The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

2020 Integrated Findings and Preview of 2021 Data

Annual Stakeholder Meeting

November 21st, 2022

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

Canada

Housekeeping

- **Presentation**
  - Can be found at this location: https://cahss.ca/cahss-networks/amuamr
  - The Canadian Animal Health Surveillance System AMU/AMR Network has also developed several guidance documents on antimicrobial use reporting that can be found at https://cahss.ca/cahss-networks/amuamr
- **Survey/Poll Using Menti.com**
  - Please use either your mobile phone or a web browser to access www.menti.com
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- **Please mute yourself**
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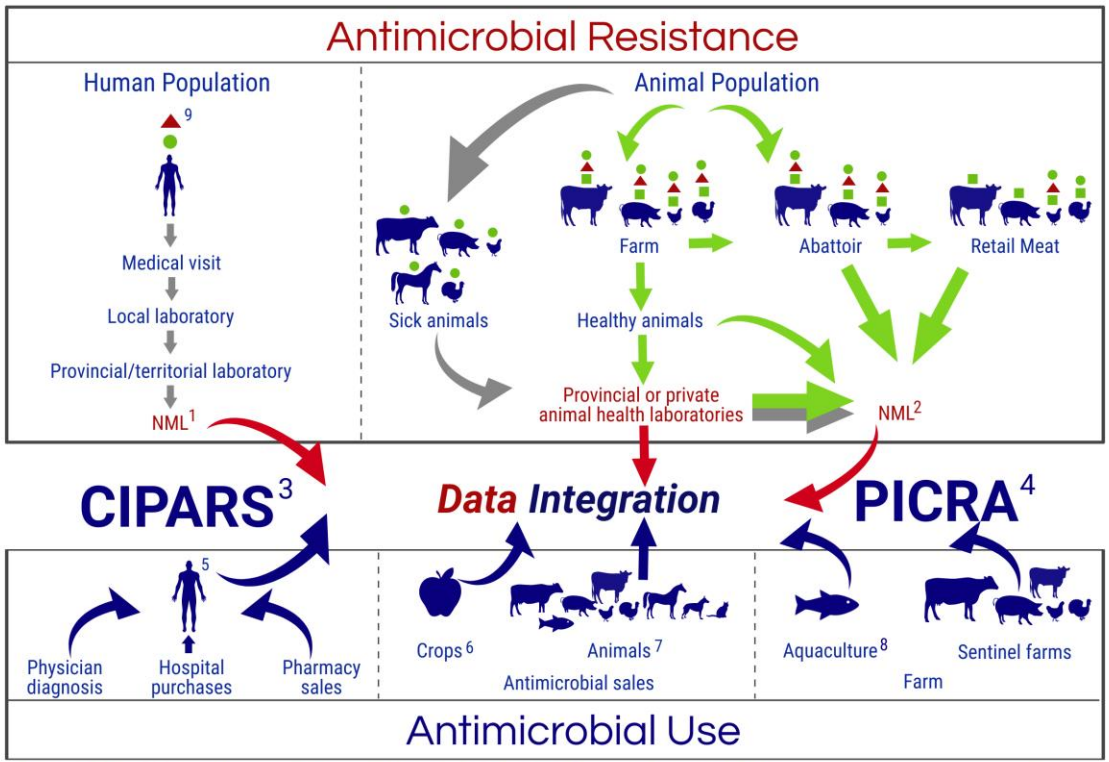
Agenda

- CIPARS Activities
- 2020 Integrated Findings
- Preview of Preliminary 2021 Findings
- Interactive Data Visualizations
- Summary
- Comments, questions, and answers

Several components of CIPARS were impacted by the pandemic – from sampling to lab testing to data availability for analysis.

CIPARS **Activities**



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)
7 Veterinary Antimicrobial Sales Reporting, HC Veterinary Drugs Directorate and PHAC
8 Fisheries and Oceans Canada
9 FoodNet Canada, PHAC

- Active surveillance
- Passive surveillance
- *Salmonella*
- *Campylobacter*
- *Escherichia coli*

Led by the Public Health Agency of Canada in conjunction with multiple federal departments and external stakeholders.

Over the past 20 years, CIPARS has expanded to a large multidisciplinary team with multiple antimicrobial resistance (AMR) and antimicrobial use (AMU) surveillance components.

Acknowledgements

Human (AMR)
- Provincial Public Health Laboratories
- FoodNet Canada (*Campylobacter*)
- National Enteric Surveillance Program (NESP)

Farm (AMR and AMU):
- Veterinarians, producers and commodity groups who participate in the farm program, Saskatchewan Agriculture
- Feedlot Cattle Surveillance Funding: Canadian Agricultural Partnership in Alberta and Ontario, Alberta Cattle Feeders Association, Bayer Animal Health, Beef Farmers of Ontario, Beef Cattle Research Council, Alberta Beef Producers, McDonald's, 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:
- Canadian Food Inspection Agency, abattoir operators, samplers and personnel

Retail:
- Participating health units and institutions

Clinical Animal Isolates:
- Provincial Animal Health Laboratories

Antimicrobial sales for animals:
- VASR: Health Canada's Veterinary Drugs Directorate, PHAC

Antimicrobial Use - humans:
- AMR Task Force and IQVIA

Antimicrobials Sold as Pesticides for use in Crops:
- Health Canada's Pest Management Regulatory Agency

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: 3rd generation cephalosporins, fluoroquinolones

Category II: High importance

Example: macrolides

Category III: Medium importance

Examples: tetracyclines, sulfonamides

Category IV: Low importance

Examples: ionophores, 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.

*Categorization system developed by Health Canada's Veterinary Drugs Directorate.

Chemical coccidiostats are considered out of scope of medically important antimicrobials. Uncategorized medically important antimicrobials include pleuromutilins, orthosomycins, coumarins and pseudomonic acids.

Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

2020 Integrated Findings

Integrated **Antimicrobial Use**

Overall Sales in 2020

↑ 7.5%

in antimicrobials sold (mg adjusted by biomass) in production animals since 2019 (increased sales of tetracyclines, penicillins, and streptogramins).

<1%

of antimicrobials sold in animals were in **Category I**. Sales of Category I antimicrobials **decreased by 5%** between 2019 and 2020.

Tetracyclines: ~ 52% of the overall sales.

~22x **more animals** than people in Canada.

~1.8x

more antimicrobials were sold for use in **production animals** than humans after adjusting for underlying biomass in 2020.

* Results represent the most recent data and may differ from the 2020 VASR Highlights report due to restatement of annual data by some data providers.

Of the antimicrobials sold in 2020:

82% were intended for production animals

17% were intended for humans

<1% were intended for cats and dogs

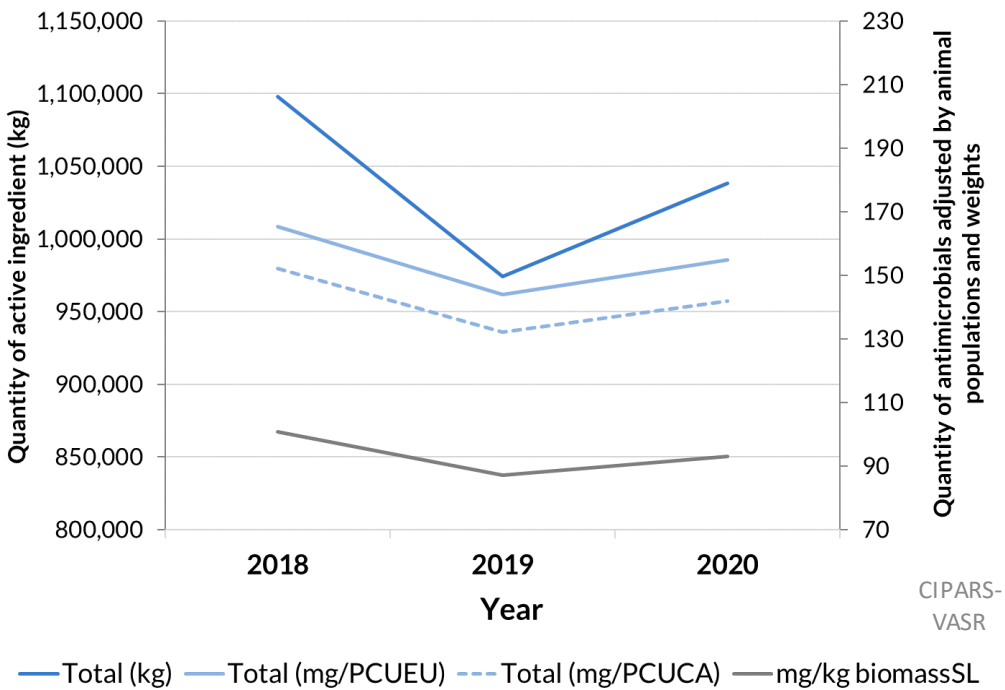
<1% were intended for crops

Data sources: Animal data – CIPARS-VASR, Human data – CARSS (IQVIA), Crop data – HC PMRA

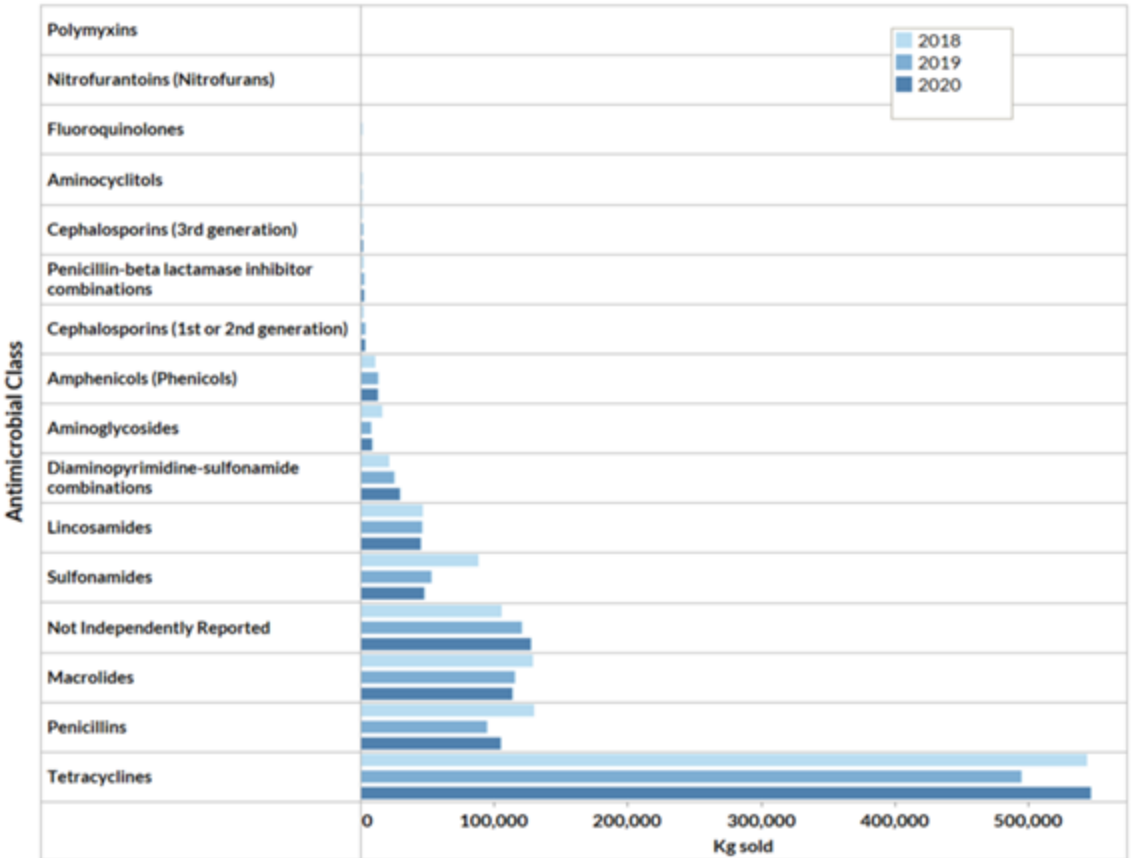
The total quantities of antimicrobials sold by manufacturers and importers for use in **production animals** increased by **6.6%** (in kg) between 2019 and 2020.

When the total quantities were adjusted for biomass, the increase was **7.5%** when using Canadian average weights at treatment (mg/PCU_{CA}) and 6.8% when using an average live weight at slaughter (mg/kg $biomass_{SL}$).

