Multi-sectoral Stakeholder Meeting on AMR/AMU Surveillance

January 22-23, 2019

Meeting Summary

National Collaborating Centre for Infectious Diseases

Centre de collaboration nationale des maladies infectieuses

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In partnership with the

Public Health Agency of Canada

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Contents

Acronyms

AMMI	Association of Medical Microbiology and Infectious Disease Canada
AMR	antimicrobial resistance
AMS	antimicrobial stewardship
AMU	antimicrobial use
CAHSS	Canadian Animal Health Surveillance System
CAP	Canadian Agricultural Partnership
CCDIC	Centre for Communicable Diseases and Infection Control (PHAC)
CCVO	Canadian Chief Veterinary Officer
CFIA	Canadian Food Inspection Agency
CFEZID	Centre for Food-borne, Environmental and Zoonotic Infectious Diseases (PHAC)
CIHR	Canadian Institutes for Health Research
CIPARS	Canadian Integrated Program for Antimicrobial Resistance Surveillance
CNISP	Canadian Nosocomial Infection Surveillance Program
CODEX	CODEX Alimentarius – International Food Standards
CVMA	Canadian Veterinary Medical Association
ECDC	European Centre for Disease Prevention and Control
F/P/T	Federal/Provincial/Territorial (governments)
GLASS	Global Antimicrobial Resistance Surveillance System
IPC	infection prevention and control
IPAC	Infection Prevention and Control Canada
NCCID	National Collaborating Centre for Infectious Diseases
NML	National Microbiology Laboratory
PHAC	Public Health Agency of Canada
P/T	Provinces and Territories

Executive Summary

Background

On January 22nd and 23rd, 2019, the National Collaborating Centre for Infectious Diseases (NCCID) and the Public Health Agency of Canada (PHAC) brought together stakeholders from human health and animal health/agri-food to discuss an overarching vision and a common approach to One Health surveillance in Canada, and to identify what needs to be done to achieve that vision. The meeting was intended to be a key step informing the development of a forthcoming *Pan-Canadian Action Plan on Antimicrobial Resistance* and a blueprint for One Health surveillance of antimicrobial resistance (AMR) and use (AMU).

The specific objectives of the meeting were:

1) To confirm a vision and objectives for a One Health approach to AMR and AMU surveillance; and
2) To validate current and potential AMR and AMU surveillance actions across sectors and jurisdictions.

This was a facilitated event, which was designed to give meeting participants considerable time to deliberate on priority AMR and AMU actions in small groups.

An opening set of presentations were intended to establish common understanding of current AMR/AMU surveillance systems across sectors, and to propose a draft vision, objectives and priority actions as starting points for the group discussions. Following these initial presentations and ensuing discussion, participants worked in small groups over the day and half to deliberate on the following key questions:

> *Is there anything missing from the overview of current surveillance activities and gaps provided in the presentations?*
>
> *What do you see as the priority actions for the next five years?*
>
> *If additional investments became available in the future, what actions would be more feasible? What actions would become priorities?*
>
> *What are the opportunities for collaboration or an integrated approach across sectors and jurisdictions?*
>
> *What are the timelines for actions, levers for implementation, and actors that should be involved in implementing actions (the doers")?*
>
> *How will success be measured? What are the appropriate performance indicators?*

This report is a summary of the points of discussion over the two days. (Note that an initial Executive Summary was prepared for the F/P/T AMR/AMU Surveillance Task Group in March 2019 to use in its work to finalize recommended surveillance actions for the pan-Canadian Action Plan.)

Summary of Key Discussion Points

There were several areas where principles of agreement emerged, summarized here:

Current status of AMR/AMU surveillance

Participants agreed on the need to improve Canada's AMR/AMU surveillance systems. Canada's recent low ranking by the Global Antimicrobial Resistance Surveillance System (GLASS) was expressed as a concern for many participants.[1] Several major gaps were discussed, including the lack of data from Indigenous and remote communities, concern about the quality and cost of proprietary human AMU data, issues related to coordination and governance of surveillance activities, timeliness and accessibility of surveillance data, and ensuring that data are appropriate for action.

Participants mentioned that much of the requisite surveillance data are already collected by various actors, but that the major challenges ahead are concluding serviceable data-sharing agreements, and standardizing and collating data. Although it was felt that many of the gaps in the current surveillance system are known, participants noted that there is a need for a systematic appraisal of gaps between the current and desired surveillance systems.

Currently, surveillance is primarily within each sector, with limited cross-sectoral interaction. There was consensus that AMR/AMU surveillance for agriculture and agri-food is more developed than AMR/AMU surveillance in human health. This was attributed to the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) having been designed as a planned system from the outset whereas the multiple human health surveillance systems developed organically.

One Health surveillance

There appeared to be consensus that One Health is useful as an organizing principle for AMR/AMU surveillance in Canada. In particular, there was agreement that surveillance of AMR is a priority for

[1] As clarification, GLASS does not, to our knowledge, rank Member States' AMR Surveillance Systems; rather it reports on what data each Member State has provided to GLASS. That said, as reported by the Tripartite organizations (WHO, OIE and FAO) in July 2018, Canada did give itself a self-designated grade of "C" (on a scale of A to E, where E is the highest possible grade) in its country self-assessment for the survey year 2017-18. The C grade is defined as: *National AMR surveillance activities are in place for common bacterial pathogens that link patient information with susceptibility testing, with a national reference laboratory that participates in external quality assurance.* https://www.who.int/antimicrobial-resistance/global-action-plan/database/en/

joint action across sectors (i.e. horizontal action), while surveillance of AMU can continue within sectors (i.e. vertical action).

The One Health approach provides opportunities to incorporate concerns for animal health into current surveillance systems, which were primarily designed to protect human health. It was recognized that there is a need to include other sectors (e.g. the environment, plant-based agriculture and companion animals) into a more comprehensive One Health AMR/AMU surveillance system, but this was viewed as a long-term objective. In the short- and medium-term, systems should be designed with flexibility so that data from those sectors can eventually be included in the fuller picture.

Evidence for action

A major theme throughout the event was that the surveillance data ought to be collected for the purpose of being responsive. Participants agreed that there is a need to ensure that the information collected is appropriate to guide actions, and not just collected "for information's sake". A number of possible functions or purposes for the surveillance system were noted, such as informing stewardship and infection prevention and control activities. However, there was a lack of consensus on the frequency and granularity of data required to support such action(s). For example, facilitating antimicrobial stewardship could involve using surveillance data for education or for regulatory enforcement; these would require different levels of data.

There was broad consensus among participants that the high level functions of the desired AMR and AMU surveillance system must be elucidated and endorsed by F/P/T governments and multi-sectoral stakeholders in consultation with Indigenous communities and industry. This step was viewed as important because the intended uses for the data will affect the type, frequency and level of aggregation required. This step was also viewed as important for facilitating data-sharing agreements and getting buy-in from those providing data.

