



CIPARS AMU and AMR surveillance

Poultry 2025 results

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

Canada

About the data presented today

- Select findings will be discussed. Detailed information is provided in the poultry industry reports available in English. Please contact either:
  - Louise (louise.bellai@phac-aspc.gc.ca)
  - Kelly (Kelly.pike@phac-aspc.gc.ca)
- Data up to 2024 is available via our interactive data visualization platform (CIPARS data visualization's webpage on Health Infobase).
- If you need to leave early and have questions – please use the chat function, and we will respond to you by email.



Agenda

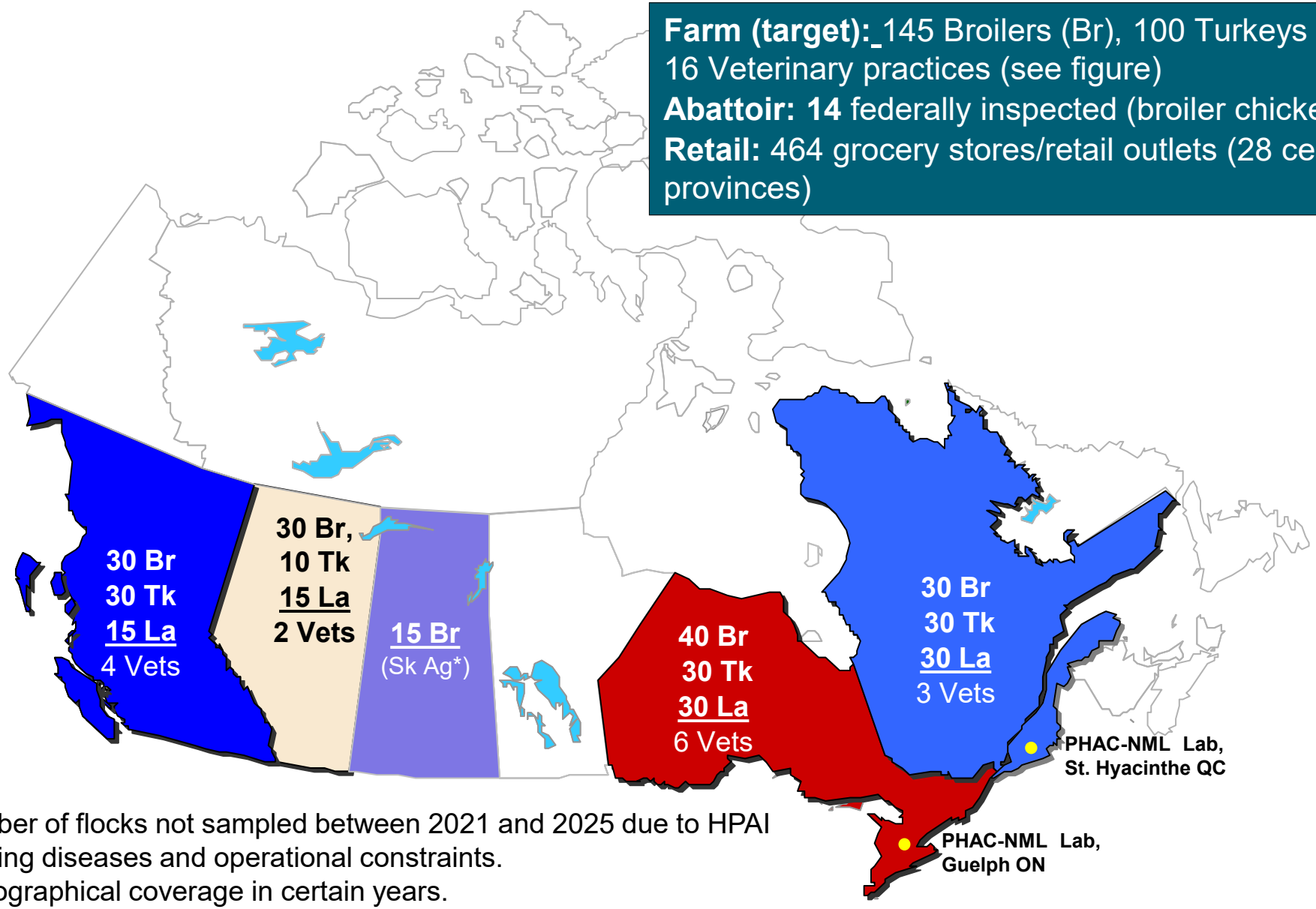
- CIPARS farm antimicrobial use (AMU), antimicrobial resistance (AMR), whole genome sequencing (WGS) of *Salmonella* isolates and flock health
  - Broiler chickens – farm, abattoir and retail
  - Turkeys – farm and retail
  - **New!** Non-antimicrobial alternatives

- Poultry overall
  - Veterinary Antimicrobial Sales Reporting (VASR)
  - Research findings

This webinar presents national and selected regional/provincial results and includes them in its annex. Detailed findings are available in the industry reports.

Design and Methods

Farm (target): 145 Broilers (Br), 100 Turkeys (Tk), 75 Layers (La); 16 Veterinary practices (see figure)
Abattoir: 14 federally inspected (broiler chickens only)
Retail: 464 grocery stores/retail outlets (28 census divisions in 4 provinces)



Farm: target number of flocks not sampled between 2021 and 2025 due to HPAI outbreaks, emerging diseases and operational constraints.
Retail: limited geographical coverage in certain years.

*Field workers are supervised by the Saskatchewan Agriculture.

Review of CIPARS surveillance objectives

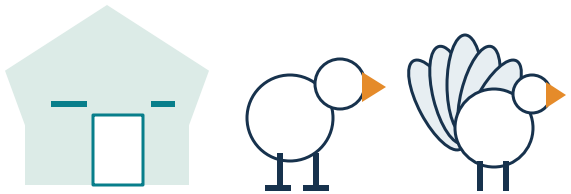
- Provide an integrated approach to monitor trends in antimicrobial resistance (AMR) and antimicrobial use (AMU) in humans and animals.
- Help identify appropriate measures to contain the emergence and spread of resistant bacteria between animals, food, and people in Canada.
- Facilitate assessment of the public health impact of antimicrobials used in humans and agriculture to support the creation of evidence-based policies to control AMU in hospital, community, and agricultural settings.
- Provide timely analysis and dissemination of surveillance data to stakeholders, and facilitate knowledge translation via targeted communications products.
- Allow accurate comparisons with other countries that use similar surveillance systems such as the National Antimicrobial Resistance Monitoring System (NARMS) and the Danish Integrated Antimicrobial Resistance Monitoring and Research Programme (DANMAP).
- Provision of data for Health Canada's Veterinary Drugs Directorate for new antimicrobial drug approval processes and post-approval monitoring.

Integrated analysis of antimicrobial use and resistance

METHODS

A standardized workflow repeated annually in Canadian broiler chicken and turkey flocks (farm-level surveillance)

SURVEILLANCE POPULATION



Broiler chicken and turkey flocks

Sentinel farms in participating Canadian provinces

Standardized flock-level data collection

Repeated annually (different flocks-barn combinations)

PARALLEL DATA STREAMS

ANTIMICROBIAL USE

Veterinary questionnaire • feed, water and injection, flock health, demographics

AMU indicators

Class • route Frequency • quantity

AMR SURVEILLANCE

Pooled faecal sampling • flock-level bacterial recovery

Laboratory testing

Salmonella • *Campylobacter* *E. coli*
Broth microdilution (NARMS panel)
WGS (*Salmonella*)

INTEGRATED ANALYSIS

Species × year × antimicrobial class/VDD categories

Do changes in antimicrobial use correspond with changes in resistance?

ANNUAL OUTPUT

Temporal patterns in AMU, resistance, full susceptibility and MDR
Integration across the production chain: FARM-ABATTOIR-RETAIL*
Complementary: Veterinary Antimicrobial Sales Reporting

* CIPARS AMR surveillance sites

Adapted from Agunos et al., Pathogens (2021), 10:1491.

Colour gradients (heat scale) and descriptions

Percentage resistance or AMU frequency*	Description	Colour gradient
20 or fewer isolates	20 or fewer isolates	
<0.1%	Rare	
0.1% to 1%	Very low	
>1% to 10%	Low	
>10% to 20%	Moderate	
>20% to 50%	High	
>50% to 70%	Very high	
>70%	Extremely high	

- **For AMR data: Low to rare levels of resistance** are considered desirable (dark green).

https://www.efsa.europa.eu/en/efsajournal/pub/7867

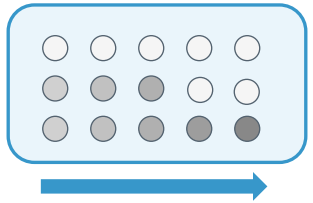
How antimicrobial resistance is determined

Two complementary approaches are used in this analysis

PHENOTYPIC METHOD

Broth microdilution

Campylobacter and *E. coli*



Increasing concentration

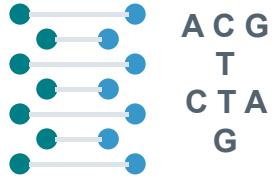
1. Observe growth across increasing antimicrobial concentrations
2. MIC = lowest concentration that prevents visible growth
3. Apply interpretive breakpoints to assign S, I or R

OUTPUT • Observed resistance phenotype

GENOTYPIC METHOD

Whole-genome sequencing

Salmonella



1. Sequence the bacterium's genome
2. Detect known resistance genes and mutations
3. Use validated rules to predict the resistance phenotype

OUTPUT • Predicted resistance phenotype*

KEY POINT **MIC measures what the organism does; WGS predicts what it is likely to do from its genetic determinants.**

Organism–method pairings shown here apply to the results presented in this deck.
*predicted resistance phenotypes were validated against the MIC values

Interpreting ciprofloxacin results

The reporting term differs because the evidence differs

MIC TESTING

Campylobacter and *E. coli*

CLSI breakpoints classify the measured ciprofloxacin MIC as susceptible, intermediate or resistant.



Three distinct categories are available

REPORTED IN THIS PRESENTATION

Resistant (R)

WGS PREDICTION

Salmonella

Current prediction rules identify ciprofloxacin non-susceptibility but do not reliably distinguish intermediate from resistant.



Intermediate and resistant are combined

REPORTED IN THIS PRESENTATION

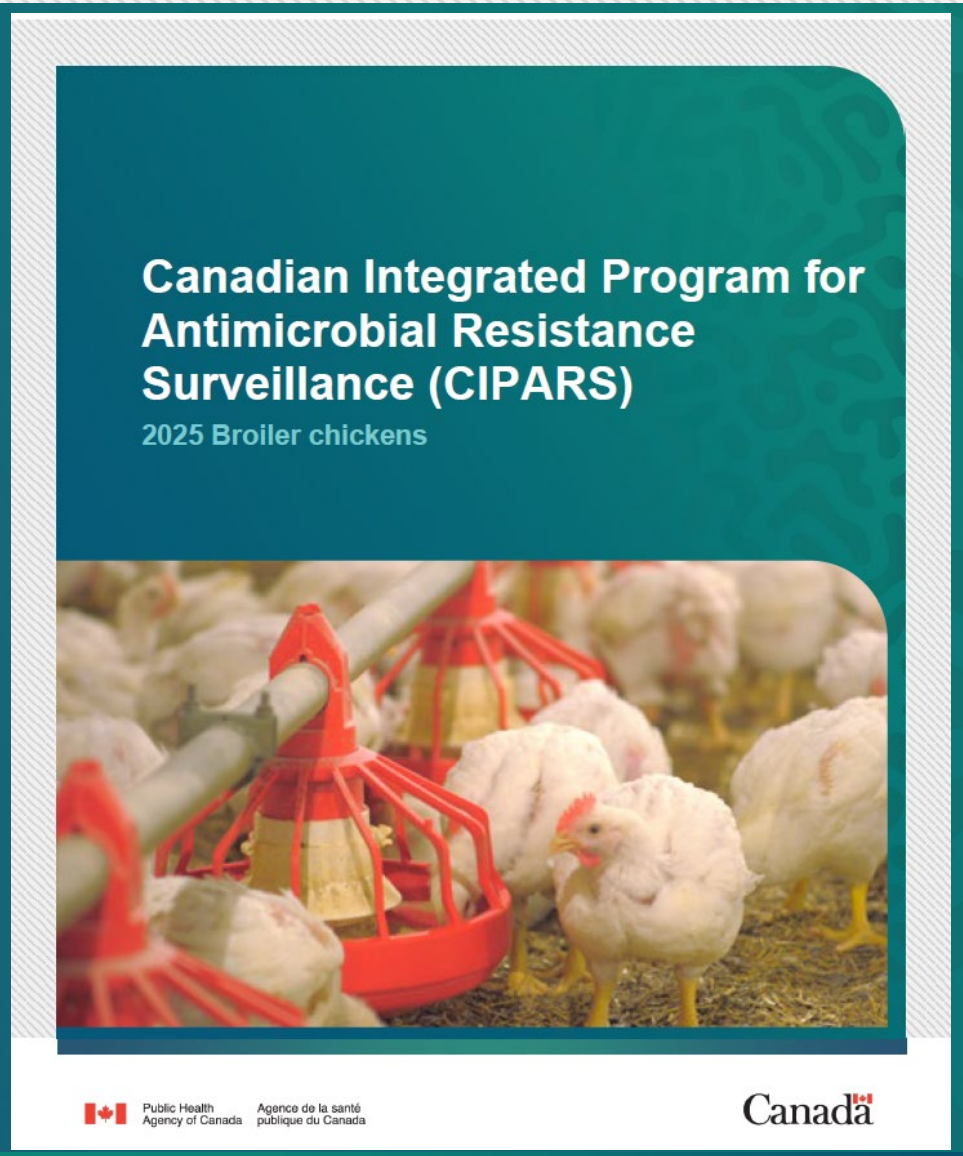
Not susceptible (I/R)

FOR CONSISTENCY IN THE REMAINING SLIDES Both are referred to as "ciprofloxacin resistant"

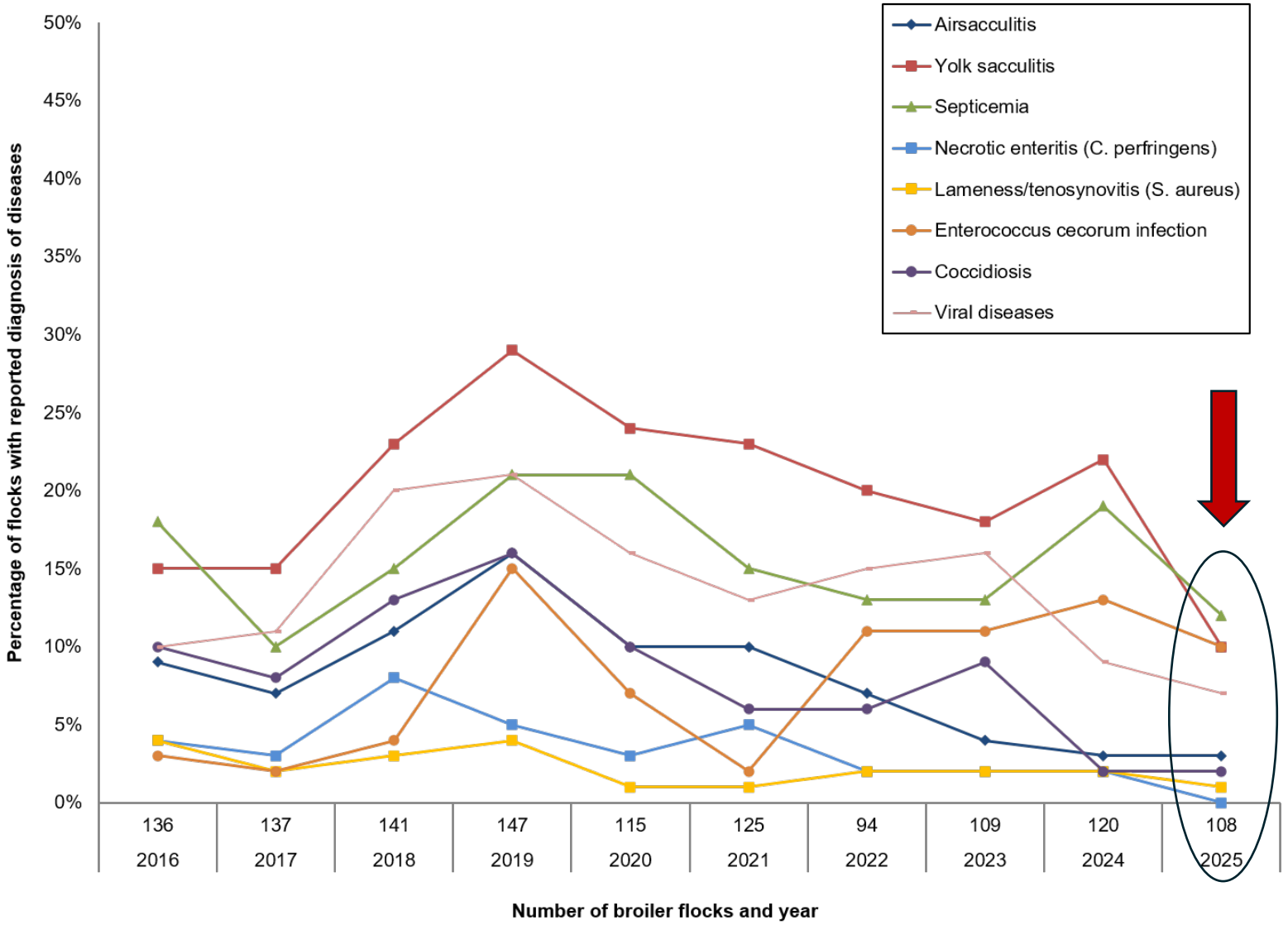
For ***Salmonella***, I/R includes isolates predicted to be intermediate or resistant.
For ***E. coli***, to harmonize with *Salmonella*, I/R from MIC testing are also reported as resistant.

