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Agency of Canada

Agence de la santé
publique du Canada

Canada

Programa Integrado de Vigilancia de la Resistencia Antimicrobiana de Canadá (CIPARS)

Buenas prácticas en la vigilancia integrada de la RAM: uso de la información para guiar intervenciones

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**Reunión de la Red
Latinoamericana y del Caribe
para la Vigilancia de la
Resistencia a los
Antimicrobianos (ReLAVRA+)
Medellín, Colombia
11-13 julio 2023**



PROTECTING AND EMPOWERING CANADIANS
TO IMPROVE THEIR HEALTH

CIPARS “Best” Practices

Development

- iterative
- prioritization vs opportunity
- stakeholder consultation
- pilot studies

Integration

- within CIPARS
- with other programs
- One Health/multi-sectoral/transdisciplinary
- analysis

Communication

- timeliness
- innovation
- audience
- science to policy

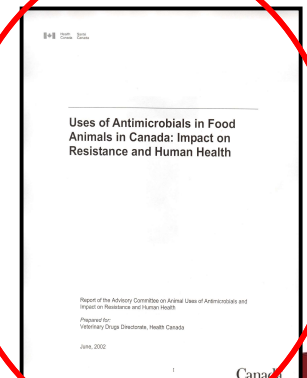
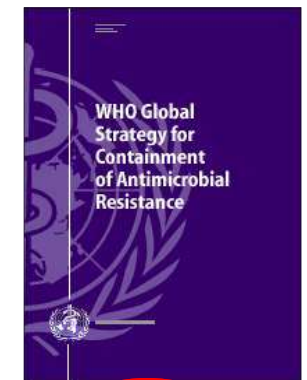
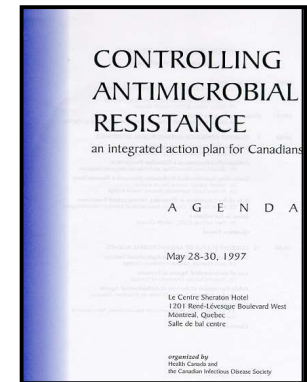
The foundation of CIPARS

Conferencia de Consenso en Montreal, Mayo 1997

2001 WHO Global Strategy for the Containment of Antimicrobial Resistance

Comité Consultivo en el Uso de Antibióticos en Animales y su Impacto en la Resistencia y Salud Humana, 2002 (the “McEwen Report”)

- Diseñar e implementar un programa nacional del monitoreo del uso de antibióticos en la producción animal
- Diseñar e implementar un sistema de vigilancia nacional continuo y permanente de la resistencia a los antibióticos que surga de la producción de alimentos de origen animal



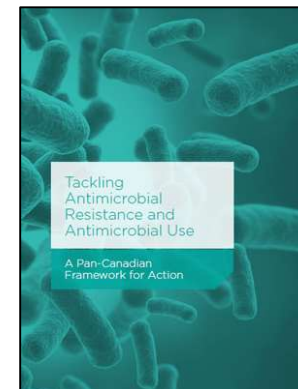
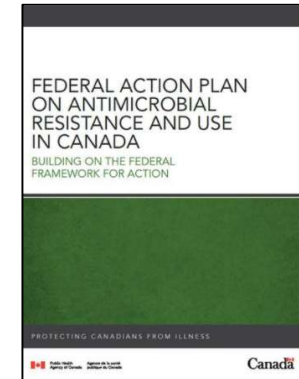
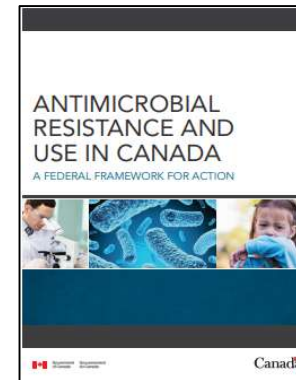
More Recently in Canada...

Federal Framework on AMR & AMU in
Canada (2014)

Federal Action Plan on AMR & AMU in
Canada (2015)

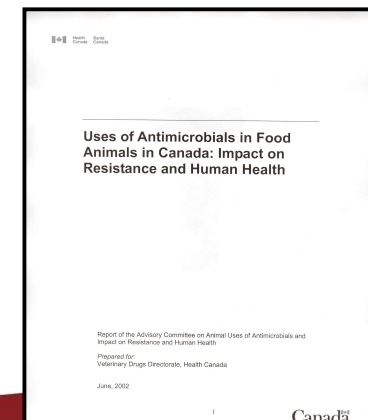
Pan Canadian Framework on AMR
& AMU (2017)

Pan Canadian Action Plan on AMR
(2023)

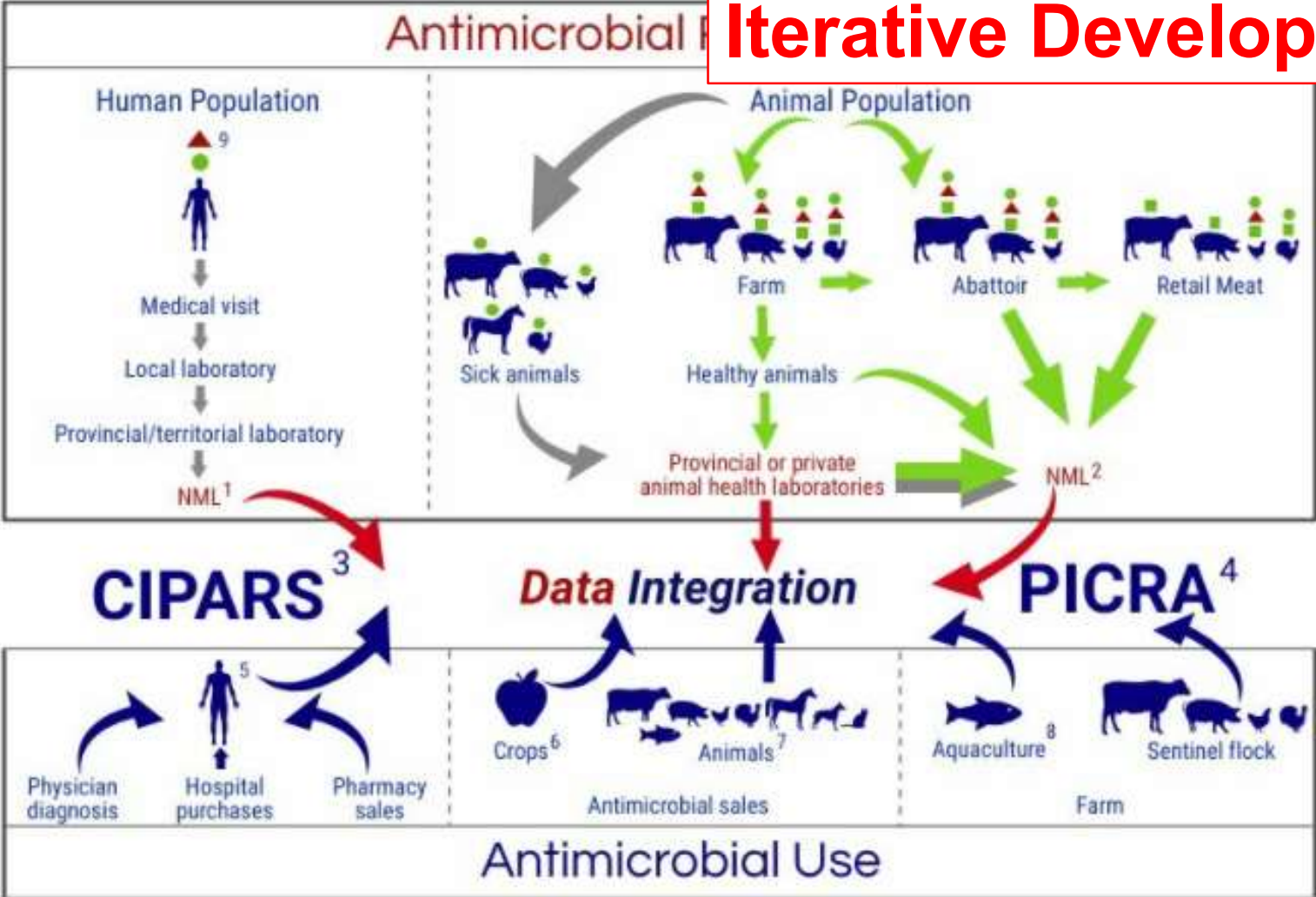


Objetivos de CIPARS (CIPARS Objectives)