Actions over the next five years

The draft actions put forward for discussion were generally viewed as appropriate for the next five years, although some refinements, considerations and suggestions were discussed. Some participants were concerned that what can be achieved within five years will be limited by the resources available. In terms of importance, there was some agreement that Actions 1-3 (see below) were the top priorities. Actions 4-5 were suggested as short-term priorities as these could be done with relative ease (i.e., these can be quick 'wins'). There was interest expressed in using accreditation standards, regulatory measures and report cards/scorecards to improve standardization, coverage of reported data, and timeliness of data.

Governance and resources

There was considerable agreement among participants on the importance of increased resources to support improvements to AMR and AMU surveillance. Many participants felt that meaningful reform would not be possible without increased and sustainable financial resources.

Establishing governance and increased resources are considered foundational and will influence the speed and extent of progress in improving AMR/AMU surveillance. Some participants expressed concern that these overarching actions may take time (in the case of governance) or may not be politically feasible (in the case of resources). Participants noted a tension between the importance of bolstering governance and resources while ensuring that these are not bottlenecks to progress in the meantime.

Based on participant feedback, suggested revised versions of the vision and high-level objectives, prepared following the meeting, are presented below.

Original Vision

An integrated, standardized, cross-sectoral pan-Canadian surveillance system in Canada that measures AMR and AMU in human and non-human sectors.

Proposed Revised Vision

An integrated and standardized One Health pan-Canadian surveillance system that measures AMR and AMU in order to guide timely action to protect Canadians from AMR.

Original Objectives

1. Estimate the extent and burden of AMR in various settings by age in humans and by species and age/class in animals
2. Estimate the extent and nature of AMU in various settings by indication and age in humans and by indication, species and age/class in animals
3. Analyze and provide timely reports on trends identified in AMR and AMU data
4. Inform and assess the impact of antimicrobial stewardship and infection prevention and control interventions, including educational efforts
5. Rapidly detect/identify new and emerging AMR of clinical significance
6. Coordinate surveillance activities with the global community

Proposed Revised High-Level Objectives

1. Estimate the extent and burden of AMR in Canada
2. Estimate the extent and nature of AMU in Canada
3. Ensure surveillance of AMR/AMU across Canada is equitable, including in smaller rural facilities and Indigenous communities
4. Analyze and provide timely reports on trends identified in AMR and AMU data, and ensure that data are accessible for use by Canadians
5. Inform and assess the impact of antimicrobial stewardship and infection prevention and control interventions, including educational efforts, regulatory enforcement and benchmarking
6. Rapidly detect/identify new and emerging AMR of clinical significance
7. Coordinate surveillance activities with the global community
8. Maintain public trust in Canadian health systems and animal-based agricultural production

1. Introduction

On January 22nd and 23rd, 2019 the National Collaborating Centre for Infectious Diseases (NCCID) and the Public Health Agency of Canada (PHAC) brought together stakeholders from human health and animal health/agri-food sectors to discuss a vision for a common approach to One Health surveillance in Canada, and to identify what needs to be done to achieve that vision. The meeting was intended to be a key step informing the development of the Pan Canadian Action Plan and a comprehensive blueprint for One Health AMR/AMU surveillance.

The specific objectives of the meeting were:

1) To confirm a vision and objectives for a One Health approach to AMR and AMU surveillance; and
2) To validate current and potential AMR and AMU surveillance actions across sectors and jurisdictions.

NCCID, PHAC and the co-chairs of the F/P/T AMR/AMU Surveillance Task Group planned a one-and-a-half day event (Appendix A) to include representatives from many disciplines and across provinces and territories, as well as delegates from agri-food associations (Appendix B). Catalyst Research facilitated the meeting, and provided valuable suggestions on the meeting structure and flow during planning. The intent was to give meeting participants considerable time to deliberate on priority AMR and AMU actions in small groups. The planning committee recommended the following questions to guide table discussions:

> *Is there anything missing from the overview of current surveillance activities and gaps provided in the presentations?*
>
> *What do you see as the priority actions for the next five years?*
>
> *If additional investments became available in the future, what actions would be more feasible? What actions would become priorities?*
>
> *What are the opportunities for collaboration or an integrated approach across sectors and jurisdictions?*
>
> *What are the timelines for actions, levers for implementation, and actors that should be involved in implementing actions (the doers")?*
>
> *How will success be measured? What are the appropriate performance indicators?*

This report provides a summary of the proceedings. Opening remarks and presentations are briefly described in Part 2. Part 3 provides a detailed description of the comments made by participants during plenary discussions and in the smaller working groups. The final section, Part 4, is a synthesis of the overarching themes that emerged over the course of the two days.

2. Summary of Presentations

Presentations at the outset of the meeting were intended to ensure that participants had a common understanding of current AMR/AMU surveillance systems across sectors, and to propose a draft vision, objectives and priority actions as a starting point for the group discussions.

2.1 Opening Remarks

Bersabel Ephram, Director General of the Centre for Communicable Diseases and Infection Control (CCDIC) at PHAC, opened the meeting. She emphasized the complexity of AMR, and the necessity to work together across sectoral boundaries in order to combat resistance. She underscored the need for a One Health surveillance system that provides timely, accessible and high-quality data and analysis, and presented this meeting as an opportunity to identify the vision and actions required to build upon current systems to address this need.

Yoav Keynan, Scientific Director of the National Collaborating Centre for Infectious Diseases (NCCID), welcomed participants and provided high-level context for NCCID's involvement. Funded by PHAC, NCCID has a mandate to provide knowledge translation of evidence and other information on infectious diseases for public health audiences. NCCID has a long-standing involvement in the area of AMR, and supports networks and opportunities such as this meeting for knowledge exchange; as well as developing new materials and practical resources to help reduce AMR, support appropriate stewardship and use, and bring awareness to the public and practitioners.[2]

2.2 Presentations

1. Stephen Sternthal and Maureen Anderson, co-chairs of the F/P/T Task Group on AMR/AMU Surveillance, presented a draft vision and objectives for a One Health Surveillance system. These may be found in Appendix C.
2. James Brooks, Medical Specialist of the Surveillance and Epidemiology Division, CCDIC, PHAC provided an overview of the current status of federal AMR/AMU surveillance systems in the human health domain.
3. Rebecca Irwin, Head, Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS), Centre for Food-borne, Environmental and Zoonotic Infectious Diseases (CFEZID), PHAC, and Aline Dimitri, Executive Director/Deputy Chief Food Safety Officer, Canadian Food Inspection Agency (CFIA) presented on the current status of AMR/AMU surveillance systems related to animal health/agrifood.

[2] See for example https://centreinfection.typeform.com/to/HpHCYi and https://antibioticawareness.ca/

4. Stephen Sternthal and Maureen Anderson, the co-chairs of the F/P/T Task Group on AMR/AMU Surveillance, presented draft, potential actions for AMR/AMU surveillance over the next five years (Appendix D).

3. Summary of Plenary and Small-group Discussions

3.1 Plenary discussion of presentations

Before breaking into small groups to discuss surveillance actions, participants had an opportunity to comment on the first three presentations in plenary.