Regardless of the metric used, the quantity of sales decreased in 2019 and increased in 2020



Kilograms of antimicrobials sold for use in all animals (manufacturers and importers)



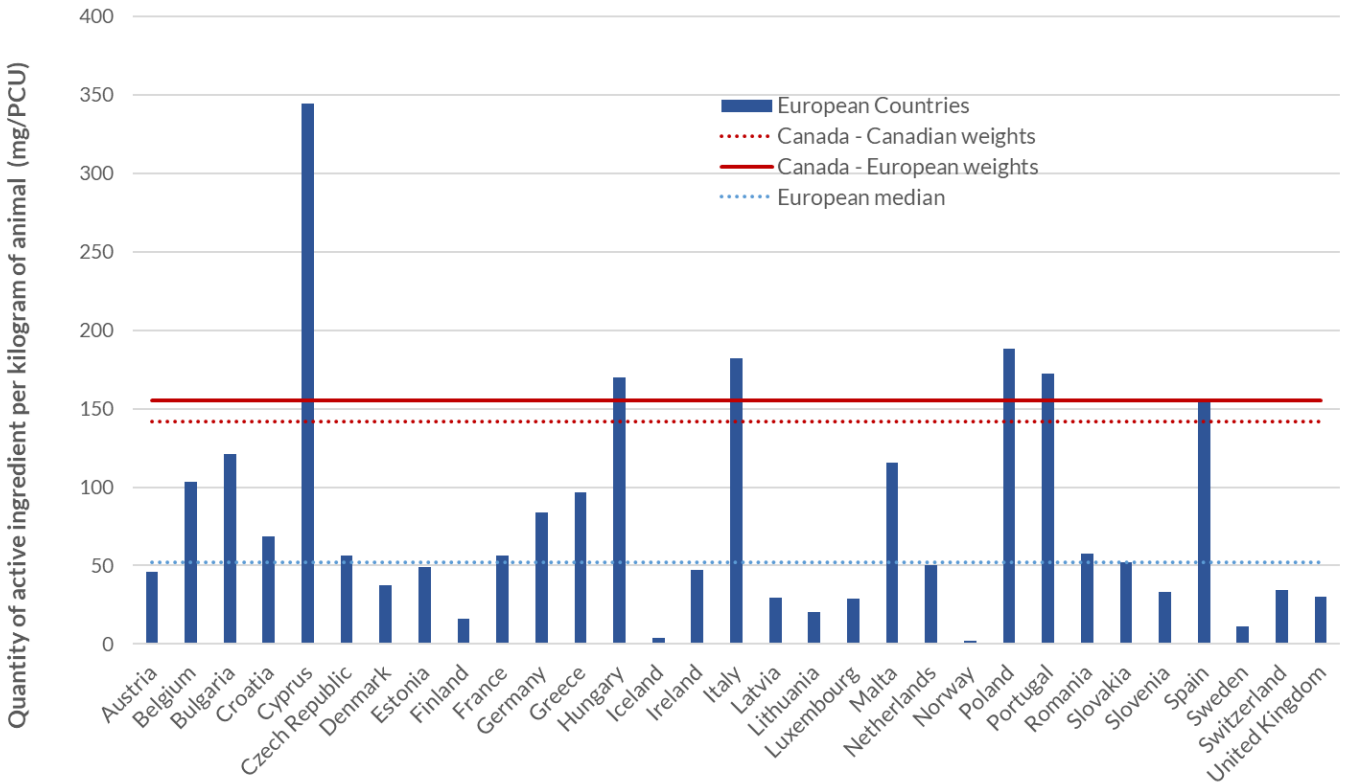
- **Tetracyclines** - highest quantity of sales
  - Between 2019 and 2020, tetracycline sales **increased by ~51,000 kg**

- Other antimicrobial classes with the highest quantity of sales in 2020:
  - Bacitracins
  - Macrolides
  - Penicillins

***Not independently reported (NIR)** antimicrobials include aminocoumarins, bacitracins, diaminopyrimidines, fusidic acid, glycopeptides, nitroimidazoles, orthosomycins, phosphonic acid derivatives, pleuromutilins, pseudomonic acids, streptogramins, and therapeutic agents for tuberculosis.

In 2020, when compared with European countries participating in the ESVAC network, Canada was placed at **6th highest** in terms of quantities of antimicrobials sold.

Quantities of antimicrobials sold (mg/PCU_{EU}) for production animals by Canada and countries participating in the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) network, 2020.



Assuming data are comparable

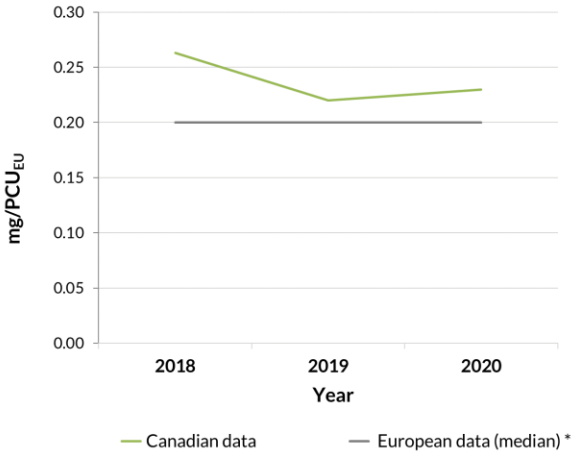
Canadian sales are ~ 3 times the European median

Data sources: VASR, ESVAC

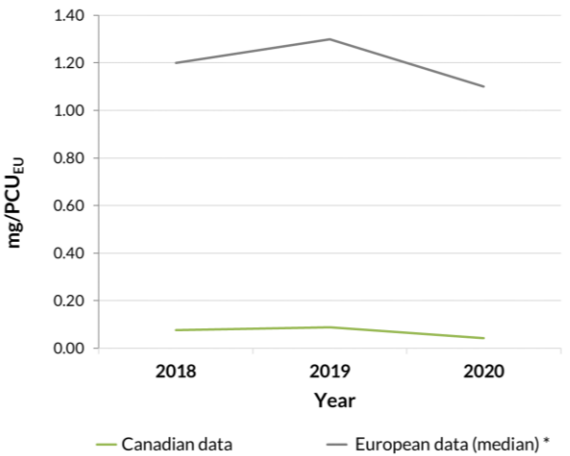
However…

- From 2018 to 2020, the quantity of 3rd generation (and higher) cephalosporins sold for production animals was similar to Europe (**~1.1 – 1.3 times higher** in Canada than European median)
  - Noting that there are no 4th generation cephalosporins labelled for use in animals in Canada

- From 2018 to 2020, the quantity of fluoroquinolones sold for production animals was **~15-21 times lower** in Canada than the European median.



3rd generation (and higher) **cephalosporin** sales



Fluoroquinolone sales

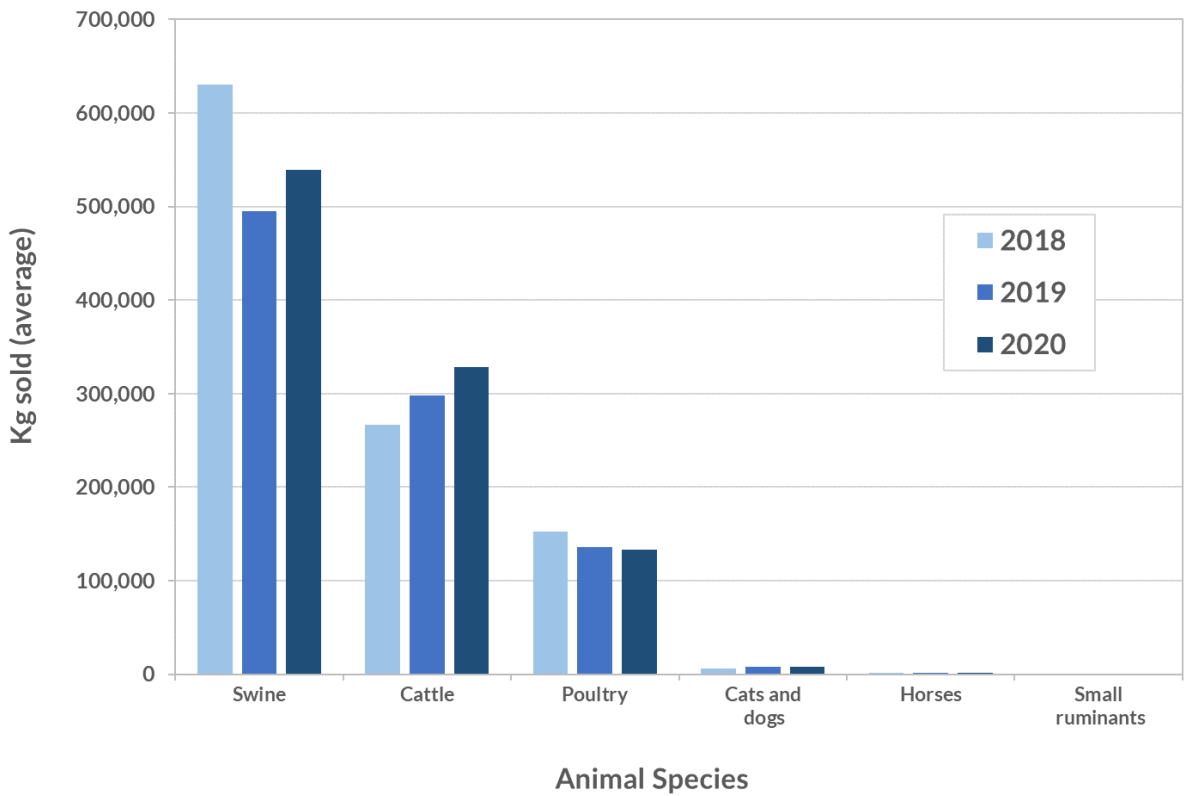
*The European median may include the sale of a small quantity of injectable products intended for use in companion animals. Also, the ESVAC (European) denominator does not include beef cows, whereas in Canada beef cows are a significant population and are included.

[a]European median includes data from 31 European countries as reported by the European Medicines Agency.

Species Comparisons

The majority (kg) of the antimicrobials sold in 2020 were for use in **pigs**, **cattle**, and **poultry**.

Quantity (kg) of medically important antimicrobials sold for use in animals by animal species



Between 2019 and 2020, sales (in kg) decreased for poultry and increased for pigs*

Poultry

- Top classes sold: bacitracins, penicillins, and tetracyclines.
- 2% ⬇ in kg sold between 2019 and 2020.
- In 2020, no 3rd generation cephalosporins were manufactured or imported for use in chickens.
- In 2018, 2019, and 2020, small (<1 kg) quantities of fluoroquinolones were compounded for use in chickens.

Pigs

- Top classes sold: tetracyclines, penicillins, and macrolides
- 9% ⬆ in kg sold between 2019 and 2020, primarily tetracyclines
- The sale of Category I antimicrobials ⬇ by 29% (112 kg) between 2019 and 2020.

* Results represent the most recent data and may differ from the 2020 VASR Highlights report due to restatement of annual data by some data providers.

Between 2019 and 2020, sales (in kg) increased for beef and decreased for dairy*

Beef Cattle

- Top classes sold: tetracyclines, amphenicols, and streptogramins.
- 11% ⬆ overall in kg sold between 2019 and 2020.
- 24% ⬇ in Category I antimicrobial sales (328 kg).
- 17% ⬇ in 3rd generation cephalosporin sales (155 kg).

Dairy Cattle

- Top classes sold: tetracyclines, diaminopyrimidine-sulfonamide combinations, and penicillins.
- 2% ⬇ in kg sold overall between 2019 and 2020.
- 52% (208 kg) ⬆ in Category I antimicrobial sales.

* Results represent the most recent data and may differ from the 2020 VASR Highlights report due to restatement of annual data by some data providers.

Between 2019 and 2020, sales (in kg) decreased for aquaculture, were stable for cats and dogs*

Aquaculture

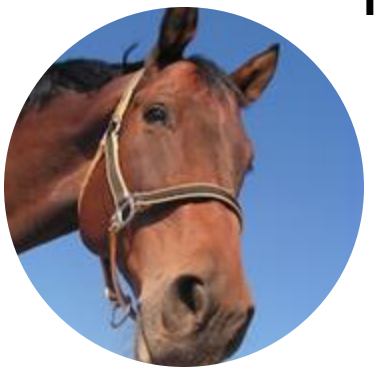
- Only tetracyclines, amphenicols, and macrolides were sold in 2020.
- 18% ⬇ in kg sold between 2019 and 2020.

Cats and Dogs

- Top classes sold: 1st generation cephalosporins, penicillin beta-lactamase inhibitor combinations and nitroimidazoles.
- Overall, quantity of sales were stable with a <1% (32 kg) ⬇ in average kg sold between 2019 and 2020.
- There was ~2% (87 kg) ⬇ in the sale of Category I antimicrobials.

* Results represent the most recent data and may differ from the 2020 VASR Highlights report due to restatement of annual data by some data providers.

Between 2019 and 2020, sales (in kg) were stable for horses and increased for veal*



Horses

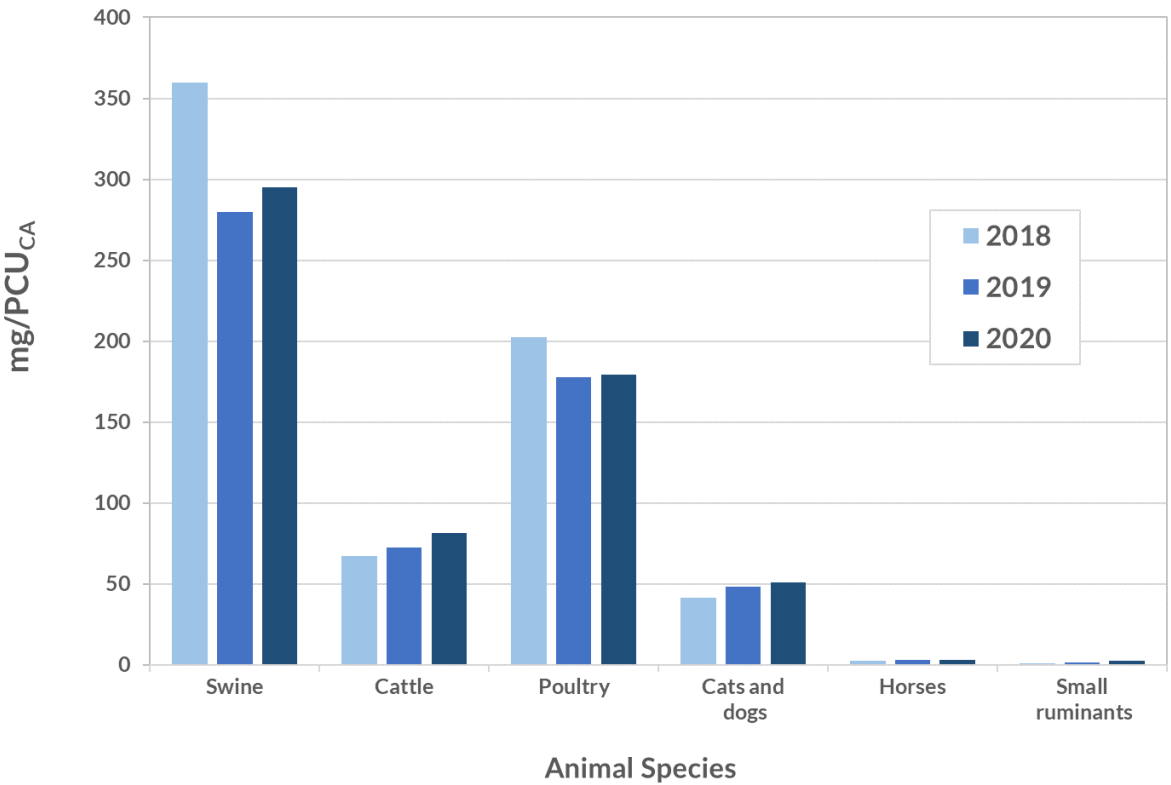
- Top classes sold: penicillins, diaminopyrimidine-sulfonamide combinations, and aminoglycosides.
- Overall, sales were stable with a ~ <1% (7 kg) ⬆ in average kg sold between 2019 and 2020.
- More antimicrobials were compounded for use in horses, than were sold by manufacturers and importers.

