Public Health Agency of Canada | Agence de la santé publique du Canada

Canada

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

Annual Stakeholder Meeting

2018 Integrated Findings

November 13, 2019

PROTECTING AND EMPOWERING CANADIANS TO IMPROVE THEIR HEALTH

Agenda and Presentation Outline

- Welcome and technical information
- Program overview
- CIPARS 2018 Integrated Findings
- Future communication product examples
- Summary
- Comments, questions and answers

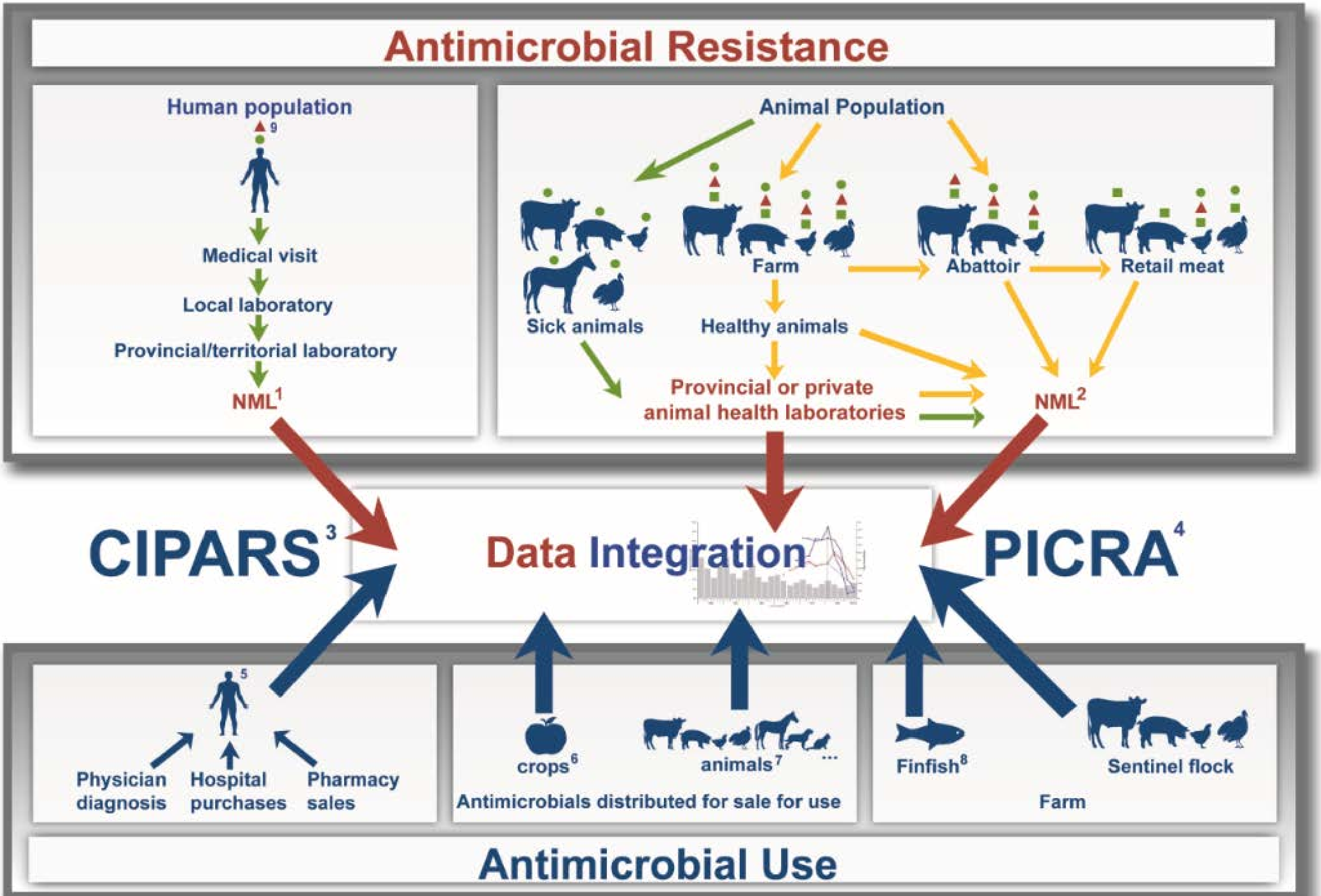
Conducting this teleconference/webinar

- **Presentation**
  - Can be found at this location: https://www.cahss.ca/groups/cipars-national-meeting/
- **Survey/Poll using Menti.com**
  - Please use either your mobile phone or a web browser to access www.menti.com
  - A 6-digit code will be provided to you, and must be entered to access the survey questions
- **Questions and comments**
  - Participants will be able to pose questions in 3 ways:
    1. By posting in the WebEx "chat" window throughout the presentation
    2. Verbally over the phone at the end of the presentation
       - Questions may be asked in preferred language
    3. By email: phac.cipars-picra.aspc@canada.ca
       - Response over next short while (not real time)
- **Data presented are from the 2018 CIPARS Integrated Findings**
  - Additional details are provided in the 2018 Figures and Tables

The purpose of this meeting is to foster exchange of information between collaborators, stakeholders, and CIPARS.

MENTI POLL

PROGRAM OVERVIEW



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

ANTIMICROBIAL CATEGORIZATION

Antimicrobials are grouped into categories based on their importance to human medicine and the potential consequences of resistance to these drugs:

Medically important antimicrobials

Category I: Very high importance

Examples: cephalosporins (3rd and 4th generation), carbapenems, fluoroquinolones.

Category II: High importance

Examples: macrolides, penicillins.

Category III: Medium importance

Examples: aminoglycosides, tetracyclines.

Category IV: Low importance

Examples: ionophores, chemical coccidiostats, flavophospholipids.

Antimicrobials of low importance (Category IV, with the exception of flavophospholipids) were removed from the integrated AMU reporting. Data will be available in other CIPARS products.

Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

2018 Integrated Findings

CIPARS Canadian Integrated Program for Antimicrobial Resistance Surveillance

Programme intégré canadien de surveillance de la résistance aux antimicrobiens PICRA

Government of Canada Gouvernement du Canada

01 | ANTIMICROBIAL USE (AMU)

- Antimicrobial sales **increased** between 2017 and 2018.
- Farm surveillance showed a **reduction of use** in 2018 compared with 2017 data in broiler chickens, with some provincial variations.
- For pigs, AMU has significantly **decreased** overall and substantially in some provinces.
- For turkeys, AMU has **increased** overall with some provincial variations.

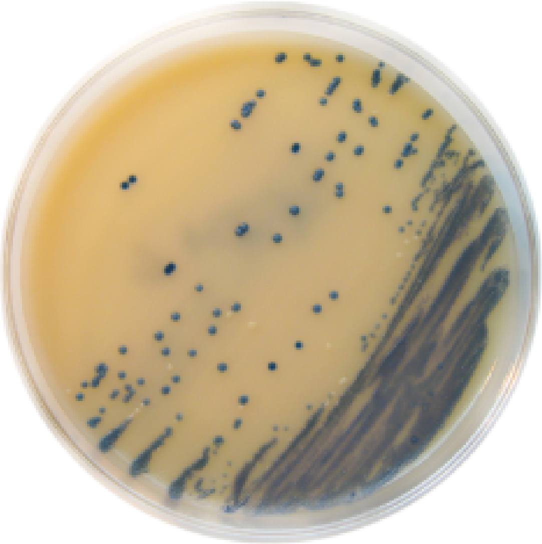
02 | ANTIMICROBIAL RESISTANCE (AMR)

QUINOLONE-RESISTANT *SALMONELLA* ENTERITIDIS

Quinolone (nalidixic acid) resistance in *S.* Enteritidis from agri-food sources is extremely rare, especially from chicken(s).

In 2018, nalidixic acid resistance in *S.* Enteritidis from chickens and chicken meat was detected at levels never observed before by CIPARS.

HIGHLY DRUG-RESISTANT *SALMONELLA*



We observed the **highest number** of highly-resistant *Salmonella* isolates to-date across all human, animal, and food sources in 2018.

Additionally, we isolated highly-resistant *Salmonella* (serovar Infantis) from a chicken source for the **first time**.

03 INTEGRATED AMU AND AMR DATA

CHICKEN AND PEOPLE

The poultry industry intervention to eliminate the use of Category I antimicrobials (including the 3rd generation cephalosporins and fluoroquinolones) for disease prevention appears to reduce AMR in most scenarios.

Ceftiofur Use and Ceftriaxone Resistance

- There has been no reported ceftiofur use in broiler chickens since 2015.
- In most scenarios, there has been a reduction in ceftriaxone (a 3rd generation cephalosporin) resistance in both *E. coli* and *Salmonella* recovered from chickens, and *Salmonella* isolates recovered from people.
- However there was an increase in ceftriaxone-resistant *Salmonella* from chickens on farm.

Fluoroquinolone-resistant *Campylobacter*

- In 2018, fluoroquinolones were reported for treatment of sick chickens in a single flock in British Columbia.
- Similar to previous years, there were regional differences in the prevalence of fluoroquinolone-resistant *Campylobacter* from chicken and chicken meat.
- Resistance to ciprofloxacin (a fluoroquinolone) was more commonly identified in human *Campylobacter* isolates and retail chicken from **British Columbia** compared to Alberta and Ontario.

