVI	No	No	
				Trimethoprim (Synonym: Trimetoprim)	AVI, BOV, CAP, EQU, LEP, OVI	No	No	
STREPTOGRAMINS			x	Virginiamycin (vet only) (Synonym: Pristinamycin)	AVI, BOV, OVI, SUI	No	No	
TETRACYCLINES	x			Chlortetracycline*	AVI, BOV, CAP, EQU, LEP, OVI, SUI, **CAN, FEL**	Yes	Yes	Tetracyclines are very important for cats and dogs. Tetracyclines can be used systemically to treatment of tick-borne diseases, respiratory and skin infections caused by pathogens such as *Anaplasma* spp., *Borrelia* spp., *Ehrlichia canis*, and *Mycoplasma* spp.. Tetracyclines can also be used topically to treat superficial skin and eye infections. Use of tetracyclines should be avoided in young animals due to effects on bone and tooth development.
				Doxycycline (Synonyms: Doxytetracycline, Doxycyclin)	AVI, BOV, CAM, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Oxytetracycline (Synonyms: Oxyterracine, Oxytetracyclin, Oxitetracyclin) Oxyterracyne)	API, AVI, BOV, CAM, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
				Tetracycline (Synonym: Tetracyclin)	API, AVI, BOV, CAM, CAP, EQU, LEP, OVI, PIS, SUI, **CAN, FEL**	Yes	Yes	
THIOPEPTIDES			x	Nosiheptide		No	No	
				Thiostrepton	**CAN, FEL**	Yes	Yes	Thiopeptides are used topically in cats and dogs in combination with other antimicrobial agents to treat ear and skin mixed infections against bacteria such as

								Staphylococcus spp. and *Streptococcus* spp. .
HALOGENATED HYDROXYQUINOLINES			x	Halquinol	SUI	No	No	
PSEUDOMONIC ACID (NEW CLASS-ADDED)				**Mupirocin* (NEW-ADDED)**	**CAN, FEL**	Yes	Yes	Mupirocin is used topically to treat skin infections caused by bacteria such as *Staphylococcus* spp.
NITROIMIDAZOLES (NEW CLASS- ADDED)				**Metronidazole (NEW- ADDED)**	**CAN, FEL**	Yes	Yes	Nitroimidazoles are used in cats and dogs to treat infections caused by bacteria such as *Bacteroides* spp. and *Clostridium* spp., and protozoa such as *Giardia* spp.
				Ornidazole (NEW-ADDED)	**CAN**	No	Yes	
				Tinidazole (NEW- ADDED)	**CAN, FEL**	Yes	Yes	

*These antimicrobial agents are authorised in some countries and/or territories for topical use in cats and/or dogs.

API: Bee; AVI: Poultry; BOV: Bovine; CAM: Camel; CAN: Canid; CAP: Caprine; EQU: Equine; FEL: Feline; LEP: Rabbit; OVI: Ovine; PIS: Fish; SUI: Swine.

Appendix 1: Use of non-authorised antimicrobials (off-label/ extra-label use) in cats and dogs.

"Off-label" or "extra-label" use of antimicrobials is very common in companion animal medicine. This is also reflected by the fact that off-label use of antimicrobials is commonly included in guidelines, well-established veterinary text books, and scientific literature on management of infectious diseases of cats and dogs.

"Off-label" or "extra-label" medication use refers to the practice of prescribing a medication for an indication, route of administration, dosing interval, dosage, or animal species that is not specifically listed on the label and associated prescribing information.

The ability for veterinarians to prescribe antimicrobials in an off-label fashion is critical for animal health and welfare and public health. Veterinarians frequently encounter situations where approved medications are unavailable for the specific disease in question and/or for the animal species needing treatment. Additionally, they may face cases where the recommended dosage or frequency of administration, as per the label instructions, has proven ineffective.