Veal Calves

- Top classes sold: tetracyclines, penicillins, and diaminopyrimidine-sulfonamide combinations.
- Overall, there was an ~6% (836 kg) ⬆ in average kg sold between 2019 and 2020.
- No Category I antimicrobials were reported to be manufactured or imported for use in veal calves in 2018, 2019 or 2020.

After adjusting for the number of animals and their weights, the majority of sales in 2020 were intended for use in **pigs**, **poultry**, and **cattle.**

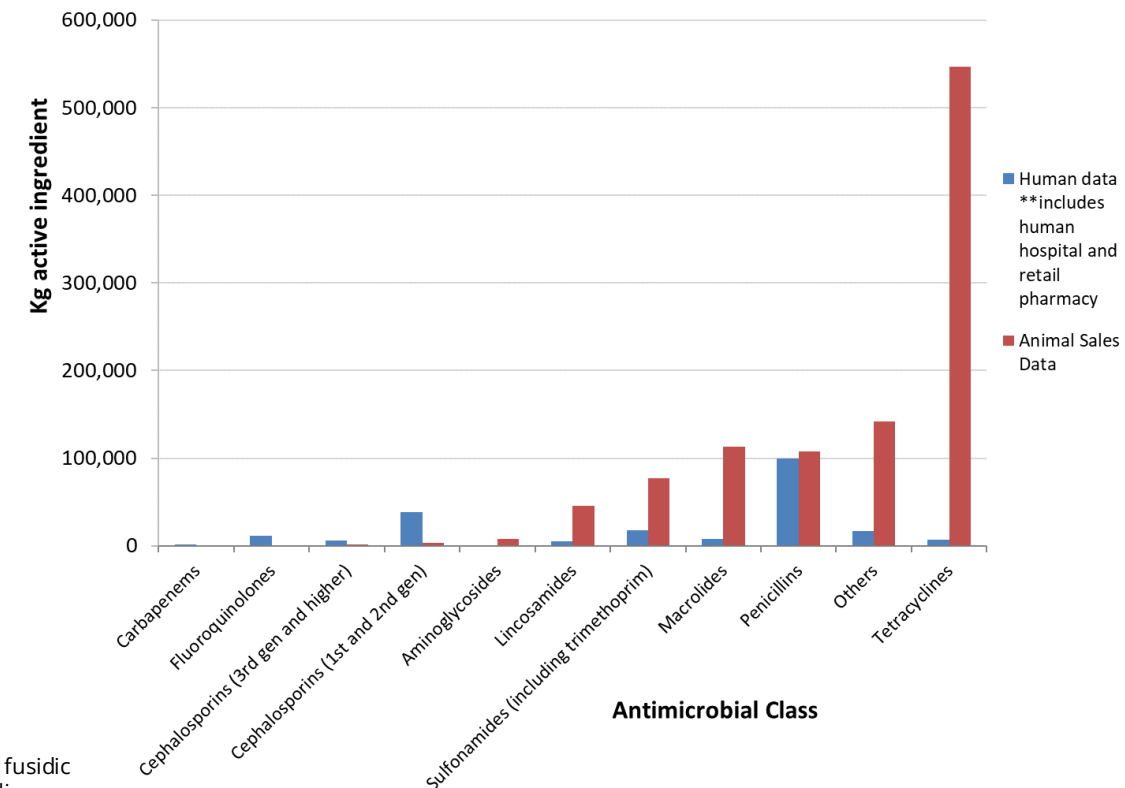
Quantity of medically important antimicrobials (adjusted for population and weights, mg/PCU_{CA}) sold for use in animals



***mg/PCU, where 1 PCU=1 kg animal**

There is a different spectrum of antimicrobials sold for use in animals compared to people

- Sales for antimicrobials in the animal sector reflected relatively more tetracyclines and macrolides, compared to the human sector
- Carbapenems and 4th generation cephalosporins have never been licensed for use in animals in Canada
- From 2018 to 2020, the quantity of 3rd generation cephalosporins sold for animals was **~10 times lower** than the quantity of 3rd generation and higher cephalosporins sold for humans.
- From 2018 to 2020, the quantity of fluoroquinolones sold for animals was **50-78 times lower** than the quantity of fluoroquinolones sold for humans.



Data sources: IQVIA (analyzed by CARSS) and CIPARS-VASR

Others for **humans** includes: bacitracins, 5th generation cephalosporins, fosfomycins, fusidic acid, glycopeptides, lipopeptides, monobactams, nitrofurans, nitroimidazoles, oxazolidinones, phenicols, and polymyxins.
Others for **animals** includes: aminocoumarins, aminocyclitols, amphenicols, β-lactamase inhibitors, cyclic polypeptides, fusidic acid, glycopeptides, nitrofurantoins, nitroimidazoles, orthosomycins, phosphonic acid derivatives, pleuromutilins, polymyxins, pseudomonic acids, streptogramins, and therapeutic agents for tuberculosis.

Integrated Antimicrobial Use and Resistance: **Farm Data**

In this section, we highlight the following integrated AMU and AMR data:

Broiler Chickens

Turkeys

Feedlot Cattle

Grower-Finisher Pigs

Dairy Cattle

Broiler Chickens – AMU Decreased, AMR overall decreased, flock morbidity/mortality generally stable or decreased

- 2020 marked the 2nd year of the Poultry Industry's Step 2 of their AMU reduction strategy.
- AMU decreased by 24% (measured by nDDDvet$_{CA}$/1,000 broiler chicken-days at risk)
  - This change was driven by a decrease in Category II antimicrobials (which decreased by 64%)

- Flock mortality remained stable, and the diagnosis of diseases decreased or remained stable in 2020.
  - Most antimicrobials were used for the prevention of enteric diseases (~88%).
  - Treatment of localized or systemic infections accounted for the remaining use.

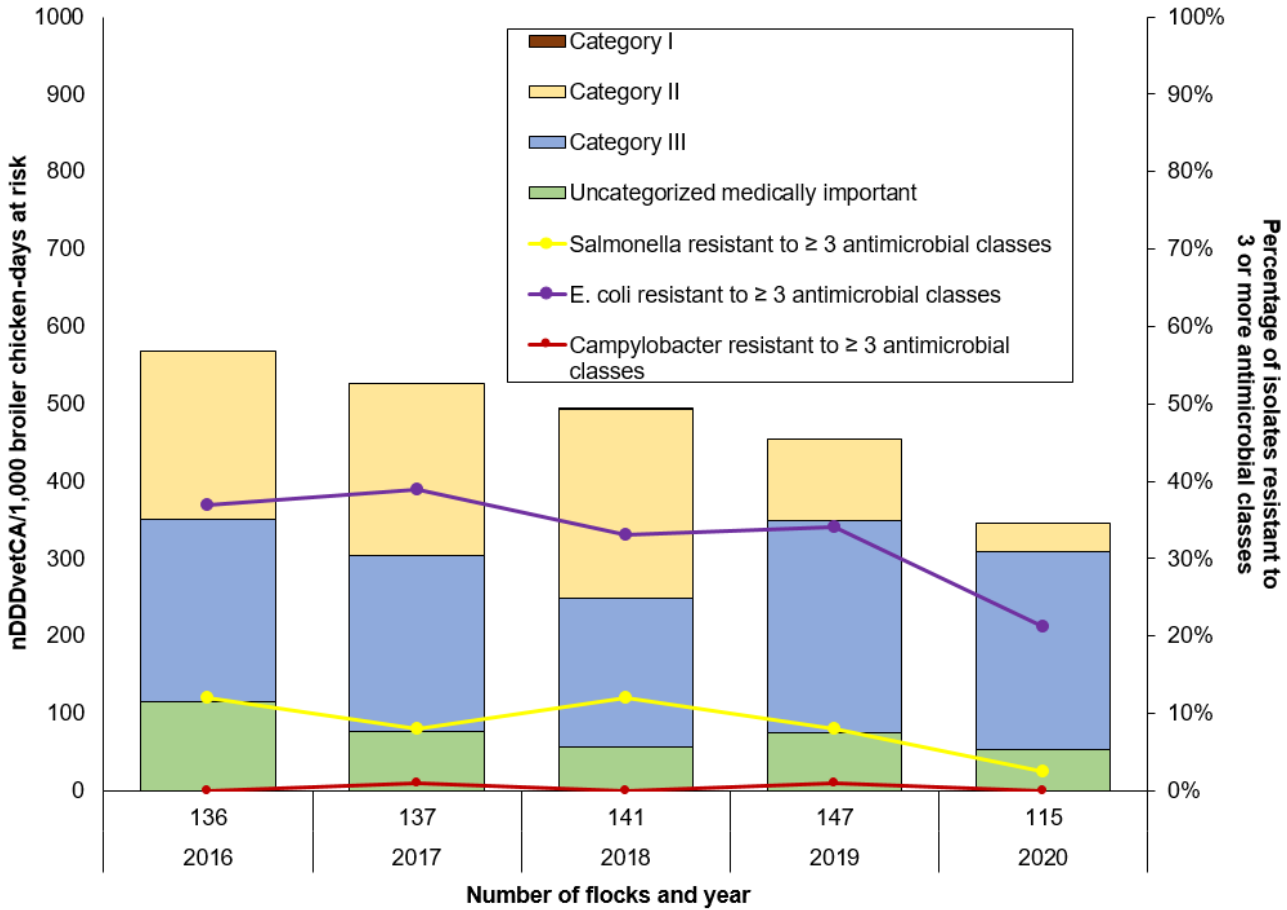
- *E. coli* and *Salmonella* resistant to ≥3 antimicrobial classes decreased.
  - Ceftriaxone resistance in *E. coli* and *Salmonella* also decreased. However, there was an increase in nalidixic acid-resistant *Salmonella*.

- Substantial increase in **ciprofloxacin resistance in *Campylobacter*** since 2018. There was a corresponding increase in resistance to ≥ 1 antimicrobial classes, although resistance to ≥ 3 classes was unchanged between 2019 and 2020.

AMU and AMR in broiler chickens

- AMU has **decreased** since 2016, as well as resistance to ≥ 3 antimicrobial classes in *Salmonella, E. coli*, and *Campylobacter*

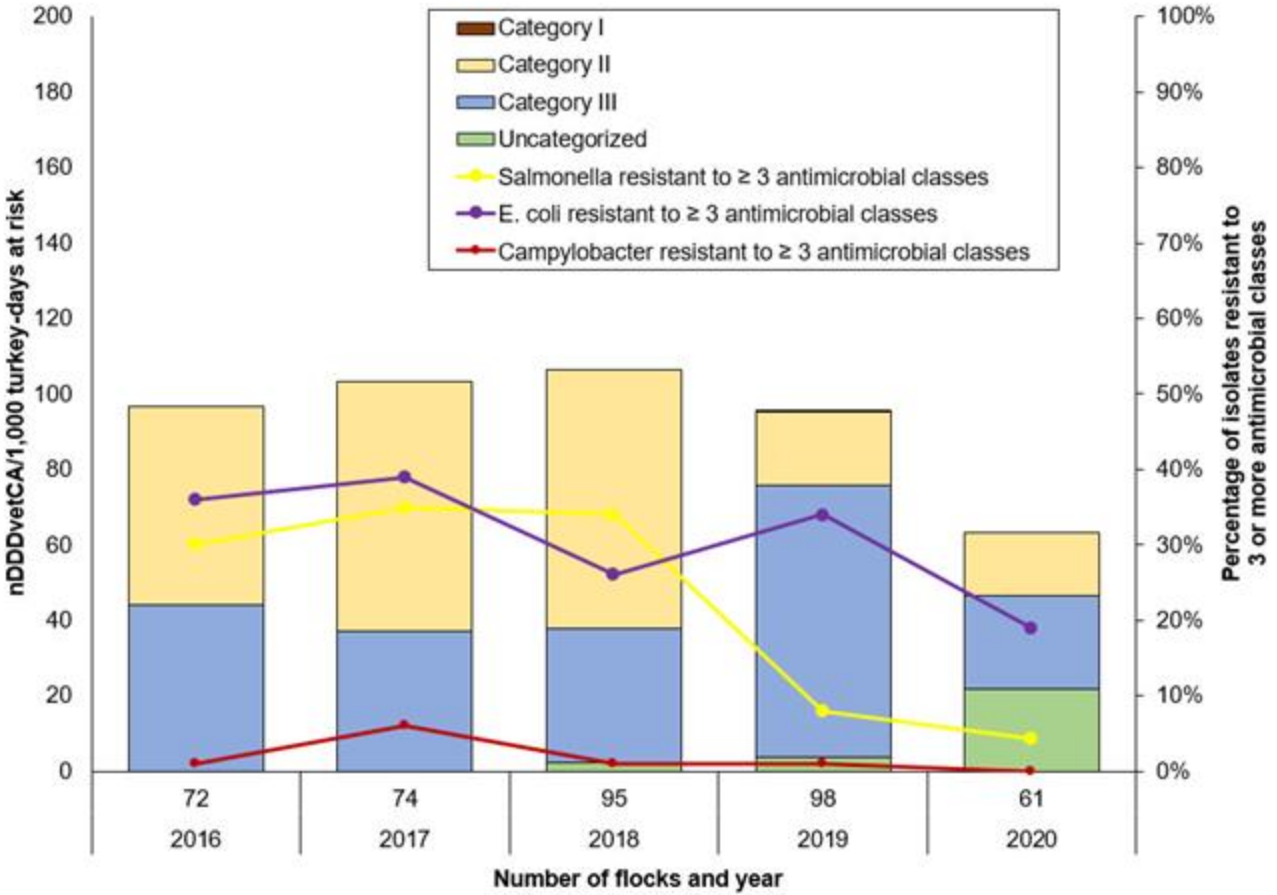
- The diversity of antimicrobial classes reported to be used has **decreased**, consistent with the timing of the elimination of preventive uses of Category II antimicrobials.