Comments regarding the draft vision and objectives (presentation 1)

General comments

- The pan-Canadian Framework was approved within animal and human health sectors at the F/P/T level. Similarly, willingness and commitment to engage on the vision and objectives is required across P/Ts, as the final decision is at the ministerial level. Bringing everyone together to achieve this is a challenge.

Specific comments and suggestions pertaining to the vision and objectives

- Engagement of smaller rural hospitals, which have more resistance and action items to work on, should be included in the objectives
  - AMR-Net and the expansion of CNISP to a broader set of facilities could the opportunity for this engagement
- The vision is missing the purpose of measurement
  - Surveillance enables the ability to be responsive; surveillance is not done for its own sake
  - Data will need to inform stewardship and IPC activities. This could involve benchmarking, regulating, etc.
  - Purpose of measurement is somewhat captured in the objectives, but should be part of the vision
- Data are intended to be used (e.g. education or other action like regulatory enforcement) and this will have bearing on the type and granularity of data that are required
  - CCVO report of AMU in the animal health sector put forwards as a good example that explains how the objectives of surveillance data collection link to the type of data that ought to be collected

Participants made additional comments and suggestions for refining the wording of the vision and objectives.

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Comments regarding presentations on current surveillance systems (presentations 2 & 3)

General comments

- Canada's surveillance systems do not meet international standards.
  - Canada recently received a C+ from GLASS
- Surveillance in agri-food is well-developed at the start and end of the food chain for most major species
- Human health side of surveillance is under-developed compared to surveillance in agri-food sector.
- Stakeholders are unsure of who is doing what, and who is responsible for surveillance. It was then noted that surveillance is a shared responsibility between F/P/T jurisdictions, but that commitments are needed from all stakeholders.
- A question was raised on the authority of the outcomes of the meeting/framework

Comments pertaining to surveillance data and broader action on AMR

- Clinicians are already seeing patients who have run out of antimicrobial options
- The burden of AMR in Canada is unknown
  - Surveillance data are needed to measure the scope of the problem
  - Data on burden can help motivate action in other domains (e.g. stewardship), although the response to AMR is already underway in the absence of data
- It is possible to move forward with antimicrobial stewardship actions regardless of how much data and analysis are available
- Decisions need to be made on the level of precision required to take action

Comments on specific problems or gaps in current surveillance systems and opportunities to address those gaps

Problems or gaps in current surveillance systems	**Current initiatives or opportunities for action**
Surveillance activities are generally limited within sectoral silos, and lack a One Health perspective. Current animal health AMR/AMU surveillance activities were viewed as being based on a concern for human health rather than animal health.	AMR-Net suggested as the platform to bring together (antibiogram) surveillance data across sectors. There were questions regarding its current scope and the feasibility of expanding AMR-Net. Some participants noted that this was initially a pilot, and funding has only recently been provided to expand AMR-Net. Long-term funding may be required to ensure the AMR-Net platform is sustainable.
AMR surveillance data are already collected (e.g. held within labs). The challenge is standardizing and collating existing data. Electronic medical record and lab data are not reported in a format that can be easily summarized to physicians. For example, a CIHR-funded study on *C. difficile* found 84 different ways of reporting a positive test.	

There are currently many surveillance activities. Facilities are frequently asked to participate in several point prevalence surveys.	Coordination of activities is required to prevent overlap and to ensure resources are used more efficiently.
Need for surveillance in remote and isolated areas and from indigenous communities	▪ CNISP is currently working to recruit rural remote hospitals, with a particular focus on Indigenous populations. ▪ Minimal data sets and AMR-Net may provide opportunities for engagement
AMU data for humans are purchased from proprietary sources. Validation of the proprietary data against (gold standard) public plan data from seniors in Ontario found only 80% agreement between these data sources.	Recent regulatory changes mandate reporting of veterinary AMU data. Similar regulations for human AMU data were proposed.
Companion animals have direct interface with the public, but there is limited surveillance in this domain. Thus far, CIPARS is focused on the food chain as the primary focus of exposure.	▪ AMR-Net may eventually incorporate veterinary data to fill this gap. ▪ Research studies are also underway to address this area. ▪ Corporate shift in ownership of small veterinary practices could provide data collection opportunities
There are AMU data in the aquaculture sector but no AMR data.	
There is possible reticence from animal producers to share additional data, due to concerns about how data will be used.	
Knowledge translation to prescribers is important for: ▪ Ensuring their participation in surveillance activities, ▪ Using the end result data	Audit and feedback were suggested as a method for knowledge translation, and it was noted as an effective method for farmers. Deadlines and guidelines can help move the discussion forward Comparative report cards were recommended as a powerful method to communicate surveillance data. Heat maps produced by ECDC based on community-level (bug and drug) data were suggested as an example of the type of data visualization outputs that are useful.

3.2 Discussion on: *Is there anything missing from the overview of current surveillance activities and gaps provided in the presentation?*

<u>Areas where surveillance data are lacking:</u>

- Aquaculture
- Companion animals
- Veal and minor antimicrobial use species
- Surveillance at intermediate points along the food chain, including in abattoirs
    - Data on AMU along the food chain is required
- Environment
- Isolates from long-term care and the community are critical. Smaller, more remote hospitals are needed within CNISP

Comments on additional gaps within current surveillance systems:

- Consideration of economics and behaviour change for AMS
- Understanding of who is responsible for the data, and which users can access and use data
- Data sharing, particularly for linking evidence to decision-making
- Ensuring that the information collected is appropriate to guide actions, such as deciding which antimicrobials to prescribe and information that is meaningful for animal producers. Need to ensure that surveillance is not just for "information's sake"
- Stakeholders need clarity on why data are collected and how data are used. Evidence (surveillance data) is only one component of behaviour change, along with culture and stakeholder knowledge
- Gaps were not explicitly presented, although some were implied in the discussion.
    - The presentations focused on a summary of activities in general. Instead, fulsome listing of gaps would be useful.
- Agricultural producers need alternatives to reduce antimicrobial use (e.g. effective vaccines). Agribusiness and animal welfare concerns must be taken into consideration when policies are changed.
- Targets, benchmarks and methods of measuring success of surveillance systems are required
- Engagement with other pillars is necessary. For example, the stewardship task group is going to require surveillance to demonstrate what interventions work.
- At the surface, many surveillance activities may seem sufficient when they are not. While there have been improvements in some areas, further investments are needed to get approximate baseline data
    - E.g., CIPARS monitors 130 chicken flocks in 5 provinces. Assumptions are required to make inferences from this data. Where there are only a small number of sentinel farms involved in surveillance, trend data only shows progress among those producers
- Data required for a minimum data set likely already exist. The larger issue is that data are not collected in the same manner. Standardizing data will be a challenge.
- Role of confidentiality and maintain trust among those that provide data, especially in the agri-food sector
- Role of resources is also important. CIPARS cannot expand, because of costs involved
- Surveillance of AMR and AMU in the animal health sector should be integrated, in order to understand how AMU in agriculture influences AMR in humans