It is crucial to acknowledge that some first-line antimicrobials and certain types of formulations may not be licensed for use in cats or dogs in certain countries, territories or regions. This is primarily due to economic considerations and regulatory approval issues. Implementing strict prohibition of off-label use could lead to an increased utilization of second- or third-line antimicrobials, such as fluoroquinolones or 3rd generation cephalosporins, which are commonly authorised for dogs and cats in most countries and territories. Such a shift in usage patterns could potentially compromise the objective of promoting prudent antimicrobial use in dogs and cats.

Secondly, it is crucial to recognize the intricate bond between humans and their companion animals. Companion animals, predominantly cats and dogs, are often considered integral members of many families worldwide. The well-being of these animals significantly impacts the mental health of their human counterparts. Therefore, any policies or regulations affecting companion animal health care are intrinsically tied to human mental health and societal well-being.

The status of dogs and cats as integral part of many families is also reflected by high quality of medical care that is offered to these species in many countries worldwide. High quality medical care for dogs and cats depends also on the off-label use of antimicrobials in certain situations, especially in the case of complications when highly resistant bacterial infections occur. Euthanasia cannot be seen as the only solution to critical cases where off-label antimicrobials might save the animal's life. It is a devastating choice for veterinarians who've sworn an oath to protect animal life and health, and it is emotionally traumatic for the families involved.

There is also a public health aspect when off-label use of antimicrobials in companion animals is discussed. For example, zoonotic diseases such as tick-borne infections and leptospirosis are commonly treated with the antimicrobial doxycycline. In many countries there are no systemic formulations of doxycycline labeled for use in dogs or cats, though it is the only agent available to treat canine anaplasmosis and is the consensus-guideline recommended therapy to eliminate carrier status and thus long-term shedding in dogs infected with leptospirosis, a zoonotic infection. Moreover, some zoonotic infections, such as mycobacteriosis in cats, brucellosis in dogs or bartonellosis in dogs and cats can only be adequately treated by off-label use of antimicrobials.

Additionally, AMR does not respect the species barrier and needs to be approached in a One Health context. Humans and companion animals live in very close contact in home environments, and transmission of resistant bacteria or antimicrobial resistance genes (ARG) from owners to companion animals and *vice versa* has been well documented. Consequently, antimicrobial-resistant bacteria or ARGs occurring in human healthcare will also occur in companion animal medicine over time. In this context, veterinary clinics and hospitals are faced with similar risks as human health care facilities. In the event of a companion animal contacting a resistant bacterial infection from a human being, there is a potential risk for maintaining the bacteria in the home environment. Off-label use of antimicrobials can, in such cases, be pivotal in controlling infections with antimicrobial resistant bacteria, thereby mitigating other public health risks. The inclusion of off-label antimicrobial agents into the WOAH document allows provision of advice regarding how to use them responsibly. The goal is to minimize the risk of AMR development while preserving the health and welfare of companion animals and protecting public health. Off-label prescribing decisions should be made on a case-by-case basis. When off-label use of antimicrobials that are critically important or highest priority critically important for human healthcare is considered in situations in which animal health and welfare or public health are at risk, prescribers should ensure that; a) antimicrobial susceptibility testing and pharmacokinetic data indicates likely efficacy at the infection site, that b) adequate administration of the antimicrobial is ensured over the entire treatment period, and, c) there is a reasonable likelihood that treatment will result in a cure.

Appendix 2: List of major pathogens and diseases affecting cats and dogs treated with antimicrobials.