Turkeys – AMU decreased, AMR decreased, flock morbidity and mortality stable

- 2020 marked the 2nd year of the Poultry Industry's Step 2 of their AMU reduction strategy.
- AMU in turkeys decreased by 34% (measured by nDDDvet$_{CA}$/1,000 turkey-days at risk).
  - This was driven by the decreases in Categories II (decreased by 13%) and III (decreased by 66%). However, the use of uncategorized medically important antimicrobials (avilamycin) increased 4.6 fold between 2019 and 2020.
- Average flock mortality increased by 0.5% in 2020 with occasional occurrences of yolk sac infection and miscellaneous bacterial diseases (mixed causes) increased.
- Most antimicrobials were used for the prevention of enteric diseases (74%). Treatment of localized or systemic infections accounted for the remaining use.
- Resistance to ≥ 3 antimicrobial classes and ceftriaxone decreased for both *E. coli* and *Salmonella*. There was also a decrease in resistance to nalidixic acid and ciprofloxacin for *Salmonella*.
- Ciprofloxacin-resistant *Campylobacter* decreased substantially since 2018.

AMU and AMR in turkeys



- AMU has **decreased since 2018**, as well as resistance to ≥ 3 antimicrobial classes in *Salmonella, E. coli,* and *Campylobacter*
- The diversity of antimicrobial classes reported to be used has **decreased**, consistent with the timing of the elimination of preventive uses of Category II antimicrobials

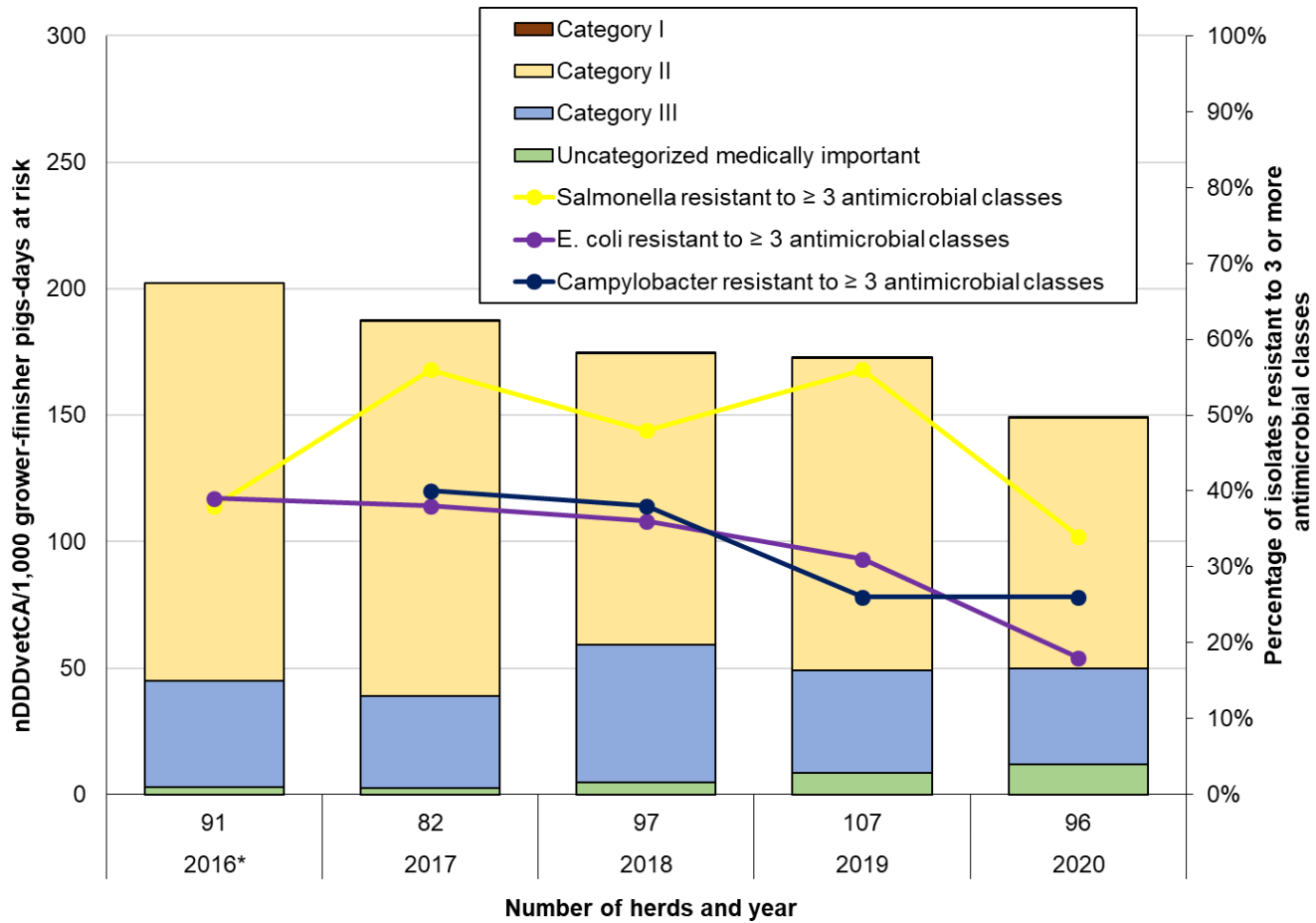
Grower-Finisher Pigs – AMU decreased, AMR decreased

- **AMU decreased by 13%** (measured by nDDDvet/1,000 grower-finisher pig-days at risk) between 2019 and 2020. This change was driven by decreased use of macrolides in-feed.
- A small quantity of 3rd generation cephalosporins were used by injection, with no reported use of fluoroquinolones since 2018.
- **Resistance to ≥ 3 antimicrobial classes decreased for** *E. coli*, *Salmonella*, and *Campylobacter*. Ceftriaxone-resistant *Salmonella* also decreased.

Grower-Finisher Pigs

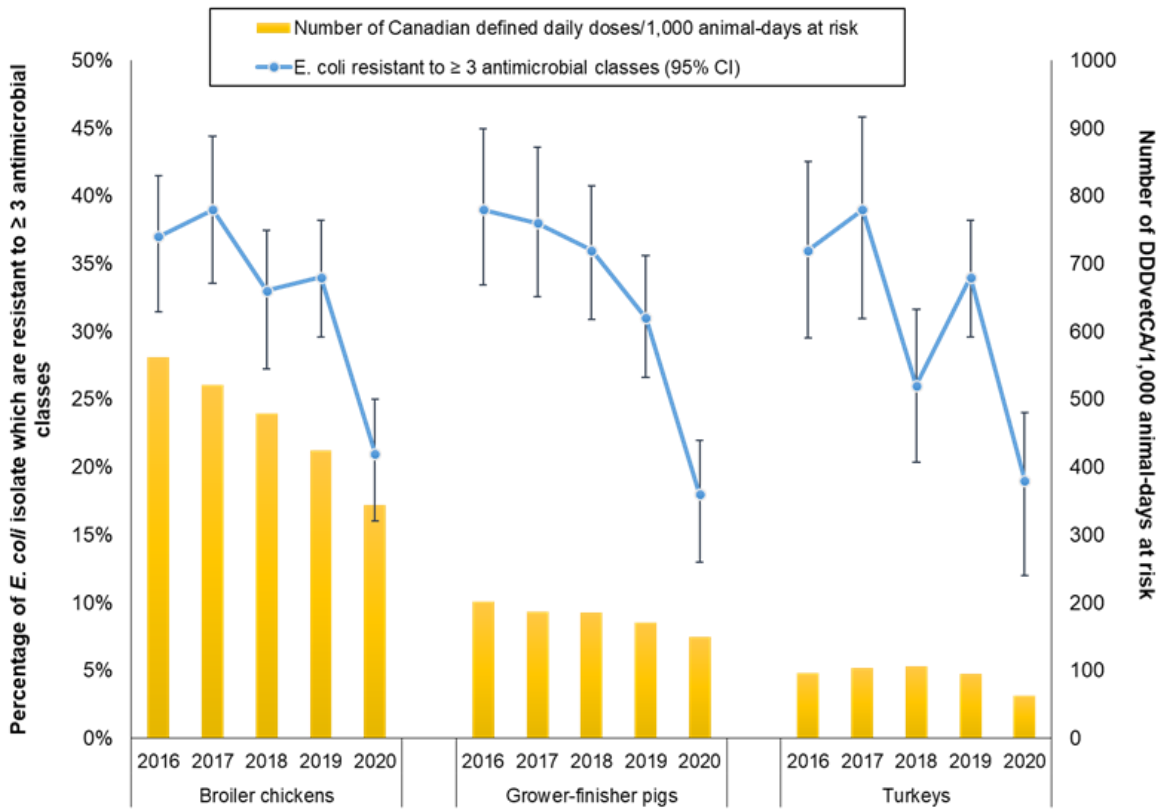
- While doses and durations were in line with labelled claims for disease treatment and/or prevention, in 2020, there was reported **growth promotion use** of medically important antimicrobials in four sentinel herds
- After adjusting for dose, the number and weight of pigs, and the time at risk, the highest quantity of AMU in grower-finisher pigs in 2020 was for **disease prevention**, primarily to prevent enteric diseases
- The proportion of antimicrobials used for **disease treatment decreased** from 2019 to 2020

AMU and AMR in grower-finisher pigs.



- Both AMU and resistance to ≥ 3 antimicrobial classes in *E. coli* and *Campylobacter* have **decreased since 2016**.
- Resistance to ≥ 3 antimicrobial classes in *Salmonella* has been more variable.

Recognizing there are antimicrobial class specific differences in trends, using a key indicator of AMR (*E. coli* resistant to ≥ 3 antimicrobial classes), **overall AMU and AMR decreased** for these food animal species.



Feedlot Cattle – AMU (new!), AMR varied

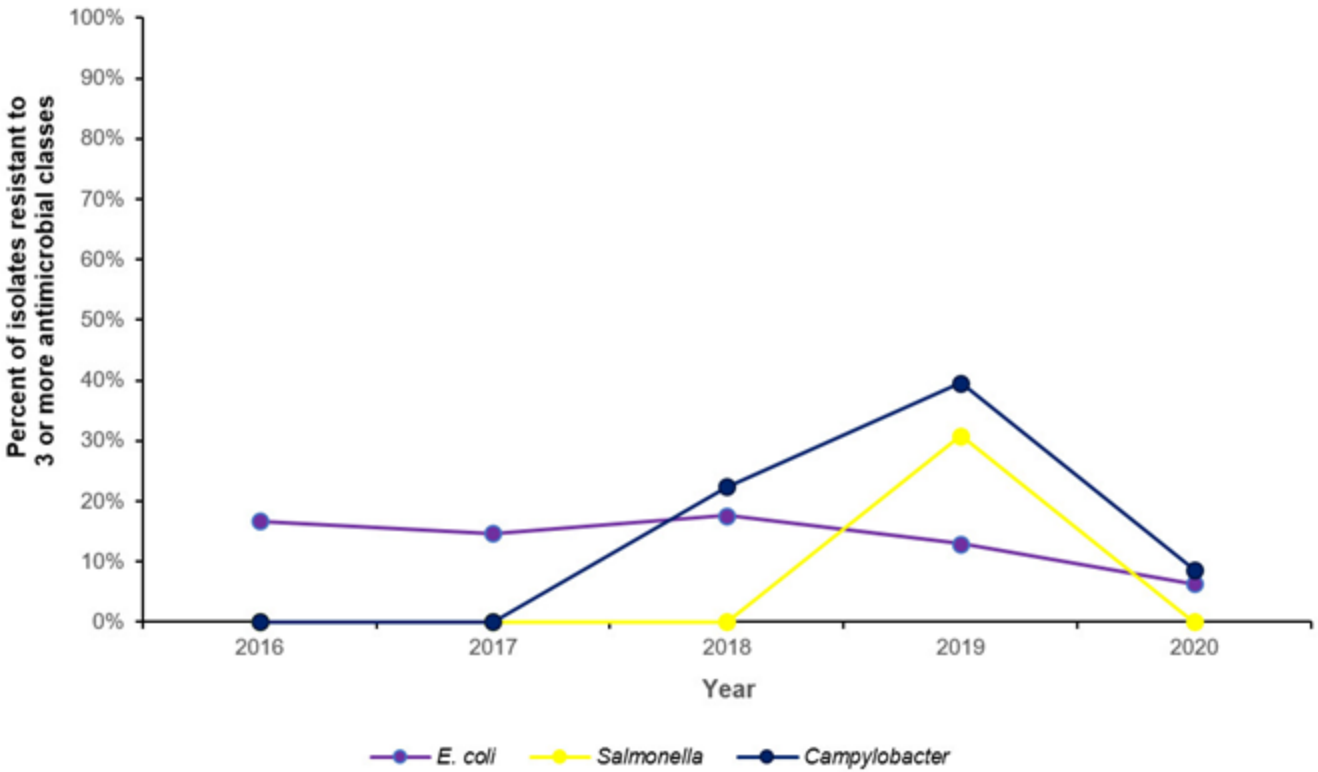
AMR

- Resistance to ≥ 1 antimicrobial class was relatively **stable** for *E. coli* and *Campylobacter.*
- **Decreasing trend** of resistance to ≥ 3 antimicrobial classes for *E. coli*.
  - **Increase in resistance to nalidixic acid** in *E. coli*
  - No resistance to ciprofloxacin detected.