BROILER CHICKENS





Broiler health status – diseases* continued to be diagnosed



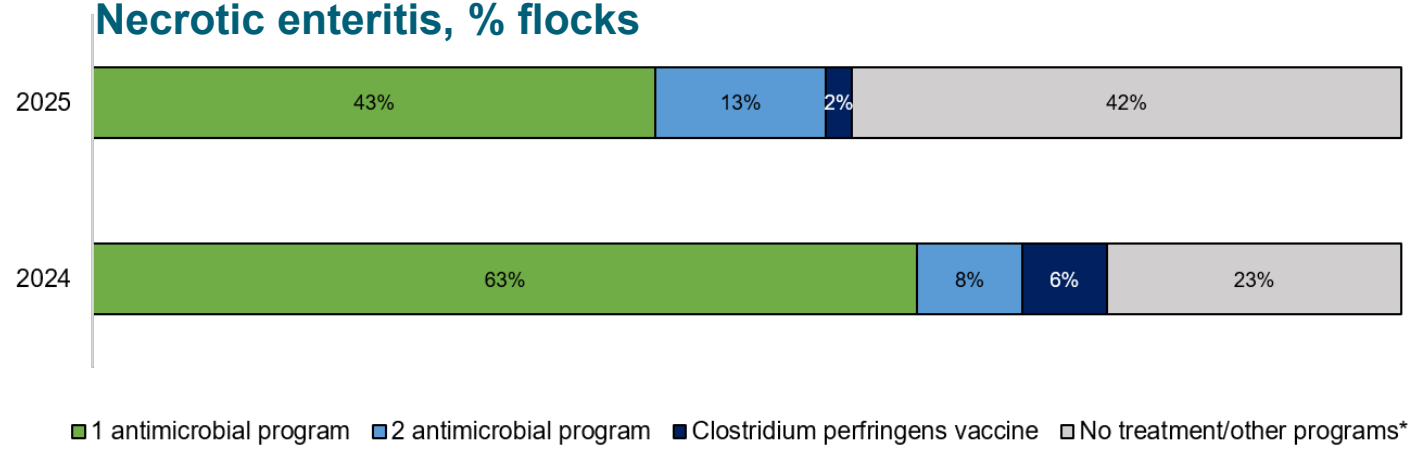
- Average flock mortality in 2025:
  - **4.8%** (↓ 0.56% vs. 2024)
  - No significant difference between flocks not exposed to medically important antimicrobials (MIA) and flocks treated with MIA (conventional flocks)
- Diagnosis of disease decreased **(↓1% to 12%)**, depending on the disease
- ***Enterococcus cecorum**** diagnoses decreased **(↓3%),** most of the cases were diagnosed in Quebec but were reported from all provinces/regions.
- **Viral diseases:**
  - Inclusion body hepatitis (n = 7), infectious bursal disease (n = 2) continued to be reported

**E. cecorum* gross pathology may overlap with lesions associated with avian pathogenic *E. coli* septicemia, *Staphylococcus* infections, multifactorial femoral head necrosis, and reovirus infections.

*Syndromic (clinical impression) data, as captured in the questionnaire, include responses classified as confirmed positive or likely positive for the disease.

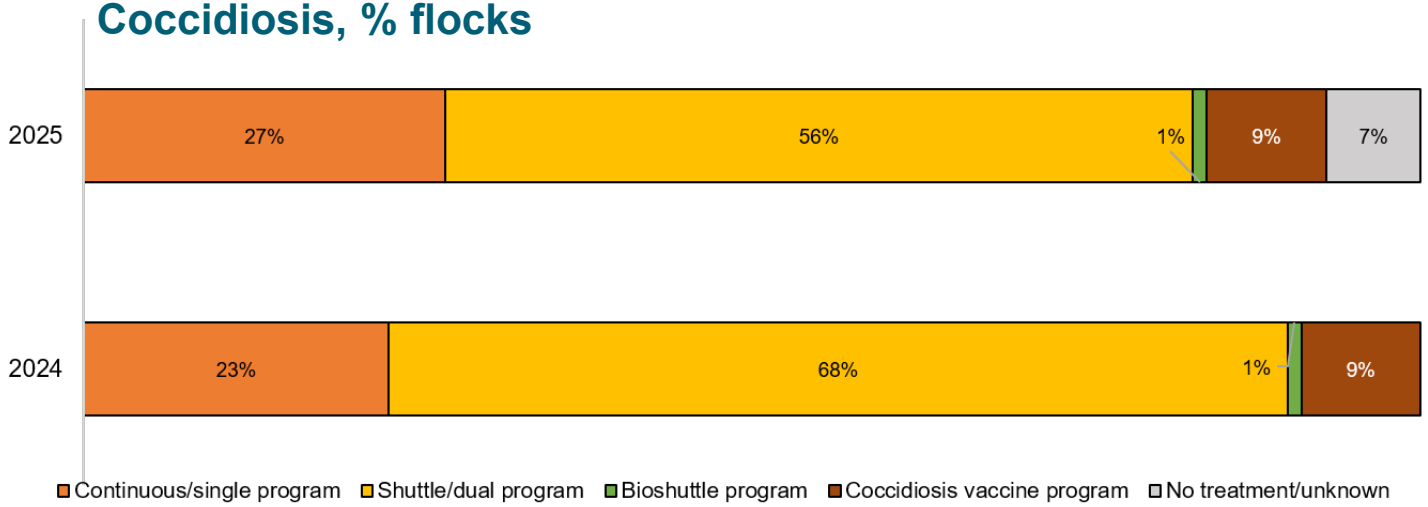
Infection prevention and control strategies in broiler chickens, 2024-2025

Necrotic enteritis, % flocks



*other – no treatment or other gut health program

Coccidiosis, % flocks



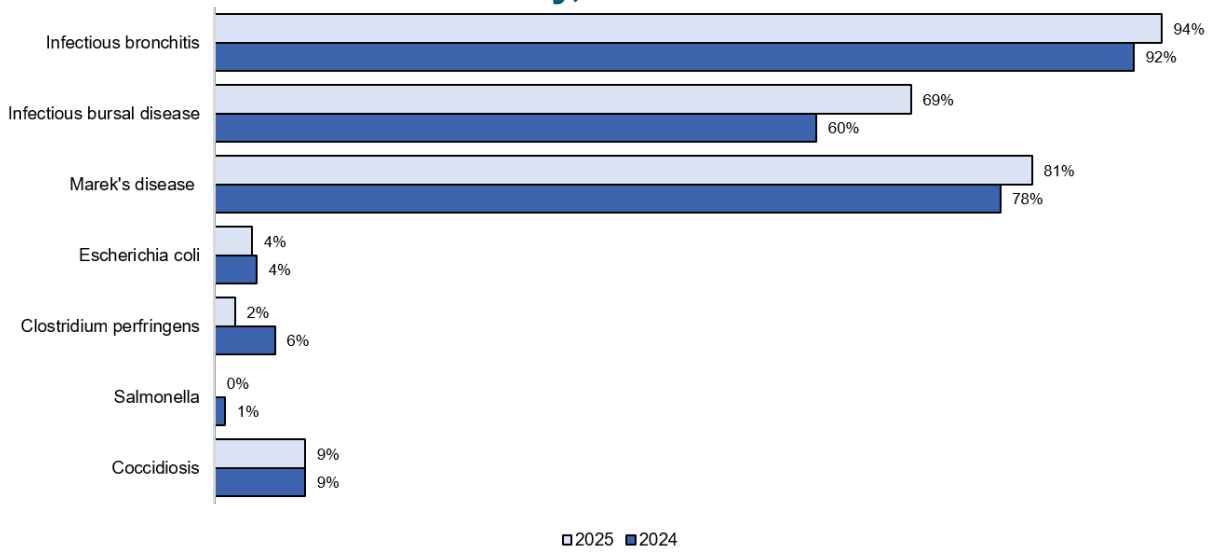
- **1 antimicrobial program** was the most frequently used (43%-63%)
- **2 antimicrobial program** was the second most frequently reported (8% to 13%)
- Overall, **necrotic enteritis** was controlled using **antimicrobials in 56% to 71% of flocks**
- Limited number of flocks were vaccinated with live *C. perfringens* vaccine **(2%-6%)**

- **Shuttle/dual control** was the most frequent program used **(56%-68%)**
- **Continuous/single control** was the second most frequently used **(23%-27%)**
- Overall, **coccidiosis** was controlled using **coccidiostats in 83% to 91% of the flocks**
- Stable proportion of flocks using a **coccidiosis vaccination program (9% in both years)**, and a limited number of flocks using bioshuttle program (1% in both years)

All data shown are percentages of flocks sampled in 2024 (n = 120) and 2025 (n = 104) (x-axis)

Infection prevention and control strategies in broiler chickens

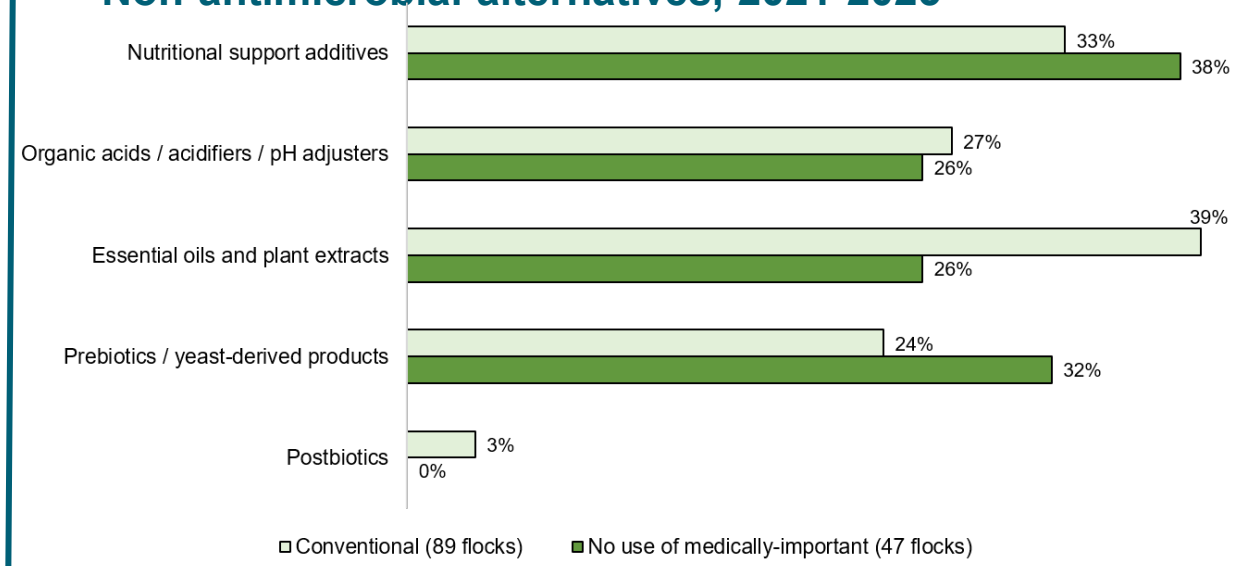
Vaccination at the hatchery, 2024-2025



- On average, **93% of flocks were vaccinated at the hatchery**
- Most frequently applied vaccines at the hatchery: **infectious bronchitis (IB), infectious bursal disease (IBD) and Marek's disease**
- **IB** – most common strains in 2025: Massachusetts (78%), Massachusetts-Connecticut (4%), Georgia type (13%)
- **IBD and Marek's disease** – often contained in one vaccine; vectored vaccine use increased over time from 26% (2013) to 59% (2025)
- On average, **30% of flocks were also vaccinated at the farm level** with infectious bronchitis, infectious bursal disease, or both
- Vaccination against bacterial agents and coccidia remained low **(< 10%)**

Vaccination summary are percentages of flocks sampled in 2024 (n = 120) and 2025 (n = 104)

Non-antimicrobial alternatives, 2021-2025*



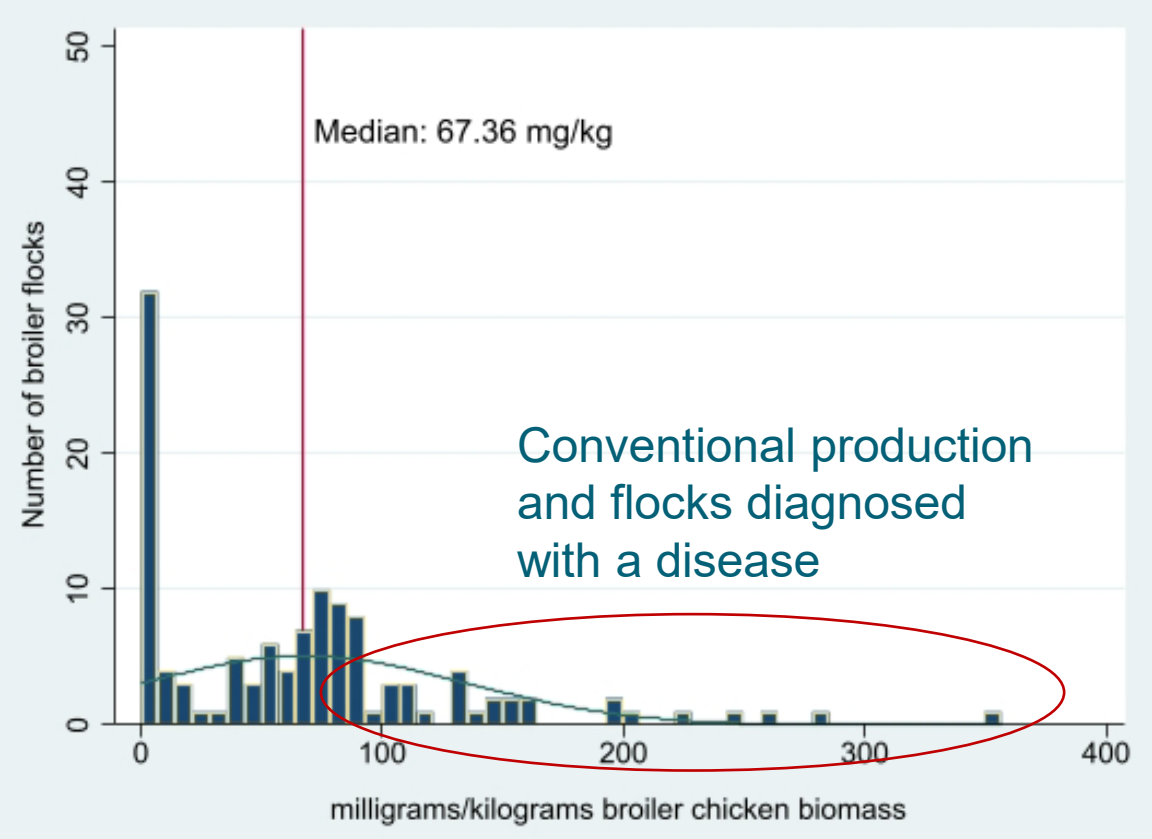
- Slight but **non-significant differences were observed** in any non-antimicrobial alternative categories when comparing conventional to no use of medically important antimicrobial flocks**
- Nutritional support additives (vitamins, minerals, trace minerals), enzymes and other products, and organic acid/acidifier and pH adjusters) were administered via water or feed
    - However, most commercially available products in all categories were added to the feed ration
- Some products contain a **mixture of 2 or more alternatives (synbiotics)**

*Cumulative data (2021-2025); flocks with no response/response cannot be confirmed were excluded from the analysis.