3.3 Discussion on: *What do you see as the priority actions for the next five years?*

General comments on the actions

- Audience for the actions must be identified
- Actions are written from a Federal point of view. The entry points of beneficiaries are not clear. Will public health decision makers or those from a clinical point of care benefit from these actions?
- Need to be speaking about a system of systems. There is confusion because of the number of different surveillance programs, for a limited number of outcomes, from a limited number of populations
- Actions can evolve over time
- Further focus on the needs of rural and remote communities is needed
- Indigenous communities must be consulted
- Certain surveillance actions are appropriate for horizontal (i.e. multi-sectoral) action, while others are appropriate for vertical action (i.e. actions mostly limited within sectoral silos
    - Surveillance for AMU was considered appropriate for vertical action, while surveillance of AMR was considered appropriate for horizontal action

- Need to be upfront with those providing data. At first data may be used for education, but then it may evolve to regulation and enforcement
    - Those who provide data need to know at what level this will happen (e.g. province versus farm)
    - A larger campaign on the value of surveillance may be needed
- Priority over the next five years is to have baseline data and to be able to provide trend analysis from baseline:
    - Data should be disaggregated to the provincial level at a minimum, with data accessible in a dashboard
    - Provincial-level pilot studies could be used, which could then be used as the basis to roll out to additional provinces
    - Considered sufficient to influence behavior change and engender public trust
    - Provincial-level data could be feasible in the next 3-5 years, after which further granularity may be possible
- Timeliness of data must be considered at the outset. If data are collected nationally, processed, and reported, then reports will be out of data by the time they are released.
- Consolidation of microbiology labs presents an opportunity. Approximately 98% of results are going to these labs, and most are using the same susceptibility tests.
- Fortification of infection control is missing

Comments on the priority/ordering of specific actions put forward:

- Groups had differing opinions in the appropriate ordering of actions:
    - The first 3 actions were viewed as the top priority by two groups
    - The governance body (Action 2) is seen as a pre-requisite for the further action, after which action 1, 4 and 5 are next priorities.
    - Suggestions of actions that can be completed relatively quickly included:
        - Action 1.1
        - Actions related to data standards, and identifying priority organisms (including those that are of importance to animal health)
        - Actions 4 & 5
    - Action 4 was suggested to be moved to be part of Action 1, as case definitions were viewed as necessary for the minimum data set by one group
    - Actions 6 & 7 were viewed as not immediate priorities by one group
    - One group thought that the final actions should be the development of implementation plans and tools for end-users

Comments on the further refinement of existing actions:

Action 1

- Several groups suggested that clarity of the desired capabilities and needs of the surveillance system at a high-level is required. In particular, decisions on how surveillance data will be used for education, policy and action were viewed as necessary before moving forward.
    - Requires ratifying adopting at the F/P/T level, with consultation with industry and indigenous communities
    - International standards as well as Canada's domestic must be considered
- A national priority setting exercise (establishing minimum needs) was suggested, that would allow for regional flexibility
- Blueprint should focus on high-level needs of surveillance, and not on the finer details. This would avoid a situation where the plan is out of date before it's finished.
- Action 1.1: The extent of overlap and common elements between sectors should be considered
- Action 1.2: Data sharing agreements need to be specific about what is needed and why, otherwise we will not have the correct access

Action 2

- Governance structure viewed as important for defining the critical needs of the surveillance system
    - Governance structure should determine what the immediate priorities are versus those that are long term
- Participants put forward a number of characteristics for the governance structure:

    - Collaborative, but with the resources and authority to make an implement decisions
    - Sustainable, with resources to allocate funds to surveillance activities
    - Flexible to allow for multiple regional approaches
    - Linked to other pillars
    - Trans-sectoral
    - Groups had differing views on whether the governance structure was of a technical or policy nature:
        - One group suggested that the governance structure must bring together technical authority and policy authority
        - Another group suggested that a decision must be made whether the governance approach will be a 'top-down' policy approach or a scientific approach
        - There are potential conflicts between actors with a technical authority versus those with a political authority. F/P/T actors will be focused on costs, while those with technical expertise may make recommendations that are not considered feasible.
        - Surveillance systems should include data that are politically important. For example, data from small hospitals are politically important, but viewed as less scientifically important

- Examples of focused governance structures that could be emulated for AMR were:
    - The Canadian Agricultural Partnership (CAP) could be a possible model. CAP has jointly negotiated priorities from F/P/T stakeholders, and is jointly funded at the F/P/T levels
    - Quebec has a governance structure with a mandate that includes the Departments of Health and Agriculture, industry (including farmers and academics).
- Developing such a governance structure could take time (3 years), which some actors were concerned that this might impede action in the interim

<u>Action 3</u>

- Some groups thought that the specific action here should be informed by the blueprint
- Another group suggested that a landscaping exercise must be undertaken to identify:
    - Systems that are working well (e.g., CIPARS). These systems should be expanded (e.g., include further species and sites)
    - Multiple sources of data exist, after which the compatibility of the data can be assessed.
    - Absolute gaps. Novel sources of data could be explored
        - In instances where existing systems are to be modified or new data sources exploited, a piloting/trial approach was recommended to establish trust
- Community AMR surveillance is required, which covers rural and remote Indigenous and non-indigenous communities. Systems must not only cover major urban centers.

Action 4

- Should also include targets and metrics for AMU

Action 5

- Lists of priority organisms and antimicrobials must be reviewed regularly
- These should be 'living documents' and the process for updating should be established
- International requirements need to be considered

Action 6

- Data need to be timely and accessible
- There are potential risks associated with having a single platform. Multiple platforms that can talk to each other via translational tools may be preferred.
- Confidentiality must be considered
- Data entry is a challenge to timeliness. Server or cloud-based data entry can improve timeliness over centralized data entry.
    - Data are owned by jurisdictions, and should be owned and inputted by jurisdictions. The Federal role is to support maintenance of the system, and the production of national reports.
    - Jurisdictions need to have access to inputted data.
        - Real-time access at the level of P/Ts is ideal
    - CNPHI hosted by NML may offer lessons for bridging nominal and non-nominal data.
    - Another model is 'open data' where those that contribute the data have access to it afterwards.
    - Timeliness may need to be incentivized. Timely data entry can deter even motivated actors, due to the work involved.
    - Getting data entered is the bottleneck to expanding CNISP
- When systems are expanded (e.g. to smaller facilities) data must be validated

Action 7

- Genomics will redefine AMR surveillance and make it easier

Proposed additional actions

- Groundwork for linkages to other sectors that are part of One Health (e.g. environment, companion animals, and plants)
    - Although it may not be realistic to start collecting surveillance data from these areas within this timeline, systems must be flexible to integrate data from these areas in the future
- Developing sustainable resources, including core CIPARS funding
    - Further resources are needed to move forward

    - Priority actions can be decided upon first, and then the resource to fund those actions can be secured subsequently
- Research on the linkages between AMU in animals and AMR in human
- Identify and begin surveillance of priority pathogens that are of importance for animal health
- As an additional component to Action 3: Consider opportunities to integrate data from novel sources
    - Would help identify areas of duplication, and fill gaps
    - Data sharing will be a barrier to integrating data from novel sources
    - This action would have implications for action 6
- As an additional component to Action 3: Estimate the burden of AMR in humans