- Expanded sampling frame including
  - *Enterococcus* (Gram-positive)
  - Bovine respiratory pathogens
    - *Manneheimia haemolytica*
    - *Pasteurella multocida*
    - *Histophilus somnus*

Feedlot Cattle

Percentage of *E. coli*, *Salmonella*, and *Campylobacter* isolates from feedlot cattle resistant to ≥ 3 antimicrobial classes

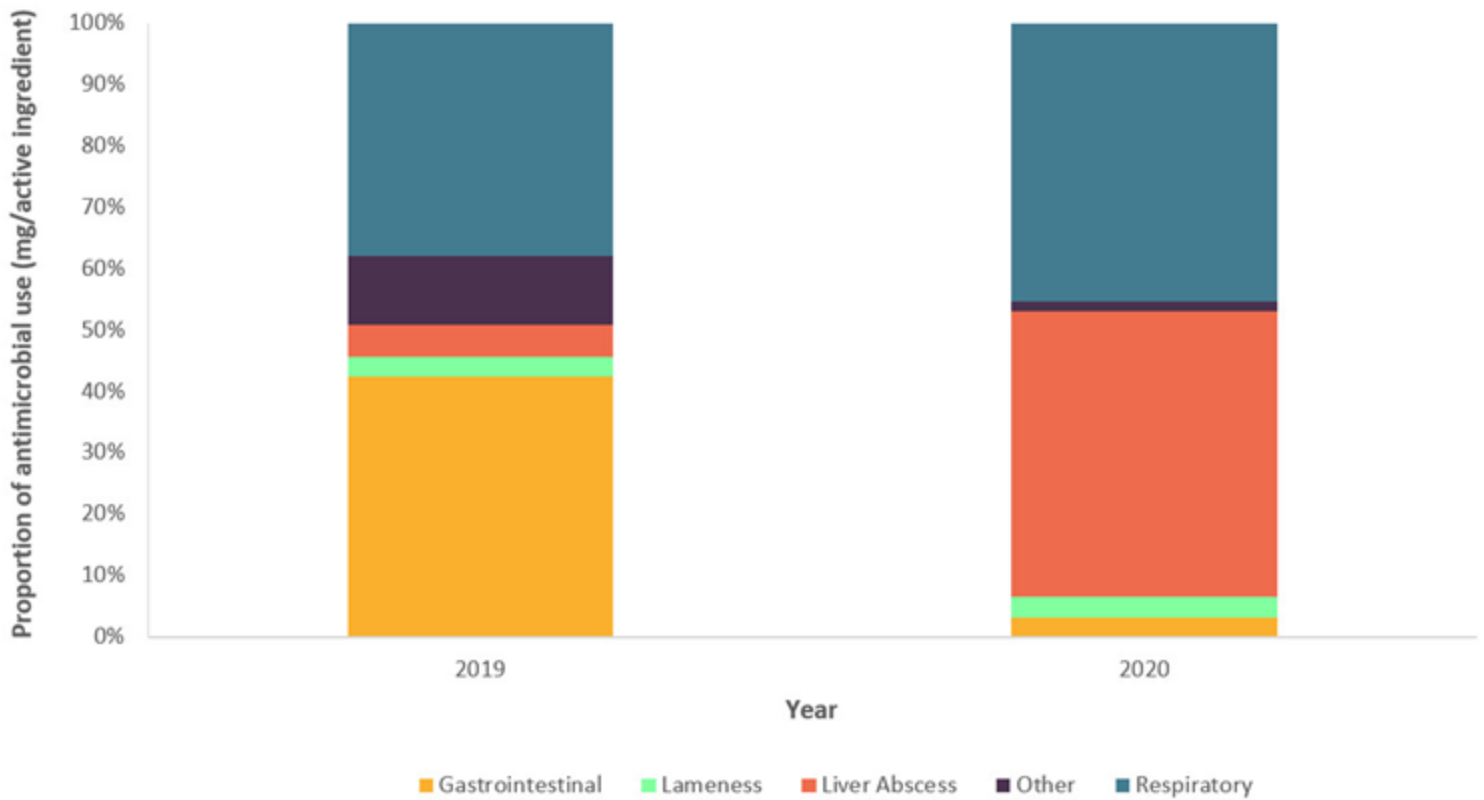


Due to low isolate numbers, the trends in AMR for *Salmonella* need to be interpreted with caution.

Note: The data for 2016-2018 are representative of Alberta only.

Feedlot Cattle – New Surveillance Reporting

Proportion of AMU in feedlot cattle per secondary reason for use



Ionophores and antimicrobials labeled for growth promotion are not shown.

Dairy Cattle – AMU (new!) and AMR (new!)

AMU:

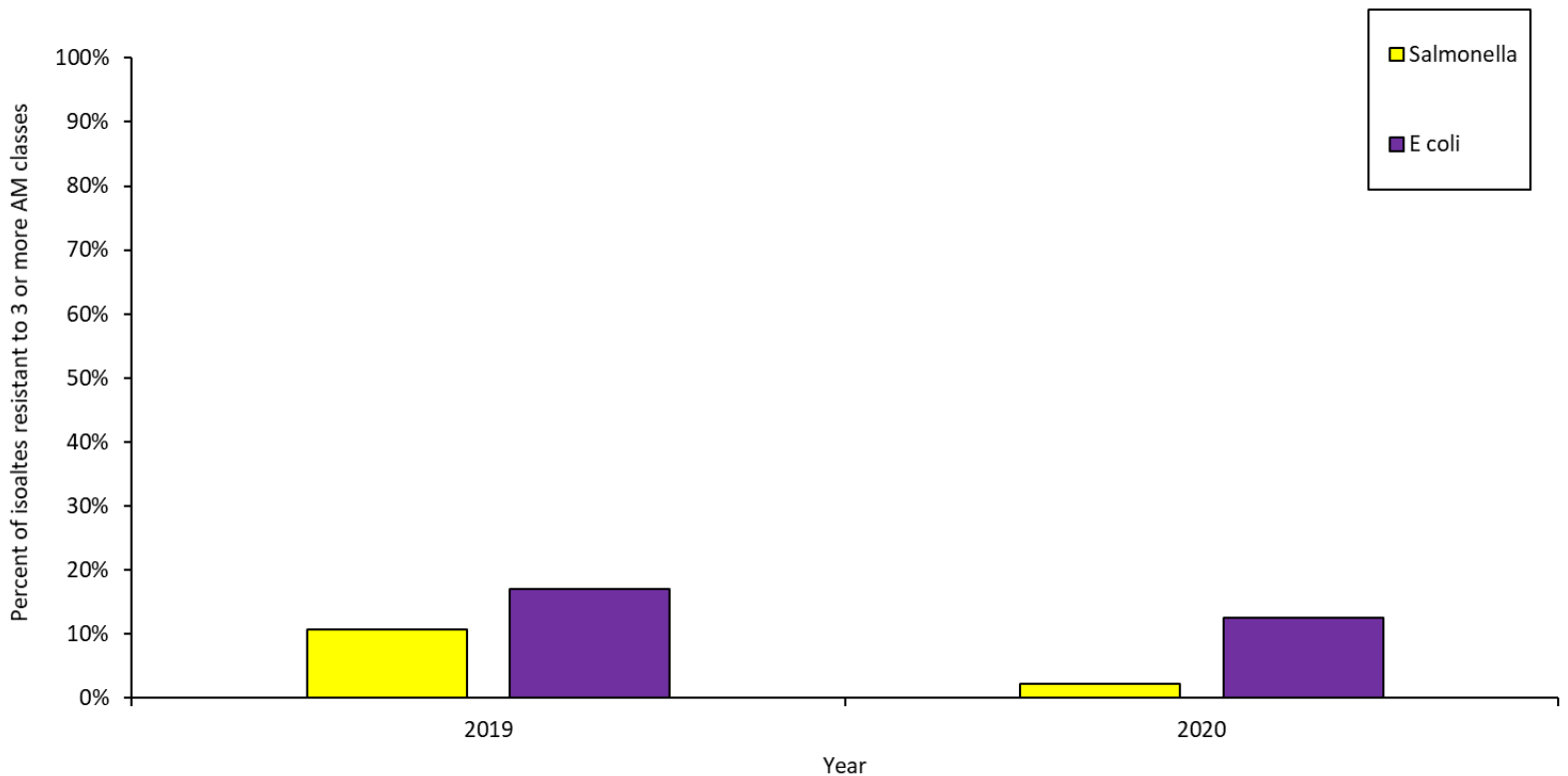
- The primary route of administration was injection and for disease treatment.
- The predominant AMU was trimethoprim-sulfonamides and penicillins.

AMR:

- Two years of reporting
- Resistance to ≥1 antimicrobial classes and ≥3 antimicrobial classes decreased for both *E. coli* and *Salmonella*
  Resistance to ceftriaxone was only observed in *E. coli.*
- Resistance was not observed to nalidixic acid or ciprofloxacin in either *E. coli* or *Salmonella*.

Dairy Cattle

Percentage of *E. coli* and *Salmonella* isolates from dairy cattle resistant to ≥ 3 antimicrobial classes (2019-2020).



Integrated **Antimicrobial Resistance**

Salmonella Enteritidis and Nalidixic Acid Resistance from Broiler Chicken

- In 2018, CIPARS detected the emergence of **nalidixic acid-resistant *Salmonella* Enteritidis** from chicken(s) in a small but notable number of isolates across multiple surveillance components. This trend continued in 2019.
- In 2020, despite limited sampling due to the COVID-19 pandemic, nalidixic acid- resistant *S.* Enteritidis was detected in a **retail chicken sample from Québec.**
- Additionally, in 2020, nalidixic acid resistance was detected in **five *S.* Enteritidis isolates** from sick chickens, noting that sick animals do not enter the food chain.

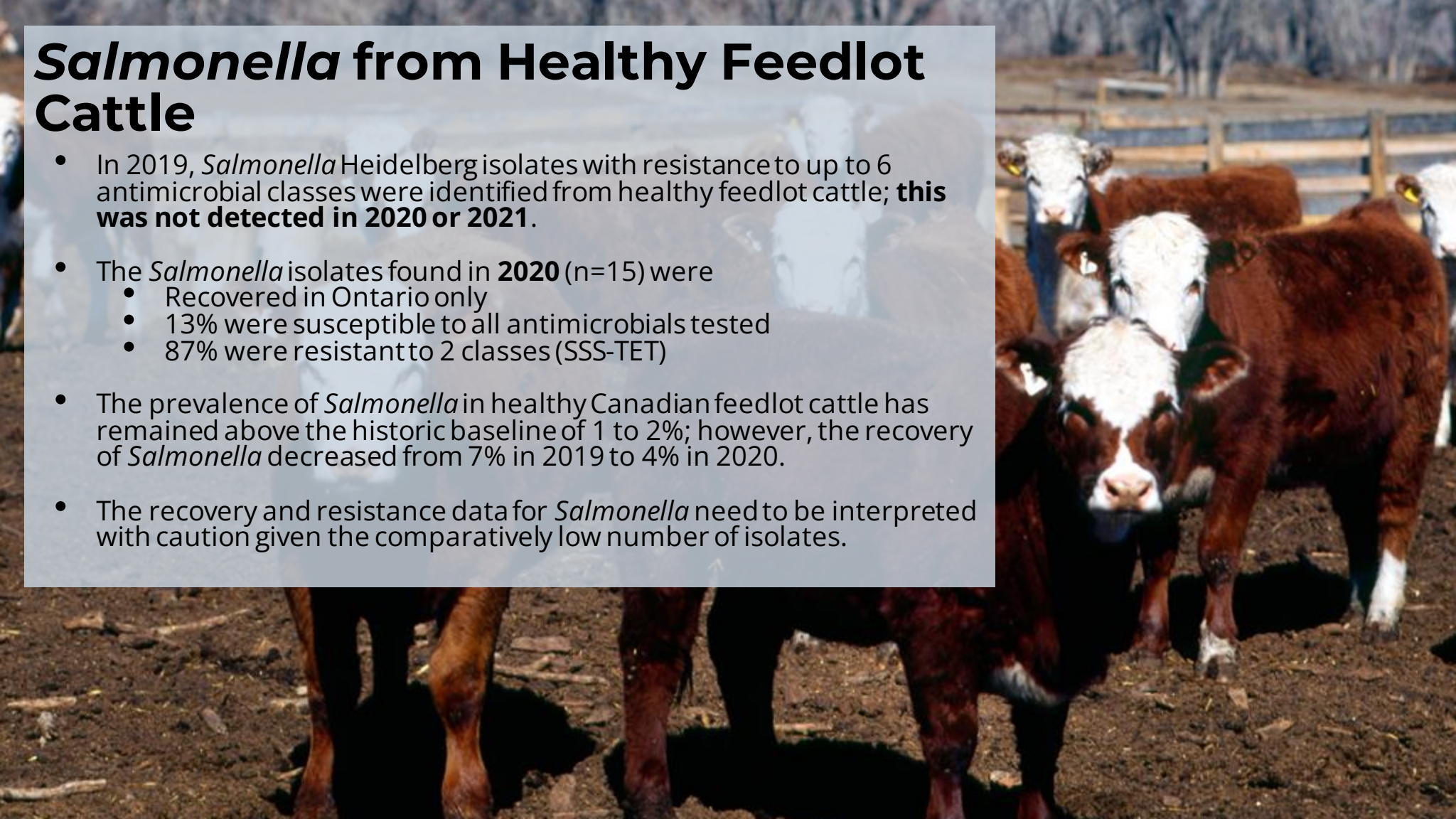
Salmonella from Healthy Feedlot Cattle

- In 2019, *Salmonella* Heidelberg isolates with resistance to up to 6 antimicrobial classes were identified from healthy feedlot cattle; **this was not detected in 2020 or 2021**.

- The *Salmonella* isolates found in **2020** (n=15) were
  - Recovered in Ontario only
  - 13% were susceptible to all antimicrobials tested
  - 87% were resistant to 2 classes (SSS-TET)

- The prevalence of *Salmonella* in healthy Canadian feedlot cattle has remained above the historic baseline of 1 to 2%; however, the recovery of *Salmonella* decreased from 7% in 2019 to 4% in 2020.

- The recovery and resistance data for *Salmonella* need to be interpreted with caution given the comparatively low number of isolates.



Detection of Colistin Resistance

- The emergence of **transmissible resistance** to colistin is of great global concern.
- People with severe infections associated with an extensively-resistant or pan-resistant bacteria may have few or in some cases, no antimicrobial treatment options available.
- Colistin is an antimicrobial of "last resort" to treat some of these infections, and is therefore categorized as an antimicrobial of very high importance to human medicine (Category I) by Health Canada's Veterinary Drugs Directorate. Resistance to colistin jeopardizes its use to treat these human cases and no other antimicrobial treatment may be available.
- Antimicrobial susceptibility screening for colistin resistance began in 2016, and in 2020 colistin was added to the panel for routine susceptibility testing.

2020 Surveillance Findings

Healthy Broiler Chickens: Two isolates (*S*. Enteritidis and *S*. Kiambu) from abattoir samples were resistant to colistin.

Healthy Grower-Finisher Pigs: One *E. coli* isolate from farm samples was resistant to colistin.

Retail Ground Beef: One *E. coli* isolate from retail ground beef samples was resistant to colistin.