Pathogen	Examples of diseases	Occurs in cats	Occurs in dogs
Bacteria			
Acinetobacter spp.	Urinary tract infections (UTI), wound infection, pneumonia, catheter-associated bacteraemia, endocarditis, necrotizing fasciitis.	Yes	Yes
Actinomyces spp.	Actinomycosis, discospondylitis, meningitis, meningoencephalitis, osteomyelitis, peritonitis (cats), polyarthritis, pyothorax (mostly cats)	Yes	Yes
Anaplasma spp. *(A. phagocytophilum, A. platys)*	Polyarthritis, thrombocytopaenia, pyrexia	Yes	Yes
Bacteroides spp.	Discospondylitis, meningitis, osteomyelitis, pyothorax, hepatic abscesses (mostly cats), peritonitis (cats), periodontitis (cats).	Yes	Yes
Bartonella spp. *(Bartonella henselae and others)*	Stomatitis, uveitis, lymphadenomegaly, neurologic signs, myalgia, myocarditis, endocarditis, reproductive disorders.	Yes	Yes
Bordetella bronchiseptica	Rhinitis, tracheobronchitis, pneumonia. Feline Upper Respiratory Tract Disease (FURTD), Canine Infectious Respiratory Disease Complex (CIRDC, “Kennel Cough”)	Yes	Yes
Borrelia burgdorferi	Arthritis, myositis, glomerulonephritis (dogs)	Yes	Yes
Brucella spp. (*B. canis, rarely B. abortus, B. melitensis, B. suis*)	Discospondylitis, abortion, orchitis, epididymitis, uveitis, osteomyelitis	No	Yes
Campylobacter spp.	Enterocolitis, bacteraemia, cholecystitis/cholangiohepatitis, meningitis, endocarditis, abscesses, Guillain-Barré syndrome, abortion, perinatal death		
Chlamydia felis (rarely Chlamydia psittaci)	Conjunctivitis, Feline Upper Respiratory Tract Disease (FURTD), reproductive tract disease, arthritis	Yes	Yes
Citrobacter spp.	UTI, septicaemia, endocarditis, myocarditis		
Clostridium spp. *(C. perfringens, C. difficile, C. piliforme)*	Discospondylitis (cats), myositis, osteomyelitis, peritonitis, pyothorax, diarrhoea	Yes	Yes
Corynebacterium spp. (*C. urealyticum, C. ulcerans, C. auriscanis, C. diphteriae*)	Arthritis, Lower Respiratory Disease, aspiration pneumonia, otitis externa/ media, discospondylitis, pyothorax, UTI	Yes	Yes
Coxiella burnetii	Q-Fever (reproductive disorders)	Yes	Yes
Ehrlichia spp. *(E. canis*, *E. ewingii, E. chaffeensis)*	Ehrlichiosis (meningitis, polyarthritis, myositis, uveitis, pancytopenia)	Yes	Yes
Enterobacter spp.	Acral lick dermatitis (dogs), Lower respiratory disease (pneumonia), prostatitis (dogs), pyothorax (dogs), peritonitis, UTI	Yes	Yes
Enteroccocus spp. (*E. faecalis, E. faecium*)	Aspiration pneumonia (dogs), peritonitis, sepsis, endocarditis, chronic otitis externa and media (dogs), deep folliculitis (dogs), discospondylitis (dogs), osteomyelitis, furunculosis (dogs), generalised deep pyoderma (dogs), interdigital pyoderma (dogs), lower	Yes	Yes