Integrated Antimicrobial Use Data

COMPARING HUMANS, ANIMALS, AND CROPS

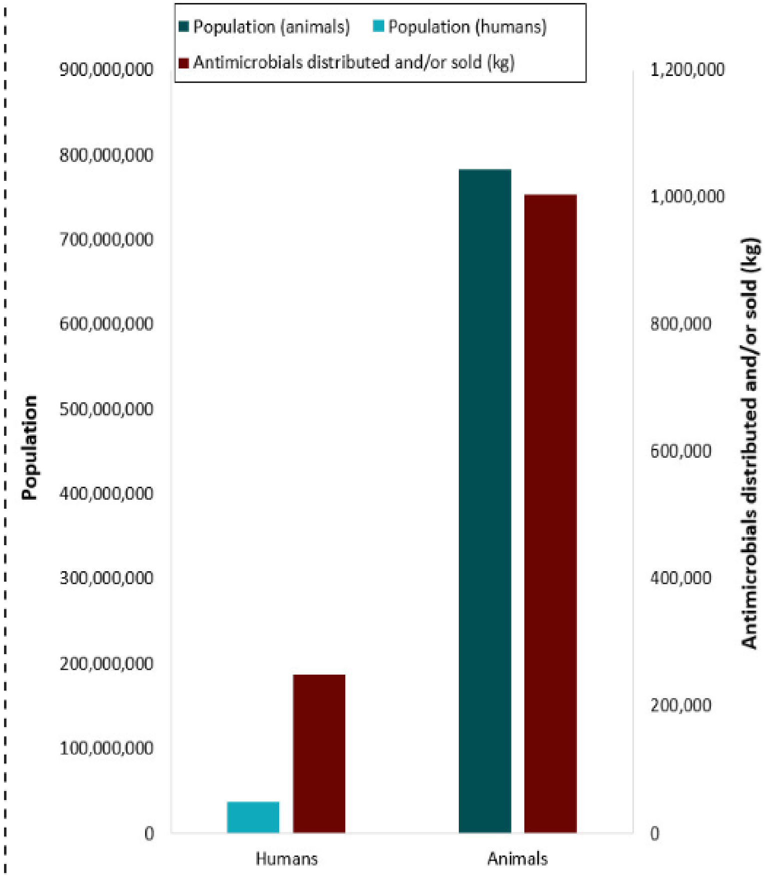
COMPARING HUMANS, ANIMALS, AND CROPS

5%

INCREASE IN TOTAL QUANTITY OF ANTIMICROBIALS (ADJUSTED BY BIOMASS) DISTRIBUTED FOR USE IN PRODUCTION ANIMALS SINCE 2017 AS A RESULT OF INCREASED SALES OF TETRACYCLINE.

~1.4x

MORE ANTIMICROBIALS WERE DISTRIBUTED FOR USE IN ANIMALS THAN HUMANS AFTER ADJUSTING FOR UNDERLYING BIOMASS IN 2018.



21x

MORE ANIMALS THAN PEOPLE IN CANADA IN 2018.

Note: This is an underestimation, as fish are not included in the animal estimate.

Of the antimicrobials distributed or sold* in 2018:

78% were intended for **production animals**

21% were intended for **humans**

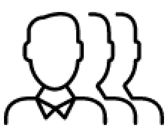
1% were intended for **companion animals**

<1% were intended for **crops**

*Animal distribution data currently do not account for quantities imported as active pharmaceutical ingredients intended for further compounding; hence, these are underestimates of total quantities used.

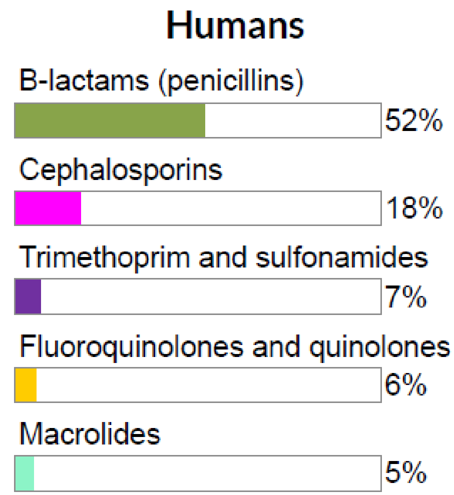
For both humans and animals, the β-lactams (penicillins) were one of the main antimicrobial classes distributed/sold on a per kg of antimicrobial basis.

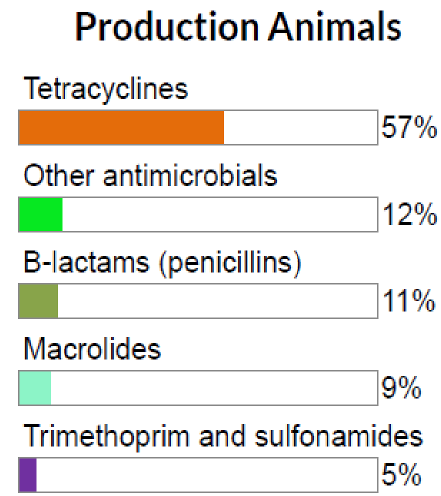
Similar antimicrobials were licensed for use in humans and animals; however, some antimicrobial classes were sold or distributed more for use in humans than animals and vice-versa.

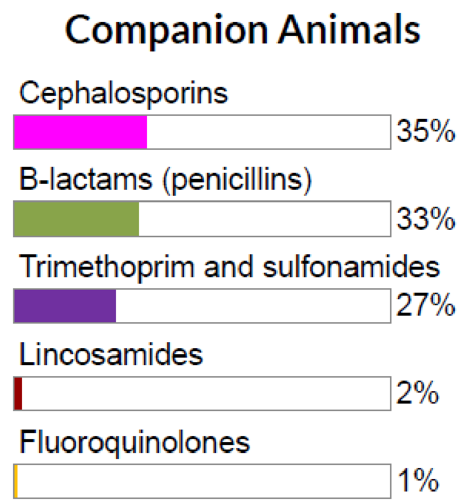


The relative quantity of cephalosporins and fluoroquinolones intended for use in people is higher compared to animals (~7x and 25x higher for people, respectively).

Tetracyclines are used predominantly in production animals.







Notes:

1. Cephalosporins are β-lactam antimicrobials, but we are displaying them separately for visualization purposes.

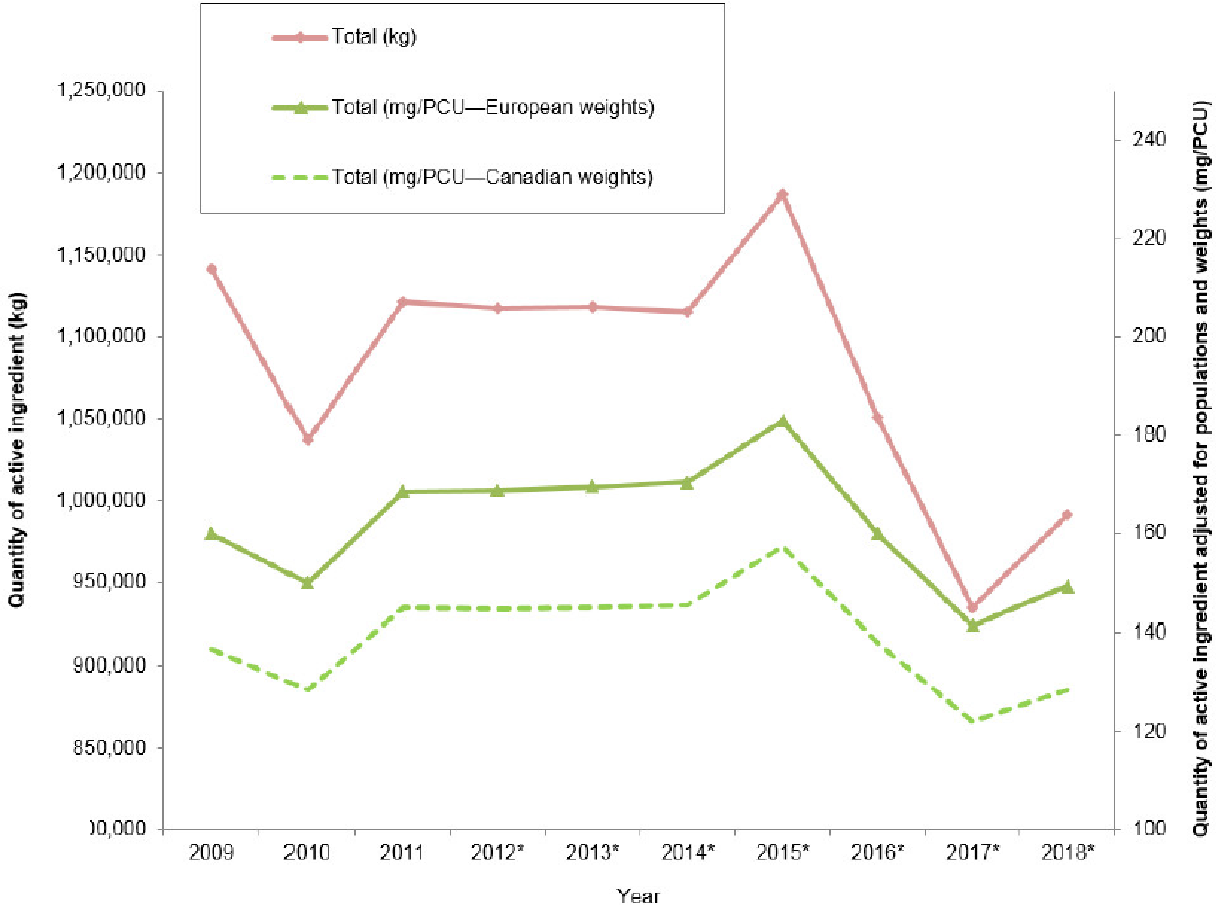
2. The percentages are based on total kilograms of active ingredients intended for use in that host species.

3. Other antimicrobials for animals: avilamycin, bacitracins, bambermycin, chloramphenicol, chlorhexidine gluconate, florfenicol, fusidic acid, novobiocin, polymixin B, tiamulin, and virginiamycin.

4. Other antimicrobials for humans: bacitracin, chloramphenicol, colistimethate, colistin, daptomycin, fidaxomicin, fosfomycin, fusidic acid, linezolid, methenamine hippurate, methenamine mandelate, metronidazole, nitrofurantoin, polymyxin B, quinupristin/dalfopristin, vancomycin.

