Canadian Academy of Health Sciences
Académie canadienne des sciences de la santé

Antimicrobial Resistance/ Antimicrobial Use in Food-Producing Animals in Canada:

Summary Report

March 2025

Antimicrobial Resistance in Canada

Antimicrobial resistance (AMR) represents a profound threat to human and animal health, driven by intricate transmission pathways and interconnections between humans, animals, and the environment. An estimated 15 people per day died in Canada in 2018 due to AMR infections, a number that is expected to increase substantially over time unless urgent action is taken. If AMR continues to increase at the current rate, by 2050, the cumulative loss to Canada's GDP has been estimated to be $388 billion (Council of Canadian Academies, 2019). A key modifiable driver of AMR is antimicrobial use (AMU) across the One Health spectrum. This includes the use of antimicrobials in food-producing animals.

The Canadian Academy of Health Sciences (CAHS), with financial support from the Canadian Food Inspection Agency (CFIA) and the Public Health Agency of Canada (PHAC), conducted the present assessment on AMR and AMU in food-producing animals in Canada. The assessment is intended to support the Pan-Canadian Action Plan on AMR (the PCAP).

The primary charge as worded by the project sponsors (CFIA and PHAC) was as follows: "Given that it is well understood that the overuse and misuse of antimicrobials drives AMR, what are the promising and strategic interventions that can be implemented to further strengthen the prudent use of antimicrobials in food-producing animals in Canada, to mitigate the risk of AMR to human health?" Additional sub-questions were included by the sponsor addressing animal health.

The Assessment on Antimicrobial Resistance/ Antimicrobial Use in Food-Producing Animals

Antimicrobial stewardship (AMS) lies at the core of managing AMR/AMU in food-producing animals and is central to this assessment. As requested by the sponsors, the assessment focused on identifying promising and strategic interventions that could be implemented to further strengthen AMS in food-producing animals in Canada, to mitigate the risk of AMR to human and animal health.

This project spanned a 14-month period (Jan 2024- Mar 2025), and was completed under the guidance of a Chair and a thirteen-member Canadian expert panel representing diverse expertise in AMR/AMU. The assessment was informed by:

1. A review of evidence in the published and grey literature
2. International case studies of policy (and practice) initiatives across 8 jurisdictions
3. A cross-Canadian engagement that included Canadian key informant interviews, virtual engagement sessions, and consumer focus groups

Key Findings: Topic Areas

Fifteen key findings were identified across 7 topic areas. "Key findings" refer to significant or important evidence derived from the academic literature reviews, international case studies, and Cross-Canadian engagement. These topic areas, and the respective Chapters of the main report, included:

- The current state of knowledge of AMR in food-producing animals and transmission of AMR to humans (Chapter 2)
- Antimicrobial stewardship in food-producing animals (Chapter 3)
- Governance, policy, and regulatory approaches to support AMS (Chapter 4)
- Farm-level interventions to reduce the need for AMU (Chapter 5)
- Surveillance of AMR and AMU in food-producing animals (Chapter 6)
- Impacts of interventions to reduce AMU on AMR (Chapter 7
- AMR awareness and education in consumers (Chapter 8)

Detailed key findings are addressed under each respective chapter in the main report. Relevant gaps, including key gaps (i.e. gaps in knowledge, regulations, Federal-Provincial-Territorial (FPT) jurisdictional issues, and practice as compared to other countries) were also identified for each topic area.

All of the key findings align with the actions identified in the PCAP. The greatest areas of alignment are under the surveillance pillar of the PCAP, followed by the stewardship pillar, and the infection prevention and control pillar.

Key findings fell under four major interconnected thematic areas:

1. **Leadership, coordination, and political commitment**
    - There is strong evidence from other jurisdictions that leadership and political commitment at the highest levels of government are essential to motivate all individuals and organizations involved in food animal production to reduce the use of antimicrobials to where benefits are clear and substantial and exceed the risks. Effective coordination is also critical.
2. **Supporting veterinarians and producers in keeping animals healthy**
    - Preventing and controlling infections is crucial to reducing AMU. Biosecurity and evidence-based livestock management practices, effective vaccines and alternative products, and validated AMU decision-making tools are essential for keeping animals healthy so that they require fewer antimicrobials.