- Proporcionar un enfoque unificado para observar las tendencias de AMR y de la utilización de antimicrobianos en los seres humanos y animales (*temporal trends in AMU/AMR in humans and animals*)
- Generar información para facilitar la evaluación del impacto en la salud pública de los antimicrobianos utilizados en los sectores humanos y agrícolas (*public health impact of AMR*)
- Permitir comparaciones internacionales precisas con otros países que utilizan sistemas de vigilancia similares (e.g., E.U.A. (NARMS), Dinamarca (DANMAP))
(*comparison with other surveillance programs globally*)
 - Sensititre Broth Microdilution
 - NARMS panels



Iterative Development



1 National Microbiology Laboratory, Winnipeg, Manitoba, Public Health Agency of Canada (PHAC)
 2 National Microbiology Laboratory, Guelph, Ontario and St-Hyacinthe, Québec, PHAC
 3 Canadian Integrated Program for Antimicrobial Resistance Surveillance, PHAC
 4 Programme intégré canadien de surveillance de la résistance aux antimicrobiens, PHAC
 5 Canadian Antimicrobial Resistance Surveillance System (CARSS), PHAC. Data source : IQVIA
 6 Pest Management Regulatory Agency, Health Canada (HC)
 7 Canadian Animal Health Institute (CAHI); Veterinary Antimicrobial Sales Reporting, HC and PHAC
 8 Fisheries and Oceans Canada
 9 FoodNet Canada, PHAC

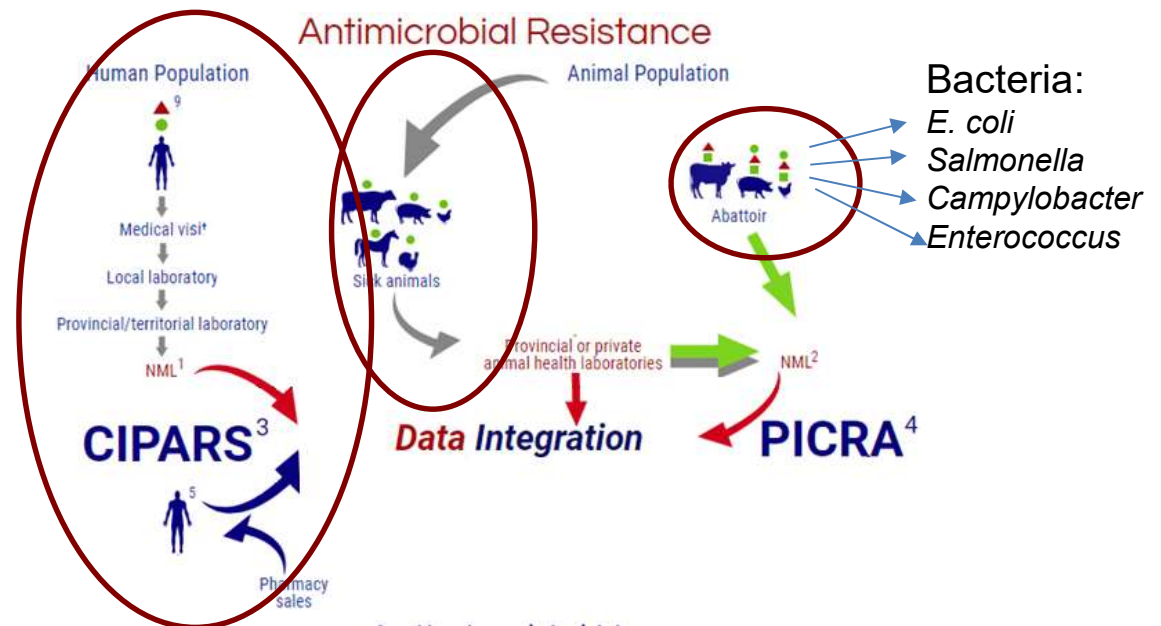
➤ Active surveillance
 ➤ Passive surveillance
 ● *Salmonella*
 ▲ *Campylobacter*
 ■ *Escherichia coli*

Iterative Development

Comienzo sencillo – muy pocos componentes (Simple Beginnings,2002)

CIPARS está dirigido por la Agencia de Salud Pública de Canadá, en colaboración con muchos otros departamentos federales, gobiernos provinciales, la industria privada y la academia.