Genetic analyses showed that the observed colistin resistance in the animal/food samples was **not** on a transmissible mobile element.

For CIPARS, the detection of transmissible colistin resistance in *Salmonella* from human samples is **currently rare** (5 isolates detected in 2020).

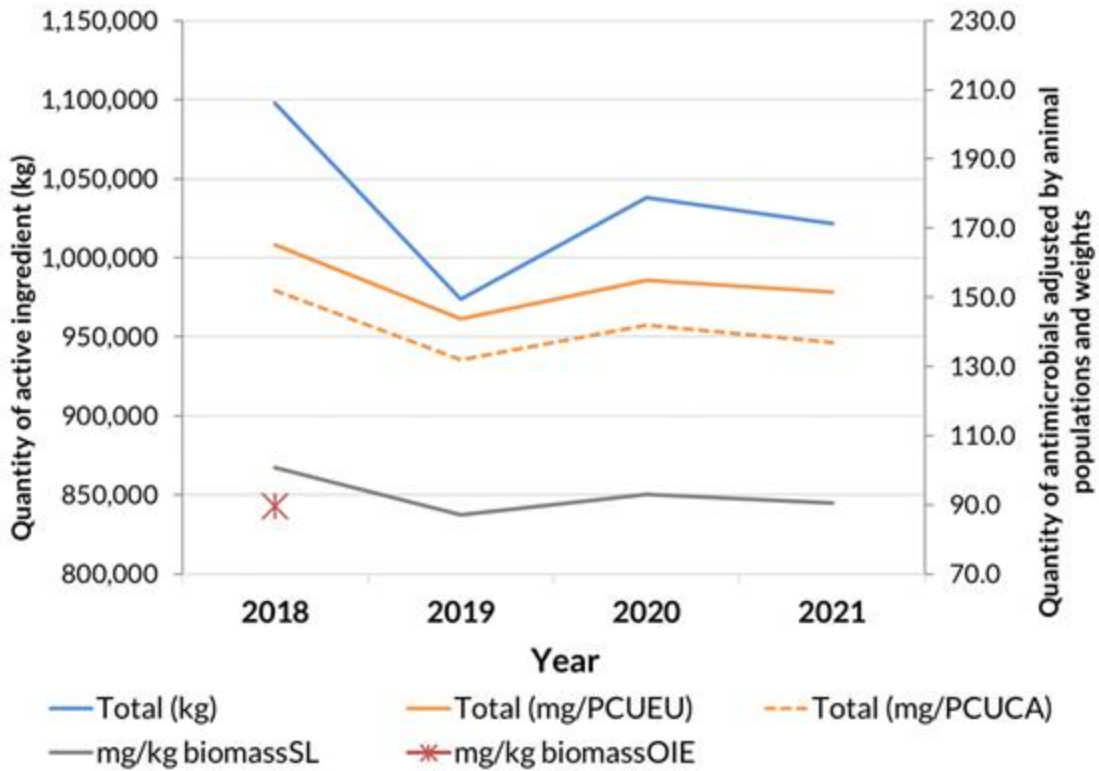
2021 **Preview**

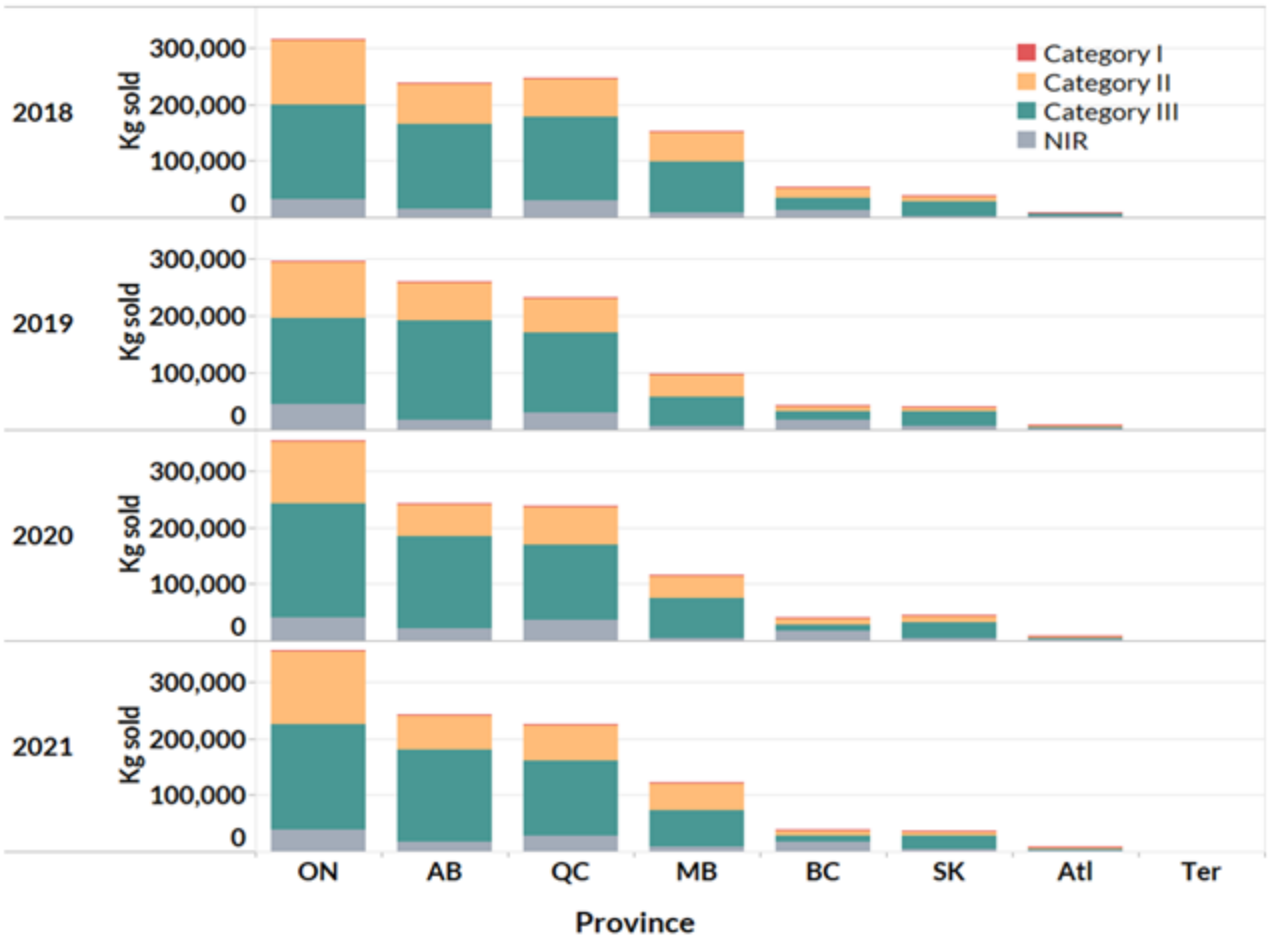
Select results from 2021 VASR, farm and abattoir surveillance

Sales of medically important antimicrobials for production animals slightly decreased between 2020 and 2021. Since 2018 there has been an ~7% decrease in kg sold and an ~10% decrease in mg/PCU_{CA}.

Between 2020 and 2021:

- **3% decrease** in antimicrobials sold in kg adjusted by animal population and weights **in production animals** (mg/PCU_{CA} and mg/kg biomass $_{SL}$).
- Increase by 2% of Category I sales





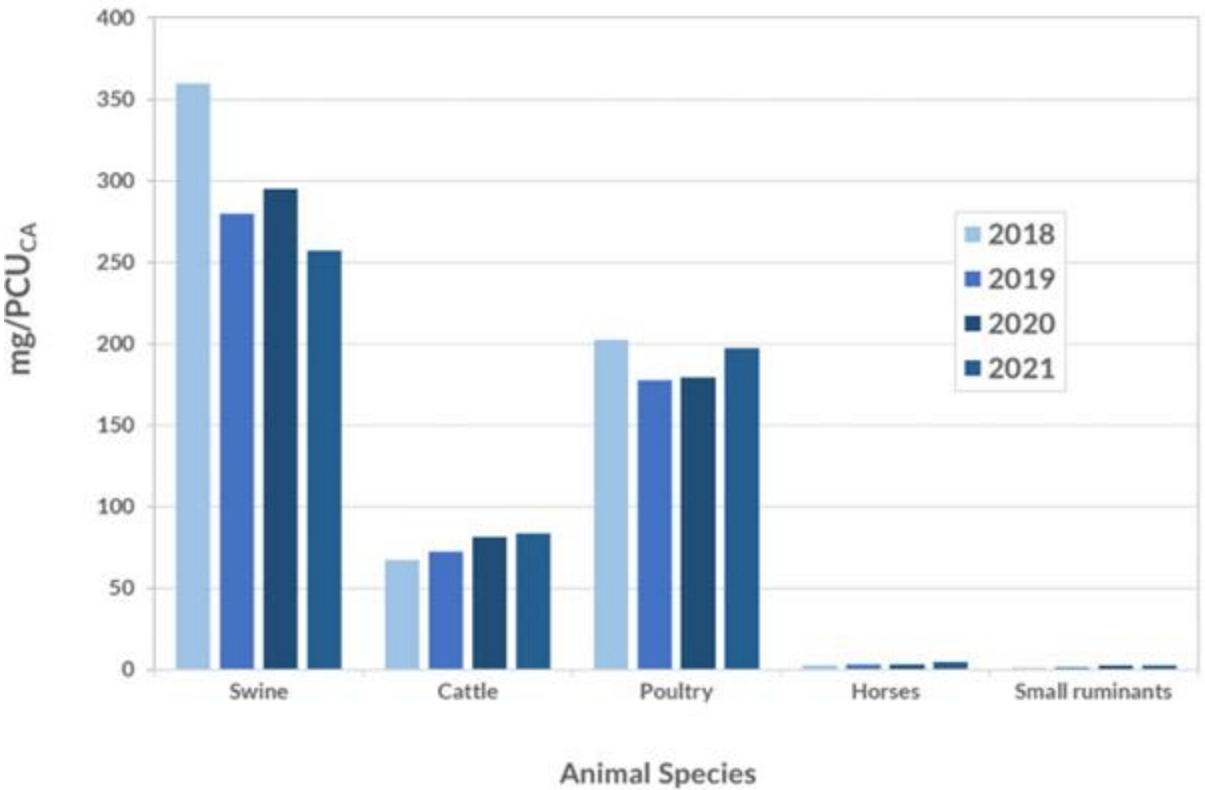
We see the most antimicrobial sales where there are the most animals

While quantities of antimicrobials compounded are not included on this slide, the majority of what was reported as compounded continued to be for use in **pigs.**

Québec, Ontario, and Manitoba continued to be the provinces with the largest quantity of reported compounding.

*Provincial biomass estimates will soon be available to contextualize sales

The overall decrease in sales nationally between 2020 and 2021 was driven by decreased sales for pigs.



Sales for pigs have been more variable, with an overall ~29% decrease since 2018.

Sales for cattle have continuously increased since 2018 (~24% increase from 2018 to 2021).

Sales for poultry have increased since 2019 and are 3% lower than 2018.

AMU (decreased)

- The percentage of flocks exposed to medically important antimicrobials decreased by 10% between 2019 and 2021.
- All AMU indicators in 2021 decreased compared to 2019.
  - mg/PCU decreased by 20%.
  - mg/kg animal biomass (a new weight-based indicator) decreased by 19%.
  - $nDDDvet_{CA}$/1,000 broiler chicken days at risk 18%.

AMR (decreased)

- One *Salmonella* isolate from abattoir chickens was resistant to colistin in 2021 (S. Enteritidis – intrinsic resistance).
- A gradual increase in resistance to tetracycline in Abattoir and Farm chicken isolates since 2017, is primarily due to *S.* Kentucky.
- 19% of *E. coli* isolates were resistant to ≥3 classes of antimicrobials tested, which is a 3% decrease from 2020.
- There was a 2% decrease in resistance to ciprofloxacin in *Campylobacter* from Farm chicken isolates since 2019, and a 3% decrease in abattoir chicken isolates over the same period.

Preview from Layer Chickens 2021

AMR in *Salmonella*

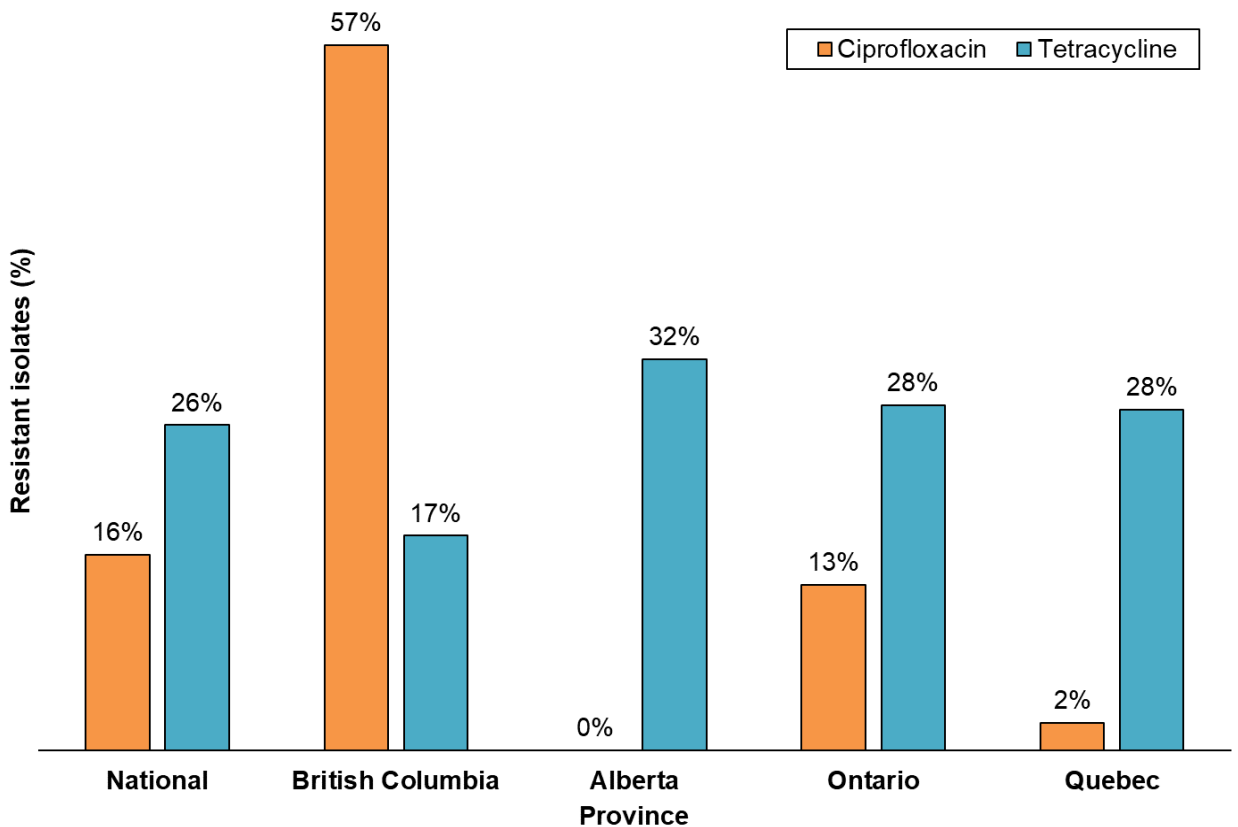
- 71 isolates tested
- No isolates resistant to 3 or more classes
- 59% susceptible to all antimicrobials tested
- No isolates resistant to Category I antimicrobials

AMR in *E. coli*

- 280 isolates tested
- Less than 3% of isolates resistant to 3 or more classes
- 72% susceptible to all antimicrobials tested
- No isolates resistant to Category I antimicrobials

AMR in *Campylobacter*

- 65% of all *Campylobacter* were susceptible to antimicrobials tested
- **High level ciprofloxacin resistance in BC is concerning**
- Ciprofloxacin-resistant isolates were also detected in Ontario and Québec
- Previous study in Ontario in 2016-17 recovered 8 ciprofloxacin- resistant isolates.