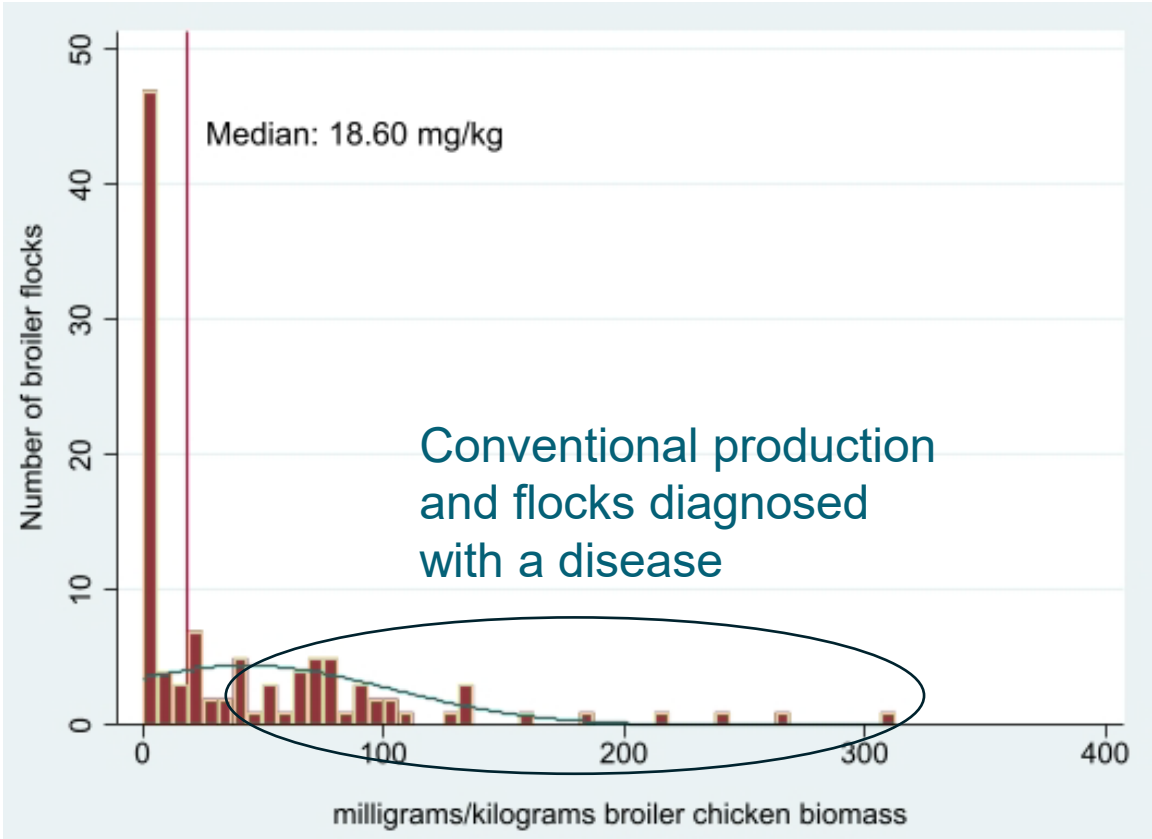
to assess between production type, data were analyzed using z-test, Holm and Fisher exact test; manuscript is in preparation for submission to ***Avian Diseases.*

Flock level quantity of use – depends on the flock health situation

2024 (n = 120 flocks)



2025 (n = 108 flocks)

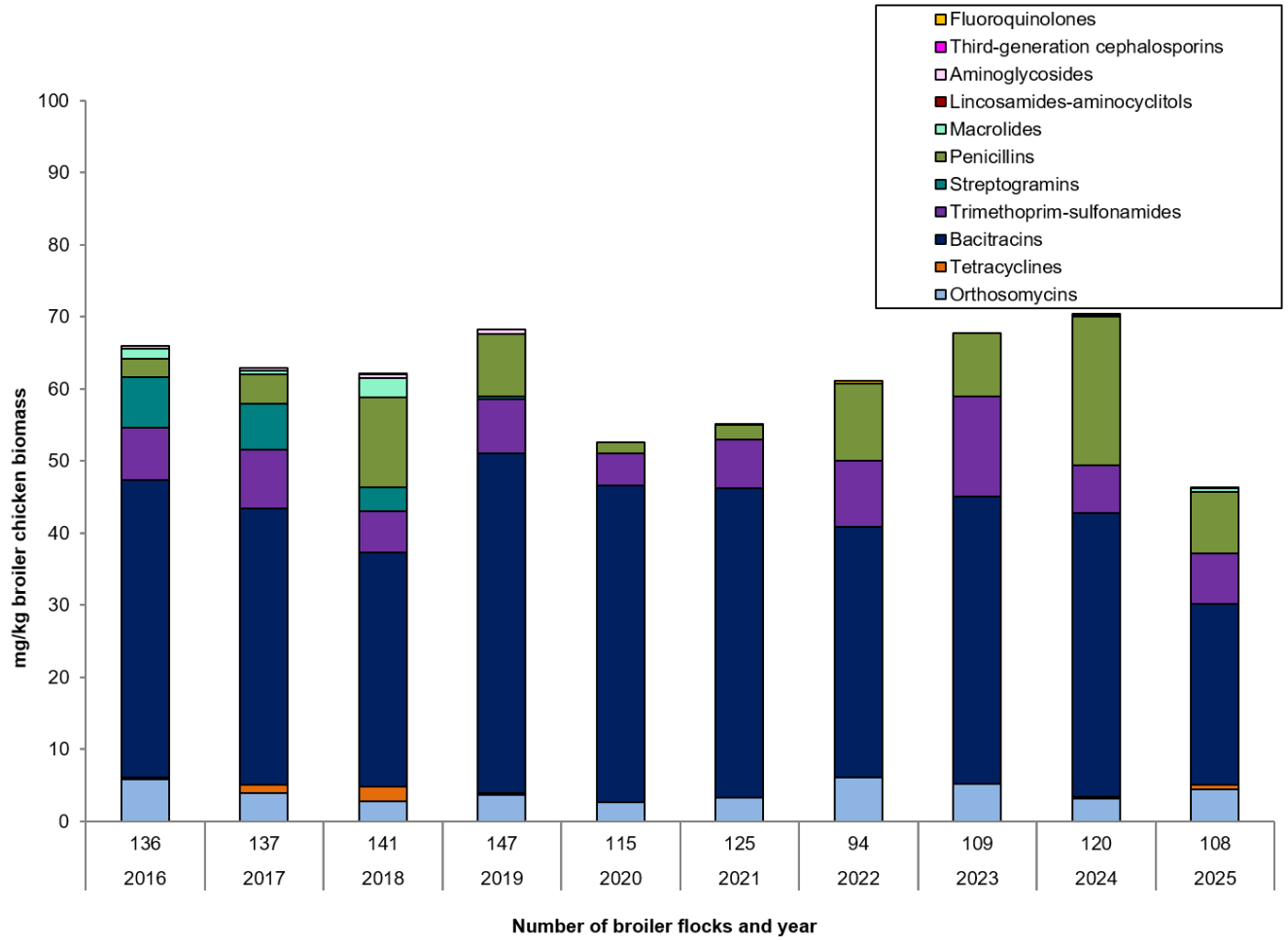


- The data represent flock-level AMU estimates. The distribution of flocks classified as low, medium, and high, **changed significantly between 2024 and 2025***
- Median flock-level mg/kg broiler chicken biomass decreased

*Analyzed using two-sample Wilcoxon rank-sum (Mann-Whitney) test

Antimicrobial use – total quantity decreased, and the relative contribution of classes changed

mg/kg broiler chicken biomass (weight-based metric)



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2025 vs. 2024 (% change)
Total	66	63	62	68	53	55	61	68	70	46	↓ 24 mg/kg (- 34%)

Frequency (count-based metric)

Antimicrobial	2024	2025	% difference
Amoxicillin	2%	3%	+1%
Avilamycin	22%	28%	+6%
Bacitracin	56%	34%	-22%*
Gentamicin	3%	9%	+6%
Penicillin (in feed)	3%	2%	-1%
Penicillin (in water)	9%	5%	-4%
Trimethoprim-sulfadiazine	6%	5%	-1%
Tylosin	0%	3%	+3%
No antimicrobial used	25%	41%	-16%*

*significant ($P \leq 0.05$)

Occasionally reported (<3%): enrofloxacin, tetracycline (+neomycin), sulfonamides

Recovery of foodborne pathogens in broiler chickens

Variable percentages of bacterial recovery depending on the surveillance component

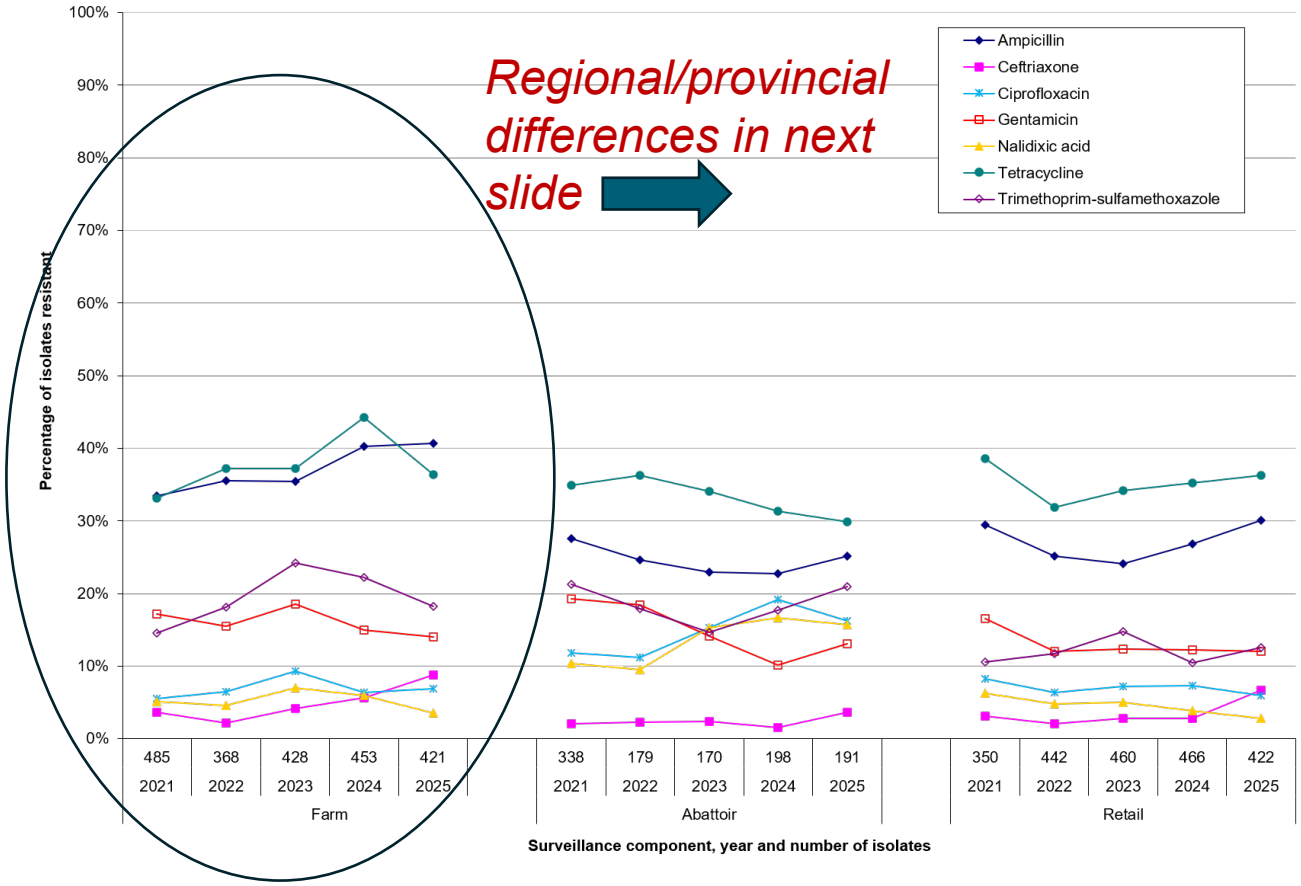
	2021	2022	2023	2024	2025	Trends	2025 vs. 2024 (% difference)
Farm							
Salmonella	38%	53%	51%	40%	39%		**-1%**
Campylobacter	25%	33%	32%	17%	24%		**7%**
Abattoir							
Salmonella	15%	20%	22%	15%	12%		**-3%**
Campylobacter	20%	21%	22%	22%	20%		**-2%**
Retail							
Salmonella	25%	28%	31%	21%	25%		**4%**
Campylobacter	44%	35%	34%	32%	27%		**-5%**

- Sampling approach differs by surveillance component (target epidemiological unit and type of samples: pooled fecal samples, cecal content, meat) that could impact recovery of bacteria

2025 recovery percentages:

- ***Salmonella* (12% to 39%)** highest recovery in farm broiler chickens
- ***Campylobacter* (20% to 27%)** highest recovery in retail chickens

Antimicrobial resistance frequencies in *Escherichia coli*

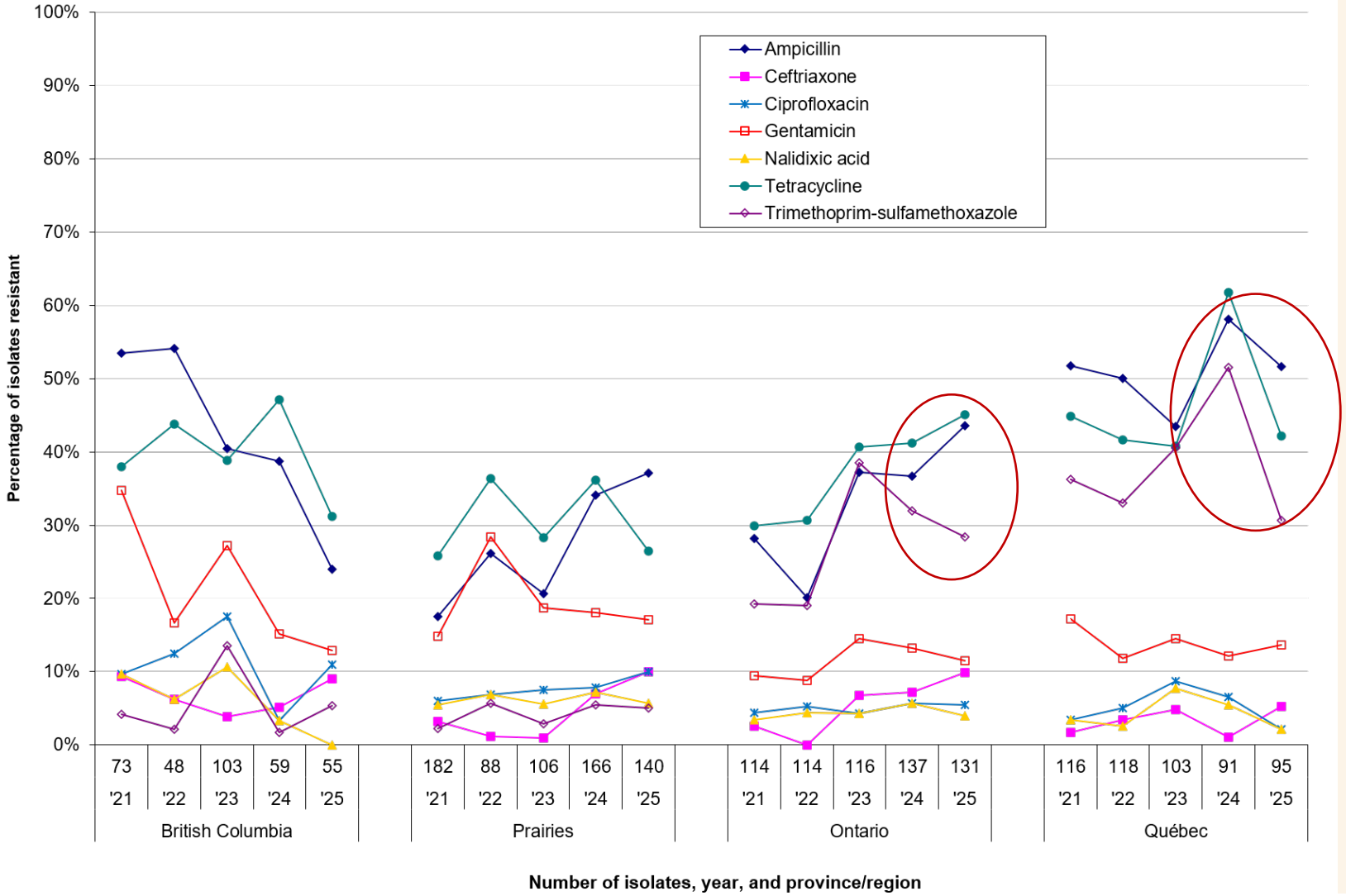


Surveillance component	Farm					Abattoir					Retail				
Year	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Number of isolates	485	368	428	453	421	338	179	170	198	191	350	442	460	466	422
Antimicrobial															
Ampicillin	33%	36%	35%	40%	41%	28%	25%	23%	23%	25%	29%	25%	24%	27%	30%
Ceftriaxone	4%	2%	4%	6%	9%	2%	2%	2%	2%	4%	3%	2%	3%	3%	7%
Ciprofloxacin	6%	7%	9%	6%	7%	12%	11%	15%	19%	16%	8%	6%	7%	7%	6%
Gentamicin	17%	15%	19%	15%	14%	19%	18%	14%	10%	13%	17%	12%	12%	12%	12%
Nalidixic acid	5%	5%	7%	6%	4%	10%	9%	15%	17%	16%	6%	5%	5%	4%	3%
Tetracycline	33%	37%	37%	44%	36%	35%	36%	34%	31%	30%	39%	32%	34%	35%	36%
Trimethoprim-sulfamethoxazole	15%	18%	24%	22%	18%	21%	18%	15%	18%	21%	11%	12%	15%	11%	13%

Notable findings:

- Similar findings were observed across the 3 surveillance components
- **Low-level ceftriaxone-resistance** was sustained across all components.
- Highest percentage of ciprofloxacin resistance **(16%)** noted in abattoir isolates, compared with low levels in farm and retail isolates
- Gentamicin resistance remained at a moderate level across all components
- Resistance to ampicillin and tetracycline remained high across all components

Antimicrobial resistance frequencies in *Escherichia coli*, regional/provincial results