IMPORTANTE!
Datos limitados en los primeros años → pero fue posible integrarlos



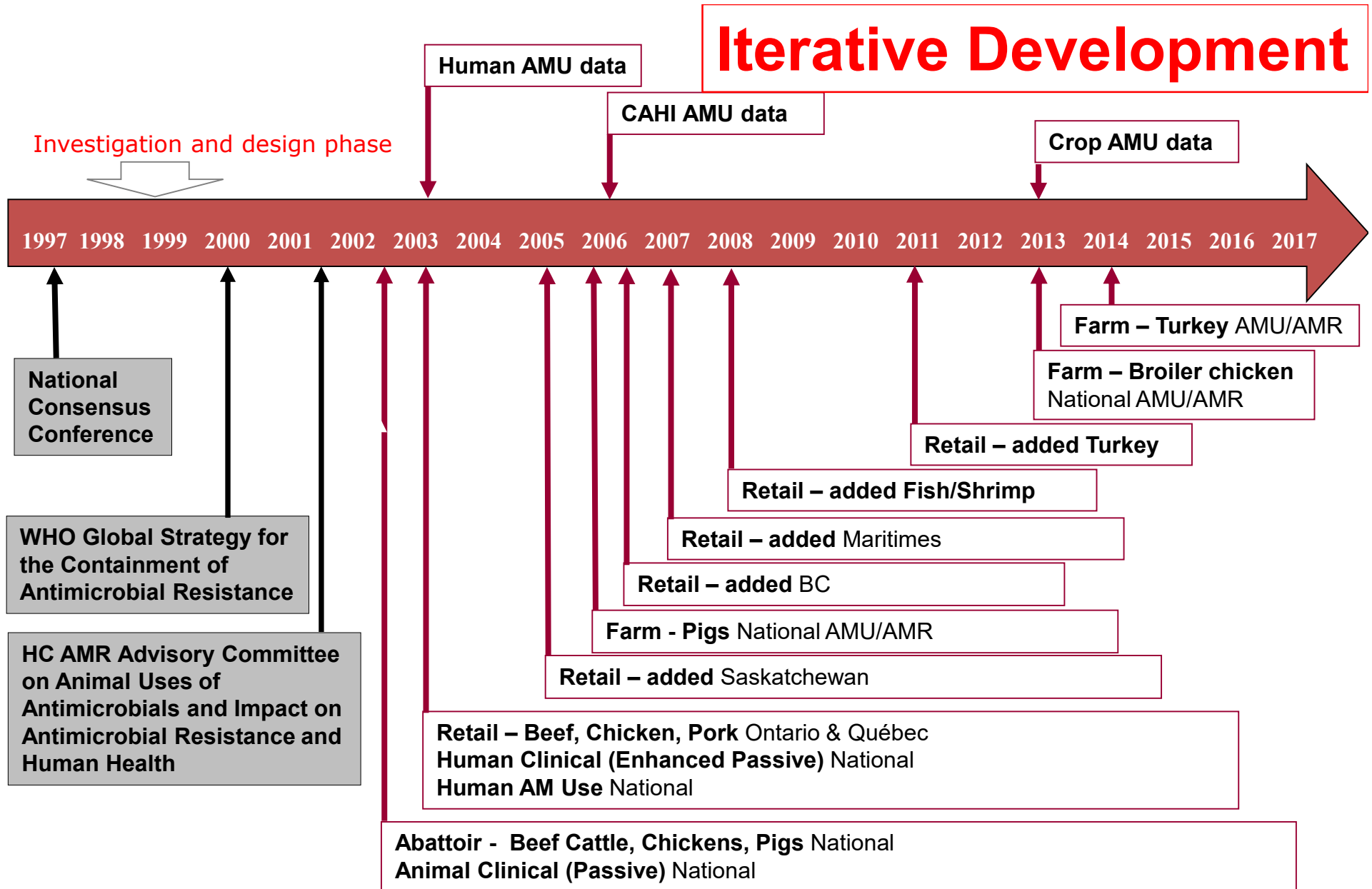
1. Vigilancia en el sector humano

Antimicrobial Use

2. Datos diagnósticos clínicos -
vigilancia en el sector animal

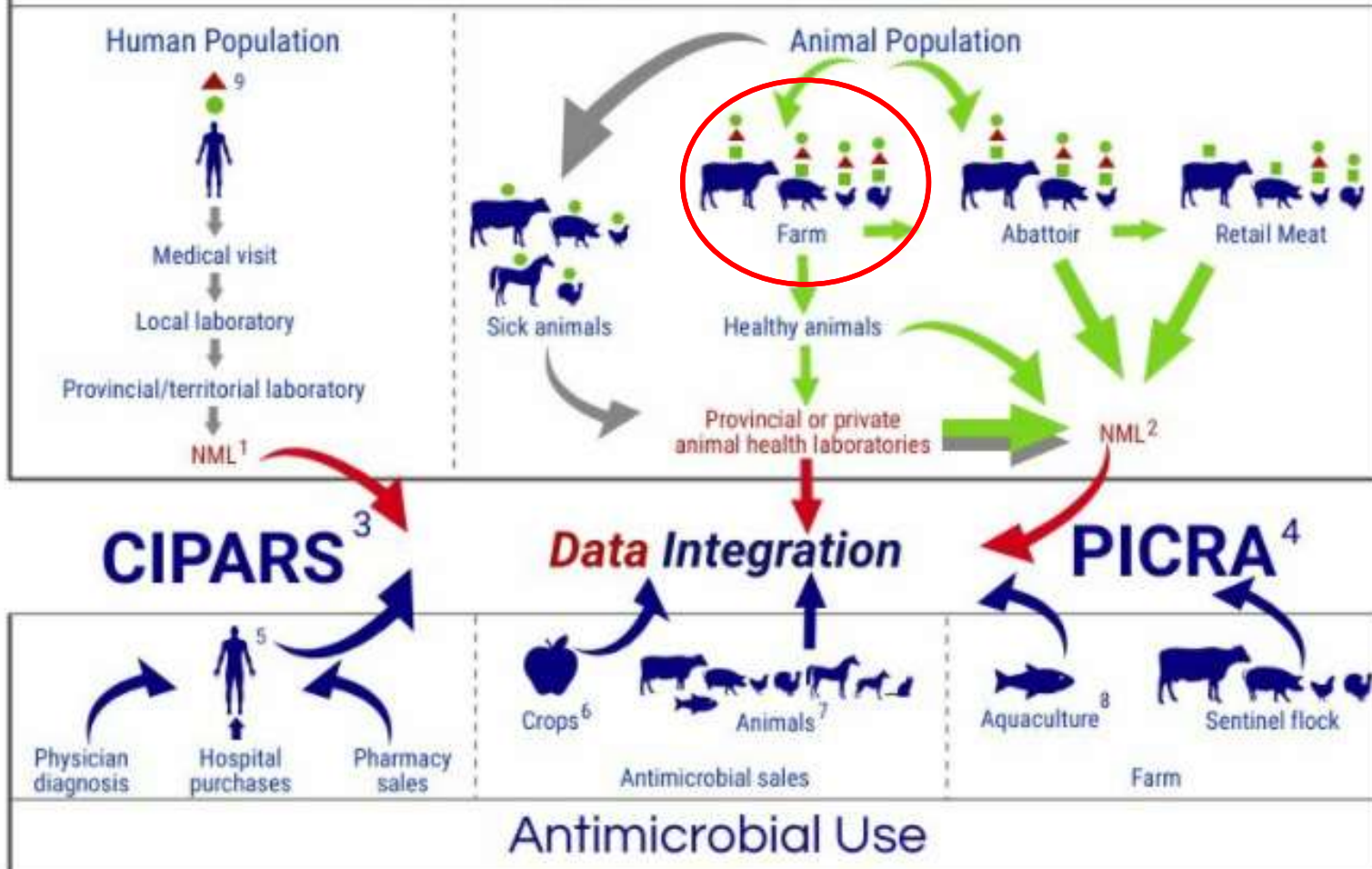
3. Vigilancia en mataderos

Iterative Development



Prioritization vs Opportunity

Antimicrobial Resistance



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➔ Active surveillance

➔ Passive surveillance

● *Salmonella*

▲ *Campylobacter*

■ *Escherichia coli*

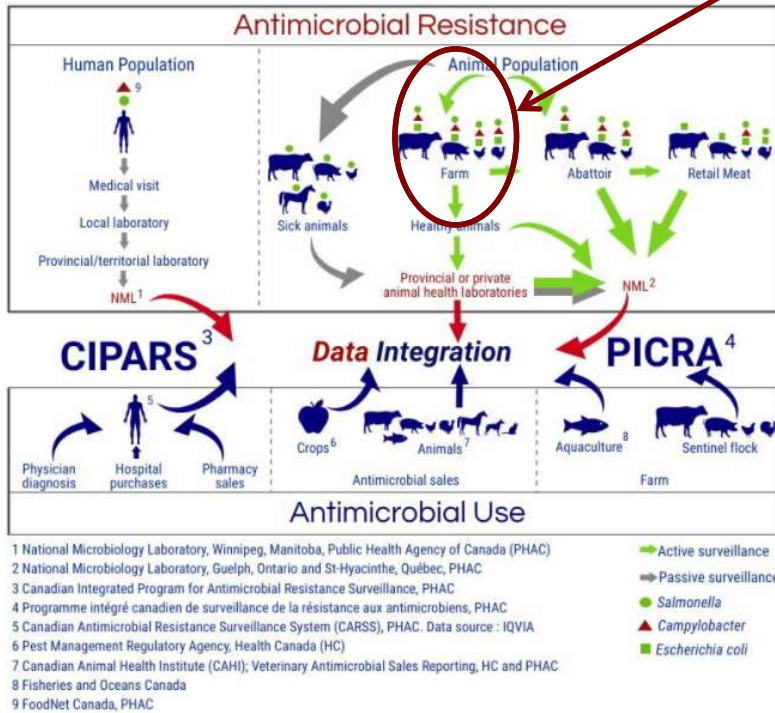
CIPARS Vigilancia en granjas

Development – Stakeholder Consultation

- Developed with extensive consultation with producers, veterinarians, & commodity groups - sustainable & practical program
- Commodities
 - Grower-finisher swine - national (2006)
 - Broiler chickens - national (2013)
 - Turkey - national (2014) - partial grant funded
 - **New: Feedlot Beef - FNC Sentinel Site (2016) → national (2019) - grant/provincial MAF funded 4 years**
 - **New: Dairy - national (2019) - grant funded 4 years**