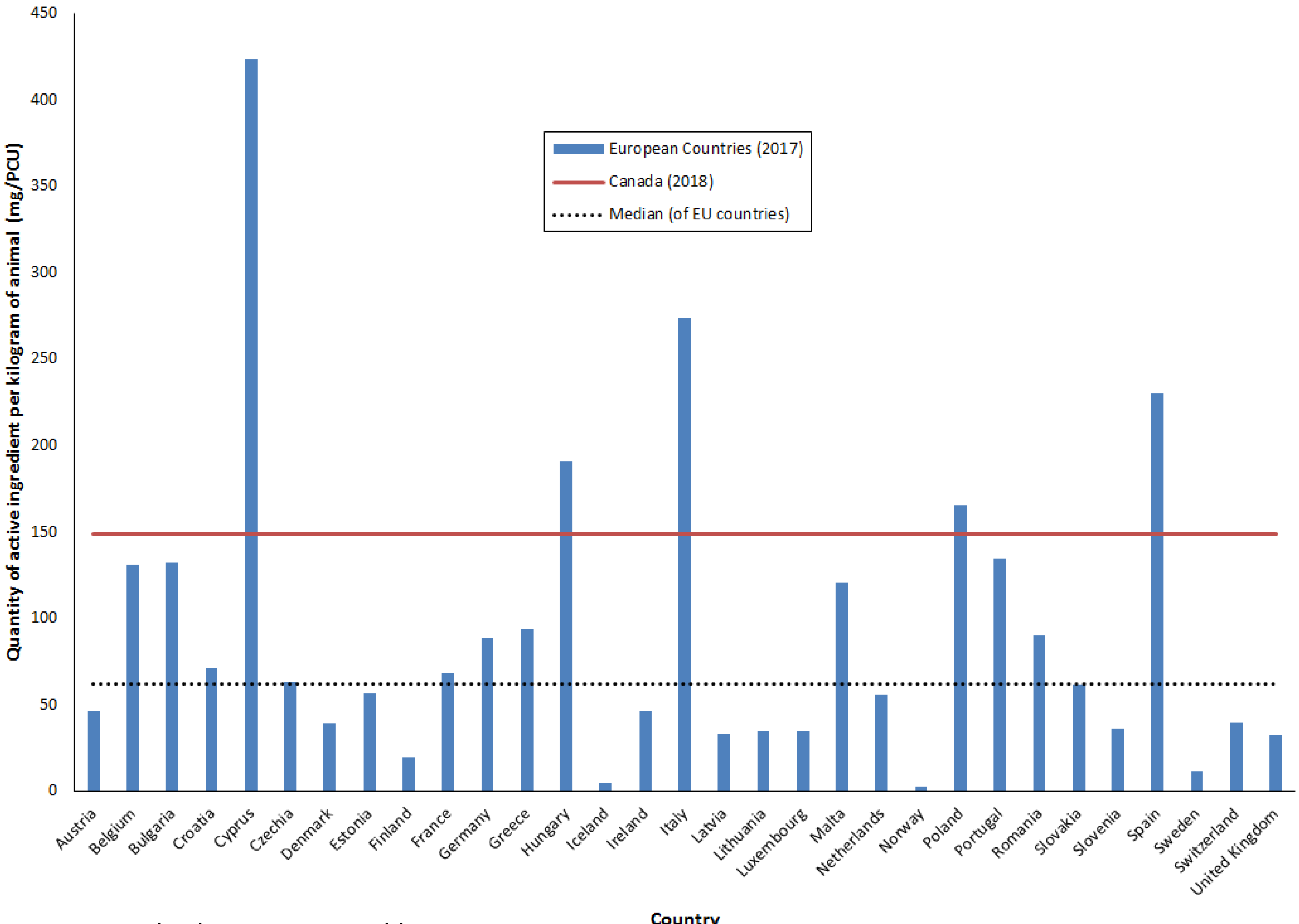
The total quantities of antimicrobials distributed for sale for use in production animals increased. When measured in kilograms, the total quantities distributed increased by 6% compared to 2017. When total quantities were adjusted for biomass (mg/PCU), the increase is 5% compared to 2017.

Quantities of antimicrobials distributed for use in animals.



Data Source: Canadian Animal Health Institute.
* Indicates years where data exclude antimicrobials sold for use in companion animals.

Canada is the 6th highest country (in comparison to Europe) for quantities of antimicrobials sold (mg/PCU).



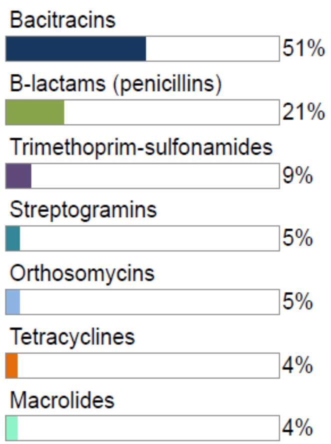
Note: This figure assumes the data are comparable.




COMPARING FARM ANTIMICROBIAL USE DATA

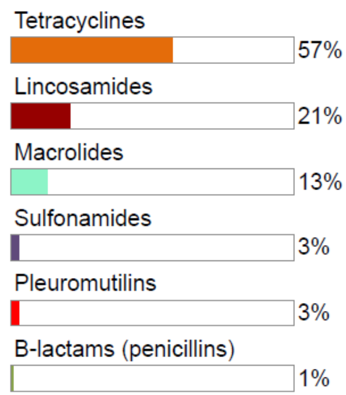
COMPARISON OF ANTIMICROBIAL CLASSES*

BROILER CHICKENS



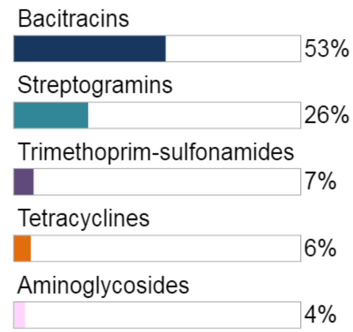
Not shown: aminoglycosides (1%), lincosamides-aminocyclitols (<1%)

GROWER-FINISHER PIGS**



Not shown: streptogramins (1%)
**used in feed only

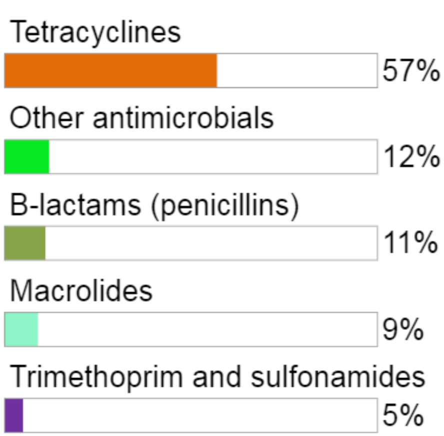
TURKEYS



Not shown: B-lactams (penicillins) (3%), orthomycins (1%), fluoroquinolones (<1%).

*The percentages are based on total kilograms of active ingredients intended for use in that host species.

Production Animals



There are important differences in the types and relative quantities of antimicrobials reported for use between food animal species, which is why we need ongoing surveillance across the food animal species.

TEMPORAL TRENDS IN AMU

BROILER CHICKENS

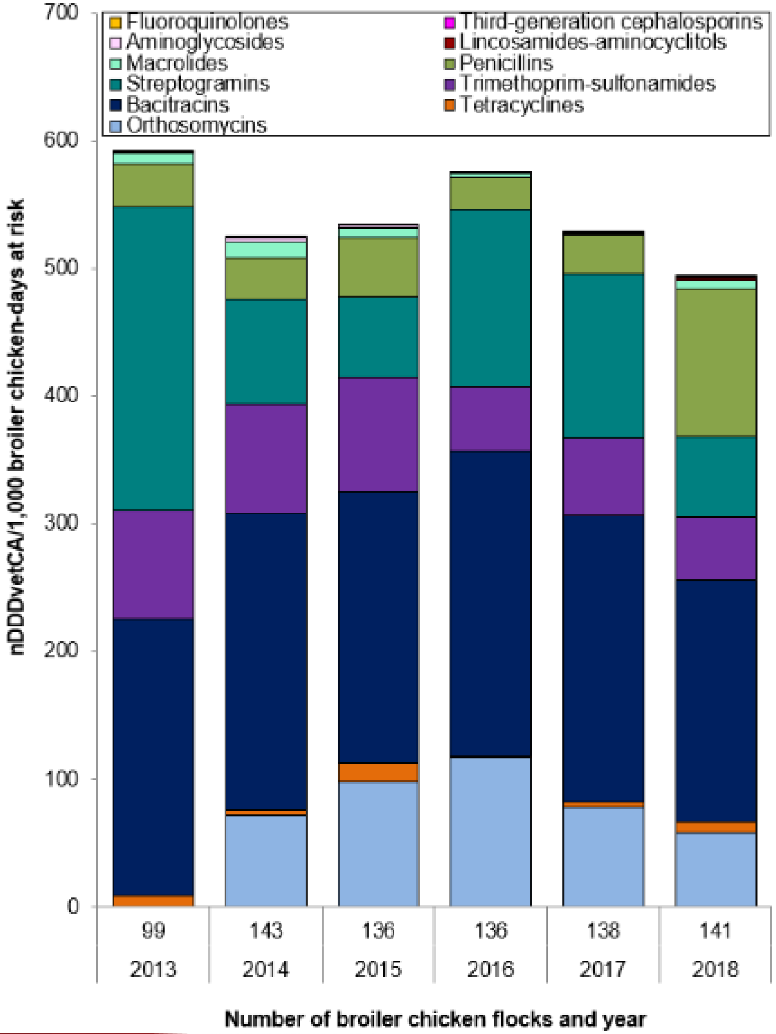
Overall (nationally), farm surveillance showed a **reduction in antimicrobial use** in 2018 compared with 2017 data in broiler chickens. The two most commonly reported antimicrobials used in broilers were bacitracins (**Category III**) and penicillins (**Category II**).