3. **Embracing antimicrobial stewardship**
    - The 5R's of AMS encompasses all of the principles that are needed: responsibility to improve antimicrobial drug use, reducing, refining, and replacing AMU when possible, and reviewing the impact of changes on a continuous basis. Antimicrobial stewardship is a helpful framework to bring government, industry sectors, veterinarians and producers together to work collaboratively through a holistic approach to address AMS.

4. **Enhancing surveillance and measurement of AMR in pathogens of veterinary interest and measurement of AMU in food-producing animals to meaningfully evaluate and document our successes and failures**
    - An essential cross-cutting theme is that "we cannot manage what we cannot measure". Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) is an important enabler to Canada's efforts to monitor AMR; however, there are major gaps that would need to be addressed to provide a clearer picture of where we are in Canada with AMR in pathogens of interest to animal health.

Promising and strategic interventions

The expert panel developed five strategic interventions to further strengthen antimicrobial stewardship in food-producing animals in Canada. These strategic interventions were developed based on the fifteen key findings. These actions to support change are not mutually exclusive; individually, each could bring about meaningful change, and collectively they could have a profound impact. Each addresses one or more of the thematic areas identified above; these are put forward for consideration with supporting evidence and potential consequences in the main report (Chapter 9). These interventions form the basis of the steps that could be taken to enhance AMS in food-producing animals in Canada.

- **Strategic intervention 1:** Identify a governance structure to lead and coordinate implementation of the PCAP for food-producing animals
    - ➢ AMR is a complex issue with many involved parties; a full consensus on pathways forward may not always be achievable. Thus, there is a clear and compelling need for a dedicated governance structure including leadership and resources to fully coordinate and implement the next steps required to operationalize the PCAP.

- **Strategic intervention 2:** Adopt farm-level AMU data collection and benchmarking
    - ➢ Countries with strong AMS frameworks use farm-level AMU data as a key component in their overall approach. Without measurement of AMU, it is not possible to determine why some farms / veterinarians / commodity groups / production sectors / or countries use more antimicrobials than others. Without measurement, it is impossible to evaluate whether AMS efforts are effective, or to monitor and document progress.

- **Strategic intervention 3:** Make antimicrobial stewardship the standard of practice for veterinarians
  - ➢ Expansion of the veterinary standard of practice to specifically include AMS, including benchmarking and restricting the use of category I antimicrobials in food-producing animals, would be an important part of a "made-in-Canada approach" to address AMS. This would ensure antimicrobials are used only when the benefits clearly outweigh the risks.

- **Strategic intervention 4:** Restrict the use of Category I antimicrobials in food-producing animals
  - ➢ Québec has successfully restricted the use of Category I antimicrobials in food-producing animals, leading to reductions in their use. Adopting restrictions for Category I use nationally would enhance AMS.

  - ➢ Several specific opportunities would enable reductions in the use of Category I antimicrobials.
    1. *Preventive uses:*
       - Ban the use of all Category I antimicrobials for systemic / injectable or oral use for preventive purposes in food-producing animals.
       - Implement a ban on blanket dry cow therapy with ceftiofur in dairy cows with a move to selective dry cow therapy, wherein treatment with ceftiofur would need to be explicitly justified.
    2. *Therapeutic uses:*
       - Ban the extra-label drug use of Category I antimicrobials for disease treatment in food-producing animals without laboratory evidence that no other treatment option will be effective.
       - Require a written justification based on clinical or laboratory evidence and a written farm-level protocol for use of all Category I antimicrobials already licensed for treatment of specific conditions in food-producing animals.

- **Strategic intervention 5:** Support relevant targeted research to enhance knowledge on application and efficacy of strategies and products to keep animals healthy
  - ➢ Countries that have implemented AMS programs and policies have enhanced biosecurity, effective vaccine programs, and access to effective alternative products. However, there is limited evidence for effectiveness of these strategies and products under current commercial conditions in Canada (see Chapter 5- main report). Additional research that prioritizes promising biosecurity measures, vaccines, and alternative products, with rigorous replication of studies, is essential for building an evidence-based foundation to support effective AMS.

Do we need to set targets in Canada?

Jurisdictional case studies have shown that setting targets and tracking progress using mandatory on-farm benchmarking data are effective at reducing AMU. However, based on our engagement activities, it is anticipated that there would be considerable resistance to setting reduction targets from many involved parties in Canada at this time. The ultimate goal is not meeting a set target, but rather is to reduce the use of antimicrobials to where benefits are demonstrably clear and substantial and exceed the risk.