CIPARS

Vigilancia en granjas Many Partners



**Development –
Stakeholder
Consultation**

- Alberta Agriculture and Forestry
- Canadian Poultry Research Council
- Ontario Ministry of Agriculture, Food and Rural Affairs
- Saskatchewan Ministry of Agriculture
- Sentinel veterinarians
- Participating producers
- Chicken Farmers of Canada
- Provincial Chicken Boards
- Turkey Farmers of Canada
- Provincial Turkey Boards
- Canadian Hatcheries Federation
- Canadian Pork Council
- Provincial Pork Boards
- Canadian Poultry and Egg Processors Council

Pilot Studies

Iterative Development

On-Farm – broiler chickens (ABF, small holder flock), swine, dairy cattle, beef cattle (cow-calf & feedlot), sheep

Abattoir – spent hens, broiler breeders, MRSA, liquid whole eggs

Retail – fish, seafood, veal, lamb, goat, spices, pet treats, raw food diets, MRSA, *C. difficile*

Wildlife – rodents, omnivores (racoons, skunks, opossums), geese, corvids

Companion animals - vet clinics, dog parks, horses

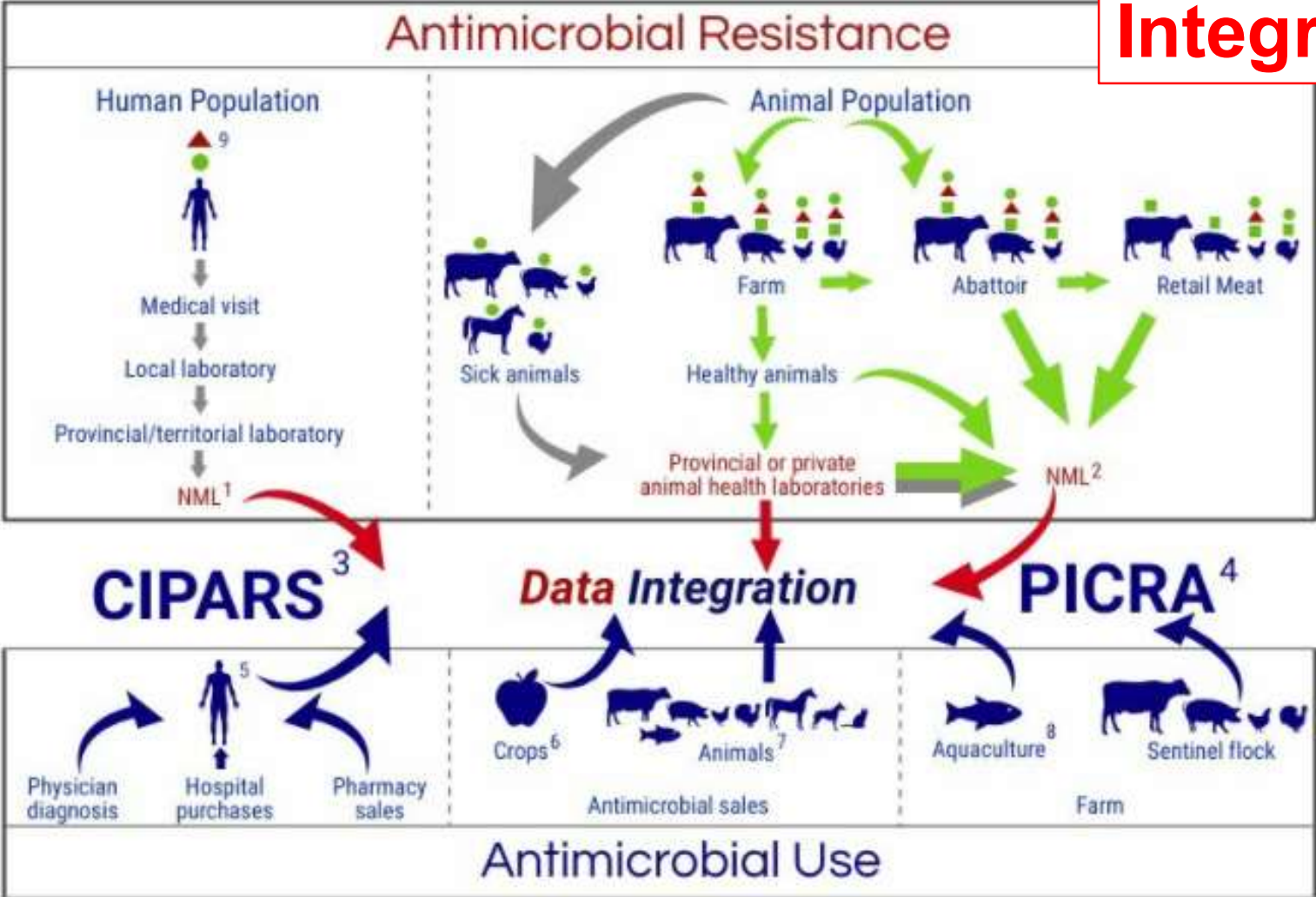
Environment – water, soil

Animal pathogens – bovine respiratory, avian and porcine *E. coli*, *Strep suis*, *C. perfringens*

Human pathogens – *Campylobacter*, UPECs

- Refine cost estimates
- Clarify logistics & protocols
- Build partnerships
- Train highly qualified personnel
- Generate data
- Aid prioritization