There were regional differences in the the number of doses of antimicrobials administered. Compared to 2017:

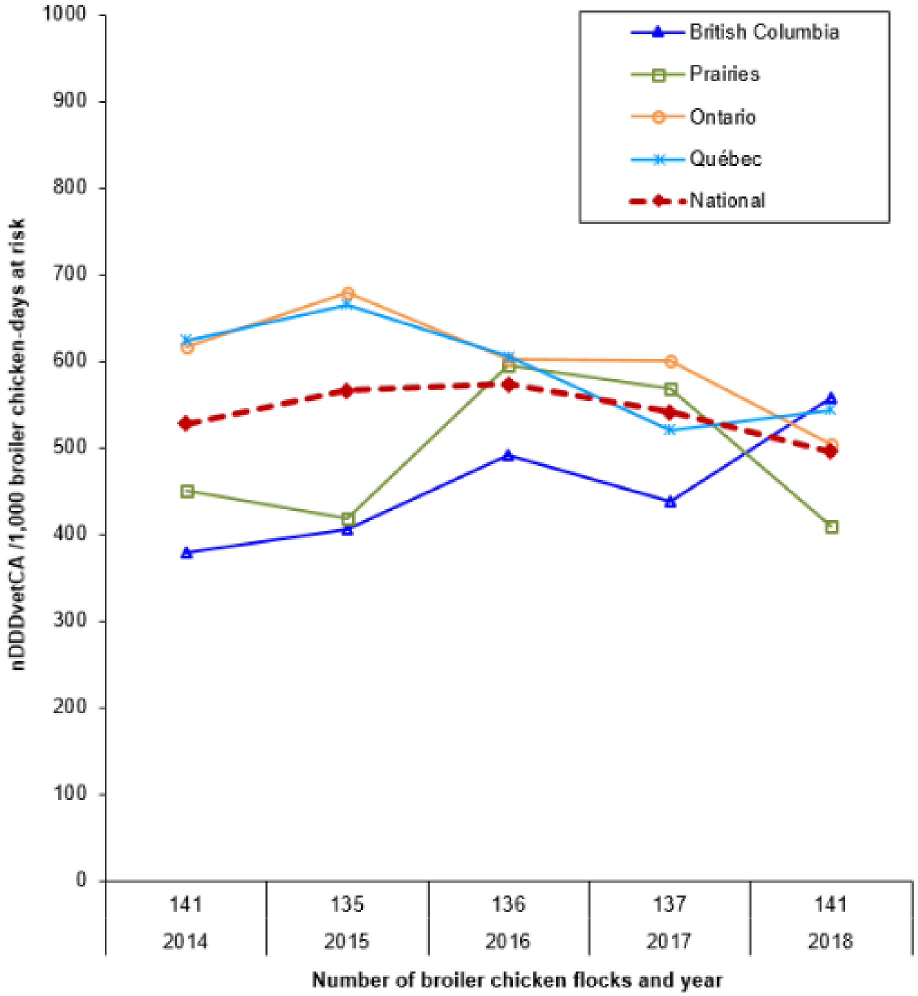
- The Prairies and Ontario **decreased** their overall AMU.
- There was an **increase** in overall AMU in flocks from British Columbia and Québec.

BROILER CHICKENS

Temporal trends in nDDDvetCA/1000 chicken-days at risk, 2013 to 2018.



Temporal trends in nDDDvetCA/1000 chicken-days at risk, by province/region, 2013 to 2018.



TEMPORAL TRENDS IN AMU

GROWER-FINISHER PIGS

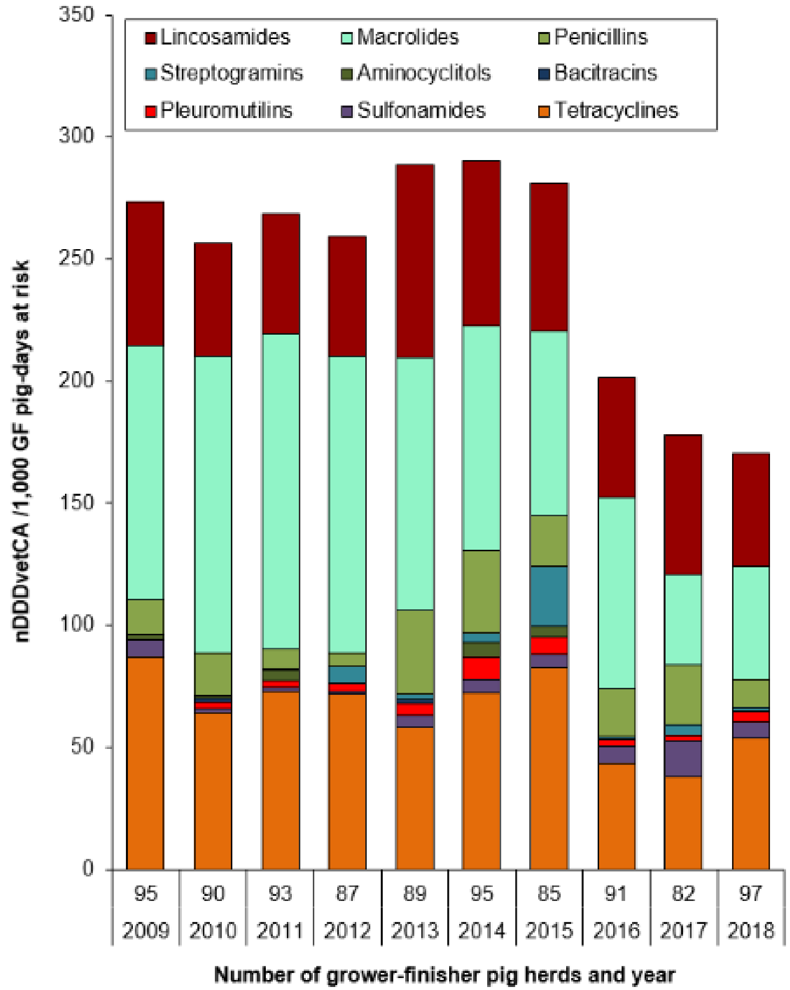
Farm surveillance showed a decrease in antimicrobials used in feed (nDDDvetCA/1000 grower-finisher pig-days at risk) between 2014 and 2018. The most commonly reported antimicrobials used in pigs included tetracyclines (**Category III)** , lincosamides (**Category II**), and macrolides (**Category II**).

There were regional differences in the quantity and the number of doses of antimicrobials administered through feed over a grower-finisher feeding period. Compared to 2017:

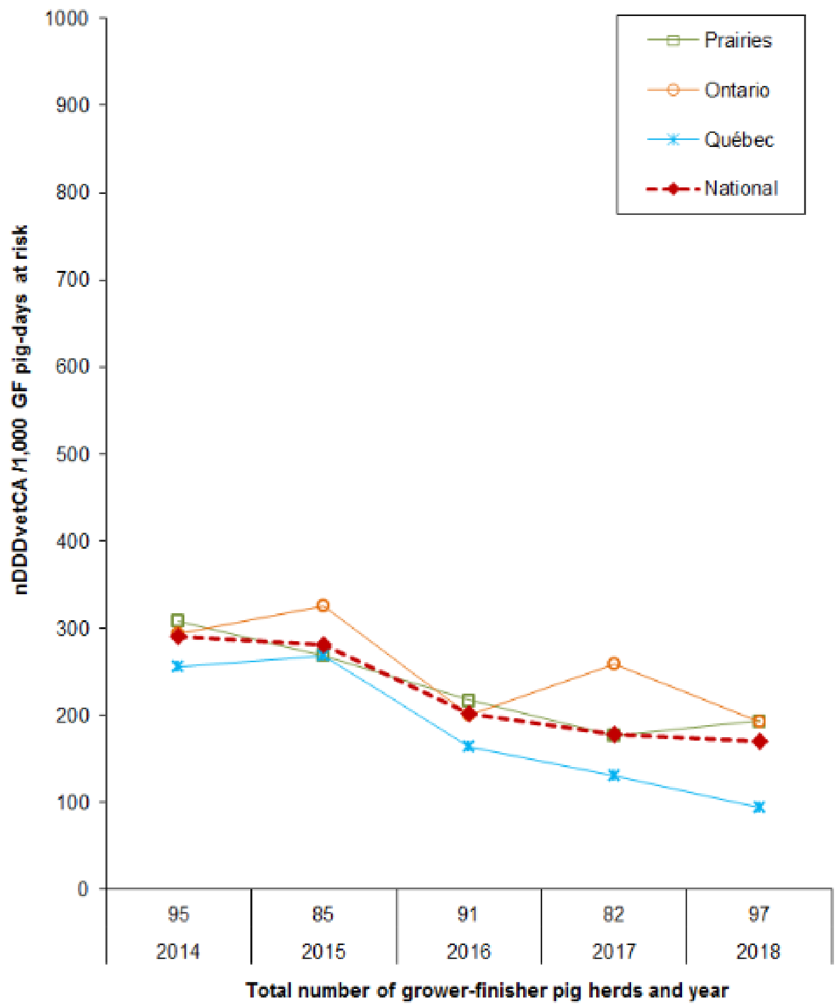
- Québec and Ontario herds decreased their overall AMU in feed.
- There was an increase in overall AMU in feed in herds from the Prairies.

GROWER-FINISHER PIGS

Temporal trends in nDDDvetCA/1000 GF pig-days at risk, 2009 to 2018.



Temporal trends in nDDDvetCA/1000 GF pig-days at risk for antimicrobials administered in feed, 2014 to 2018.



TEMPORAL TRENDS IN AMU

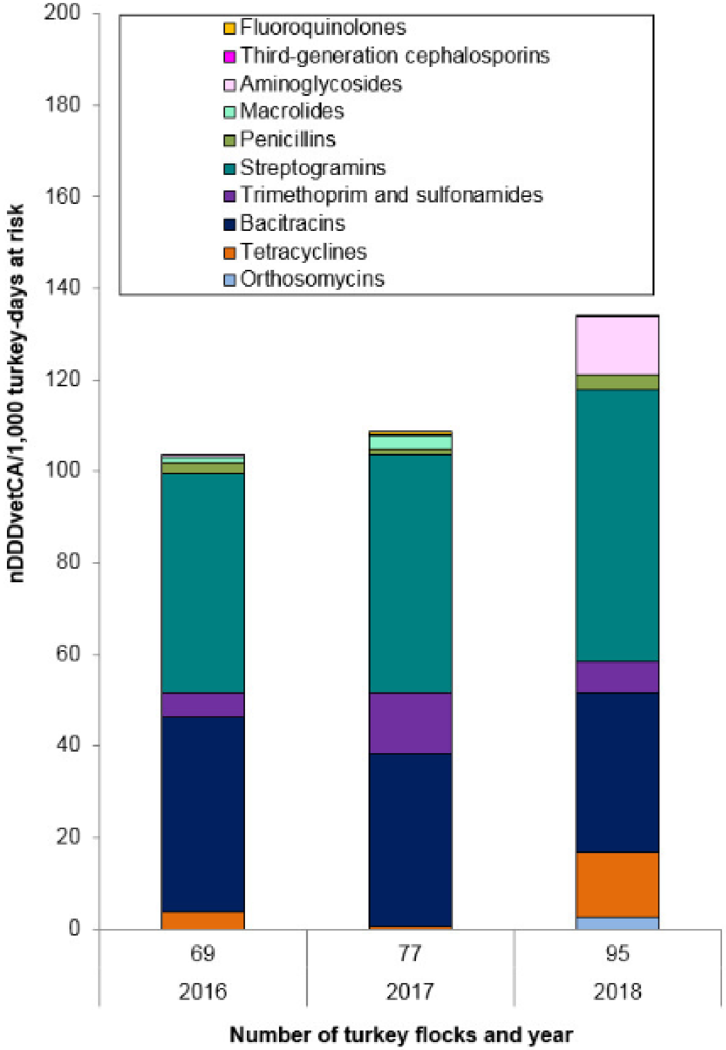
TURKEYS

In 2018, the overall reported antimicrobial use in turkeys **increased**. The top reported antimicrobials used in turkeys included streptogramins (Category **II**) and bacitracins (**Category III**). Compared to 2017:

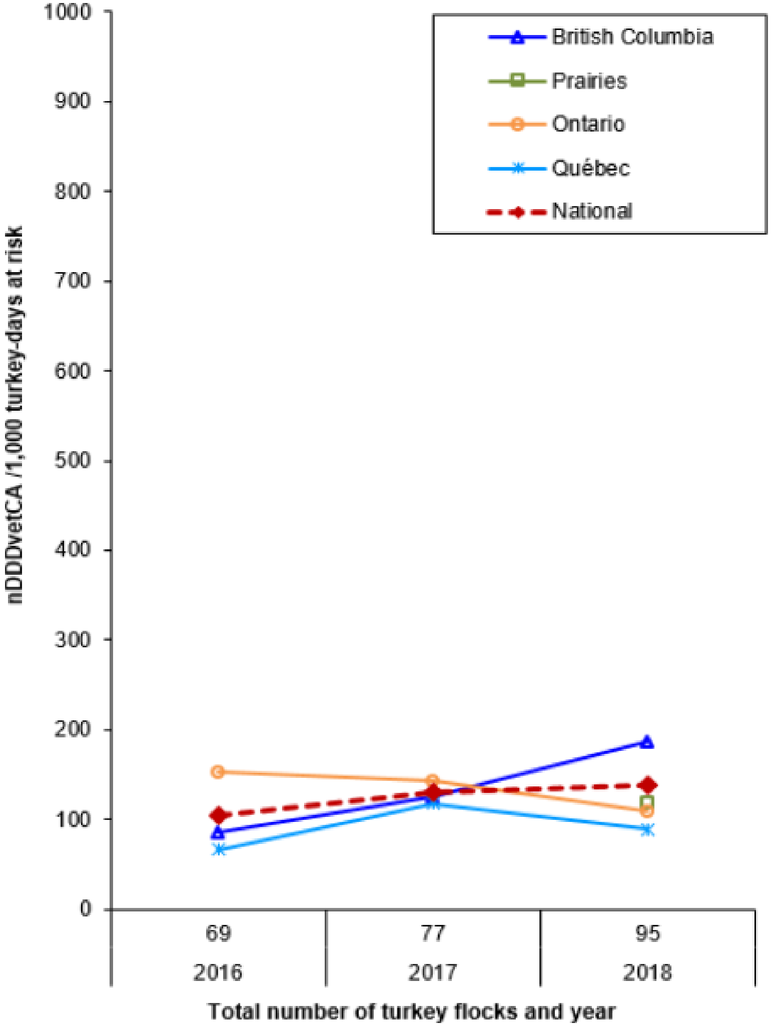
- Ontario and Québec flocks **decreased** their overall AMU.
- There was an **increase** in overall AMU in flocks from the British Columbia.

TURKEYS

Temporal trends in nDDDvet per 1000 turkey-days at risk in Canada, 2016 to 2018.



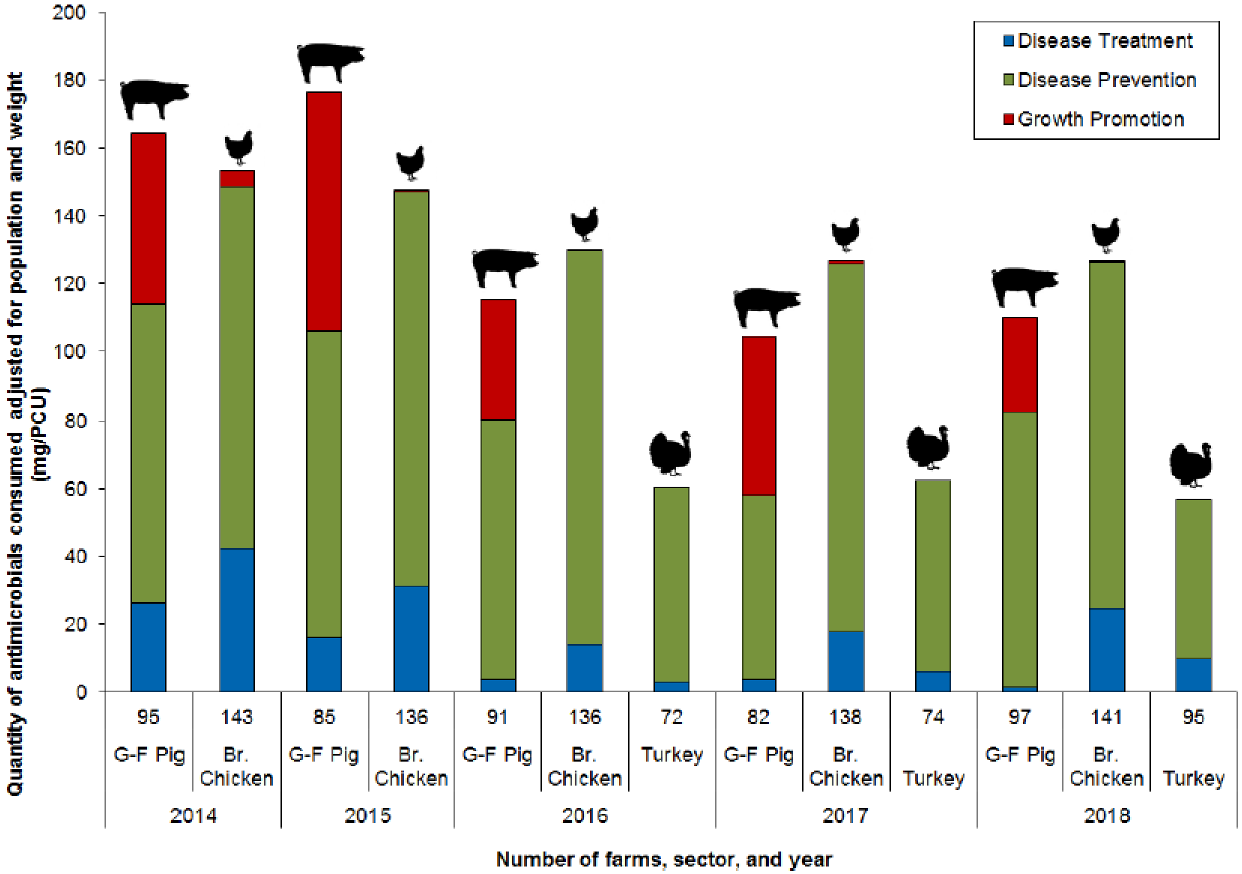
Temporal trends in nDDDvet per 1000 turkey-days at risk in Canada, by province/region, 2016 to 2018.



REASONS FOR ANTIMICROBIAL USE

- In broiler chickens (Br. Chicken), turkeys, and grower-finisher pigs (G-F Pig), the predominant reason for reported administering antimicrobials was for **disease prevention**.
- In grower-finisher pigs, there continues to be reported use of antimicrobials for growth promotion.

Quantity of antimicrobials used (mg/PCU) by reason for use; CIPARS Farm 2014 to 2018.



Note: Swine data are for antimicrobial use in feed only; chicken and turkey data include all routes of administration.

Veterinary Antimicrobial Sales Reporting (VASR)

- New authorities under *Food and Drug Regulations* require reporting on the **volume of medically important antimicrobials** sold annually in Canada by manufacturers, importers and compounders.
- The first wave of data was collected for year 2018, and all reporting was requested by March 31, 2019.
- VASR system collects the sales data by:
  - Antimicrobial class;
  - Species (Cattle, Pigs, Chickens, Turkeys, Horses, Aquaculture, Small Ruminants, Companion Animals and Other);
  - Jurisdiction (province/territory);
  - Route of administration (Oral, Injection, Intra-mammary, Intrauterine, Ophthalmic, Otic, Topical, and Other);
  - Medical Importance category; and,
  - Labelled use (Prevention, Therapeutic, Prevention & Therapeutic, Growth Promotion and Other)

NEW CIPARS INITIATIVES

Canadian Feedlot Cattle

3rd Party Collaboration/Funding:

- Funding sources: Alberta Canadian Agricultural Partnership, Alberta Cattle Feeders, Bayer, Beef Farmers of Ontario, Ontario Canadian Agricultural Partnership, McDonalds, Saskatchewan Agriculture, Saskatchewan Cattle Feeders, Vetoquinol
- Administered by: ACFA, BCRC, and BFO

Framework Development (2018):

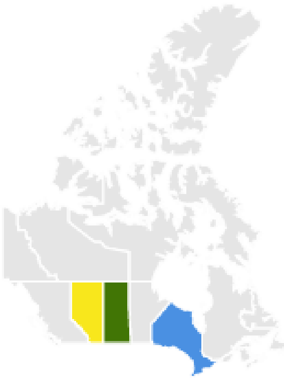
- Developed in conjunction with expert group of industry representatives and feedlot veterinarians

Research and Surveillance Objectives:

1. Provide representative estimates of AMU and AMR in the Canadian finishing feedlot sector;
2. Provide a unified approach to monitor trends in AMU and AMR over time;
3. Investigate associations between AMU and AMR periodically on a targeted basis based on emerging AMR trends;
4. Provide collated industry data for the assessment of the potential public and animal health risk of AMU in the Canadian finishing feedlot sector.