Conclusion

In the face of the ongoing global threat of AMR to human and animal health, the incentives and motivation for change are clear. There will be no substantial new antimicrobials introduced into food-producing animal agriculture in the foreseeable future. If AMS is to improve for food-producing animal agriculture, a long-term commitment to action is required. This requires the sustained leadership of politicians, veterinarians, organized veterinary medicine, food-producing animal producers and their organizations, regulatory agencies, consumers, and food-producing animal product retailers, and a more effective and focused system of managing this commitment. The promising and strategic interventions outlined above could help bridge the key gaps identified through this assessment, ensure that antimicrobials are preserved as a precious resource for generations to come, and used where the benefits are clear and substantial.

This report was prepared for the Government of Canada in response to a request from the Canadian Food Inspection Agency (CFIA) and the Public Health Agency of Canada (PHAC). It was undertaken with the approval of the Board of the Canadian Academy of Health Sciences (CAHS).

The members of the Expert Panel responsible for the report were selected from among the CAHS fellows and other individuals with expertise in the field to collectively provide both depth and breadth of expertise to inform the issue of AMR/AMU in food-producing animals. Any opinions, findings, or conclusions expressed in this publication are those of the authors, the Expert Panel on the Assessment on AMR/AMU, and do not necessarily represent the views of their organizations of affiliation or employment, or the sponsoring organizations, the CFIA and the PHAC.

Please visit https://cahs-acss.ca/ for the full report.

Glossary

Antimicrobials: "Including antibiotics, antivirals, antifungals and antiparasitics - are medicines used to prevent and treat infections in humans, animals and plants." (World Health Organization, 2024b). In this report, however, the focus is on antibiotics, specifically.

Antimicrobial resistance: "Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. AMR occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result, the medicines become ineffective and infections persist in the body, increasing the risk of spread to others." (World Health Organization, 2024b)

Antimicrobial stewardship: "A concept relevant to and applicable by all (individuals, communities, and institutions) [scope and scale], aiming at using and prescribing antimicrobials in humans, animals and the environment in a way that ensures the availability of antimicrobials for individuals in the present day, as well as preserving antimicrobial effectiveness for current and future populations [collective and temporal responsibility]. The operationalisation of stewardship includes considerations of whether antimicrobials should be used, the ways in which antimicrobials are used, as well as the broader context within which these decisions are made [contextual contingency]." (Hibbard et al., 2024)

Antimicrobial use (veterinary context): "means the administration of an antimicrobial agent to an individual or a group of animals to treat, control or prevent infectious disease:

- to treat: means to administer an antimicrobial agent to an individual or a group of animals showing clinical signs of an infectious disease;
- to control: means to administer an antimicrobial agent to a group of animals containing sick animals and healthy animals (presumed to be infected), to minimise or resolve clinical signs and to prevent further spread of the disease;
- to prevent: means to administer an antimicrobial agent to an individual or a group of animals at risk of acquiring a specific infection or in a specific situation where infectious disease is likely to occur if the drug is not administered" (World Organization for Animal Health, 2020)

Category I antimicrobials: These antimicrobials are considered of very high importance in human medicine as they meet the criteria of being essential for the treatment of serious bacterial infections and limited or no availability of alternative antimicrobials for effective treatment in case of emergence of resistance to these agents (Health Canada, 2009).

One Health: "An integrated, unifying approach to balance and optimize the health of people, animals and the environment" (World Health Organization, 2017).

References

Health Canada. (2009). *Categorization of Antimicrobial Drugs Based on Importance in Human Medicine*. https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/categorization-antimicrobial-drugs-based-importance-human-medicine.html

Hibbard, R., Mendelson, M., Page, S.W., Pinto Ferreira, J., Pulcini, C., Paul, M.C., & Faverjon, C. (2024). Antimicrobial Stewardship: A Definition with a One Health Perspective. *NPJ Antimicrob Resist*, 2(1), 15. https://doi.org/10.1038/s44259-024-00031-w

World Health Organization. (2017, September 21). One Health. https://www.who.int/news-room/questions-and-answers/item/one-health

World Health Organization. (2024b). *Antimicrobial Resistance*. https://www.who.int/health-topics/antimicrobial-resistance

World Organisation for Animal Health. (2020). *OIE Standards, Guidelines and Resolutions on Antimicrobial Resistance and the use of Antimicrobial Agents*. https://www.woah.org/app/uploads/2021/03/book-amr-ang-fnl-lr.pdf