Integration

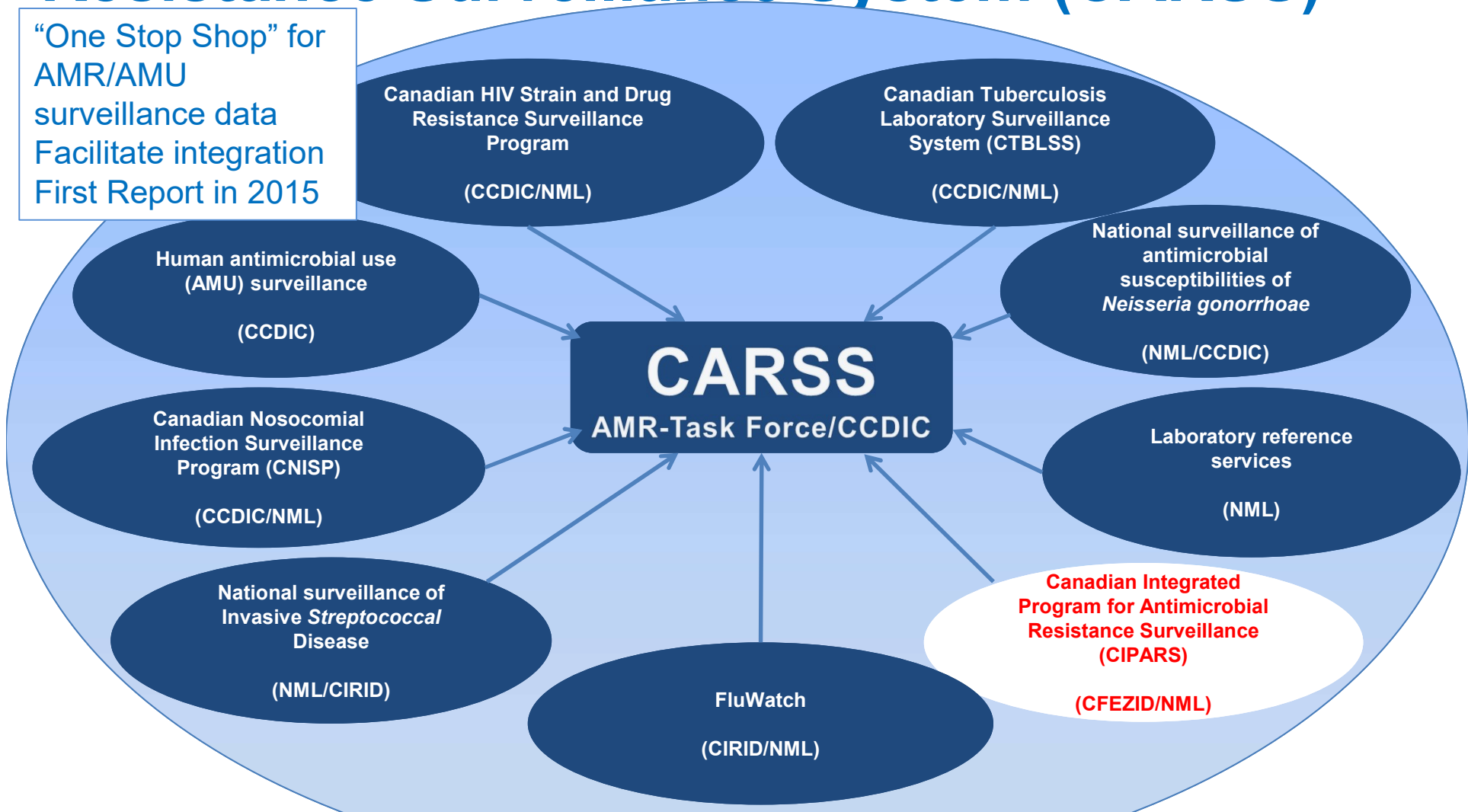


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Canadian Antimicrobial Resistance Surveillance System (CARSS)

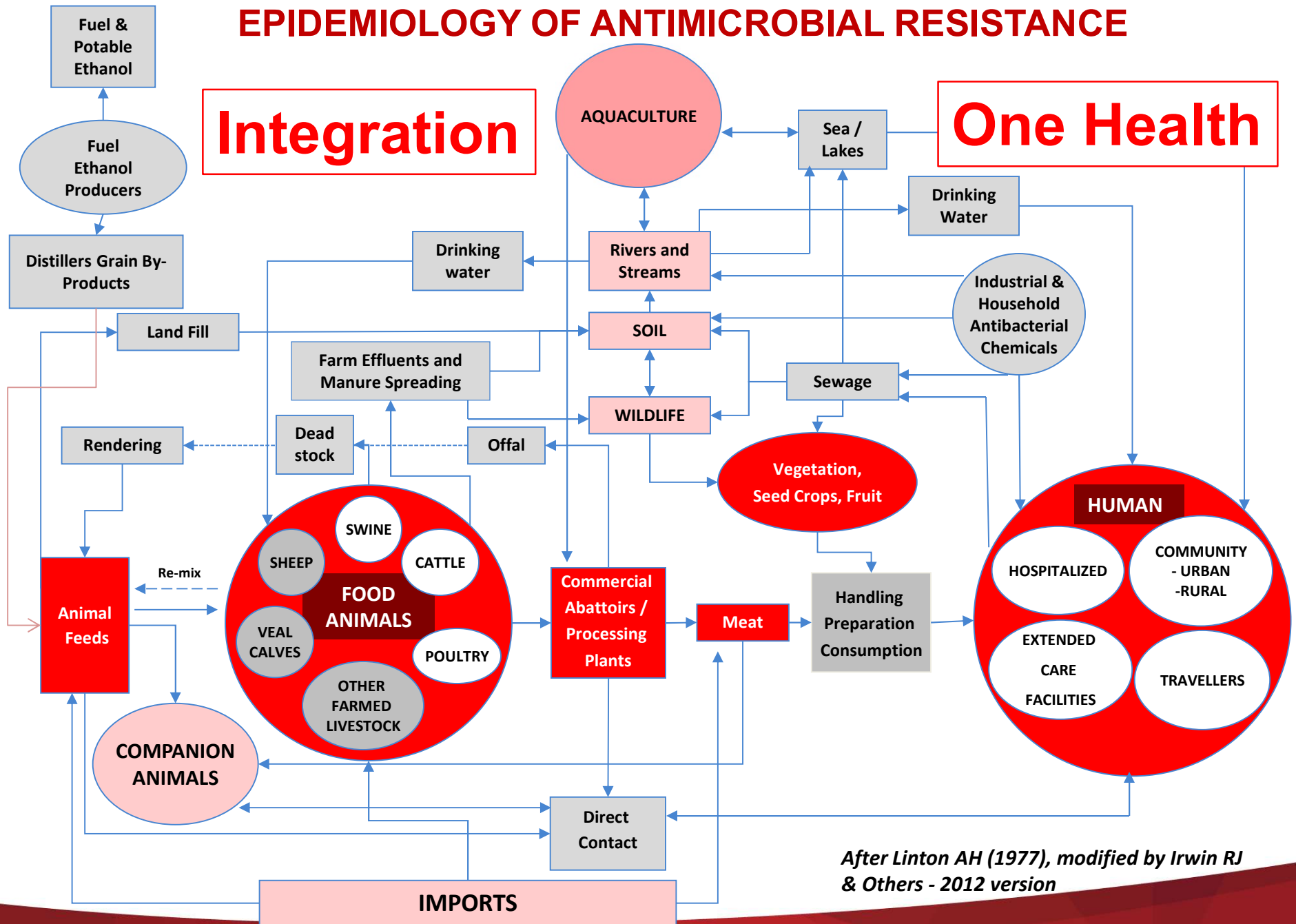
Integration

“One Stop Shop” for AMR/AMU surveillance data
Facilitate integration
First Report in 2015



NML: National Microbiology Laboratory
 CCDIC: Centre for Communicable Disease Infection & Control
 CFZID: Centre for Food-borne Environmental & Zoonotic Infectious Disease
 CIRID: Centre for Immunization & Respiratory Infectious Disease

EPIDEMIOLOGY OF ANTIMICROBIAL RESISTANCE



After Linton AH (1977), modified by Irwin RJ & Others - 2012 version

CIPARS

Integration - Multi-sectoral

- Coordinado por PHAC
 - NML (LNM): Laboratorio Nacional de Microbiología
 - CFEZID: Centro de Enfermedades transmitidas por Alimentos, Ambiente y Zoonosis
- Colaboradores:
 - Health Canada – Veterinary Drugs Directorate & Pest Management Regulatory Agency
 - Canadian Food Inspection Agency
 - Agriculture & Agrifood Canada
 - Dept. of Fisheries and Oceans
 - Ministerios de Agricultura y Salud Pública
 - Academia
 - Industria privada

Integration - Multidisciplinary

CIPARS Staff

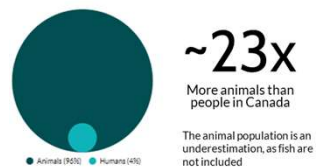
- Microbiologists/Veterinary Microbiologist
- Microbiology Technicians
- Bioinformaticians / Computational Biologists
- Veterinary Epidemiologists / Public Health Veterinarians
 - Commodity/practice experience
 - Risk modelling/risk assessment
- Public Health Epidemiologists & Data Managers
- Biologists
- Project Managers
- Administration