Implementation Status:

- ✔ Framework implemented in July 2019
- ✔ Funding available until 2022
- ✔ Feedlots (40) enrolled in major fed cattle producing provinces of AB, SK, and ON



Next Steps:

- Procure stable funding beyond 2022

NEW CIPARS INITIATIVES

Canadian Dairy Network for Antimicrobial Stewardship and Resistance (CaDNetASR)

Collaboration/Funding:

- Universities (6) and PHAC-CIPARS
- Funded through DFC Dairy Research Cluster funding (CAP) with support from PHAC

University of Saskatchewan; Memorial University; University of Guelph; University of Prince Edward Island; University of Calgary; Université de Montréal

Framework Development (2018-present):

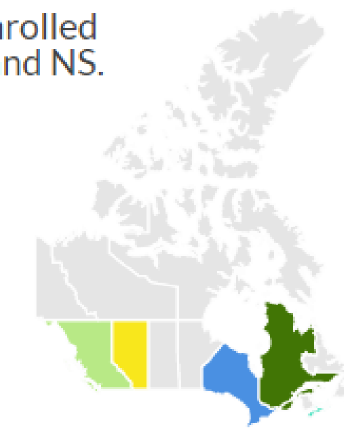
- Expert Panel and Industry Steering Committee

Research and Surveillance Objectives:

1. To assess farm AMU records, GCA, and vet dispensing;
2. To assess farm AMR using three different methods;
3. To develop evidence-based AMU decision tools; support improved stewardship (AMS) practices on dairy farms;
4. To assess the impacts of changes in AMU/AMS practices on animal health and welfare indicators.
   - UCalgary: BC/AB 80 herds/prov., DCT/CMT project
   - UGuelph: Calf management project, in all 5 regions
5. Establish multi-commodity surveillance framework to inform human health risk assessment

Implementation Status:

- ✔ Framework implemented; Year 2 of 5
- ✔ Dairy herds (150) enrolled in BC, AB, ON, QC, and NS.



Next Steps:

- Procure stable funding


Integrated Antimicrobial
Resistance Data

DETECTION OF QUINOLONE RESISTANCE IN *SALMONELLA* ENTERITIDIS FROM CHICKEN

In 2018, a clear **increase** in nalidixic acid (a quinolone) resistance among *S.* Enteritidis from chickens occurred across **several surveillance components from multiple provinces.**

RETAIL

1 isolate from a chicken burger in British Columbia (FoodNet Canada)

RETAIL

1 isolate from Alberta

Not previously observed

ABATTOIR

2 isolates from Ontario and Québec

Not previously observed

CLINICAL CASES

2 isolates from Ontario (sick chicken)

Previously observed in a single isolate in Manitoba (2010)

DETECTION OF QUINOLONE RESISTANCE IN *SALMONELLA* ENTERITIDIS FROM CHICKEN

The **majority** of *S.* Enteritidis from animal and food sources were susceptible to all antimicrobials tested.

From 2003 to 2018, nalidixic acid resistance was only observed in a **single isolate** from a sick chicken (clinical isolate) from Manitoba in 2010.

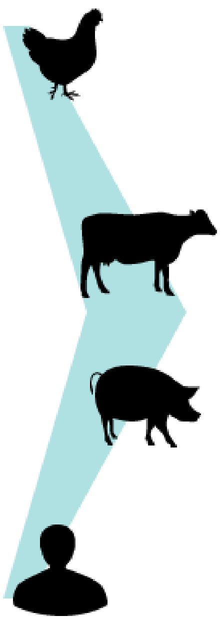
Most *S.* Enteritidis from people were susceptible to all antimicrobials tested. When resistance did occur, it was most commonly to **nalidixic acid**.

This may be a new source of human exposure to nalidixic acid-resistant *S.* Enteritidis in Canada. This unprecedented and sudden increase in chickens and chicken meat will be monitored closely by CIPARS.

HIGHLY DRUG-RESISTANT *SALMONELLA*

- The number of highly resistant *Salmonella* isolates have **increased** substantially since 2008 in both human and animal sources.
- 2018 was the **first time** where highly resistant *Salmonella* were isolated from a chicken source.
- Despite a slight decrease in 2017, a substantial increase in the number of highly resistant *Salmonella* occurred in 2018 to levels not previously observed by CIPARS.

In 2018, 132 *Salmonella* isolates were identified as highly drug resistant from the following sources:



Chicken

- All retail isolates (from chicken burgers) from British Columbia, the Prairies, and Ontario.
- All isolates were ***S.* Infantis**.

Cattle

- Sick cattle (clinical isolates).
- Most isolates were ***S.* Dublin**.

Swine

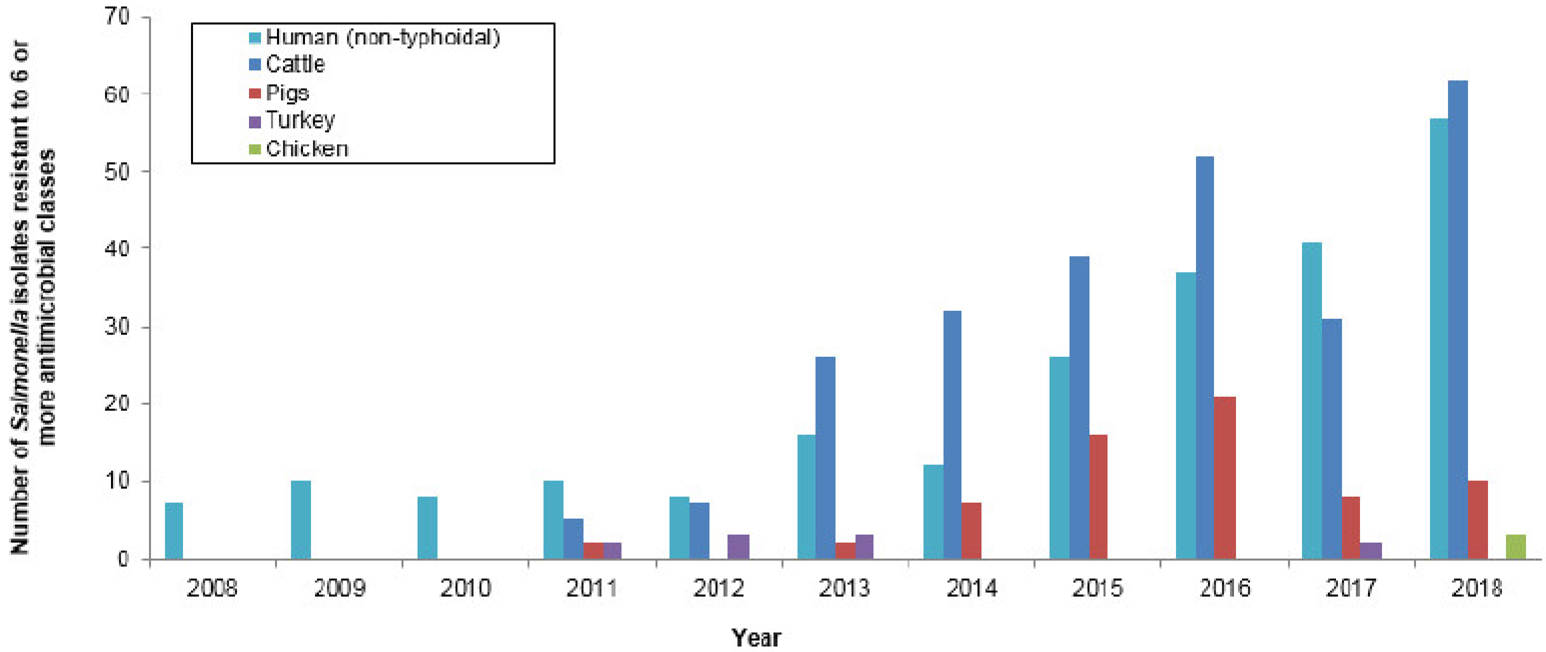
- Sick pigs (clinical isolates).
- Some isolates demonstrate resistance to **all 7 classes** of antimicrobials tested.
- Four serovars were detected.

Human

- Only clinical isolates tested.
- Most isolates were *S.* Infantis, *S.* Newport, and *S.* Typhimurium.

HIGHLY DRUG-RESISTANT *SALMONELLA*

Number of *Salmonella* isolates resistant to 6 or more antimicrobial classes from 2008 to 2018.




Integrated Antimicrobial
Use and Resistance Data

FLUOROQUINOLONE-RESISTANT *CAMPYLOBACTER*

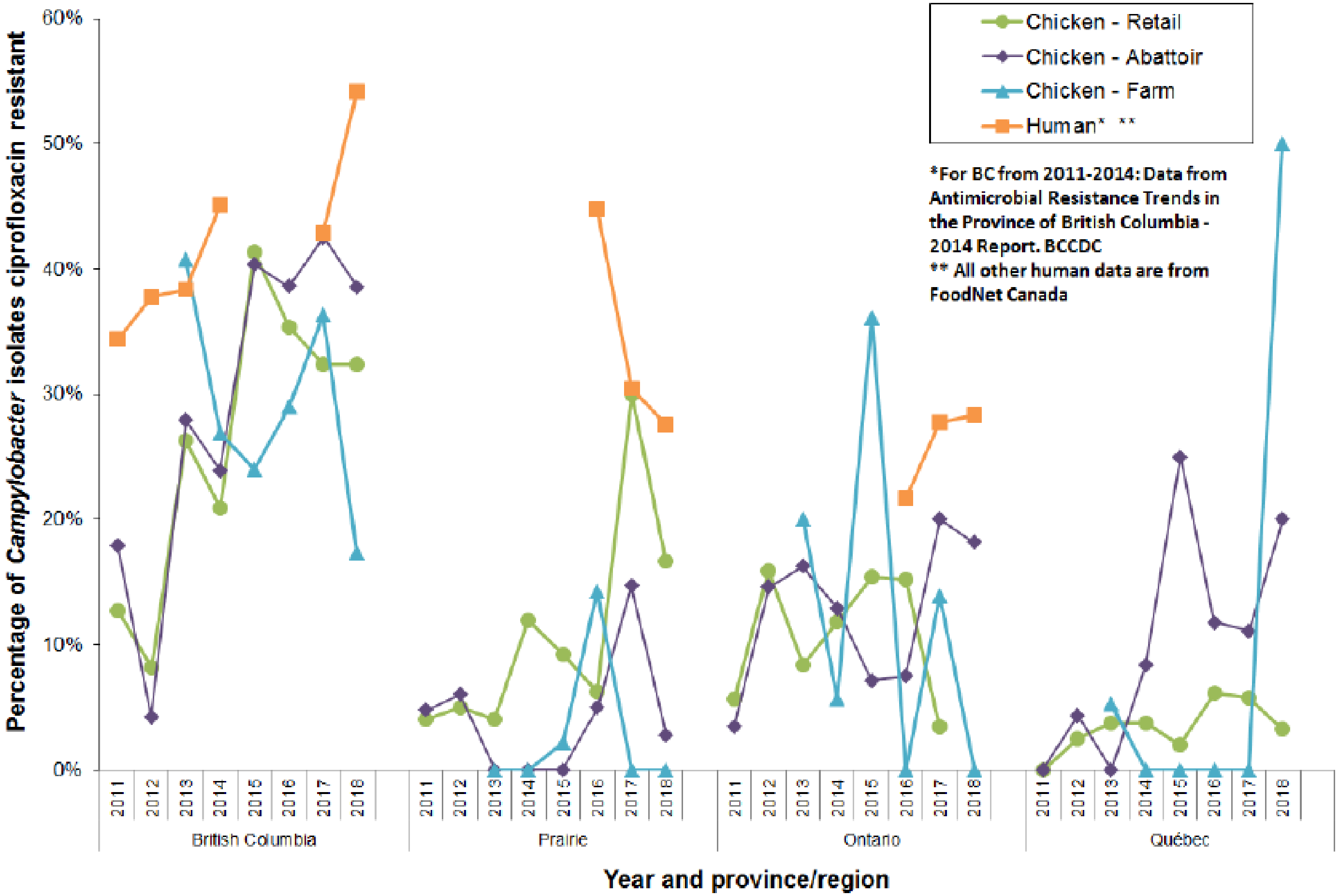
- In 2018, **one flock** from **British Columbia reported using a fluoroquinolone for disease treatment**. Since 2014, there was no reported fluoroquinolone use on sentinel broiler chicken farms with the exception of 2018.