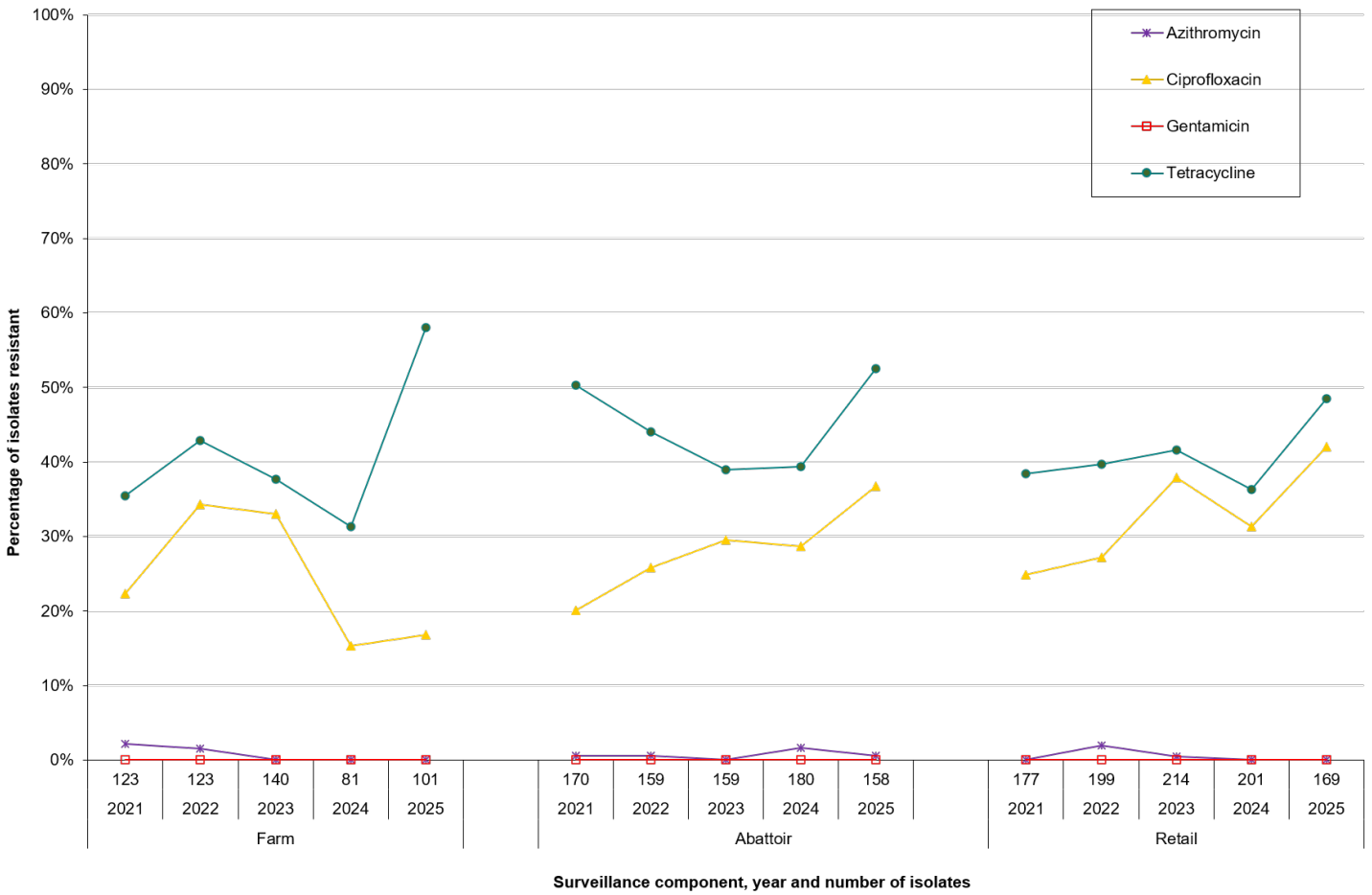


Notable regional/provincial findings:

- **Ontario:** Resistance to AMP and TCY peaked in 2025, while SXT resistance declined slightly.
- **Quebec:** Resistance to AMP, TCY, and SXT peaked in 2024, then decreased in 2025.
- The resistance patterns in Ontario and Quebec increased the ≥ 3 MDR*
- Ciprofloxacin resistance
  - Remained stable in Ontario and Quebec (< 5%)
  - Ranged from 10% to 11% in the western provinces

AMP-ampicillin, TCY-tetracycline, SXT-trimethoprim-sulfamethoxazole
*Multidrug resistance measurements are found in the annex

Antimicrobial resistance frequencies in *Campylobacter*

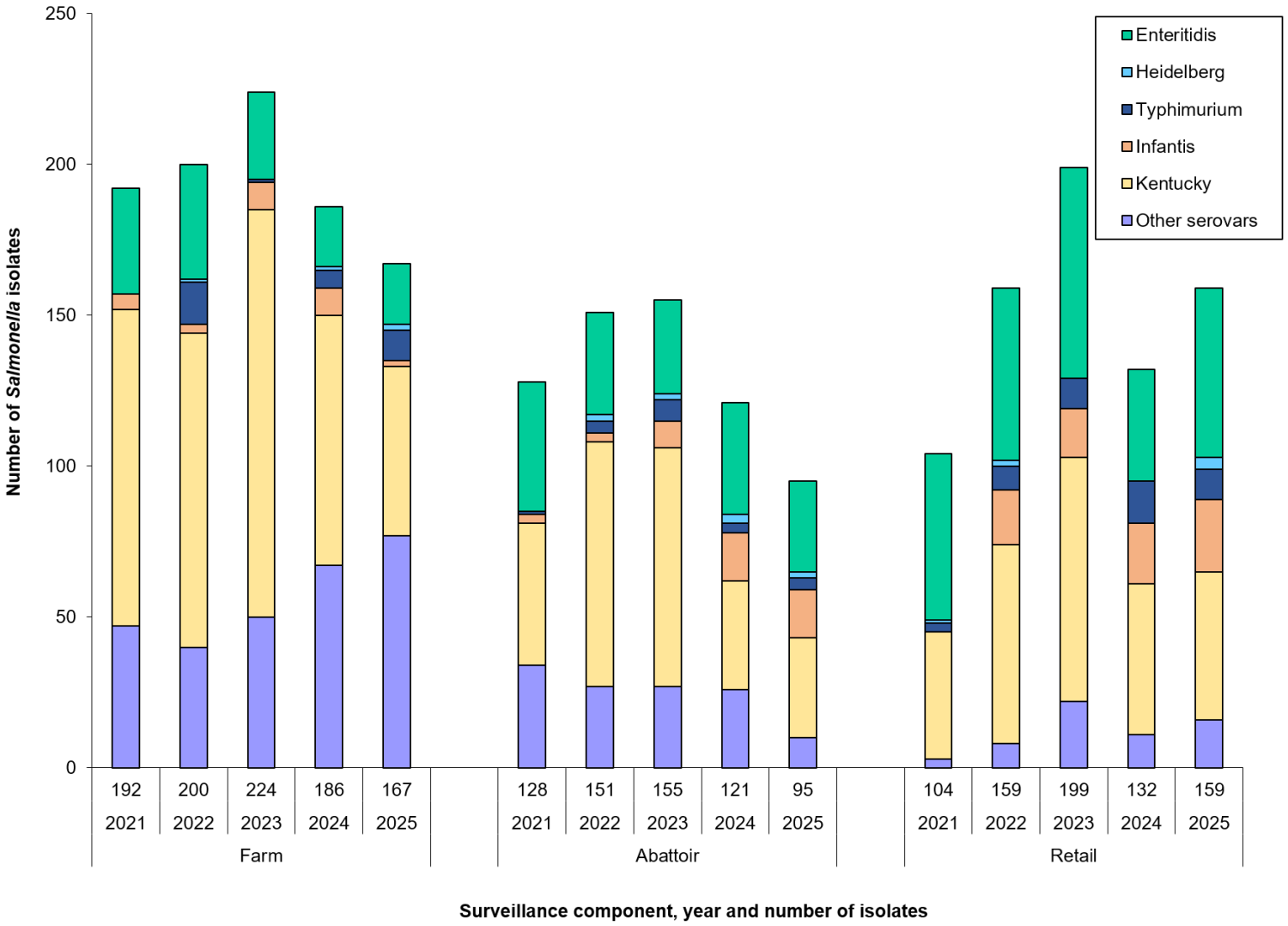


Surveillance component	Farm					Abattoir					Retail				
Year	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Number of isolates	123	123	140	81	101	170	159	159	180	158	177	199	214	201	169
Antimicrobial															
Azithromycin	2%	2%	0%	0%	0%	1%	1%	0%	2%	1%	0%	2%	0%	0%	0%
Ciprofloxacin	22%	34%	33%	15%	17%	20%	26%	30%	29%	37%	25%	27%	38%	31%	42%
Gentamicin	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Tetracycline	35%	43%	38%	31%	58%	50%	44%	39%	39%	53%	38%	40%	42%	36%	49%

Notable findings:

- Ciprofloxacin resistance continued to be detected in *Campylobacter* isolates throughout the production continuum, from farm to retail
  - The highest level of ciprofloxacin resistance was observed in **retail chicken isolates (42%)**
- Resistance was detected in both ***C. coli*** **and** ***C. jejuni***, the latter being the species most commonly associated with human foodborne illness
- Tetracycline resistance was maintained at high to very-high levels

Salmonella serovars in broiler chicken production chain, farm to retail

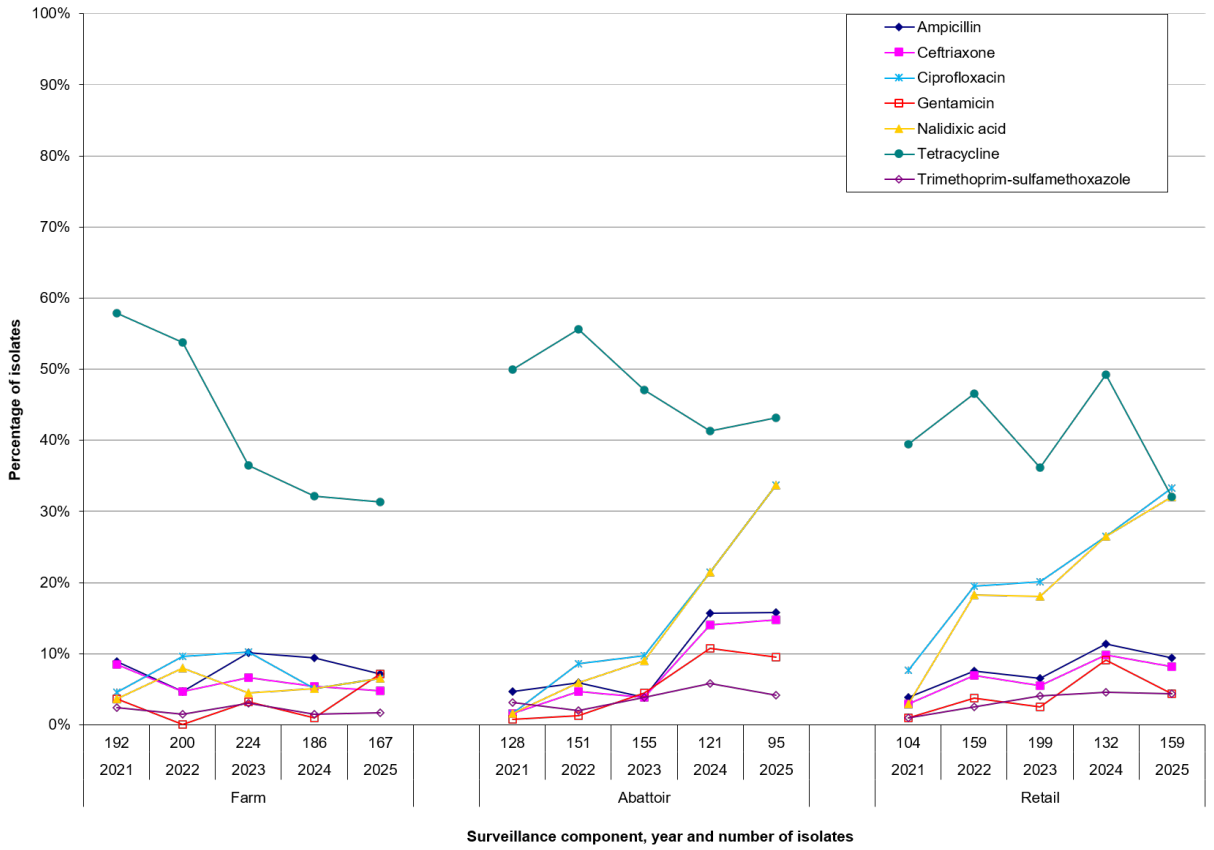


Notable findings:

- The ranking of the top 3 serovars varied across years and surveillance components
  - Sampling gaps may have influenced serovar rankings
- CIPARS closely monitors the following serovars due to the emergence of resistance to **Category I antimicrobials:**
  - ***S.* Enteritidis**
  - ***S.* Infantis**
- Historically, ***S.* Heidelberg** was closely monitored; it was occasionally detected during the surveillance timeframe
- Although the sources of these serovars beyond the broiler farm level remain unclear, some serovars are known to be **vertically transmitted from parent flocks to their offspring, while others can persist in the environment***

*Source: https://doi.org/10.3389/fvets.2026.1812851

Antimicrobial resistance frequencies in *Salmonella*



Surveillance component	Farm					Abattoir					Retail				
Year	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Number of isolates	192	200	224	186	167	128	151	155	121	95	104	159	199	132	159
Antimicrobial															
Ampicillin	9%	5%	10%	9%	7%	5%	6%	4%	16%	16%	4%	8%	7%	11%	9%
Ceftriaxone	9%	5%	7%	5%	5%	2%	5%	4%	14%	15%	3%	7%	6%	10%	8%
Ciprofloxacin	5%	10%	10%	5%	7%	2%	9%	10%	21%	34%	8%	19%	20%	27%	33%
Gentamicin	4%	0%	3%	1%	7%	1%	1%	5%	11%	9%	1%	4%	3%	9%	4%
Nalidixic acid	4%	8%	4%	5%	7%	2%	6%	9%	21%	34%	3%	18%	18%	27%	32%
Tetracycline	58%	54%	36%	32%	31%	50%	56%	47%	41%	43%	39%	47%	36%	49%	32%
Trimethoprim-sulfamethoxazole	2%	2%	3%	2%	2%	3%	2%	4%	6%	4%	1%	3%	4%	5%	4%

Notable findings*:

- Ceftriaxone resistance ranged from low to moderate levels, with the highest percentage observed among **abattoir** isolates **(15%)**
  - Predominantly driven by ***S.* Kentucky** and ***S.* Heidelberg**, with occasional detection in other serovars
  - Expressed the ***bla*CMY-2 gene** (most commonly detected gene)
- In 2025, the **ESBL-associated *bla*CTX-M-65 gene** was also detected in ***S.* Infantis** isolates, primarily from abattoir (n = 10) and retail (n = 12) sources; none from farm
- Ciprofloxacin resistance was **low on farm (7%)** but exceeded **30%** at both abattoir and retail
  - Largely driven by ***S.* Enteritidis** and ***S.* Infantis** expressing the ***gyrA* D87Y mutation**

*part of the data presented during the CIPARS integrated findings webinar

Salmonella in broiler chickens– whole genome sequencing

2021-2025 CIPARS/FNC isolates sequenced in PulseNet Canada†, matching to a human outbreak cluster

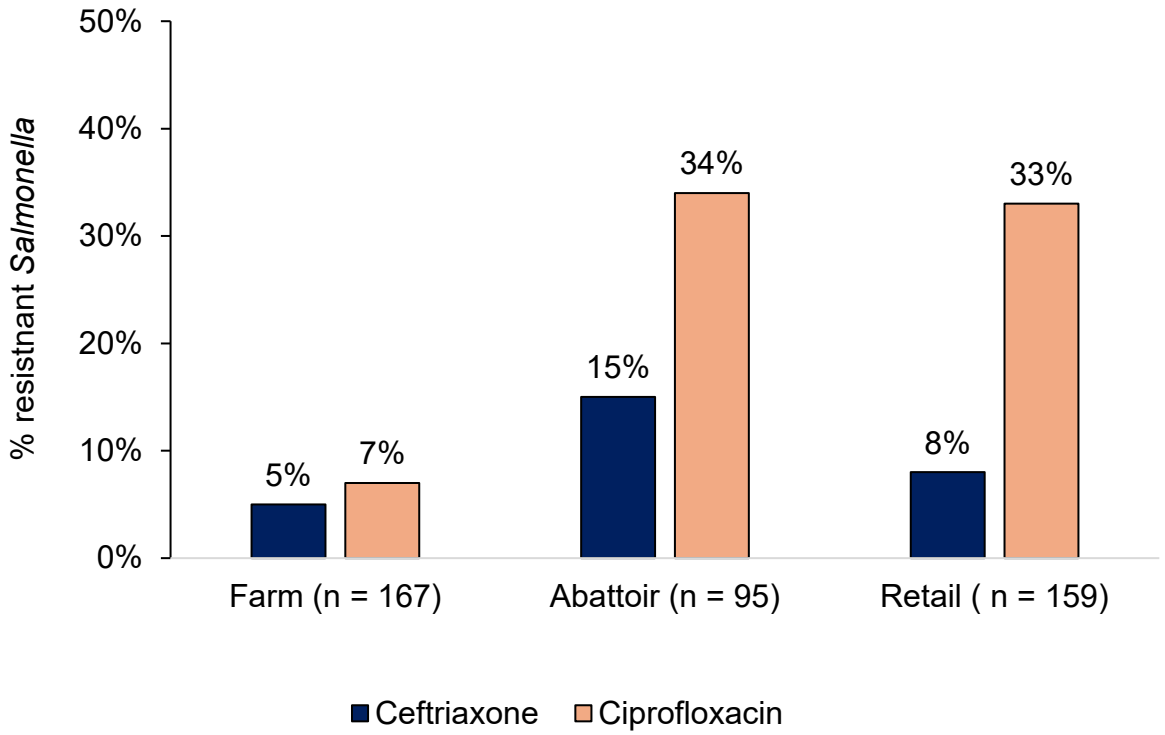
Host Species	Commodity (surveillance component)	Percentage of isolates matching human outbreak cluster (matches/total isolates in PulseNet Canada†)	Top 5 serovars (2021-2025 combined)
Chicken	Broiler chickens (farm)	35% (289/822)	Kentucky* (n = 483), **Enteritidis* (n = 142)**, Alachua (n=55), Typhimurium* (n = 31), **Infantis* (n = 28)**
	Broiler chickens (slaughtered chickens /abattoir)	36% (221/619)	Kentucky* (n = 276), **Enteritidis* (n = 175), Infantis* (n = 47),** Livingstone* (n = 30), Typhimurium* (n = 19)
	Raw chicken (retail)	55% (412/749)	Kentucky* (n = 287), **Enteritidis* (n = 274)**, **Infantis* (n = 78)**, Typhimurium* (n = 45), Thompson (n = 10), Livingstone* (n = 10)