Pathogen	Examples of diseases	Occurs in cats	Occurs in dogs
	respiratory tract disease (cats), otitis media (dogs), prostatitis (dogs), UTI, wound infections		
Erysipelothrix spp. (*E. rhusiopathiae* (insidiosa) *E. tonsillarum)*	Arthritis, discospondylitis, endocarditis, erythematous cutaneous lesions, sepsis	Yes	No
Escherichia coli	Arthritis, aspiration pneumonia (dogs), meningitis, meningoencephalitis, bacterial pneumonia, cellulitis, otitis externa/ media (dogs), colitis, cystitis (dogs), diarrhoea, discospondylitis, fasciitis (cats), furunculosis (dogs), deep and interdigital pyoderma (dogs), haemorrhagic colitis, vaginitis (dog), metritis, pyometra, neonatal sepsis, osteomyelitis, peritonitis, prostatitis (dogs), sepsis, UTI	Yes	Yes
Francisella tularensis	Pyrexia, lymphadenopathy, cutaneous abscesses, splenomegaly, hepatomegaly, jaundice	Yes	Yes
Helicobacter spp.	Gastritis	Yes	Yes
Klebsiella spp.	Aspiration pneumonia (dogs), pneumonia, enteritis, lower respiratory infection (cats), meningitis or meningoencephalitis, sepsis, neonatal sepsis, osteomyelitis, peritonitis, pyometra, pyothorax (dogs), sepsis, surgical wound infection, UTI	Yes	Yes
Leptospira spp.	Leptospirosis (dogs, rarely cats): nephritis, hepatitis, myocarditis, vasculitis, haemorrhage	Yes	Yes
Mycobacterium tuberculosis complex (*M. tuberculosis, M. bovis, M. microti*)	Skin lesions, lymphadenopathy, pneumonia, osteomyelitis, (pyo)granulomatous infiltrates in different organs	Yes	Yes
Non-tuberculous mycobacteria (*M. avium* intracellulare complex (MAC) and others)	Subcutaneous nodules, non-healing wounds, local or general lymphadenopathy	Yes	Yes
Mycoplasma spp. *(M. cynos, M. felis, M. edwardii, M. gateae*)	Arthritis, conjunctivitis, rhinitis, pneumonia, pyothorax, UTI, arthritis, meningoencephalitis, reproductive tract disease	Yes	Yes
Haemotropic Mycoplasma spp.	Haemolytic anaemia, thrombocytopaenia	Yes	Yes
Neorickettsia helminthoeca	Salmon poisoning disease	No	Yes
Nocardia spp.	Nocardiosis (sc. masses, non-healing skin lesions, pulmonary lesions, disseminated forms e.g. neurologic signs, chorioretinitis, arthritis, osteomyelitis)	Yes	Yes
Pasteurella spp. (*P. multocida*, *P. canis)*	Abscesses, aspiration pneumonia (dogs), Canine Infectious Respiratory Disease (CIRD) complex (“kennel cough” or “canine Infectious tracheobronchitis (ITB)”) (dogs), rhinitis, bronchitis, pneumoniae, UTI, cellulitis, discospondylitis, fasciitis, focal abscesses, meningitis, meningoencephalitis, osteomyelitis, pyoderma, pyothorax, tenosynovitis, septic arthritis, sepsis	Yes	Yes
Porphyromonas spp.	Discospondylitis (cats), periodontal disease, pneumonia (cats), pyothorax	Yes	Yes
Prevotella oralis	Meningitis, periodontal disease (dogs), pyothorax (dogs)	Yes	Yes