- In general, the highest proportion of ciprofloxacin-resistant *Campylobacter* continued to be from British Columbia. However, resistance from chicken(s) continued to vary over time and across regions.

  - In British Columbia, ciprofloxacin-resistant *Campylobacter* from chickens on farm **decreased** to 17% (8 out of 46 isolates were resistant).
  - In Québec, ciprofloxacin-resistant *Campylobacter* from chickens on farm **increased** to 50% (8 out of16 isolates were resistant).

FLUOROQUINOLONE-RESISTANT *CAMPYLOBACTER*

Ciprofloxacin resistance in *Campylobacter* isolates over time and between regions; CIPARS 2011 to 2018.



CEFTRIAXONE RESISTANCE IN NON-TYPHOIDAL *SALMONELLA* AND GENERIC *E. COLI*

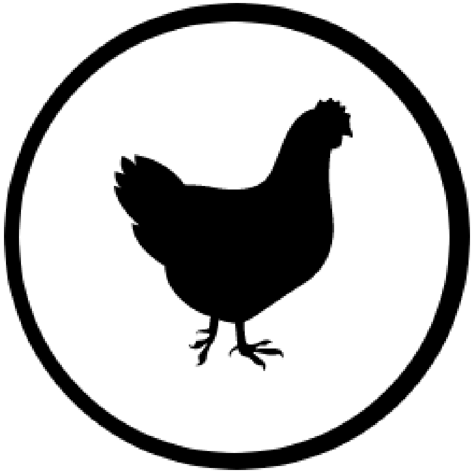
Since 2015, there has been **no reported ceftiofur use** in sentinel broiler chicken flocks, as well as **reduced ceftriaxone resistance** in both *E. coli* and *Salmonella* from chickens and chicken meat in most scenarios.

CEFTRIAXONE RESISTANCE IN NON-TYPHOIDAL *SALMONELLA*

Previously, ceftriaxone-resistant *Salmonella* in humans were primarily serovar Heidelberg isolates. However, in 2018, the majority of resistant isolates were serovar Infantis, followed by serovar Heidelberg.

In 2018, ceftriaxone resistance in *S.* Infantis **decreased** to 15%, compared to 17% in 2017. Ceftriaxone resistance in *S.* Heidelberg also **decreased** to 7% compared to 12% in 2017.

CEFTRIAXONE RESISTANCE IN NON-TYPHOIDAL *SALMONELLA* AND GENERIC *E. COLI*

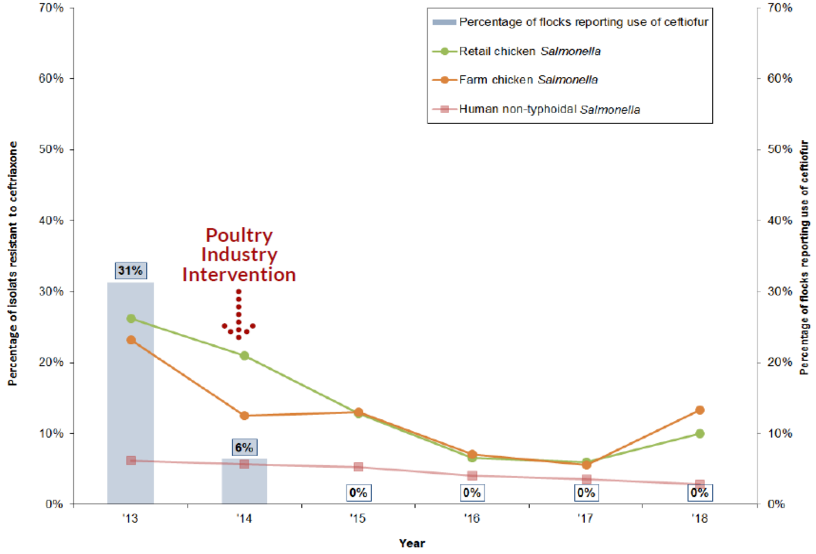


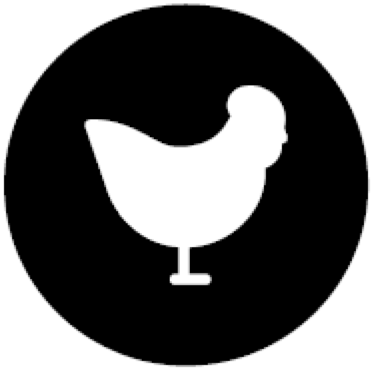
Overall, ceftriaxone resistance in *Salmonella* and *E. coli* isolates from chicken sources remained relatively stable or decreased after the 2014 intervention to eliminate the use of Category I antimicrobials for disease prevention. Most *Salmonella* isolates were *S.* Kentucky, followed by *S.* Heidelberg and *S.* Infantis.

However, there were some increases in ceftriaxone resistance in 2018 compared to 2017 data. This is most notable in *Salmonella* isolated from **chickens at the farm level**.

CEFTRIAXONE RESISTANCE IN NON-TYPHOIDAL *SALMONELLA*

Reduction in reported use of ceftiofur on sentinel farms and changing resistance to ceftriaxone in non-typhoidal *Salmonella* from humans and chicken sources between 2013 and 2018.





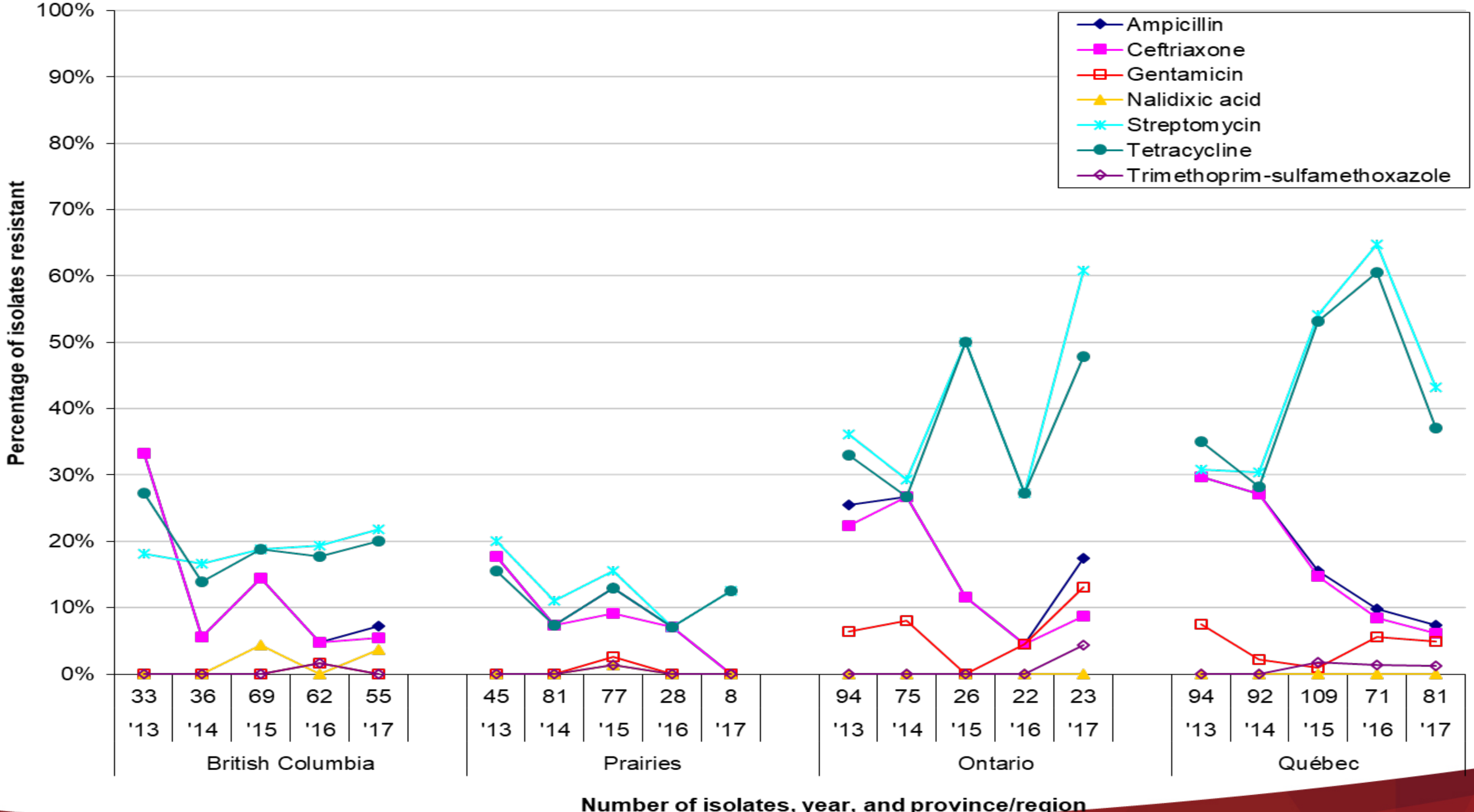
The reduction in ceftiofur use and associated decrease in ceftriaxone resistance compared to pre-2014 data in chickens and humans is a good example of a successful intervention to limit antimicrobial resistance.