Preview from Turkeys 2021

AMU (decreased)

- The number of flocks exposed to medically important antimicrobials decreased by 35% between 2019 and 2021.
- The number of flocks exposed to any antimicrobials decreased by 23% between 2019 and 2021.
- **All AMU indicators in 2020 and 2021 decreased compared to 2019.**
- In 2021 there was reported use of **enrofloxacin**, gentamicin, and virginiamycin

AMR (decreased)

- Two *Salmonella* isolates with resistance to colistin were detected in 2021
  - Genomic analyses of these isolates will determine if the resistance is transmissible
- The number of isolates susceptible to all antimicrobials tested increased by 14% in *Salmonella*, 14% in *E. coli*, and 9% in *Campylobacter* when compared to 2020.
- There was a 17% decrease in resistance to ciprofloxacin in *Campylobacter*

Category I antimicrobials are used by **injection** and **intramammary routes** of administration.

Category II antimicrobials are most commonly used across **all production types** and **all routes of administration**.

Main Drivers of AMU

13%
Calf Respiratory

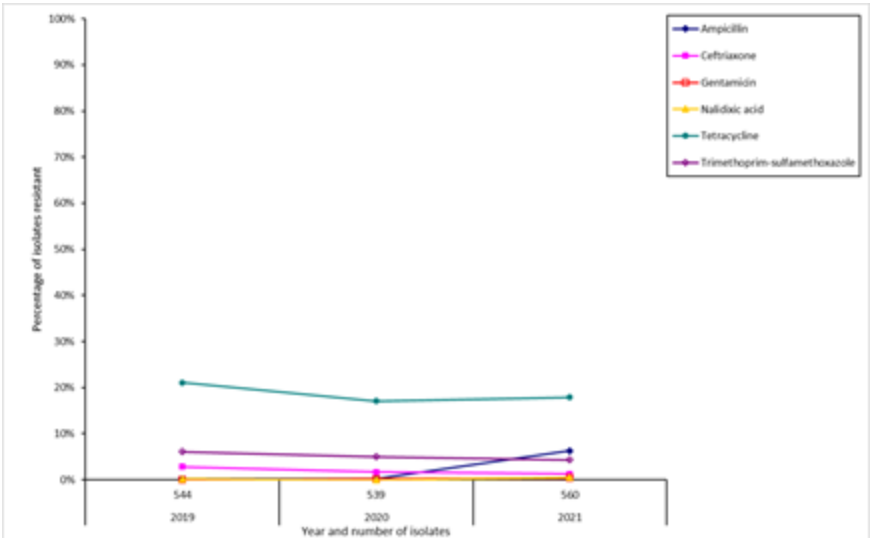
16%
Clinical Mastitis (CM)

12%
Dry Cow Treatment (DCT)

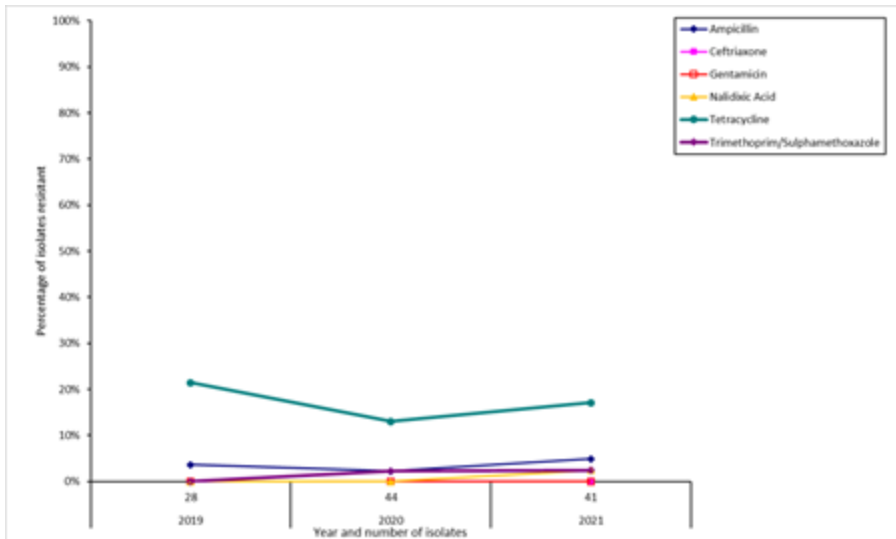
Higher levels of Category I AMU in cows may be related to the absence of a **milk withhold time** for injectable 3rd generation cephalosporins.

There is evidence of selective AMU practices in both CM and DCT, positive stewardship indicators.

AMR in *E. coli* from Dairy Cattle



AMR in *Salmonella* from Dairy Cattle



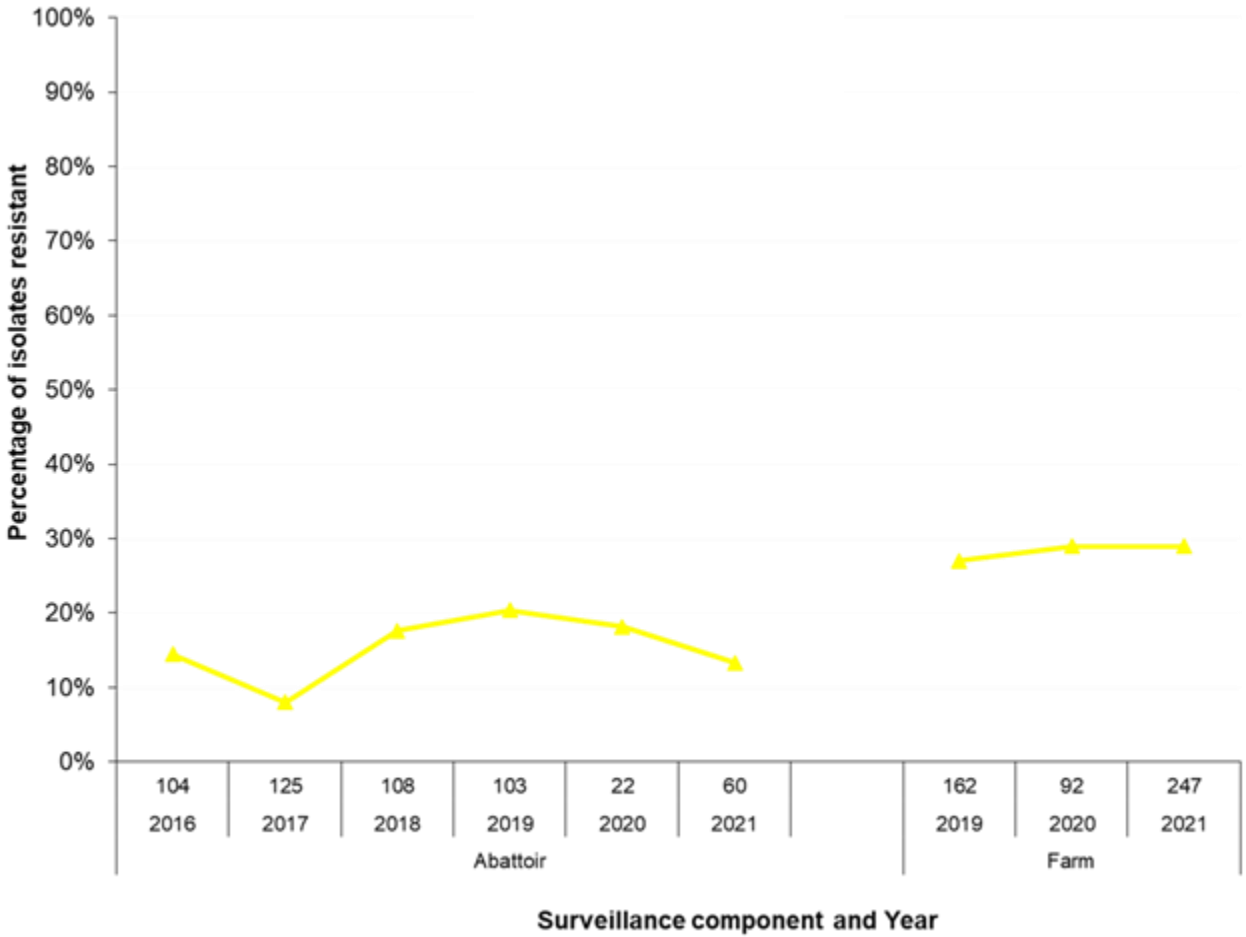
- *Salmonella* was recovered from 3% of fecal samples from Dairy Cattle in 2019, 4% in 2020, and 5% in 2021. This is similar to the recovery of *Salmonella* from the CIPARS Feedlot Beef Cattle Surveillance program.
- *Salmonella* were isolated from calf (n=8), heifer (n=6) and cow (n=7) manure samples, and manure pit samples (n=20) showed no significant difference in AMR across production phases or sample type.
- *E. coli* isolated from calf manure samples had significantly higher levels of resistance to Category II and III compared to other production phases.

Preview from Feedlot Cattle 2021

AMR

- The proportion of *Campylobacter* isolates resistant to ciprofloxacin was maintained at 29% in feedlot cattle in 2021.
- Resistance in *Campylobacter* isolates from healthy cattle at slaughter decreased between 2019 and 2021, however the target number of isolates was not achieved in 2020 or 2021 due to impacts of COVID-19 mitigation measures on sampling.
- There were no *E. coli* isolates from feedlot cattle or Abattoir cattle that were resistant to ciprofloxacin in 2021.
- There were no *Salmonella* isolates from feedlot cattle resistant to ciprofloxacin in 2021. *Salmonella* is not isolated from abattoir cattle due to low prevalence.

Ciprofloxacin resistance in *Campylobacter* from cattle (feedlot cattle and healthy cattle at slaughter)



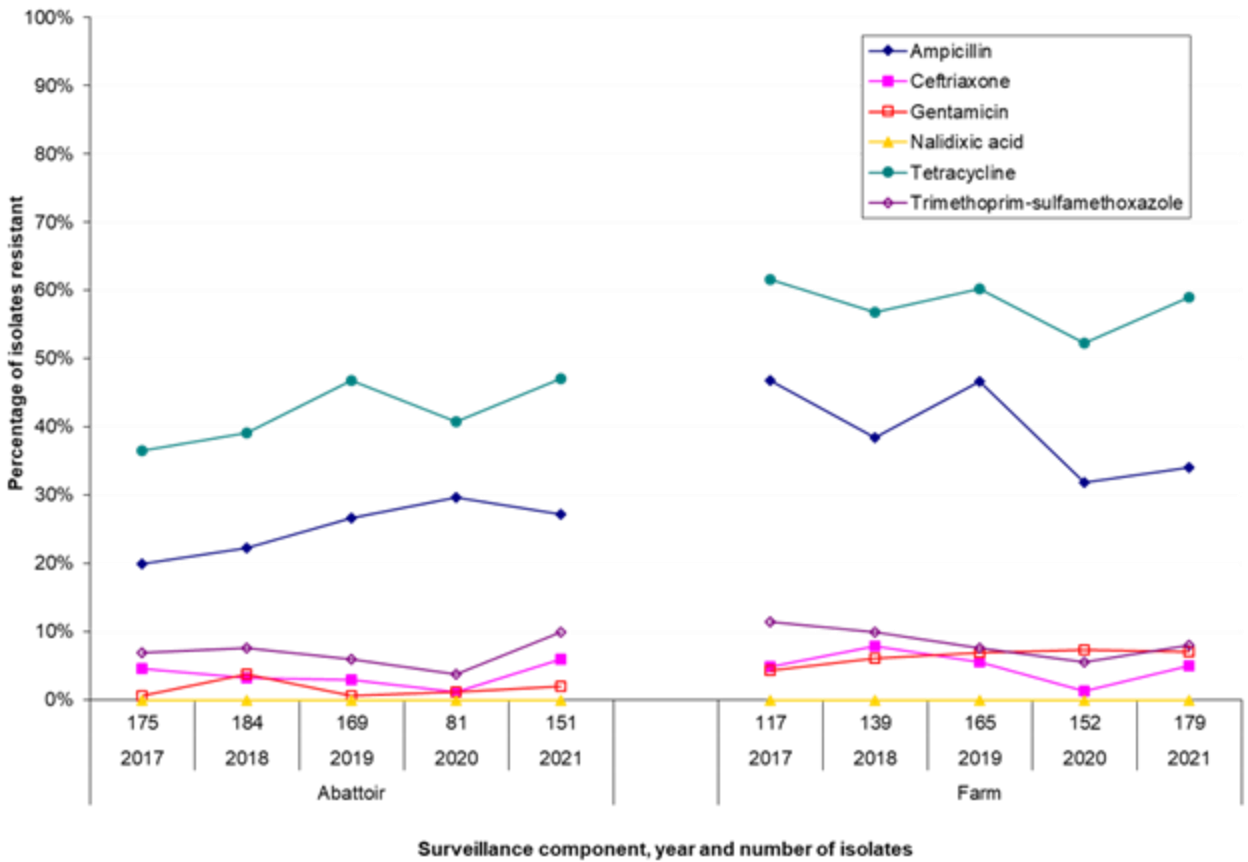
Ciprofloxacin resistance in *Campylobacter* in healthy feedlot cattle seems to be stable – at **almost 30%** of isolates resistant

Preview from Grower-Finisher Pigs 2021

AMR (decreased)

- The **decrease** in the proportion of *Salmonella* and *E. coli* isolates from farm and abattoir pigs resistant to ≥3 classes of antimicrobials continued into 2021.
- There was an additional **12% decrease** in the proportion of *E. coli* isolates resistant to ≥3 classes of antimicrobials in abattoir pigs between 2020 and 2021.
- Resistance to Nalidixic acid has **increased** since 2017 in *E. coli* isolates from farm and abattoir pigs but remains below 2%.
- Resistance to ≥3 classes of antimicrobials in *Campylobacter* has **decreased**:
  - Farm pigs: 40% of isolates in 2017 to 0% in 2021
  - Abattoir pigs: 25% of isolates in 2017 to 8% in 2021
- The proportion of *Campylobacter* isolates susceptible to all antimicrobials tested **increased** from 22% in 2019 to 54% in 2021 for farm pigs. A similar change was not seen in *Campylobacter* isolates from abattoir pigs over the same time period.