Pathogen	Examples of diseases	Occurs in cats	Occurs in dogs
Proteus spp.	Cellulitis (cats), chronic otitis externa (dogs), fasciitis (cats), lower respiratory infection (cats), meningitis, osteomyelitis, otitis media (dogs), polyarthritis, prostatitis (dogs), pyoderma (cats), pyometra, UTI (dogs, cats)	Yes	Yes
Pseudomonas aeruginosa	Acral lick dermatitis (dogs), arthritis, aspiration pneumonia (dogs), bacterial pneumonia (dogs), Canine Infectious Respiratory Disease (CIRD) complex ("kennel cough" or "canine Infectious tracheobronchitis (ITB)") (dogs), lower respiratory infection (cats), otitis externa and media, discospondylitis (dogs), deep pyoderma, osteomyelitis, peritonitis (dogs), prostatitis (dogs), pyometra, sepsis, UTI (dogs)	Yes	Yes
Rickettsia spp. *(e.g., R. rickettsii, R. conorii)*	Rocky Mountain Spotted Fever (RMSF, *R. rickettsii*) , Mediterranean spotted fever (*R. conorii*)	No	Yes
Salmonella spp. (e.g., *S. typhimurium*)	Abortion (cats), arthritis, bacteriaemia, endocarditis (cats), endotoxaemia, gastroenteritis, meningitis, osteomyelitis (cats), pyometra, stillbirths (cats)	Yes	Yes
Serratia spp.	Osteomyelitis, pyometra, secondary peritonitis (dogs)	Yes	Yes
Staphylococcus spp. *(S. pseudintermedius*, *S. aureus,* coagulase-negative staphylococci)	abscesses, Canine Infectious Respiratory Disease (CIRD) complex ("kennel cough" or "canine Infectious tracheobronchitis (ITB)") (dogs), lower respiratory disease (cats), pneumonia, pyothorax (dogs), endocarditis, osteomyelitis, discospondylitis (dogs), gastrointestinal infection, impetigo (dogs), interdigital pyoderma (dogs), folliculitis, furunculosis (dogs), cellulitis (dogs), mastitis, meningitis or meningoencephalitis, otitis externa, otitis media (dogs), prostatitis (dogs), pyoderma, pyometra, septic arthritis, sepsis, UTI, vaginitis (dogs).	Yes	Yes
Streptococcus spp.	Acute Tracheobronchitis (cats), rhinitis, pharyngitis, sinusitis, bronchopneumonia, pneumonia, chronic bronchitis (cats), Canine Infectious Respiratory Disease (CIRD) complex ("kennel cough" or "canine Infectious tracheobronchitis (ITB)") (dogs), pyothorax, cervical lymphadenitis, cholangiohepatitis, , discospondylitis, endocarditis, keratitis, mastitis, metritis, vaginitis (dogs), meningitis or meningoencephalitis, necrotizing fasciitis, neonatal bacteraemia, osteomyelitis, otitis externa, otitis media (cats), otitis interna (cats), polyarthritis, peritonitis, pharyngitis, prostatitis (dogs), pyometra, sepsis, sinusitis, toxic shock syndrome, UTI	Yes	Yes
Yersinia spp. *(Y. enterocolitica*, *Y. pseudotuberculosis, Y. pestis)*	Arthritis, diarrhoea, plaque (lymphadenopathy, subcutaneous abscesses)	Yes	Yes
Wolbachia pipientis	Endosymbiont of *Dirofilaria immitis*, part of treatment protocol against dirofilariosis	Yes	Yes
Protozoa			
Amoebas (e.g., *Acanthamoeba, Balamuthia, Hartmannella*)	Nonenteric amebiasis (Acanthamebiasis, Hartmannelliasis, Balamuthiasis)	Yes	Yes
Babesia spp. *(*e.g., *B. gibsoni, B. conradae, B. vulpes)*	Babesiosis (fever, haemolytic anaemia, thrombocytopenia, leukopenia, bleeding, jaundice, acute kidney injury, proteinuria)	Yes	Yes

Pathogen	Examples of diseases	Occurs in cats	Occurs in dogs
Balantidium coli	Balantidiasis	Yes	Yes
Cryptosporidium spp.	Cryptosporidiosis (small bowel, diarrhoea)	Yes	Yes
Cystoisospora spp. (*C. felis*, *C. rivolta, C. canis*, *C. ohioensis*, *C. burrowsi*, and *C. neorivolta*)	Large or small bowel diarrhoea	Yes	Yes
Cytauxzoon spp.	Cytauzoonosis (pyrexia, anaemia, jaundice, dyspnoea, multi-organ failure)	Yes	No
Entamoeba histolytica	Amebiasis (severe ulcerative colitis, dysentery)	Yes	Yes
Giardia spp.	Giardiasis (large bowel diarrhoea)	Yes	Yes
Hepatozoon americanum	Canine Hepatozoonosis (myositis)	No	Yes
Neospora spp.	Neosporosis (meningitis, meningoencephalitis, myositis, neurological clinical signs)	Yes	Yes
Sarcocystis spp.	Myositis	Yes	Yes
Toxoplasma gondii	Toxoplasmosis (granulomatous chronic inflammatory bowel disease, meningitis, myositis)	Yes	Yes
Tritrichomonas foetus	Trichomoniasis (Chronic large bowel diarrhoea, lymphoplasmacytic and neutrophilic colitis)	Yes	Yes

Pathogens not included in the above list fulfil at <u>least one</u> of the following criteria:

1) Pathogens cause infections that are deemed very rare in dogs and cats
2) Pathogens for which antimicrobials are not usually indicated for the control of disease