- PulseNet uses whole-genome sequencing to identify clusters of genetically related isolates, enabling the detection of outbreaks and helping link human cases to potential food, animal, or environmental sources
- **What does it mean when an isolate "matches a human outbreak cluster"?**
  - A matching isolate is genetically indistinguishable from, or very closely related to, isolates recovered from human cases associated with a Canadian outbreak, typically differing by only a small number of alleles

†Please note that not all *Salmonella* isolates are sequenced in PulseNet Canada
*seen across chicken commodities
FNC : FoodNet Canada

2025 *Salmonella* resistance across the broiler production chain

Phenotypic resistance and WGS markers at farm, abattoir, and retail



Multidrug resistance (≥ 3 classes) **Highest at abattoir**

FARM	ABATTOIR	RETAIL
8%	21%	13%

Data were previously presented in the CIPARS integrated webinar
WGS- whole genome sequencing
MDR – multidrug resistant

WGS resistance genes and serovar context

QUINOLONES *gyrA(D87Y)* observed across the production chain

FARM 12 isolates, all ***S.* Enteritidis**

ABATTOIR 32 isolates, 16 ***S.* Enteritidis** and 16 ***S.* Infantis**

RETAIL 51 isolates, 28 ***S.* Enteritidis** and 23 ***S.* Infantis**

THIRD-GENERATION CEPHALOSPORINS

FARM 4 *blaCMY-2* isolates, all ***S.* Alachua**
No *blaCTX-M* ESBLs detected

ABATTOIR 14 *blaCMY-2* in ***S.* Anatum** and ***S.* Kentucky**
10 *blaCTX-M-65* ESBL (***S.* Infantis, MDR ≥ 5)**

RETAIL No *blaCMY-2* isolate, 12 *blaCTX-M*-positive
12 blaCTX-M -65 ESBL (***S.* Infantis**, **MDR ≥ 3**)

What the combined data show

S. Enteritidis: *gyrA(D87Y)* was present from farm to retail

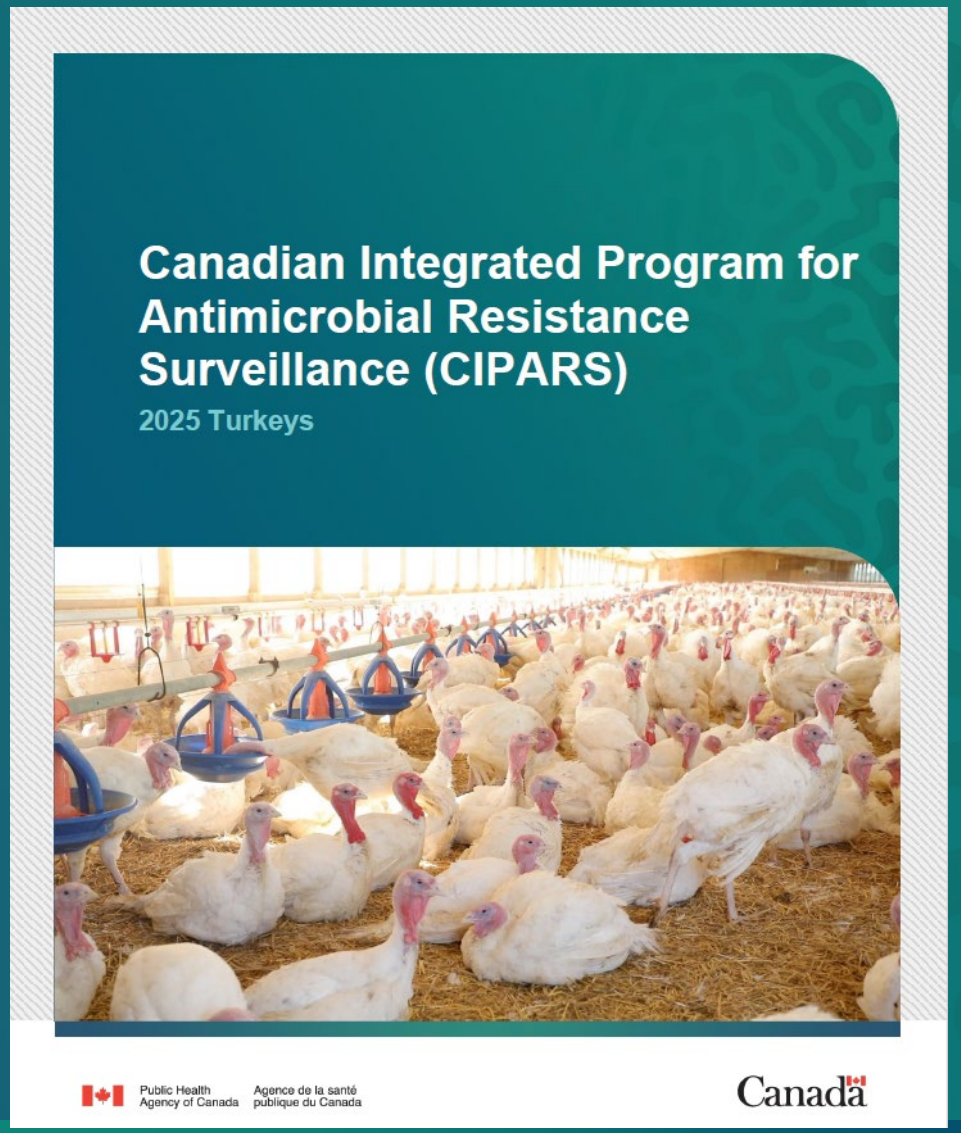
***S.* Infantis:** presence of quinolone resistance and ESBL across the production chain may indicate persistence of the serovar in the environment*

Industry reduction strategy: identifying the source of *Salmonella* (breeder flocks, poultry environments, and pests) and reviewing other surveillance data sources

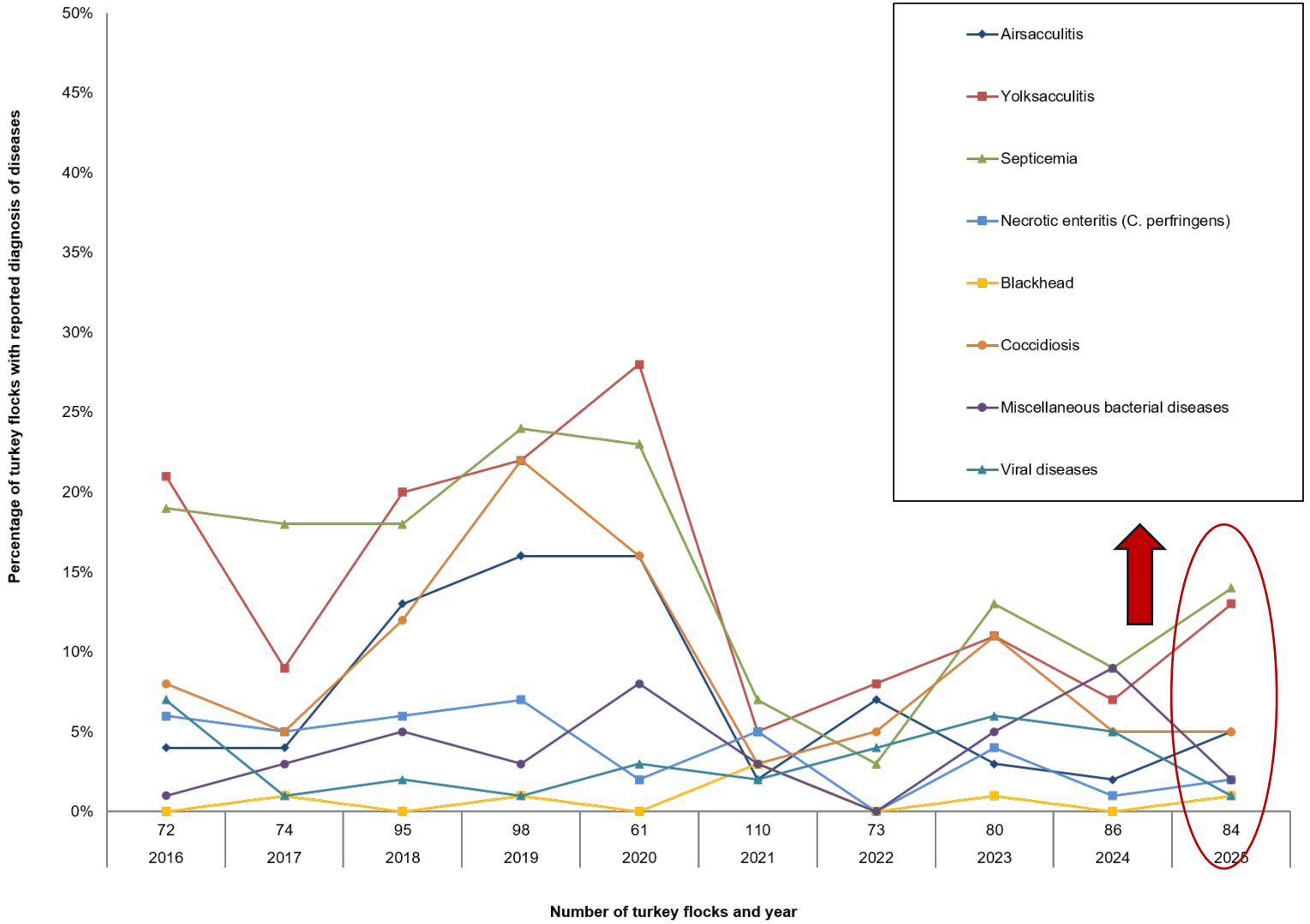
*Source: https://doi.org/10.3389/fvets.2026.1812851

TURKEYS


FarmPhotos.ca


Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)
2025 Turkeys
Public Health Agency of Canada
Agence de la santé publique du Canada
Canada

Turkey health status – diseases* continued to be diagnosed

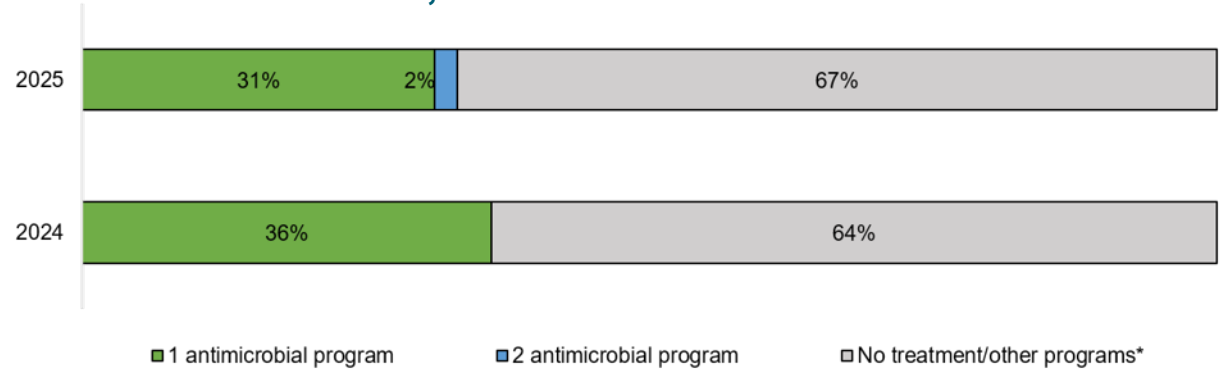


- Average mortality in 2025
  - **6.65%** (↑ 0.6% compared to 2024)
- Diagnosis of CIPARS monitored diseases increased
  - **1 to 6%** depending on the disease
  - **↑6%** in yolk sacculitis and **↑5%** in septicemia
- Notable diseases reported in 2025 (1 to 2 flocks):
  - Mycoplasmosis
  - *Ornithobacterium rhinotracheale*
  - Reovirus
  - Avian metapneumovirus (aMPV)
  - *Hexamita meleagridis*
- New vaccine included in some flock programs
  - Turkey rhinotracheitis (TRT) for aMPV prevention (4 flocks)

*Syndromic data (based on clinical impression), as captured in the questionnaire, include responses classified as confirmed positive or likely positive for the disease

Infection prevention and control strategies in turkeys

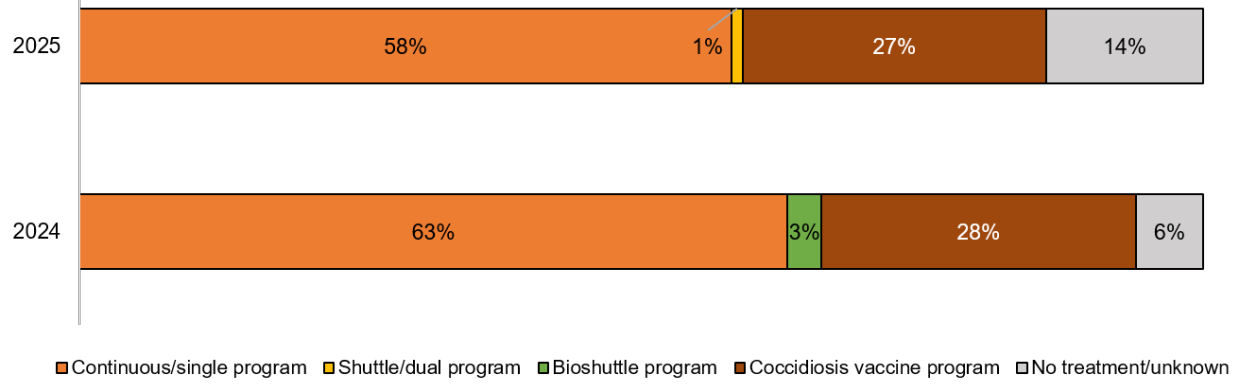
Necrotic enteritis, % flocks



*other – no treatment or other gut health program

- **1 antimicrobial program** was used most consistently (**31%-36%**), but in 2025, 1 flock used 2 antimicrobial program
- No turkey flock was vaccinated against *C. perfringens*

Coccidiosis program, % flocks

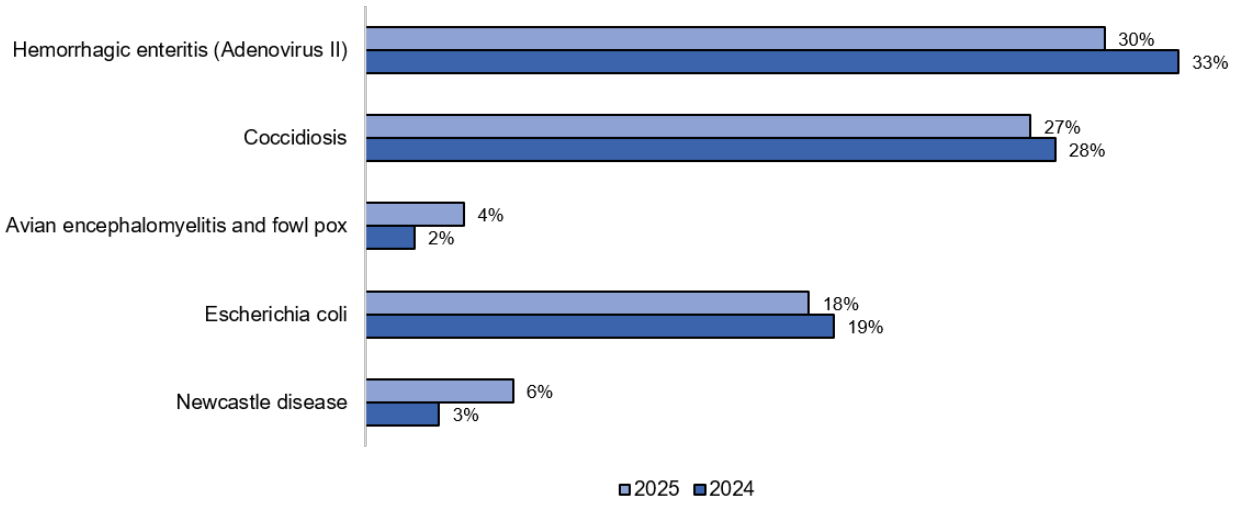


- **Continuous control** was the most frequently used program **(59%-63%)**
- A limited number of flocks used shuttle or bioshuttle program
- Stable proportion of flocks used a coccidiosis vaccination program **(27%-28%)**

All data shown, except the non-antimicrobial alternatives, are percentages of flocks sampled in 2024 (n = 86) and 2025 (n = 84) (x-axis)