FUTURE COMMUNICATION: PRODUCT EXAMPLES

Future Communication Products Examples

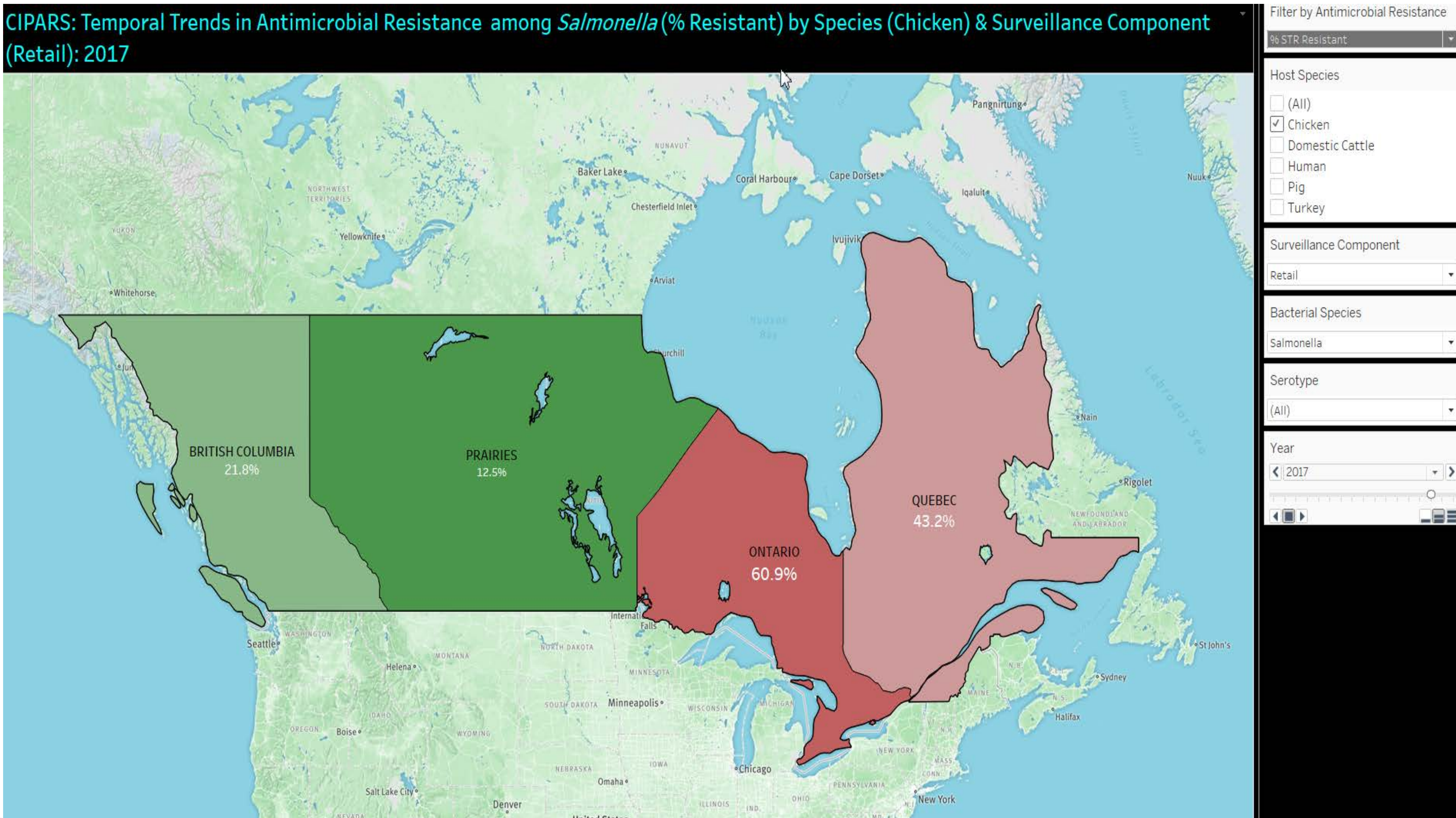
THE OLD WAY…

Temporal variations in resistance of *Salmonella* isolates from retail chicken, 2013 to 2017



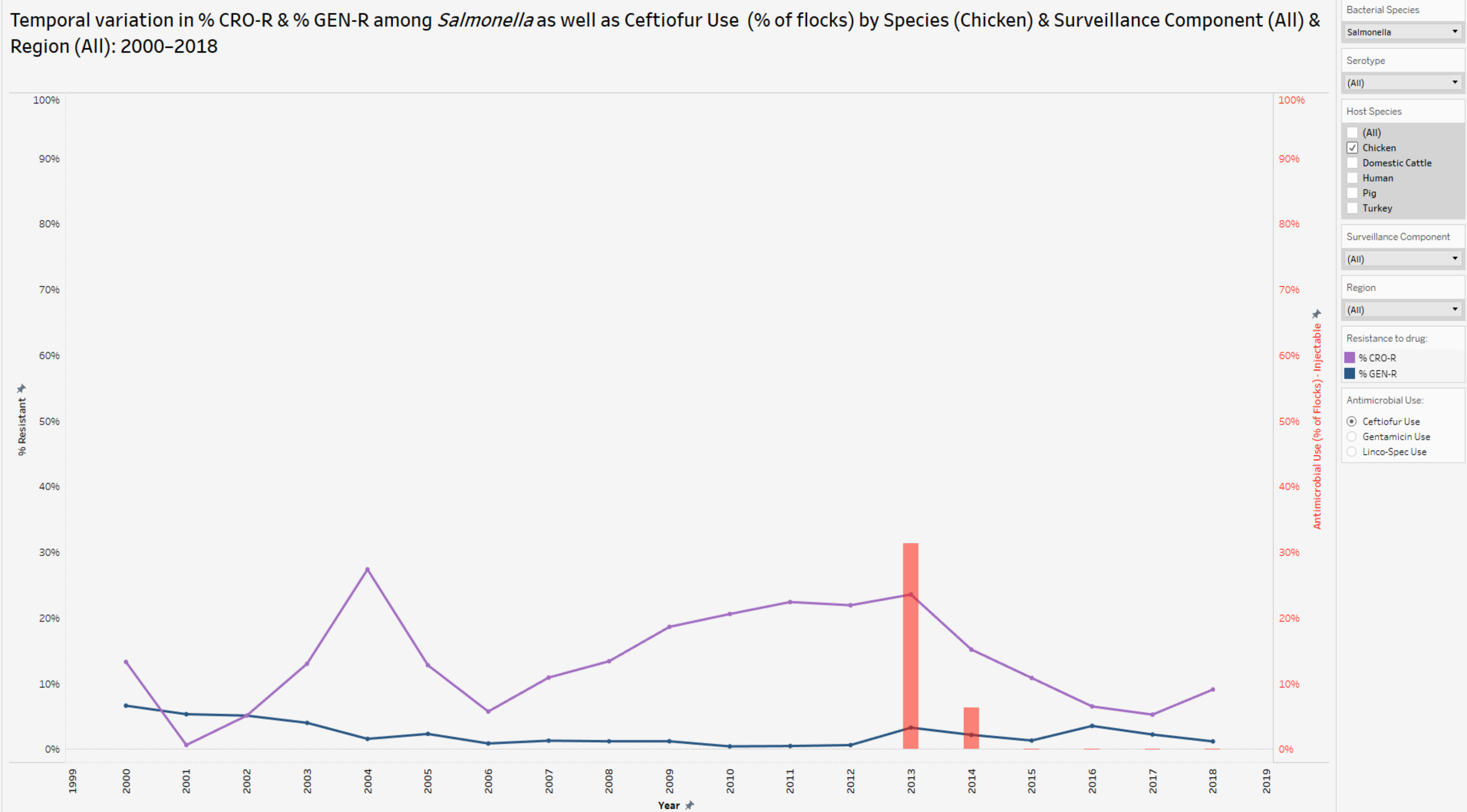
Future Communication Products Examples

Interactive Data Visualization – Example 1 (Spatial-Temporal Trends – AMR)



Future Communication Products Examples

Interactive Data Visualization – Example 2 (Integrated Antimicrobial Use & AMR)



Summary

- Antimicrobial sales increased between 2017 and 2018.
- Antimicrobial use decreased in broiler chickens and pigs, but increased in turkeys, though there were provincial variations.
- Nalidixic acid resistance was detected in *S.* Enteritidis in chicken and chicken meat, at levels never observed previously.
- The number of highly drug-resistant *Salmonella* isolates is increasing.
- On broiler chicken sentinel farms, we continue to see no reported ceftiofur use, but there was a reported use of fluoroquinolones for treatment.
  - For related resistance, for the most part ceftriaxone resistance has decreased, though there was an increase in resistance in *Salmonella* on farm.
- CIPARS has recently launched sentinel farm surveillance activities in feedlot and dairy cattle
- Stay tuned for more updates on new ways of communicating CIPARS surveillance data.

ACKNOWLEDGEMENTS

- Human (AMR)
  - Provincial Public Health Laboratories
  - FoodNet Canada (*Campylobacter*)
- Farm (AMR and AMU):
  - The veterinarians, producers and commodity groups who participate in the farm program, Saskatchewan Agriculture
  - Feedlot Cattle Surveillance: Canadian Agricultural Partnership in Alberta and Ontario, Alberta Cattle Feeders, Bayer, Beef Farmers of Ontario, McDonalds, 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
  - Fisheries and Oceans Canada (AMU)
- Abattoir:
  - The CFIA, abattoir operators, samplers and personnel
- Retail:
  - All the participating health units and institutions
- Clinical Animal Isolates:
  - Provincial Animal Health Laboratories
- Antimicrobial Use – distribution/sales in animals:
  - Canadian Animal Health Institute, Impact Vet
  - Health Canada’s Veterinary Drugs Directorate
- Antimicrobial Use - distribution in humans:
  - Centre for Communicable Diseases and Infection Control
- Antimicrobials Sold as Pesticides for use in Crops
  - Health Canada’s Pest Management Regulatory Agency

QUESTIONS?

MENTI POLL

- Any further questions – we can be reached at phac.cipars-picra.aspc@canada.ca