3.4 Discussion on: *Who should undertake what actions over the next 3-5 years?*

In general, participants did not identify who should undertake specific actions, but discussed who should be involved and the overall roles of certain actors. These include:

- Since ministries have the authority, a declaration at the F/P/T level is needed
    - Official statement could help get buy-in from all actors
    - Sectors involved: human and animal health, agriculture, environment and research and industry
- PHAC as the leader and organizer. PHAC could be responsible for:
    - Defining priorities
    - Bringing together representatives from other jurisdictions to articulate their needs
    - Follow-up with stakeholders that don't come to the table, and work to establish trust or provide resources to bring forward missing stakeholders
    - Situating AMR/AMU surveillance within CIDSC/PHAC has risk of having a predominately human-health focus; animal health and other concerns need to be incorporated
- Regional (P/T) participation is viewed as necessary going forward
- Governance structure put forward in Action 2 is required to move forward
    - A One Health Pan-Canadian Plan is needed to look at what can be done across sectors
    - A simple F/P/T model may not be sufficient
- Federal government can set benchmarks and priorities
    - After priorities are set, then other (e.g. AMMI or other experts) can set the case definitions
    - After benchmarks are decided, P/Ts can then figure out what they need to do to meet the benchmarks
    - Benchmarks would impact what other pillars can do with the data, so they would need to be involved.

    - Benchmarks must also consider what P/Ts need from surveillance (e.g. tonnage of AMU is not useful for stewardship).
    - P/Ts can be incentivized through report cards

- Others who should be involved:Food industry
    - Consumer groups
    - Academics/researchers
    - Health professionals
    - Physician groups
    - AMMI
    - Laboratories
    - CNPHI
    - Pharma data (Canadian Animal Health Institute and IMS)
    - CIHI
    - Ethics and data sharing experts
    - Canadian Council of Grocery Distributors

Action-specific comments

- Action 3.2: Regulators (e.g. Health Canada) have a role, as do pharmacists and prescribers.
    - Regulations could be made in parallel for human and animal health
    - What's feasible:
        - In 3 years, sales by P/T from pharmaceutical manufacturers
        - In 8-9 years, P/T data on community prescriptions

3.5 Discussion on: *If additional investments become available in the future, what actions would be more feasible? What action would become priorities?*

General comments

- There was debate on what could be done to improve surveillance systems in the absence of further investments
    - Without additional funding, progress on the proposed actions will be minimal
        - Discussions on reforming AMR/AMU surveillance have been happening for a long time
        - Lack of resources are a major bottleneck to reforms.
    - Others suggested that some actions, could be done with minimal or modest investments:
        - Devising and harmonizing lists of priority pathogens, and agreeing on case definitions
        - Integrating data that already exist

- The source and likelihood of additional funds should be considered. Novel sources of funding (e.g. industry) should be pursued
- AMR needs to be higher on the political agenda to garner the additional funds needed

Suggested priorities if additional funding becomes available:

- Core sustainable funding for existing systems (particularly CIPARS and CNISP) to maintain their current operations, with additional funds for:
    - Capacity building/training
    - Expansion, including proof-of-concept/pilot studies
    - Improving timeliness of data
- Support of data sharing agreements and industry partnerships
- Education on the value of tracking AMR and AMU to make engagement easier, including support for data/research on the economic impact of AMR
- Funding for pilot projects to generate baseline data or to combine data sets
- Creation of dashboards
- Surveillance in the environment
- Improving data on AMU in humans
- Establishing a governance structure
- Improving international rating and fulfilling international commitments

3.6 Discussion on: *What are the opportunities for collaboration or an integrated approach across sectors and jurisdictions?*

- Broad consensus from participants that AMR surveillance is where there are opportunities for collaboration across sectors ("resistance is resistance")
- Surveillance of AMU could continue to happen vertically (i.e. within sectoral silos)
- Human health side of AMR/U surveillance needed continued dialog and discussion. A national consensus conference was proposed to establish the vision and priority actions specific to human health surveillance. The animal health side of AMR/U surveillance is well developed.
- Competitive grant model discourages collaborative effort
- If there is a clear landscape of what data are there, resources can be targeted more efficiently
- Mandate and resources are needed, otherwise the system will remain fragmented

Specific opportunities for collaboration

- Community-level sentinel sites for joint animal/human surveillance

    - Of particular concern is examining the linkages between AMR/AMU in humans and animals, as this is viewed as a major gap
- Designing a One Health surveillance system for priority organisms
    - *E. coli* suggested as the starting point, as it has the largest burden
    - System could later be extended to other pathogens
- Harmonizing across sectors the vision for how data will be used
- Collaborative scheme with industry and pharma
- Update the NCCID and CCVO reports

3.7 Discussion on: *What are the timelines for actions, levers for implementation, and actors that should be involved in implementing actions ('the doers')?*

General comments

- Content experts and doers are not the same those that have authority to act.
    - Both need to be brought together when making decisions
- Appropriate role of CARSS moving forward
    - Build governance structure?
    - Mechanism to bring people together?
- Across actions, the following actors were identified as 'doers':
    - Continued leadership from CFIA & PHAC
    - Health Canada as the regulator
    - Provinces and jurisdictions for willingness to share data
    - CAHI support reporting
- Consultation and engagement should include:
    - Indigenous communities
    - Health professionals (nurses, doctors, dentists & veterinarians)
    - Commodity-specific associations, including those for minor species
    - Pharmaceutical industry
    - Environmental authorities

Comments on implementation of specific actions:

Each group focused on different actions and aspects of the questions. A summary of the points discussed may be found in the table below:

Action	Timeline	Levers	Doers
Action 1 – Development of the blueprint and implementation plan	Short-term	▪ Environmental scan of who is doing what in surveillance ▪ Environmental scan of lab infrastructure ▪ Environmental scan of environmental surveillance (food safety, water safety)	All actors
Action 1 – Development of the blueprint		▪ Development of a surveillance-only blueprint	▪ An AMR Council representing all pillars ▪ Surveillance task group and content experts ▪ F/P/T stakeholders ▪ Input from industry, academics, and data contributors
Action 1.1 - Work on AMU minimum data set is for agriculture is underway. Currently at the stage of determining who is doing what and where	In progress	Need small focus groups (10 people) to have an overall look at AMU, and what data are there	CAHSS
Action 1, 1.1 & 1.3	Short-term	National consensus conference to establish a One Health partnership and agree upon: ▪ Minimum data set ▪ Commitment to international obligations ▪ Goals for next 3, 5 & 10 years	All actors
Action 1.2		Negotiation of data sharing agreements	F/P/T
Action 2 – Establish a One Health entity/governance structure	Immediate priority		PHAC and CFIA as leaders
Actions 3 – Improve reporting and standardization of AMR data	Short/medium term	Policy levers, such as accreditation standards or regulation (e.g. CPE reportable in some provinces)	Health Canada, P/Ts, PHAC
Action 3.1		▪ Coordinate point prevalence data in hospitals to avoid duplication ▪ CNISP is a good platform for its purpose, but is not designed to be expanded into other setting. AMR-Net is more appropriate.	CNISP, AMR-Net