- *Anaerobiospirillum* spp.
- *Bacillus anthracis*
- *Bacillus* spp.
- *Bergeyella zoohelcum*
- *Besnoita* spp.
- *Brachyspira* (*Serpulina*) *pilosicoli*
- *Burkholderia (Pseudomonas) pseudomallei*
- *B. (Pseudomonas) mallei*
- *Capnocytophaga canimorsus*
- *Carypospora* spp.
- *Dermatophilus congolensis*
- *Eubacterium* spp.
- *Flavobacterium breve*
- *Fusobacterium* spp.
- *Hammondia* spp.
- *Lawsonia intracellularis*
- *Listeria monocytogenes*
- *Micrococcus* spp.
- *Moraxella* spp.
- *Neisseria animaloris*
- *Peptostreptococcus* spp.
- *Propionibacterium* spp.
- *Plesiomonas shigelloides*
- *Rhodococcus equi*
- *Shigella* spp.
- *Stenotrophomonas* spp.
- *Ureaplasma* spp.
- *Wolinella* spp.

Appendix 3: Antimicrobial classes authorised for use for the treatment of common infections in cats and dogs

Table 3. Examples of antimicrobial classes authorised for use in common bacterial and parasitic infections.

ANTIMICROBIAL CLASSES	BACTERIAL INFECTIONS																								PROTOZOAL INFECTIONS				
	Actinomyces spp. infections	Anaplasma spp. infections	Bacteroides spp. infections	Bordetella bronchiseptica infections	Borrelia burdorferi infections	Campylobacter spp. infections	Clostridium spp. infections	Corynebacterium spp. infections	Ehrlichia spp. infections	Enterobacter spp. infections	Enterococcus spp.	Escherichia coli infections	Fusobacterium spp.	Klebsiella spp.	Leptospira spp. infections	Mycoplasma spp. infections	Pasteurella spp. infections	Porphyromonas spp. infections	Prevotella oralis infections	Proteus spp. infections	Pseudomonas aeruginosa infections	Salmonella spp. infections	Serratia spp. infections	Staphylococcus spp. infections	Streptococcus spp. infections	Amoebiasis	Giardiasis	Neosporosis	Toxoplasmosis	Trichomoniasis
AMINOCYCLITOL	x		x				x						x			x								x	x					
AMINOGLYCOSIDES				x						x		x		x	x	x				x	x	x	x	x	x					
AMPHENICOLS	x										x													x						
ANSAMYCINS																														
CEPHALOSPORINS					x					x		x	x	x			x			x				x	x					
FUSIDANE																								x						
LINCOSAMIDES			x										x			x		x	x					x	x			x	x	
MACROLIDES						x					x													x	x					
PENICILLINS	x		x				x					x	x		x		x	x	x	x				x	x					
POLYMYXINS												x									x			x	x					
QUINOLONES				x		x				x		x		x		x	x			x	x	x		x	x					
SULFONAMIDES ± DIAMINOPYRIMIDINES	x			x	x			x				x	x	x								x		x	x				x	
TETRACYCLINES		x		x	x				x						x	x	x			x	x			x	x					
THIOPEPTIDES																														
NITROIMIDAZOLES			x				x						x				x	x	x		x					x	x			x

Appendix 4: List of external experts involved in the revision of the TRD

Dr Rosanne Jepson UNITED KINGDOM	Dr Valeria Rumi ARGENTINA	Prof Scott Weese CANADA

Appendix 5: List of international non-governmental and professional organisations involved in the revision of the TRD

HealthforAnimals
BELGIUM
https://www.healthforanimals.org/

World Small Animal Veterinary Association (WSAVA)
CANADA
https://wsava.org/

World Veterinary Association (WVA)
BELGIUM
https://worldvet.org/

Appendix 6: List of Collaborating Centres involved in the revision of the TRD

National Institute of Animal Health
JAPAN

National Veterinary Assay Laboratory
JAPAN

École Inter-Etats des Sciences et Médecine Vétérinaires (EISMV)
SENEGAL

Centre National de Veille Zoosanitaire (CNVZ)
TUNISIA

Food and Drug Administration (FDA)
UNITED STATES OF AMERICA