AMR in *Salmonella* from abattoir and farm pigs



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There has **not been any resistance to ciprofloxacin** in *Salmonella* isolates from farm and abattoir pigs.

There was a **significant decrease** in resistance to **ampicillin** between 2017 and 2021 in *Salmonella* isolates from **farm pigs**.

However, **ampicillin resistance** in *Salmonella* isolates from **abattoir pigs increased** over the same time period.

Will continue to monitor **ceftriaxone resistance** in abattoir and farm isolates.

Take-away messages

	Antimicrobial Sales (2018-2021)	AMU (farm) (2016-2021)	AMR (farm & abattoir) (2016-2021)
Pigs	All pigs: ↓	Grower-finishers: ↓ (2016-2020)	Grower finishers: ↓
Cattle	↑	Feedlot: NA – **new!** Dairy: NA – **new!**	Feedlot (2019-21): Dairy (2019-21): ↓
Poultry	Poultry: variable, almost the same as 2018	Broilers: ↓ Turkeys: ↓ Layers; NA – **new!**	Broilers: ↓ Turkeys: ↓ Layers; NA – **new!**
Cats and Dogs	↑	NA	NA
Horses	↑	NA	NA
Small Ruminants	↑	NA	NA
Aquaculture	↓	Data not presented: ↓	NA

*AMR for this table is reflected primarily by the indicator "resistant to ≥ 3 antimicrobial classes". Noting that there are fluctuations in resistance to individual antimicrobials within bacterial species.

Interactive Data Visualizations

- Platform: Infobase/Tableau
- Antimicrobial Sales (VASR)
- Antimicrobial Resistance

Take away messages

- While we have higher sales than countries reporting in Europe, there are important differences in the antimicrobial classes sold
- *Salmonella* Heidelberg from healthy cattle on farm resistant to many antimicrobial classes – this was only detected in 2019 and not repeated- including the detection of *Salmonella* Heidelberg
- *Salmonella* Enteritidis from chicken(s) resistant to nalidixic acid – continuing
- Non-transmissible colistin resistance? Handful of isolates in multiple animal species/stages of the food chain
- We have new surveillance components/reporting: feedlot and dairy AMU, layer AMU/AMR and broiler chicken surveillance is expanding on a pilot basis to include *Enterococcus* (re-implementation) and adding a chicken pathogen (*Clostridium perfringens*)
- 20th anniversary – infographics will be published
- Two years' worth of material – catch up
  - 2020 findings will be in our upcoming *Executive Summary, Integrated Findings Report with Technical Annex,* and *CARSS report*
  - Some 2021 findings will be available via interactive data
  - *2021 VASR Highlights Report* to be released during WAAW

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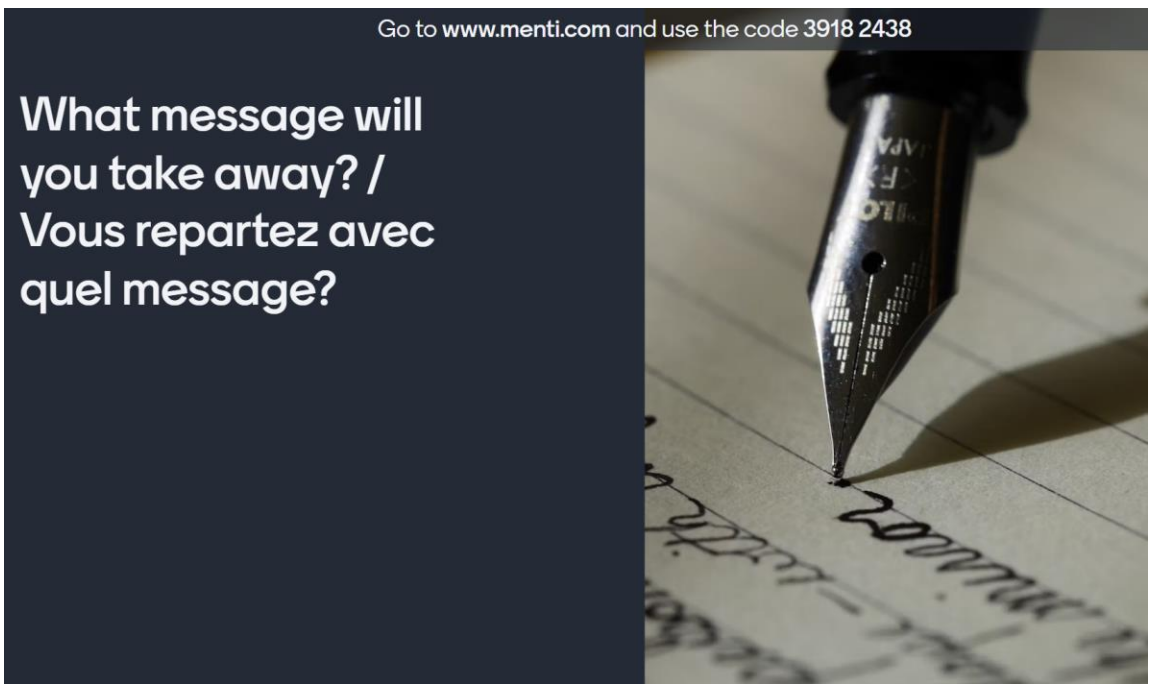

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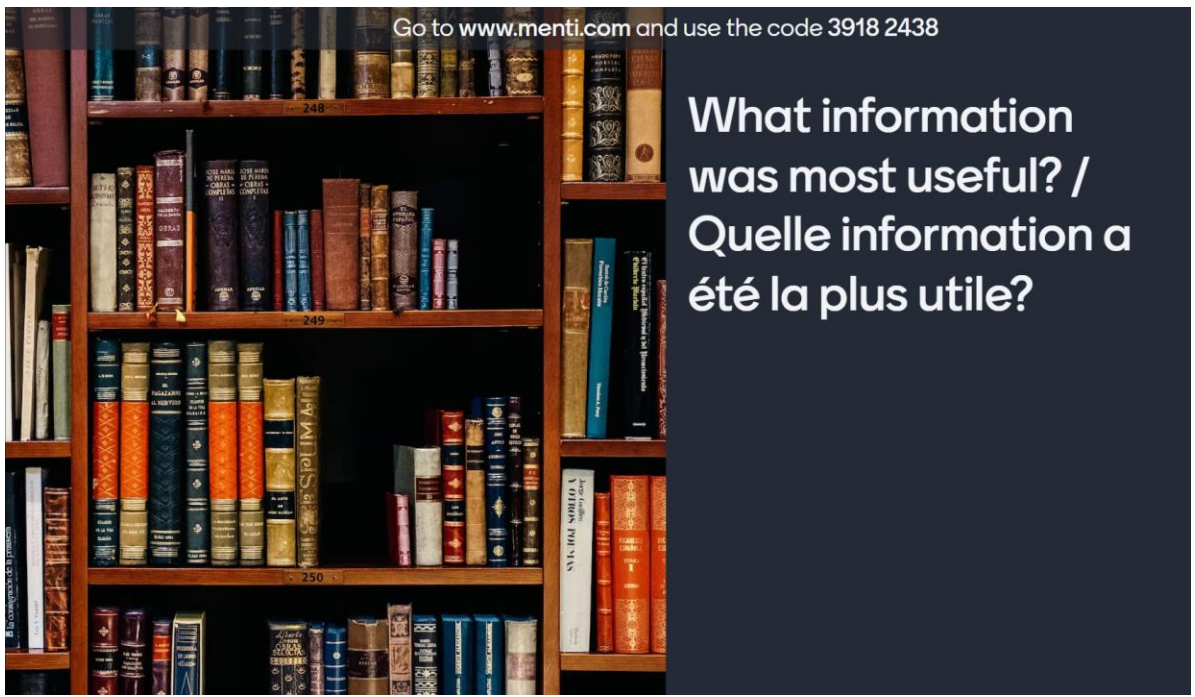

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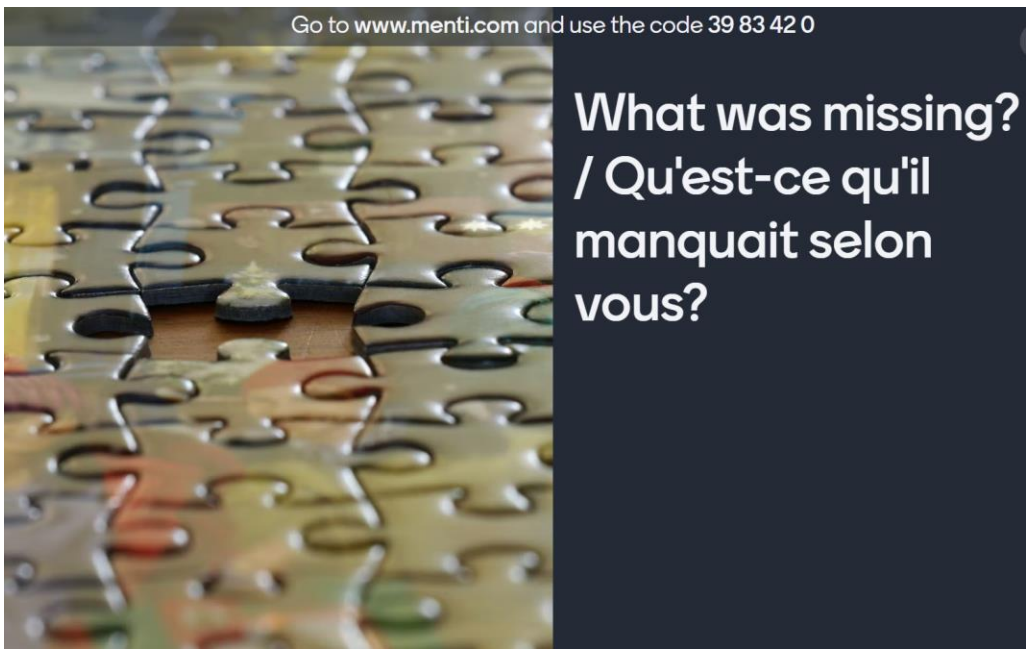

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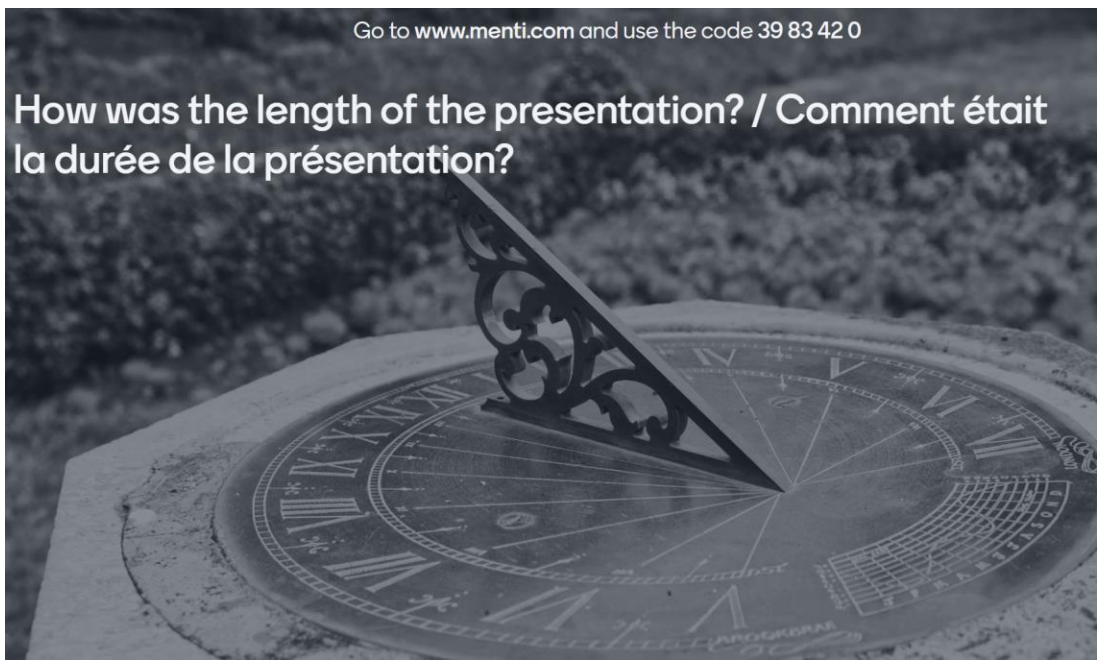

Questions?

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