Action	Timeline	Levers	Doers
Action 3.1 – platform for expansion of AMR surveillance in human health		AMR-Net as the best platform for incorporating surveillance data from private labs, long-term care, and indigenous communities	AMR-Net
Action 3.1 & 3.2	5 years	Compelling private labs to share data	
Action 3.2		Alternative to purchasing AMU data should be considered	P/Ts, CMVA, CAHI
Action 3.3 - National vet AMU data can be disaggregated to the (vet) facility, and heat maps can be created	In progress	Mandatory reporting, although data were available prior to the regulatory change	CAHI
Action 3.3 - Project on dispensing data in underway, but it is not representative. Buy-in for the project is fragile	In progress		CVMA
Action 3.3 Expansion of AMR surveillance in agriculture/animal health: ▪ surveillance at retailers to other provinces ▪ seafood (due to high exposure to pathogens) ▪ consider refinement of farm-level data, focusing on AMU ▪ surveillance of abattoirs (agreements in place) ▪ beef & dairy: framework and development ▪ veal and aquaculture: needs expansion in scope and further investment ▪ veterinary drivers in use: deciding on priority pathogens	Medium term		CIPARS
Action 3: Decide on priorities for action in the human health domain based on risks	Medium-term		
Action 7	Consider genomics early on, even though this is a long-term priority		NML
Other: Improve lab infrastructure and standardize data across labs	Long-term		

3.8 Discussion on: *How will success be measured? What are the appropriate performance indicators?*

General comments

- Policy-oriented scorecards and targets (such as the 90-90-90 HIV treatment targets) were viewed as a good approach for motivating F/P/T authorities
    - Focus could be on human health, by province
    - Funded federally, and directed at provinces
    - Could also be used for infection prevention and control
    - Resource benchmarks (funds spent per 100,000 population) on AMR/AMU surveillance
    - AMMI, IPAC and HealthCare *CAN* should be involved in establishing benchmarks
- There are already many frameworks, blueprints and reports. Measuring success against these is needed
- Consider unintended consequences of interventions on animal health (morbidity and mortality), and access to other whether there are other licensed products and alternatives to licenced products

Performance indicators associated with particular actions:

Action	Performance indicator
Action 1.3	▪ GLASS criteria for organisms used for AMR-Net and CNISP ▪ Improved global rating
Action 2	▪ Existing governance structures assessed o CAHSS o Value chain committees o National animal welfare council ▪ Governance structure established ▪ Governance structure is a competent authority (in line with CODEX requirement)
Action 3 – AMU data	▪ Commitments to share AMU data in place ▪ Dataset able to monitor trends ▪ Improved capacity to do analysis, reporting and dissemination ▪ Data are comparable to other countries ▪ Data disaggregated according to drug-class ▪ # of provinces with data ▪ F/P/T agreements on pharmaceutical dispensing data
Action 3 - others	▪ Data released in a short-time period (<1 year) ▪ Improved global grade ▪ Decisions on priority organisms and antimicrobials (classes) ▪ Data definitions agreed to ▪ Evaluation of feasibility (including scalability) of expanding AMR-Net complete ▪ Data are used to inform decision making related to IPC and stewardship ▪ Tracking who is using data (local (including individual prescribers), P/Ts, and federal ▪ % of labs using the same methods of reporting ▪ % of labs using the same bioinformatics platform ▪ # of provinces with data ▪ % of beds/facilities reported

	▪ Coverage of animal species, and representativeness of lots
Action 4	▪ % of case definitions for organisms of importance to human health ▪ % of case definitions for organisms of importance to animal health
Action 5	Process of adding or removing organisms from the list established

4. Discussion

4.1 Closing Remarks

1) Stephen Sternthal and Maureen Anderson discussed the F/P/T Task Group on AMR/AMU Surveillance's next steps for producing recommendations for the pan-Canadian Action Plan
2) Bersabel Ephram, Director General of CCDIC at PHAC, and Margaret Haworth-Brockman, Senior Program Manager at NCCID, closed the meeting.

4.2 Synthesis of Main Points

There were several areas where principles of agreement began to emerge. These were:

1) There appeared to be consensus that One Health is useful as an organizing principle for AMR/AMU surveillance in Canada. In particular, there was agreement that surveillance of AMR is a priority for joint action across sectors (i.e. horizontal action), while surveillance of AMU can continue within sectors (i.e. vertical action).

   The One Health approach provides opportunities to incorporate concerns for animal health into current surveillance systems, which were primarily designed to protect human health. It was recognized that there is a need to integrate other sectors (e.g. the environment, plant-based agriculture and companion animals) into a One Health AMR/AMU surveillance system, but this was viewed as a long-term objective. In the short- and medium- term, systems should be designed with flexibility so that data from those sectors can eventually be incorporated.

2) There was consensus that AMR/AMU surveillance and agriculture and agri-food is ahead of surveillance in human health. This was attributed to CIPARS having been designed as a planned system from the outset, whereas the multiple human health surveillance systems developed organically.

3) There was a broad consensus that the high-level functions of AMR and AMU surveillance must be elucidated and endorsed by F/P/T stakeholders (political authority) in consultation with industry and indigenous communities. This step was viewed as important, because intentions for how data will be used affect the type, frequency and level of aggregation required. This step

was also viewed as important for facilitating data sharing agreements and getting buy-in from those providing data.

4) The actions put forward were generally viewed as the appropriate actions for the next five years, although some additional refinements, considerations and suggestions were discussed. Some participants were concerned that what can be achieved in that timeframe will be limited by the resources available. In terms of importance, there was some agreement that the first three actions were the top priority. Other actions (pertaining to case definitions and lists of priority pathogens) were suggested as short-term priorities, as these could be done with relative ease.

5) There was interest in using accreditation standards, regulatory measures and report cards/score cards to improve standardization, coverage of reported data, and timeliness of data.

6) There was considerable agreement on the importance of increased resources to support improvements to AMR and AMU surveillance. Many participants felt that meaningful reform would not be possible without increased and sustainable financial resources.

7) Governance and increased resources were widely viewed as foundational actions that will influence the speed and extent of progress in improving AMR/AMU surveillance. Some participants expressed concern that these overarching actions may take time (in the case of governance) or may not be politically feasible (in the case of resources). These participants noted a tension between the importance of bolstering governance and resources, while ensuring that they are not bottlenecks in the interim.

4.3 Proposed Revised and Re-prioritized List of Actions

High-priority and high-impact actions that may take longer to implement

The following revised and re-prioritised actions were viewed as having the largest potential impact on enhancing surveillance. Therefore, participants felt that these actions should be initiated quickly while also noting that implementing such actions could take time. Participants had differing views on the appropriate ordering and prioritisation of Actions 1 and 2.