Infection prevention and control strategies in turkeys

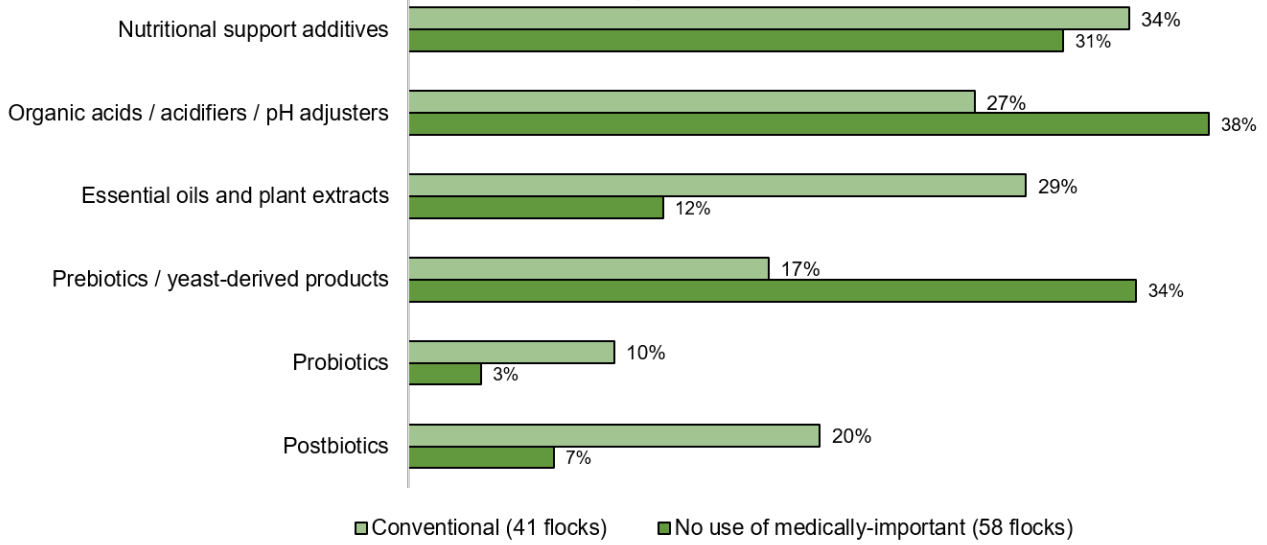
Vaccination, % flocks



- On average, **64% of flocks** were vaccinated with at least 1 agent
- Vaccination against **hemorrhagic enteritis virus (Adenovirus)** was the most frequently administered vaccine, with 1 or 2 applications during the turkey growing period
- Flocks vaccinated against Newcastle disease virus received 1 to 3 applications
- In 2025, **4 flocks** were vaccinated against **avian metapneumovirus (turkey rhinotracheitis vaccine)**

Data shown are percentages of flocks sampled in 2024 (n = 86) and 2025 (n = 84)

Non-antimicrobial alternatives, % flocks with data*



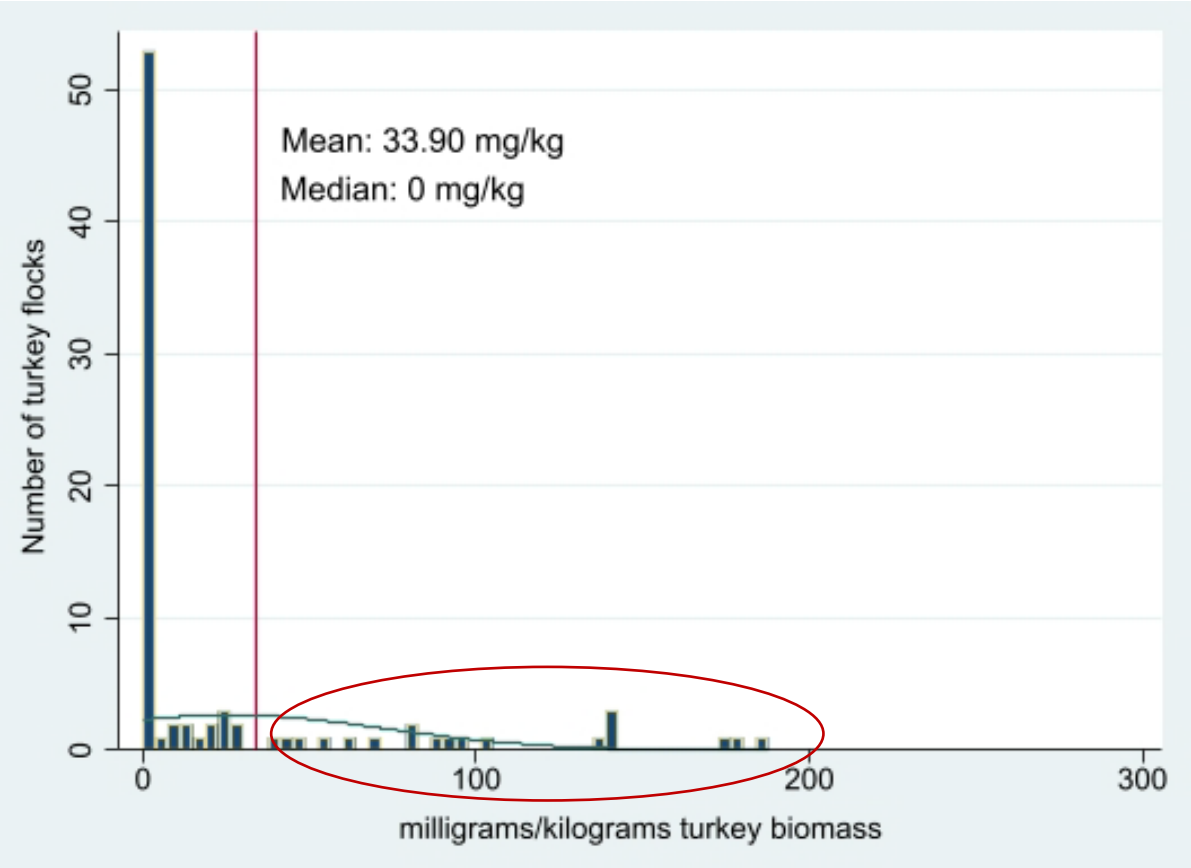
- **Non-significant differences** were observed in any non-antimicrobial alternative categories when comparing conventional to no use of medically important antimicrobial flocks**
- Nutritional support additives (vitamins, minerals, trace minerals, enzymes and other products, and organic acid/acidifier and pH adjusters) were administered via water or feed
    - However, most commercially available products in all categories were added to the feed ration (similar to broiler chickens)
- Some products contain a **mixture of 2 or more alternatives (synbiotics)**

*Cumulative data (2021-2025); flocks with no response/response cannot be confirmed were excluded in the analysis

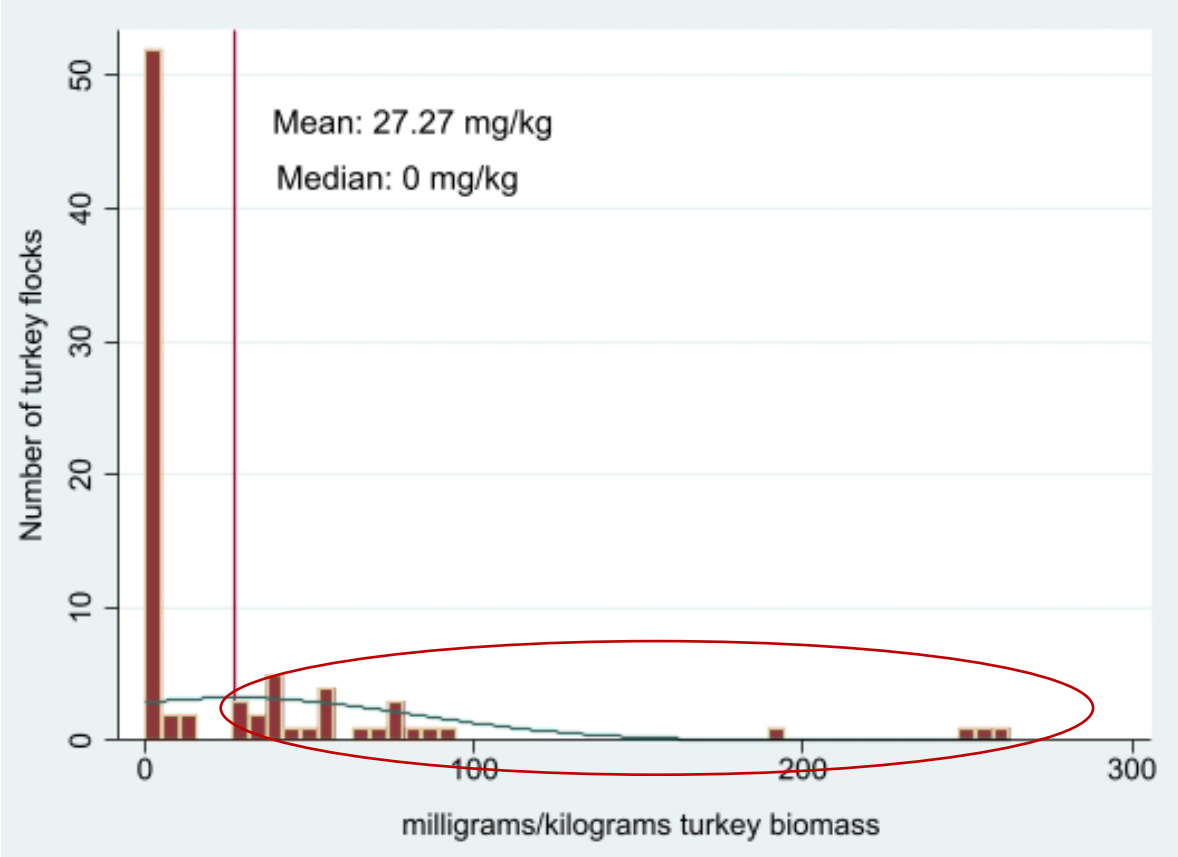
to compare between production types, data were analyzed using z-test, Holm and Fisher exact test; manuscript is in preparation for submission to ***Avian Diseases*

Flock level quantity of use – depends on the flock health situation

2024 (n = 86 flocks)



2025 (n = 84 flocks)

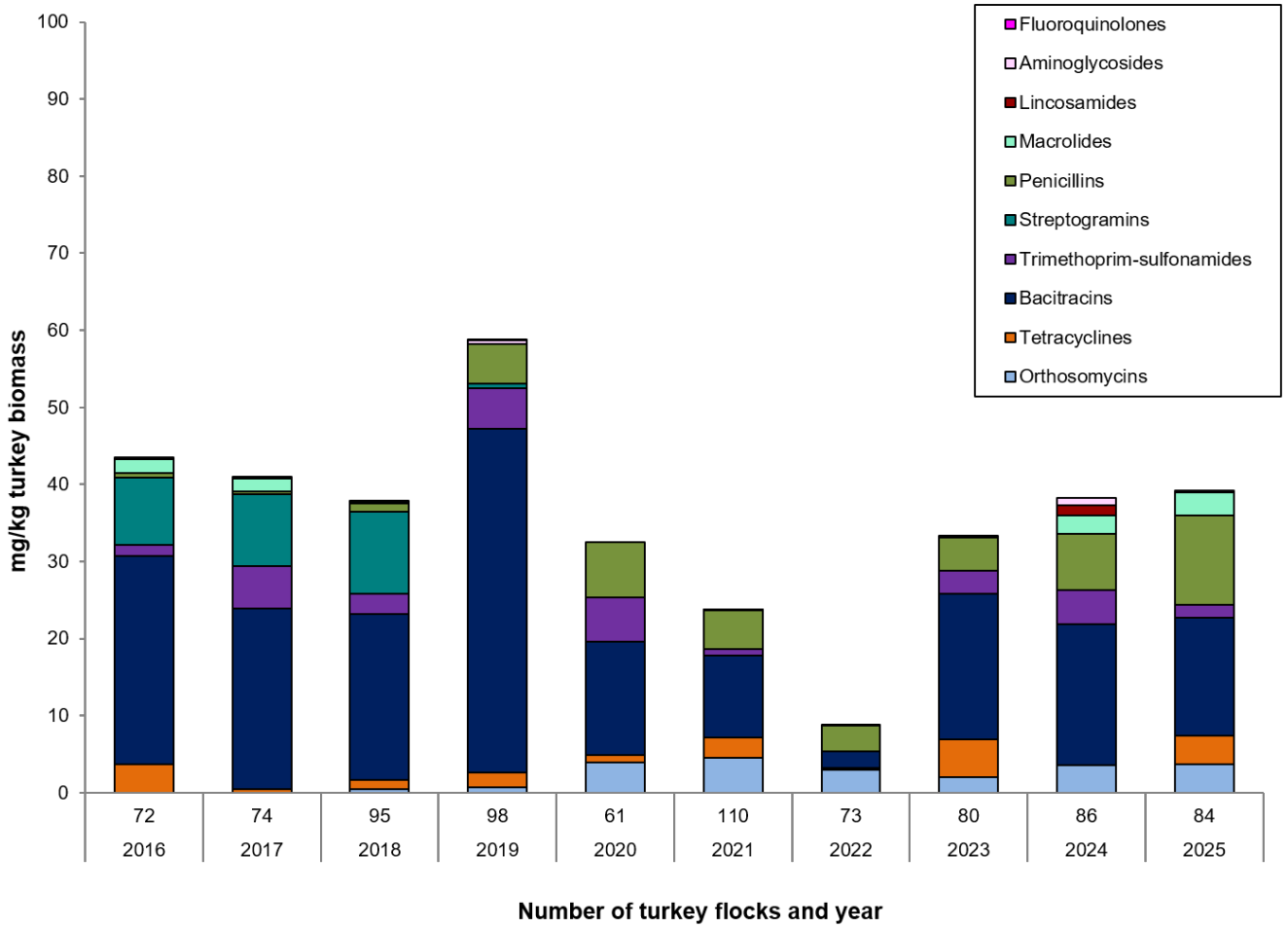


The data shown represent flock-level AMU estimates. Mean AMU slightly decreased but the distribution of flocks classified as low, medium, or high users remained relatively stable between 2024 and 2025*.

*Two-sample Wilcoxon rank-sum (Mann–Whitney) test

Antimicrobial use - total quantity was stable, but the relative contribution of classes changed

mg/kg broiler turkey biomass (weight-based metric)



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2025 vs. 2024 (% change)
Total	44	41	38	59	33	24	9	33	38	39	↑ 1 mg/kg (+2%)

Frequency (count-based metric)

Antimicrobial	2024	2025	% difference
Amoxicillin	0%	1%	+1%
Avilamycin	19%	14%	-5%
Bacitracin	16%	17%	+1%
Gentamicin	1%	2%	+1%
Penicillin (in feed)	0%	2%	+2%
Penicillin (in water)	5%	2%	-3%
Trimethoprim-sulfadiazine	7%	4%	-3%
Tylosin	2%	1%	-1%
No antimicrobial used	60%	62%	+2%

No significant changes noted between 2024 and 2025

Occasionally reported (<3%): enrofloxacin, tetracycline (+/-neomycin), sulfonamides

Recovery of foodborne pathogens from turkeys

Bacterial recovery was higher in farm turkey samples compared to retail meats

	2021	2022	2023	2024	2025	Trends	2025 vs. 2024 (% difference)
Farm							
Salmonella	57%	56%	55%	52%	46%		-6%
Campylobacter	56%	39%	34%	43%	33%		-10%
Retail							
Salmonella	33%	30%	39%	17%	23%		6%
Campylobacter	NT	6%	5%	10%	6%		-3%

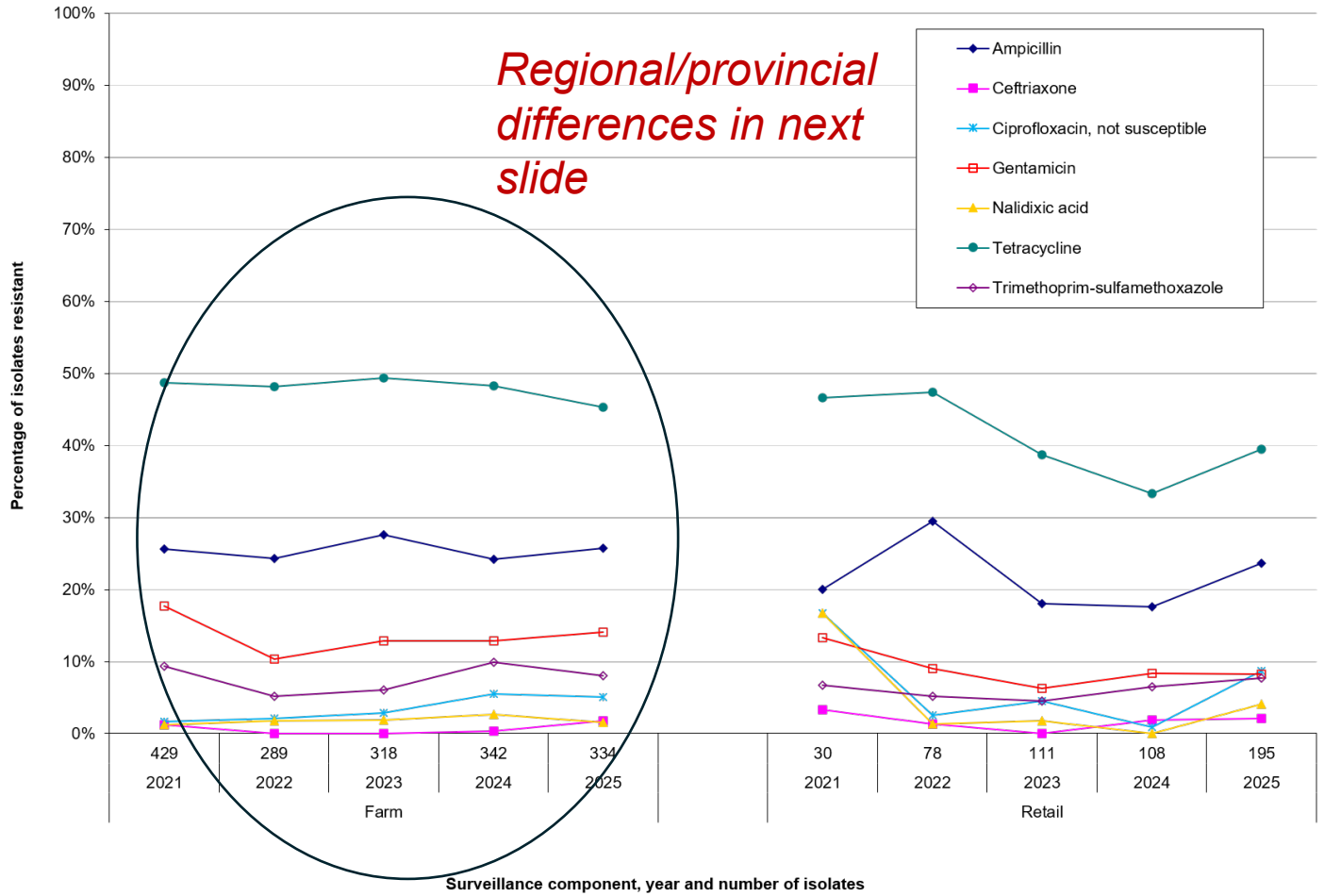
NT – Not tested

- Farm sampling utilizes pooled fecal samples, while retail collects ground turkey meat at grocery stores/retail outlets