CIPARS – Análisis e integración de información

Integration - Analysis

- Tendencias en UAM/RAM (*Trends in AMU/AMR*)
- Tendencias en RAM entre especies de bacterias, entre y dentro de las poblaciones animales, y con RAM en humanos (*Trends in AMR across bacterial species, across and within animal populations, and with human AMR*)
- Posibles vínculos entre UAM y RAM (*Potential links between AMU and AMR*)
- Detección de nueva resistencia, con énfasis en antimicrobianos de importancia crítica (*Detection of new resistance, with an emphasis on critically important antimicrobials*)

Vigilancia de uso de antimicrobianos



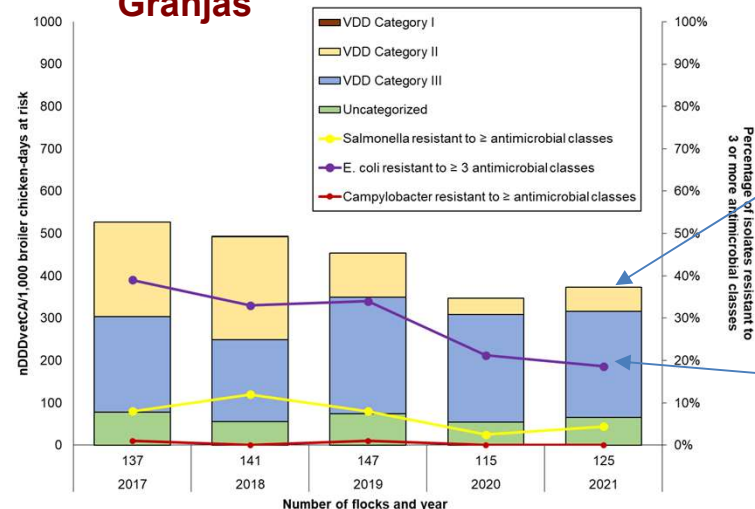
~1.4x

More antimicrobials were sold for use in production animals than humans after adjusting for underlying biomass

Of the antimicrobials sold:

- 78% were intended for **production animals**
- 22% were intended for **humans**
- <1% were intended for **companion animals**
- <1% were intended for **crops**

Vigilancia en Granjas

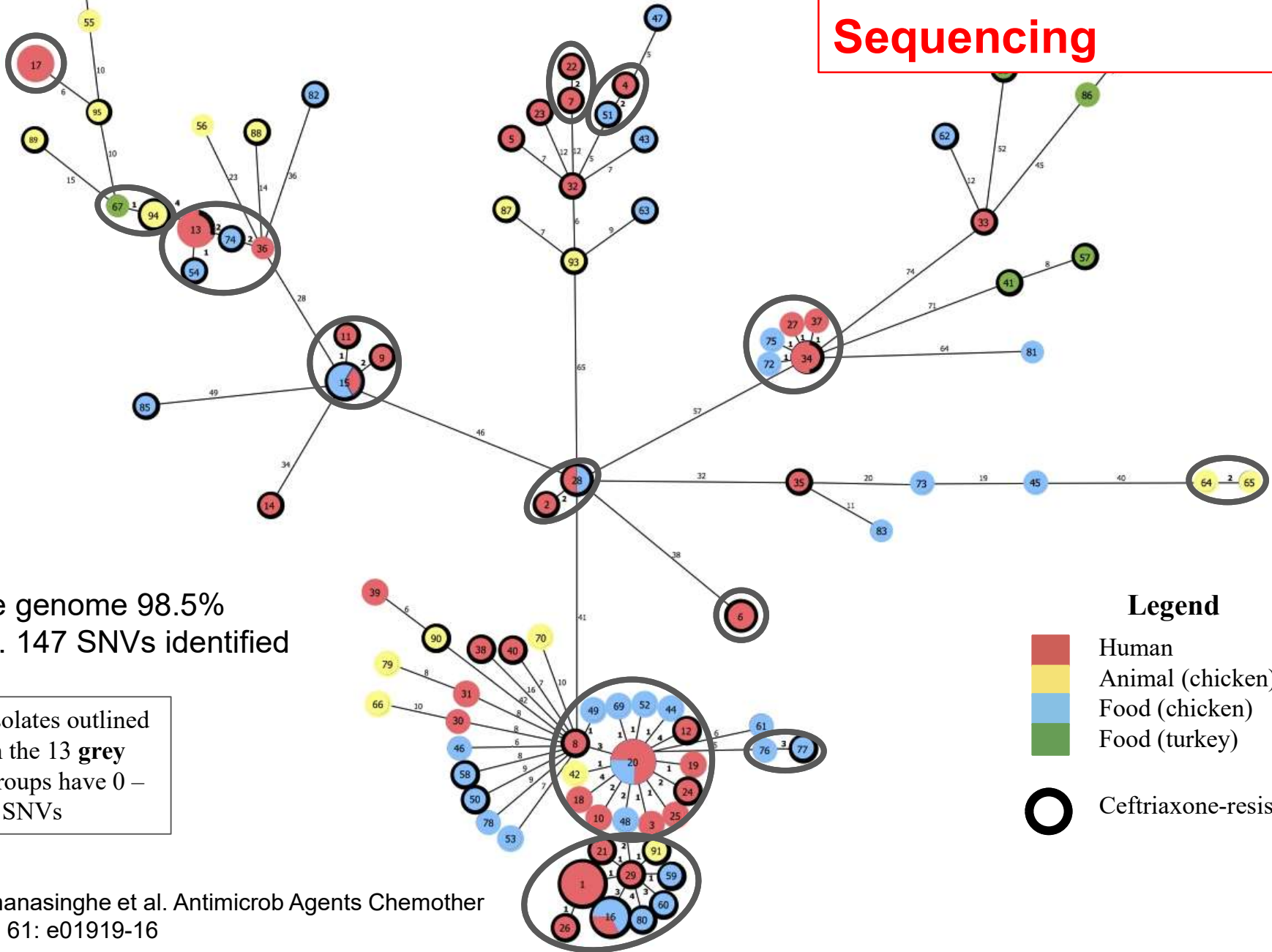


UAM
total de antimicrobianos utilizados

RAM
Resistencia multiclase

Minimum Spanning Tree of *S. Heidelberg* Quebec in 2012 (n=113)

Integration – Whole Genome Sequencing



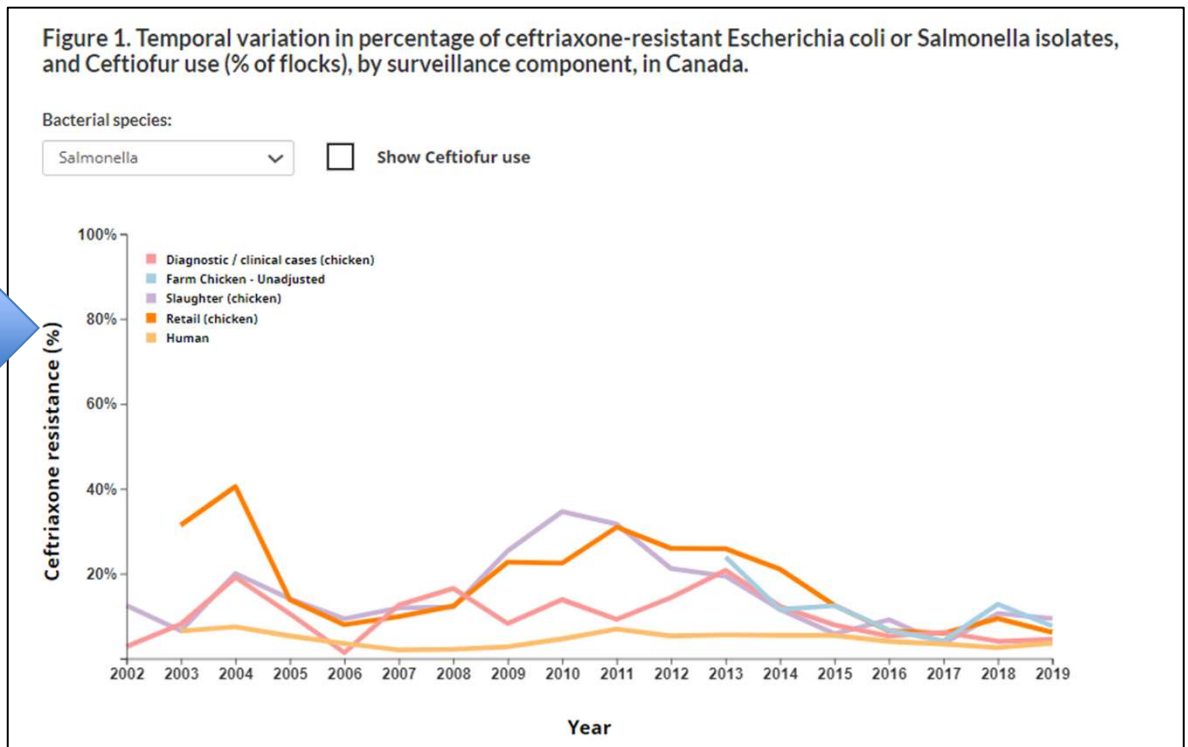
Core genome 98.5%
Max. 147 SNVs identified