ACTION 1: Establish a governance structure with access to sustainable resources as the foundation of One Health AMR/AMU surveillance systems[3]

- 1.1 Establish a multidisciplinary surveillance governance structure to coordinate and guide efforts to fill AMR/AMU gaps
- 1.2 Ensure sustainable resources are available to support surveillance systems, including core funding for existing activities*

ACTION 2: Develop a blueprint for national AMR and AMU surveillance with clear objectives for human and animal health / agrifood surveillance, and a plan for implementation

- 2.1 Clarify/Confirm high level capabilities of the desired surveillance system and the needs that it would fulfill*
- 2.2 Establish data-sharing agreements with / between municipal, P/T and federal partners and other stakeholders
- 2.3 Encourage best practices for integrated surveillance are established for international and national guidance documents (e.g. CODEX, WHO AGISAR, OIE, ESVAC, TATFAR), and that Canadian surveillance is calibrated to support international reporting requirements, e.g., GLASS, OIE, etc.[4]

ACTION 3: Expand existing surveillance programs to address gaps in human and animal health/agrifood surveillance

- 3.1 Expand surveillance of AMR to all acute care hospitals, including in rural, remote and northern communities[5]
- 3.2 Explore opportunities for integrating antimicrobial prescription/dispensing or use data from existing sources

[3] The description of this action was modified to reflect incorporating the proposed additional sub-action.
[4] The authors of this report suggest reviewing the wording of the first clause of this action. This suggestion was not discussed during the meeting, but the authors believe that the current wording is ambiguous.
[5] Reference to 'bloodstream infections' was deleted from the action description, based on participant feedback.
*Additional proposed action

- 3.3 Expand surveillance of AMR (clinical and non-clinical) and AMU for all food commodities
- 3.4 Identify new sources of community data in P/Ts/regional health authorities
- 3.5 Consider opportunities to integrate data from novel sources*
- 3.6 Estimate the burden of AMR in humans*
- 3.7 Research the linkages/possible linkages between AMU in animals and AMR in humans*

Medium priority actions which can be completed in the short term

The following actions were viewed as 'quick wins', and could likely be completed with minimal resource investments.

ACTION 4:[6] Establish minimum data set requirements for AMR and AMU in human and animal health/agrifood sectors

- 4.1 Establish agreement on standard case definitions for AMR priority pathogens
- 4.2 Establish minimum data set requirements for AMR and AMU in human and animal

ACTION 5: Regularly review priority organisms and priority antimicrobials lists

- 5.1 Expand reportable pathogens
- 5.2 Establish agreements with P/Ts to continuously review and update priority pathogens (including emerging resistant pathogens) and confirm required data metrics
- 5.3 Identify priority pathogens that are of importance to animal health*

Long-term priorities

The following actions were viewed as long-term priorities. Action 6 was considered to have greater importance than Actions 7 and 8, which were viewed as longer term considerations.

ACTION 6: Develop platforms/tools to capture and make data available (timely, accessible, interactive, etc.).

- 6.1 Establish a web-based, interactive portal to facilitate faster availability of results, and better access to data in a variety of formats to support end users.

[6] Note: This had previously been action 1.1, but was moved here due to comments that this action could be accomplished relatively quickly
*Additional proposed actions

ACTION 7: Develop and implement genomic and bioinformatics tools

- 7.1 Develop and implement genomic and bioinformatics tools for improved characterization to inform early diagnosis and treatment

ACTION 8: Develop linkages to other sectors that are a part of One Health (e.g., environment, companion animals, and plants) [7*]

* Proposed additional action

APPENDIX A: Multi-sectoral Stakeholder Meeting on AMR/AMU Surveillance

January 22 and 23, 2019
Final Agenda

Objectives:
1. To confirm a vision and the objectives for a One Health approach to AMR and AMU surveillance; and
2. To confirm current and potential AMR and AMU surveillance actions across sectors and jurisdictions.

Tuesday, January 22, 2019

10:00 Registration and morning reception *(plenary room 210)*

11:00 Welcome

- Yoav Keynan, Scientific Lead, National Collaborating Centre for Infectious Diseases (NCCID)
- Kim Elmslie, Vice President, Infectious Disease Prevention and Control Branch, Public Health Agency of Canada (PHAC)

Introductions and overview of meeting objectives, agenda and logistics

- Lynne Tyler, Facilitator, Catalyst Research and Communications

11:15 Vision and key objectives for a One Health surveillance system

- Steven Sternthal, Director General, Centre for Food-borne, Environmental and Zoonotic Infectious Diseases, PHAC & Co-chair, F/P/T AMR Surveillance Task Group
- Maureen Anderson, Lead Veterinarian, Animal Health & Welfare, Ontario Ministry of Agriculture, Food and Rural Affairs & Co-chair, F/P/T AMR Surveillance Task Group

11:30 Current status of federal AMR/AMU surveillance systems in the human health domain

- James Brooks, Medical Specialist, Surveillance and Epidemiology Division, Centre for Communicable Diseases and Infection Control, PHAC

11:50 Current status of AMR/AMU surveillance systems related to animal health/agrifood

- Rebecca Irwin, Head, Canadian Integrated Program for Antimicrobial Resistance Surveillance, Centre for Food-borne, Environmental and Zoonotic Infectious Diseases, PHAC
- Aline Dimitri, Executive Director/Deputy Chief Food Safety Officer, Canadian Food Inspection Agency (CFIA)

12:10 Questions and discussion on presentations

- Lynne Tyler, Facilitator, Catalyst Research and Communications

12:30 Lunch

1:10 Discussion of vision and key objectives for a One Health surveillance system

- Lynne Tyler, Facilitator, Catalyst Research and Communications

1:30 Potential actions for the next five years

- Steven Sternthal, Director General, Centre for Food-borne, Environmental and Zoonotic Infectious Diseases, PHAC & Co-chair, F/P/T AMR Surveillance Task Group
- Maureen Anderson, Lead Veterinarian, Veterinary Science and Policy, Ontario Ministry of Agriculture, Food and Rural Affairs & Co-chair, F/P/T AMR Surveillance Task Group

2:00 Prioritize One Health surveillance actions to be undertaken over the next five years

- Small group working sessions

Discussion questions:

1) *Is there anything missing from the overview of current surveillance activities and gaps provided in the presentation?*
2) *What do you see as the priority actions for the next five years?*
3) *Who should undertake what actions over the next 3-5 years?*

3:**30 Break**

3:50 Report back from small groups

4:30 Prioritize One Health surveillance actions to be undertaken over the next five years

- Small group working sessions

Discussion questions:

4) *If additional investments become available in the future, what actions would be more feasible? What action would become priorities?*
5) *What are the opportunities for collaboration or an integrated approach across sectors and jurisdictions?*