2025 recovery percentages:

- **Decreased *Salmonella*-positive** in farm samples, while it increased at retail
- **Decreased *Campylobacter*-positive** in farm samples; very limited isolate numbers (n = 9) at retail

Antimicrobial resistance frequencies in *Escherichia coli*

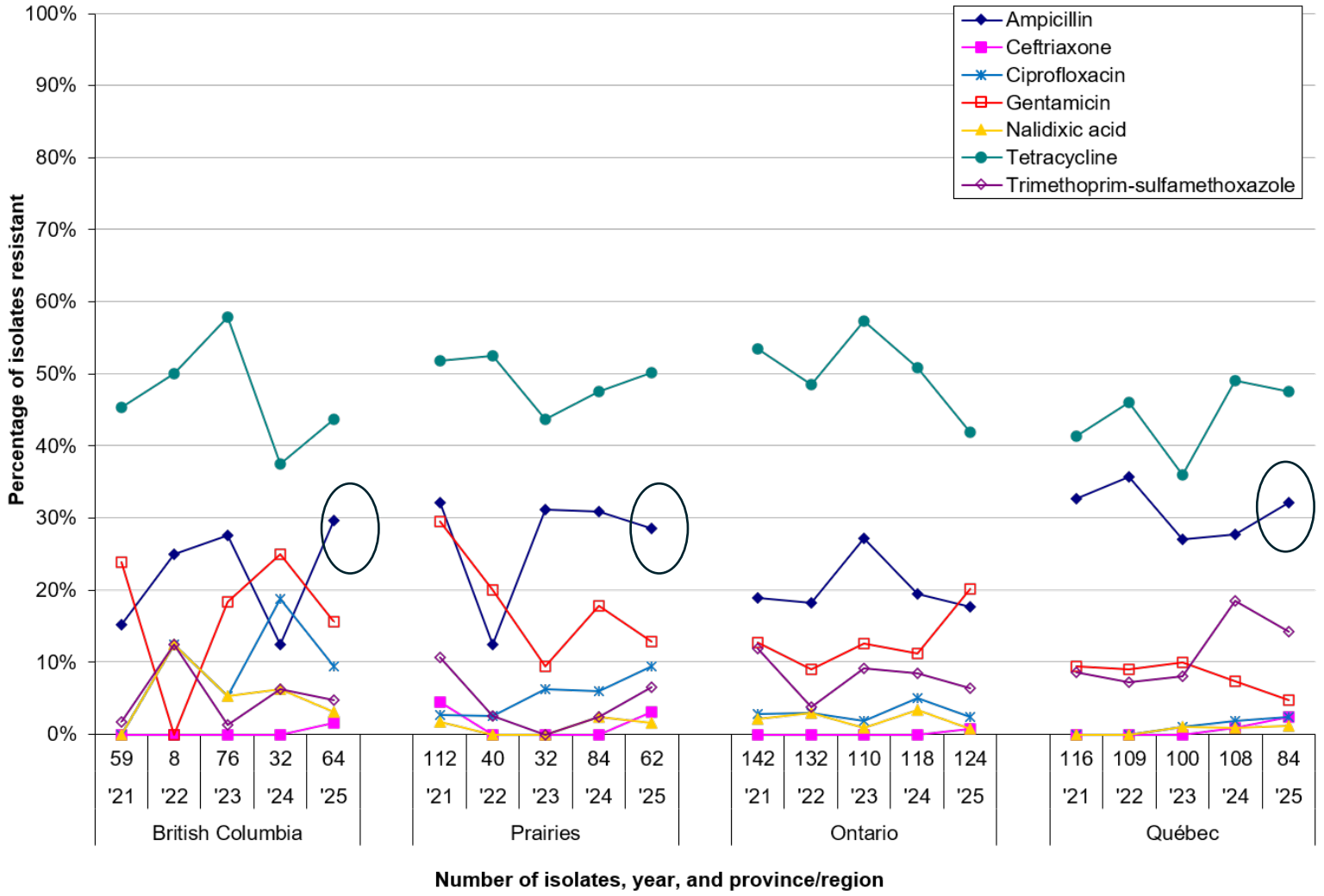


Surveillance component	Farm					Retail				
Year	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Number of isolates	429	289	318	342	334	30	78	111	108	195
Antimicrobial										
Ampicillin	26%	24%	28%	24%	26%	20%	29%	18%	18%	24%
Ceftriaxone	1%	0%	0%	0.3%	2%	3%	1%	0%	2%	2%
Ciprofloxacin	2%	2%	3%	6%	5%	17%	3%	5%	1%	9%
Gentamicin	18%	10%	13%	13%	14%	13%	9%	6%	8%	8%
Nalidixic acid	1%	2%	2%	3%	1%	17%	1%	2%	0%	4%
Tetracycline	49%	48%	49%	48%	45%	47%	47%	39%	33%	39%
Trimethoprim-sulfamethoxazole	9%	5%	6%	10%	8%	7%	5%	5%	6%	8%

Notable findings:

- Levels of resistance were comparable in farm and retail isolates
- **Low-level** resistance to ceftriaxone and ciprofloxacin was observed
- Gentamicin resistance remained at a moderate level in farm isolates and low-level in retail isolates
- Resistance to ampicillin and tetracycline remained at a high level in farm and retail

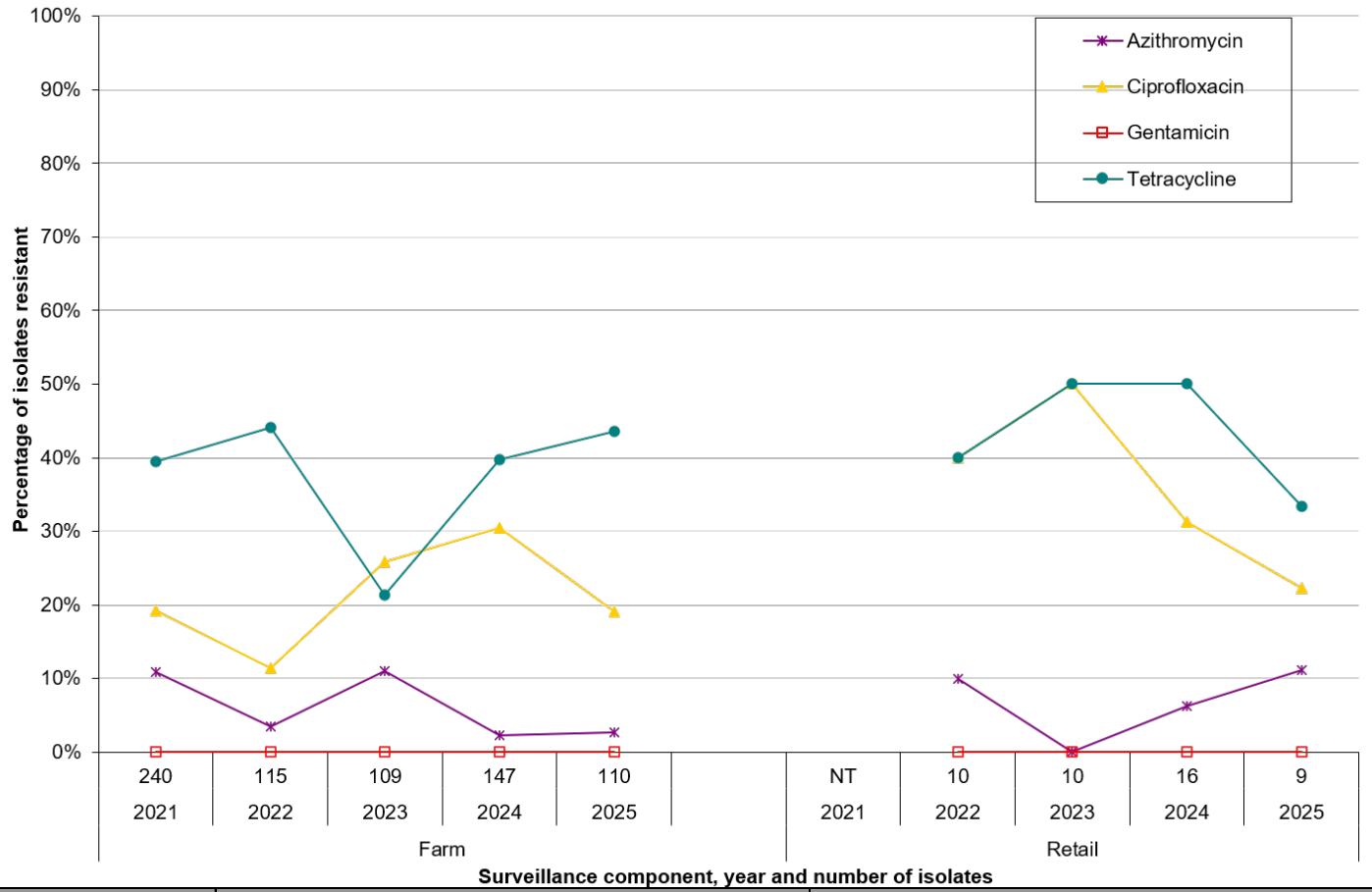
Antimicrobial resistance frequencies in *Escherichia coli*, regional/provincial results



Notable regional/provincial differences:

- **Ampicillin:** Higher levels of resistance in most provinces (British Columbia, the Prairies and Quebec) were noted in 2025.
- **Ciprofloxacin**: higher level (9%) in British Columbia and the Prairies compared to Ontario and Quebec (2%)
- **Trimethoprim-sulfamethoxazole:** highest level noted in Quebec.

Antimicrobial resistance frequencies in *Campylobacter*



Surveillance component	Farm					Retail				
Year	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Number of isolates	240	115	109	147	110	NT	10	10	16	9
Antimicrobial										
Azithromycin	11%	3%	11%	2%	3%	NT	10%	0%	6%	11%
Ciprofloxacin	19%	11%	26%	31%	19%	NT	40%	50%	31%	22%
Gentamicin	0%	0%	0%	0%	0%	NT	0%	0%	0%	0%
Tetracycline	39%	44%	21%	40%	44%	NT	40%	50%	50%	33%

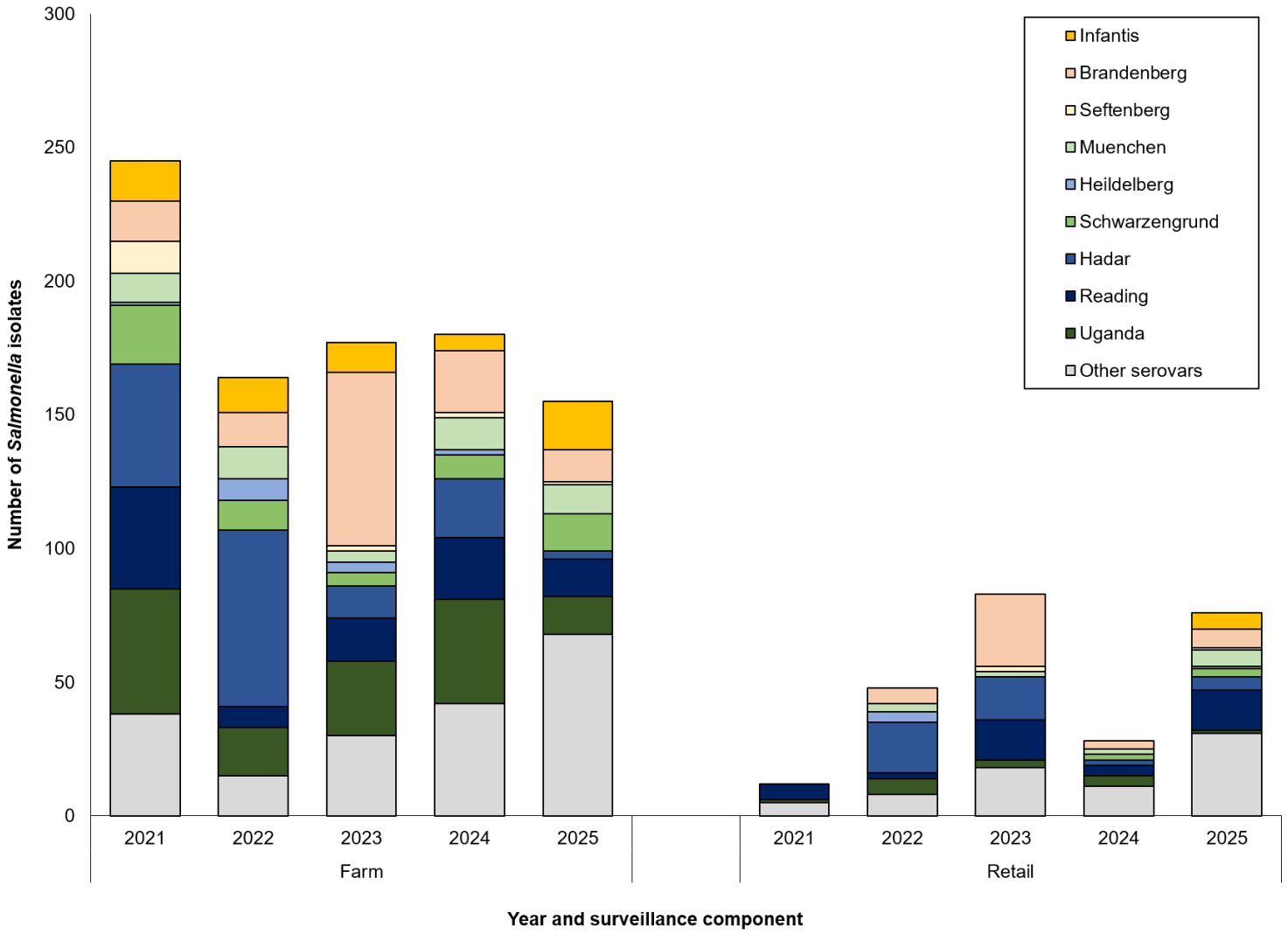
NT-not tested

Notable findings*:

- Resistance to ciprofloxacin continued to be detected in farm and retail*
  - Decreased in farm isolates (↓ 12%)
  - Resistance was detected in both ***C. coli*** **and** ***C. jejuni***, the latter being the species most commonly associated with human foodborne illness**
- Resistance to azithromycin (a macrolide antimicrobial) was observed in both farm and retail isolates
- Tetracycline resistance remained at high level in farm isolates

*caution in interpreting data, as fewer flocks were sampled in the western provinces/regions and very limited retail isolates were recovered also due to regional gaps in sampling.
** In 2025 retail samples, 2 of the 9 isolates were ciprofloxacin resistant

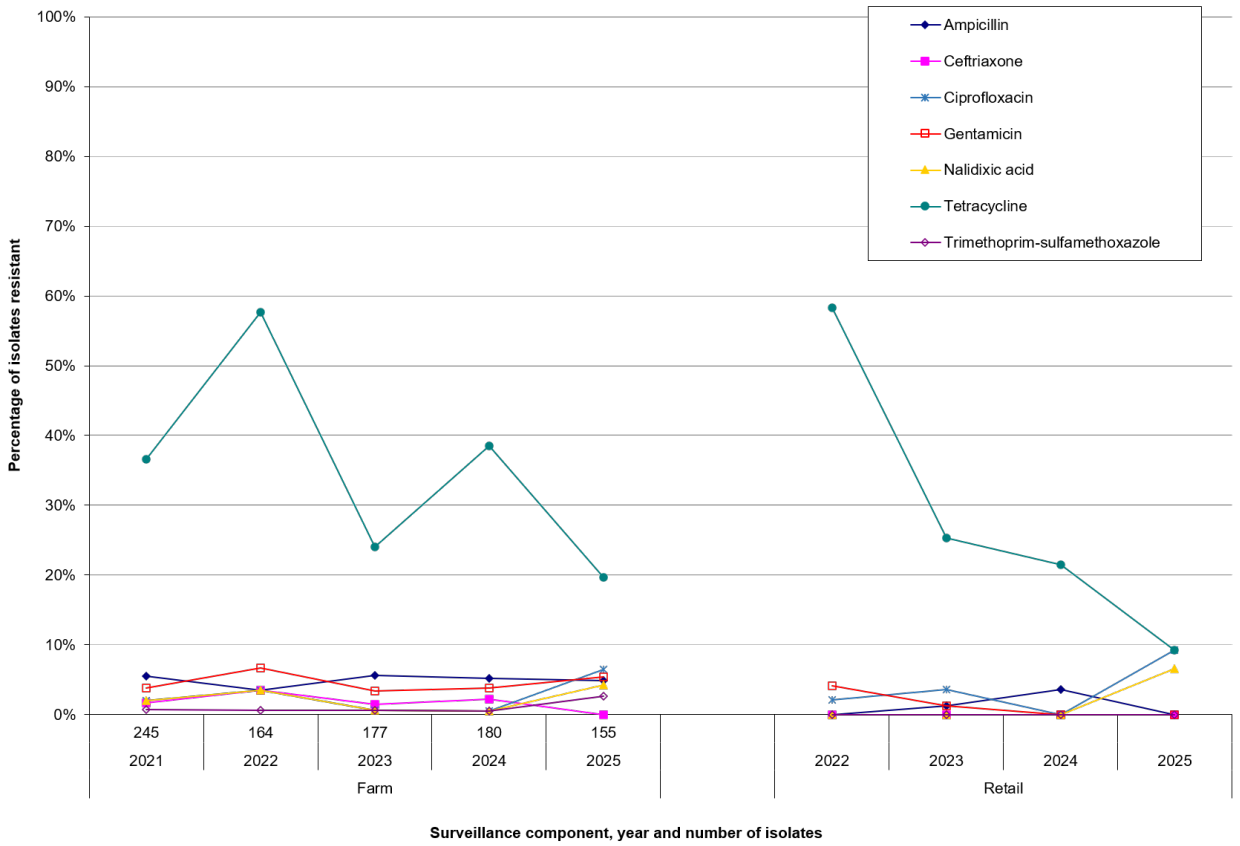
Salmonella serovars from turkeys



- The diversity and proportion of serovars varied each year
- The top 3 most frequent serovar varied in farm and retail isolates over time. In 2025:
  - **Farm:** Infantis, Uganda, Reading
  - **Retail:** Reading, Brandenberg, Muenchen
- Closely monitored serovar because of the emerging resistance to ciprofloxacin :
  - *S.* Enteritidis
  - *S.* Infantis