Isolates outlined in the 13 grey groups have 0 – 3 SNVs

Communication - Timeliness & Innovation

Reports – hard copies, electronic format (emailed) or downloaded online

Interactive data visualization



Communication - Innovation & Audience

**CIPARS has generated various communication products
in multiple formats**

Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

Surveillance reports

[Publications](#)

[Infographics](#)

[About CIPARS](#)

[Data visualization](#)

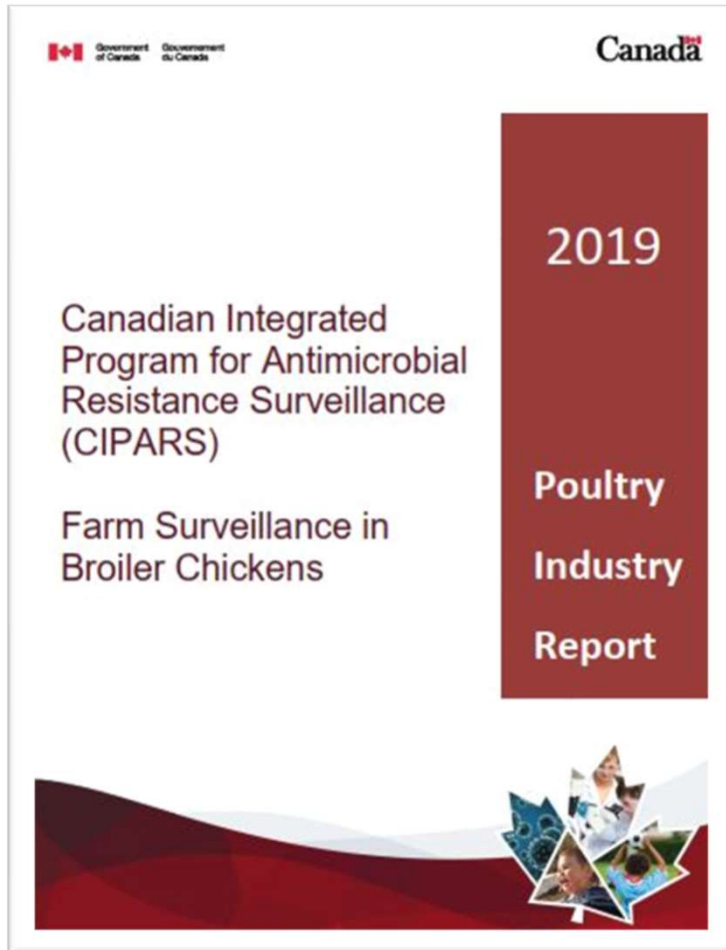
[Design and methods](#)

[Collaborators](#)

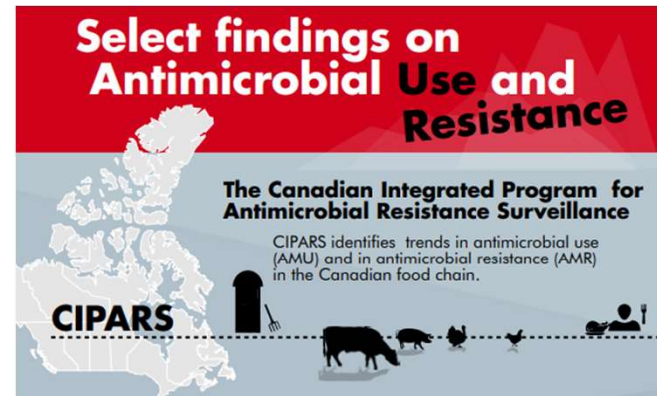
[Resources](#)

<https://www.canada.ca/en/public-health/services/surveillance/canadian-integrated-program-antimicrobial-resistance-surveillance-cipars.html>

Communication - Audience

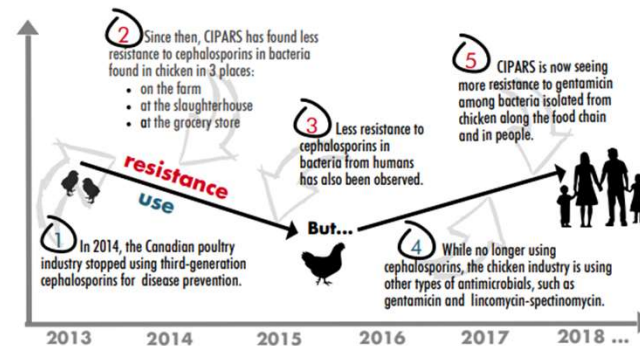


Reports for Stakeholders



The complex battle against antimicrobial resistance Highlights of one important story that CIPARS is following