5:30 Report back from small groups

6:15 Adjourn for the day

Wednesday, January 23, 2019

7:00 Breakfast *(plenary room 210)*

8:00 Recap discussions from the first day

- Steven Sternthal, Co-chair, F/P/T AMR Surveillance Task Group
- Maureen Anderson, Co-chair, F/P/T AMR Surveillance Task Group
- Lynne Tyler, Facilitator, Catalyst Research and Communications

8:30 Address areas requiring further discussion arising from the first day

- Small group working sessions

9:30 Report back from small groups

10:00 Break

10:20 Identify possible approaches to monitoring and evaluating the implementation and impact of surveillance actions

- Small group working sessions

10:50 Report back from small groups

11:15 Plenary discussion of outstanding items

- Lynne Tyler, Facilitator, Catalyst Research and Communications

12:15 Wrap-up & closing remarks

- Margaret Haworth-Brockman, Senior Program Manager, NCCID
- Bersabel Ephrem, Director General, Centre for Communicable Diseases and Infection Control, PHAC

1:00 Evaluation and adjournment

Appendix B. List of Participants

Aleksandra Wierzbowski	National Collaborating Centre for Infectious Diseases
Aline Dimitri	Canadian Food Inspection Agency
Allison McGeer	Sinai Health System
Ann Chapman	Canadian Institute for Health Information
Cecile Ferrouillet	Faculté de médecine vétérinaire of the University of Montreal
Charles Frenette	McGill University Health Centre
Christian Klopfenstein	Centre de développement du porc du Québec (CDPQ)
Claudia Woronko	Government of Northwest Territories
Corlena Patterson	Canadian Sheep Federation
Gary Garber	Public Health Ontario
Cheryl James	Canadian Food Inspection Agency
Erica Charlton	Canadian Poultry & Egg Processors Council
Gabriela Guigou	Canadian Pork Council
Gregory John German	Health PEI
Hélène Trepanier	Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
Jane Pritchard	British Columbia Ministry of Agriculture
Jean Szkotnicki	Canadian Animal Health Institute
Jessica Minion	Saskatchewan Health Authority
John Fairbrother	Université de Montréal
Jorge Correa	220 Laurier av W. - 930
Joyce Van Donkersgoed	National Cattle Feeders Association
Lynora Saxinger	University of Alberta, Division of Infectious Diseases
Margaret Haworth-Brockman	National Collaborating Centre for Infectious Diseases
Matthew Gilmour	Public Health Agency of Canada
Maureen Anderson	Ontario Ministry of Agriculture, Food and Rural Affairs

Max Trubnikov	First Nations and Inuit Health Branch, Indigenous Services Canada
Megan Bergman	National Farmed Animal Health and Welfare Council
Melissa Dumont	Animal Nutrition Association of Canada
Nicole Le Saux	Association of Medical Microbiology and Infectious Diseases
Paul Gregory Van Caeseele	Cadham Provincial Laboratory, Manitoba Health
Rebecca Irwin	Public Health Agency of Canada
Sarah Leslie Tougher	National Collaborating Centre for Infectious Diseases
Scott McEwen	University of Guelph
Shane Renwick	Canadian Veterinary Medical Association
Simon Otto	University of Alberta, School of Public Health
Steve Leech	Chicken Farmers of Canada
Yoav Keynan	National Collaborating Centre for Infectious Diseases

Appendix C: Draft Vision and Objectives for a pan-Canadian One Health Surveillance System Presented at Meeting

Overall purpose

- Surveillance provides information for action
- Surveillance of AMR and AMU is needed to inform:
    - Stewardship activities to improve AMU in human healthcare and agriculture/veterinary medicine alike in order to reduce unnecessary use and guide judicious AMU
    - Interventions and policy decisions at the local, provincial and federal government levels to help protect the health of Canadians from the threat of AMR

Vision

An integrated, standardized, cross-sectoral pan-Canadian surveillance system in Canada that measures AMR and AMU in human and non-human sectors.

Objectives

1. Estimate the extent and burden of AMR in various settings by age in humans and by species and age/class in animals
2. Estimate the extent and nature of AMU in various settings by indication and age in humans and by indication, species and age/class in animals
3. Analyze and provide timely reports on trends identified in AMR and AMU data
4. Inform and assess the impact of antimicrobial stewardship and infection prevention and control interventions, including educational efforts
5. Rapidly detect/identify new and emerging AMR of clinical significance
6. Coordinate surveillance activities with the global community

Additional considerations

- Maintain public trust in the sustainable production of safe, affordable food from humanely-raised animals
- Clearly outlined roles, responsibilities, and accountabilities for the collection, analysis, and dissemination of these data
- Produce client-focused, granular, timely, and easily accessible results, available to all AMR/AMU stakeholders

Appendix D: Potential Surveillance Actions

As originally presented at meeting

Opportunities for action from the pan-Canadian Framework

- Engage with stakeholders to ensure coordination at all levels to move towards robust and comprehensive surveillance systems with defined objectives and the required capacity for AMR and AMU data collection
- Enhance coordinated, harmonized technical guidance for data collection, collation and comparison, including developing standardized definitions of AMR and priority microorganisms in humans and animals
- Establish coordinated platforms and mechanisms to link AMR and AMU data, in particular from human health, animal health and agriculture sectors

Potential actions identified by the F/P/T task group

ACTION 1: Develop a blueprint for national AMR and AMU surveillance with clear objectives for human and animal health / agrifood surveillance, and a plan for implementation

- **1.1** Establish minimum data set requirements for AMR and AMU in human and animal health/agrifood sectors
- **1.2** Establish data sharing agreements with / between municipal, PT and federal partners and other stakeholders
- **1.3** Encourage best practices for integrated surveillance are established for international and national guidance documents (e.g. CODEX, WHO AGISAR, OIE, ESVAC, TATFAR), and that Canadian surveillance is calibrated to support international reporting requirements, e.g., GLASS, OIE, etc.

ACTION 2: Establish a multidisciplinary surveillance governance structure to coordinate and guide efforts to fill AMR/AMU gaps

ACTION 3: Expand existing surveillance programs to address gaps in human and animal health/agri-food surveillance

- 3.1 Expand surveillance of AMR and blood-stream infections to all acute care hospitals, including in rural, remote and northern communities
- 3.2 Explore opportunities for integrating antimicrobial prescription/dispensing or use data from existing sources

- 3.3 Expand surveillance of AMR (clinical and non-clinical) and AMU for all food commodities
- 3.4 Identify new sources of community data in PTs/regional health authorities

ACTION 4: Establish agreement on standard case definitions for AMR priority pathogens

ACTION 5: Regularly review priority organisms and priority antimicrobials lists

- 5.1 Expand reportable pathogens
- 5.2 Establish agreements with PTS to continuously review and update priority pathogens, including emerging resistant pathogens and required data metrics

ACTION 6: Develop platforms/tools to capture and make data available (timely, accessible, interactive, etc.).

- 6.1 Establish a web-based, interactive portal to facilitate faster availability of results, and better access to data in a variety of formats to support end users.

ACTION 7: Develop and implement genomic and bioinformatics tools

- 7.1 Develop and implement genomic and bioinformatics tools for improved characterization to inform early diagnosis and treatment