The Canadian poultry industry is fighting back against antimicrobial resistance



Plain-simple language summaries for the general public



The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

Annual Stakeholder Meeting

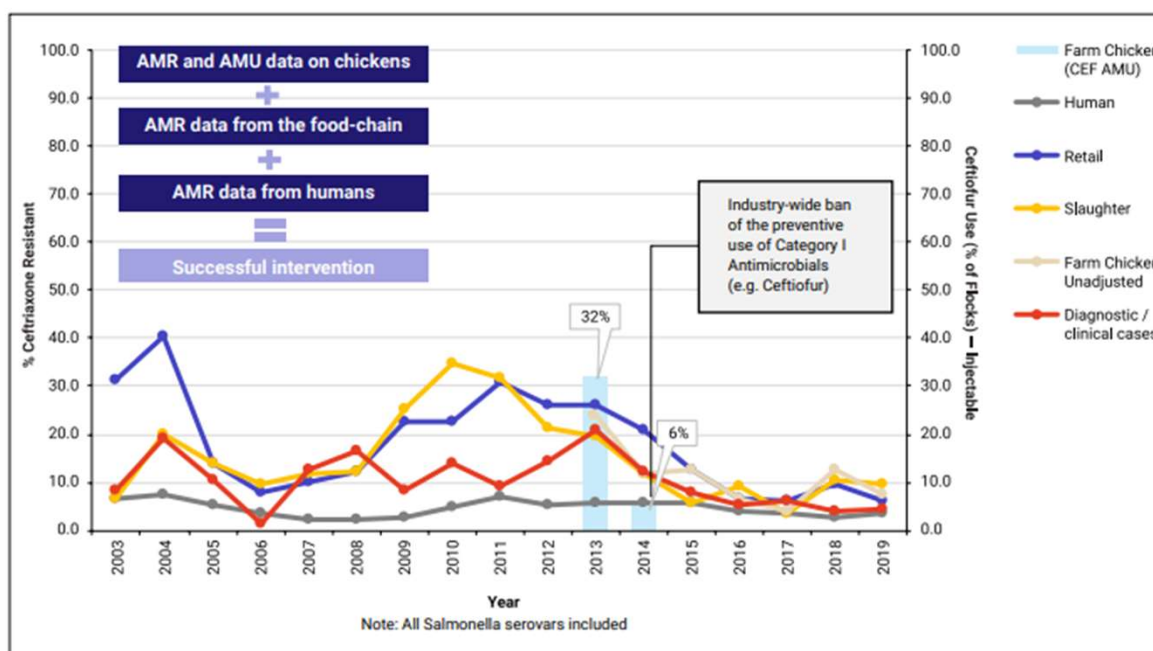
November 21st, 2022



**Communications – Stakeholders
& Science to Policy**

Communications – Stakeholders & Science to Policy

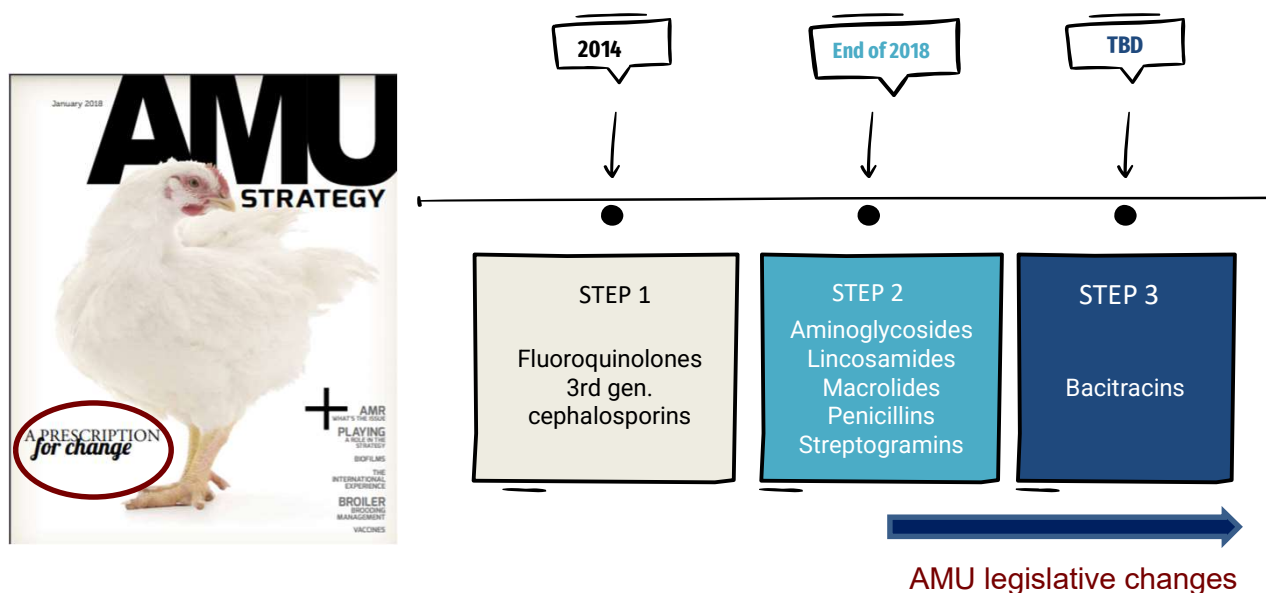
Figure 47. Temporal variation in frequency of ceftriaxone resistance (%) among all *Salmonella* serovars as well as ceftiofur use (% of flocks) by host species (chicken and human) and CIPARS surveillance component, 2003-2019



Source: CARSS 2022 Report. <https://www.canada.ca/en/public-health/services/publications/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-report-2022.html>

Communication – Stakeholders & Science to Policy

Poultry industry – AMR Mitigation Policy



*The strategy involved preventive uses only

** To be determined, ongoing review of the impact

***Enhanced veterinary oversight/veterinary prescription only use, removal of growth promotion claims in some antibiotics, and mandatory reporting of sales and distribution data.

Los impactos de las acciones voluntarias por parte de los productores avícolas

Impacts of voluntary actions by poultry producers



- ↓ resistencia a cefalosporinas de 3ra generación (*resistance to 3rd generation cephalosporins*)
- ↓ resistencia a 3 o más antimicrobianos (*resistance to 3 or more antimicrobials*) (**multidrug resistant bacteria**)
- ↓ uso de antimicrobianos (*antimicrobial use*) (Category I antimicrobials equivalent to World Health Organization's Highest Priority Critically Important Antimicrobials)
- Sin efecto sobre los parámetros de rendimiento de producción (*production performance parameters*)

Communication - Science to Policy


Application: QMRA (Farm-to-fork quantitative risk assessment model for antimicrobial-resistant *Salmonella* Heidelberg in Canadian broiler chickens (Collineau et al , 2020)

International Journal of Food Microbiology 330 (2020) 108559

Contents lists available at ScienceDirect

 International Journal of Food Microbiology

journal homepage: www.elsevier.com/locate/ijfoodmicro



A farm-to-fork quantitative risk assessment model for *Salmonella* Heidelberg resistant to third-generation cephalosporins in broiler chickens in Canada 

Lucie Collineau^a, Brennan Chapman^{a,b}, Xu Bao^{a,c}, Branavan Sivapathasundaram^{a,c}, Carolee A. Carson^d, Aamir Fazil^a, Richard J. Reid-Smith^{b,d}, Ben A. Smith^{a,*}

^a Public Health Risk Sciences Division, National Microbiology Laboratory, Public Health Agency of Canada, Guelph, ON, Canada
^b Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, ON, Canada
^c Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada
^d Food-Borne Disease and Antimicrobial Resistance Surveillance Division, Centre for Food-borne, Environmental and Zoonotic Infectious Diseases, Public Health Agency of Canada, Guelph, ON, Canada

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ACKNOWLEDGEMENTS

**Gracias
a todos**

- **CIPARS/FoodNet Canada – CFEZID & NML**
- **CIPARS Collaborators:**
 - » Human (AMR): Provincial Public Health Laboratories
 - » Farm (AMR and AMU):
 - Poultry & Swine: Participating veterinarians, producers and commodity groups, Sask Ag.
 - Feedlot Cattle Surveillance: Canadian Agricultural Partnership in Alberta and Ontario, Alberta Cattle Feeders, Bayer, Beef Farmers of Ontario, McDonald's, Saskatchewan Agriculture, Saskatchewan Cattle Feeders and Vetoquinol
 - Dairy Cattle Surveillance: Funding provided by Dairy Farmers of Canada Dairy Research Cluster as part of the Canadian Agricultural Partnership
 - » Abattoir & Feed: CFIA, abattoir operators, samplers and personnel
 - » Retail: Participating health units, UPEI, UofGuelph, CCH, AAFC
 - » Clinical Animal Isolates: Provincial Animal Health Laboratories
 - » Antimicrobial Use - distribution in animals and plants:
 - VDD-HC, PMRA-HC, DFO, Canadian Animal Health Institute, IQIVA, commodity groups
 - » Antimicrobial Use - distribution in humans:
 - PHAC - Centre for Communicable Diseases and Infection Control / CARSS, IQIVA
 - » Targeted Studies:
 - Including UofGuelph, UofWaterloo, UofSask, UofMontreal, UofCalgary, UofLethbridge, UBC, AAFC, CSU, Texas A&M, Cornell, Oakridge National Lab, UofGlasgow