Interpret retail data with caution due to sampling gaps (e.g., 2021 COVID-19 disruptions) and limited geographic coverage during parts of the study period reported in the figure

Antimicrobial resistance frequencies in *Salmonella*



Surveillance component	Farm					Retail				
Year	2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Number of isolates	245	164	177	180	155	12	48	83	28	76
Antimicrobial										
Ampicillin	6%	3%	6%	5%	5%	42%	0%	1%	4%	0%
Ceftriaxone	2%	3%	2%	2%	0%	0%	0%	0%	0%	0%
Ciprofloxacin	2%	3%	1%	1%	6%	8%	2%	4%	0%	9%
Gentamicin	4%	7%	3%	4%	5%	0%	4%	1%	0%	0%
Nalidixic acid	2%	3%	1%	1%	4%	0%	0%	0%	0%	7%
Tetracycline	37%	58%	24%	38%	20%	25%	58%	25%	21%	9%
Trimethoprim-sulfamethoxazole	1%	1%	1%	1%	3%	0%	0%	0%	0%	0%

*very few isolates from retail ; shown for information purposes only

Notable findings*:

- In 2025, no ceftriaxone resistance was noted in both farm and retail isolates
- **Ciprofloxacin resistance increased** in farm (by 5%) and retail (by 9%)
  - Farm: ***S.* Enteritidis** (n = 1) expressing the ***gyrA* D87Y** mutation; **S. Infantis** (n = 1) and S. Liverpool (n = 2) expressing ***qnr*B19** gene
  - Retail: ***S.* Infantis** (n = 1) and ***S.* Enteritis** (n = 3) expressing the ***gyrA* (D87Y)** mutation; ***S.* Reading** (n = 2) expressing the ***qnr*B19** gene
- Significant decrease in resistance to tetracycline in farm and retail isolates

*part of the data presented during the CIPARS integrated findings webinar

Salmonella in turkeys – whole genome sequencing

2021-2025 CIPARS/FNC isolates sequenced in PulseNet Canada†, matching to a human outbreak cluster

Host Species	Surveillance commodity (component)	Percentage of isolates matching human outbreak cluster (matches/total isolates in PulseNet Canada†)	Top 5 serovars (2021-2025 combined)
Turkey	Turkeys (farm)	76% (643/846)	Hadar*(n = 149), Uganda* (n = 146), Brandenburg* (n = 126), Reading* (n = 99), Schwarzengrund (n = 61)
	Raw turkey (retail)	80% (196/247)	Brandenburg* (n = 43), Hadar* (n = 42), Reading* (n = 42), Agona (n = 27), Uganda* (n = 15), Muenchen (n = 13)

- **Higher percentage of isolates from turkeys matching human outbreak clusters** compared to other poultry species or commodities
- Although not among the top 5 most frequent serovars, ***S.* Enteritidis and *S.* Infantis** are closely monitored by CIPARS because of the emergence of resistance to Health Canada's Category I antimicrobial (fluoroquinolones)

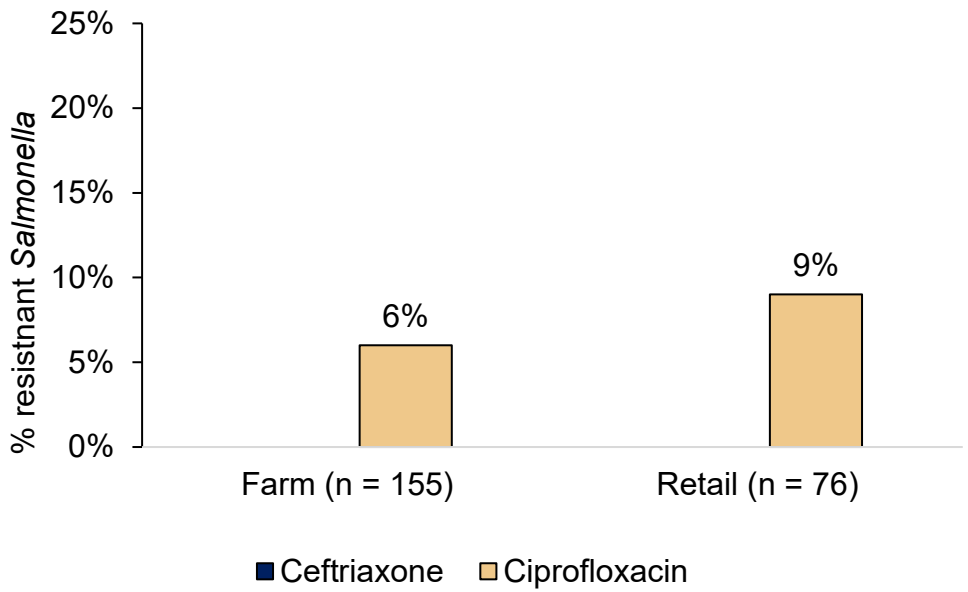
†Please note that not all *Salmonella* isolates are sequenced in PulseNet Canada
*seen across turkey surveillance components

FNC : FoodNet Canada

Salmonella in farm and retail – genotypic and phenotypic summary

Phenotypic resistance and WGS

Phenotypic resistance to VDD Category I antimicrobials (% of isolates)



Multidrug resistance (≥3 classes) **No MDR at retail**

FARM	RETAIL
3%	0%

WGS genes detected and serovar context

QUINOLONES Markers differ by serovar

FARM *gyrA(D87Y)* in 1 ***S.* Enteritidis** isolate
qnrB19 in 1 **S. Infantis** isolate and 2 ***S.* Liverpool** isolates

RETAIL *gyrA(D87Y)* in 4 ***S.* Enteritidis** isolates and 1 **S. Infantis** isolate
qnrB19 in 2 ***S.* Reading**

THIRD-GENERATION CEPHALOSPORINS

FARM No *blaCMY-2* or other 3GC resistance genes
No *blaCTX-M* ESBLs detected

RETAIL No *blaCMY-2* or other 3GC resistance genes
No *blaCTX-M* ESBLs detected

What the combined data show

***S.* Enteritidis:** detected at farm and retail with *gyrA(D87Y)* at both stages

Ciprofloxacin: 6% resistant at farm and 9% at retail

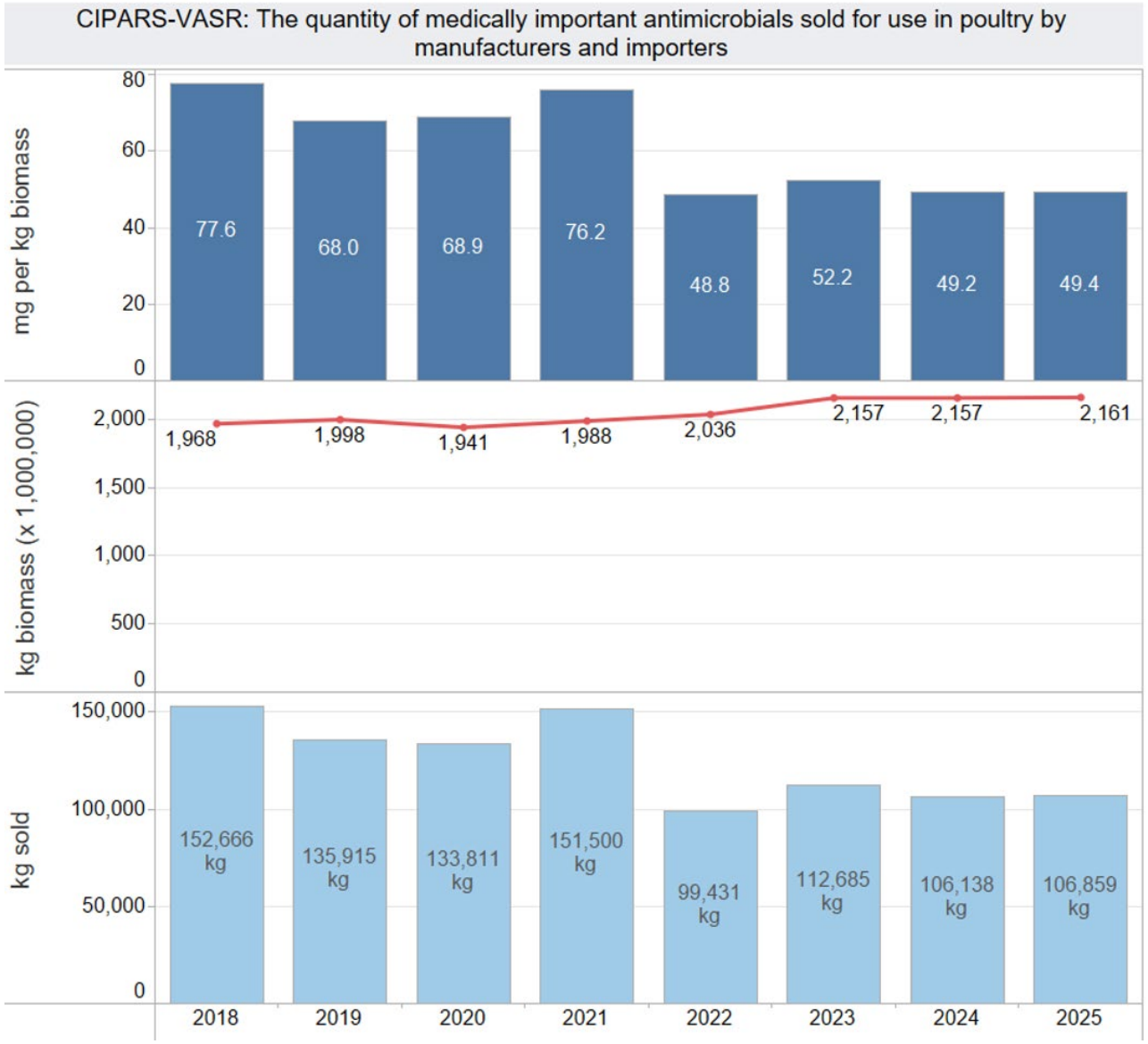
Industry priority: source attribution for Category I-resistant ***S.* Enteritidis**, ***S.* Infantis**, and ***S. Reading***

Data previously presented in the CIPARS integrated webinar
3GC- third generation cephalosporins
WGS – whole genome sequencing

Poultry overall

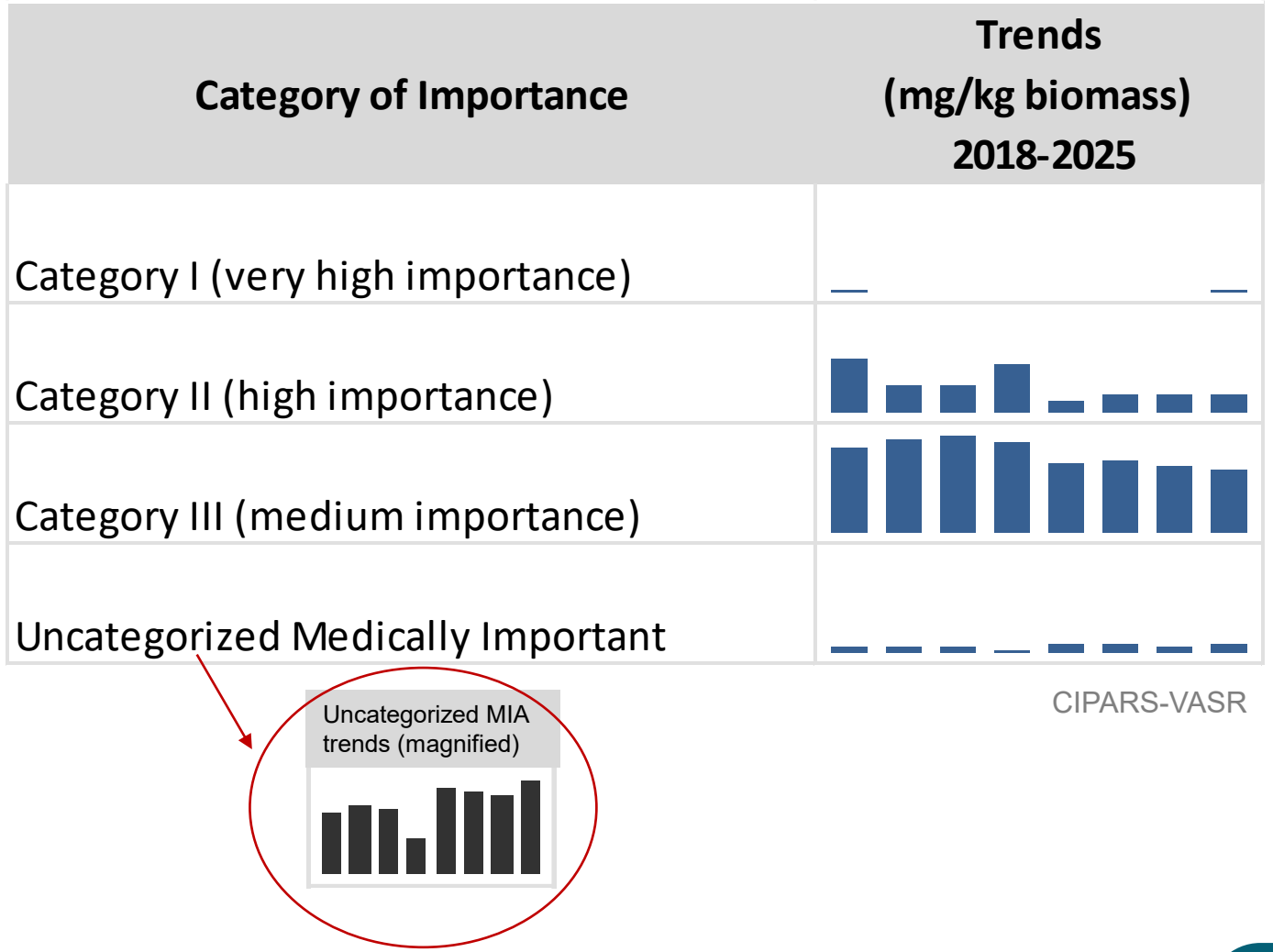
Poultry

- Sales of medically important antimicrobials by **manufacturers** and **importers** have **decreased by 35%** relative to 2021 (5-year trend) and were **stable in 2025** relative to 2024 (in mg/kg biomass).
- There has been a small increase in the biomass of poultry (red line on figure) produced since 2018.
- There were small quantities of antimicrobials reported by **compounders** for use in poultry each year (data not shown), including Category I antimicrobials.



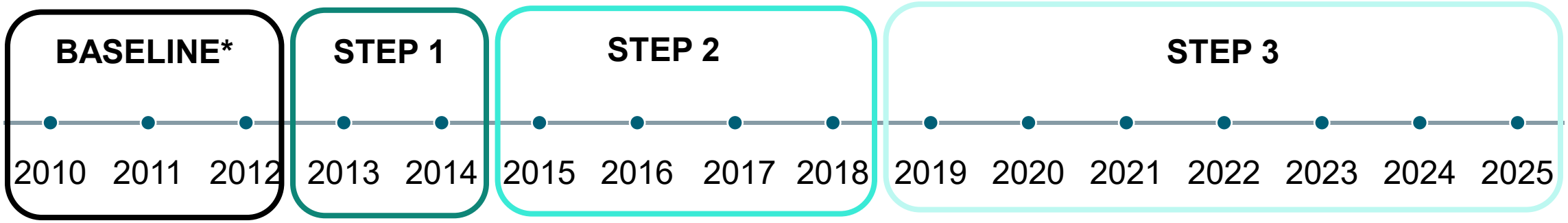
Veterinary Antimicrobial Sales Reporting – POULTRY

- Sales for poultry by **manufacturers** and **importers** were primarily Category II and III antimicrobials.
    - In 2025 **bacitracins** were the top class sold followed by **penicillins, orthosomycins** and **trimethoprim-sulfonamides**
- A small quantity of Category I antimicrobials were reported sold by manufacturers in 2025. Prior to 2025, no Category I antimicrobials were reported sold by manufacturers or importers since 2018.
- Sales were primarily for use in feed, followed by water, and small quantities for use by injection.



Note: Uncategorized medically important antimicrobials can include: aminocoumarins, gramidcin, orthosomycins, pleuromutilins and pseudomonic acids

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?



Ontario data recovered from previous project

STEP 1: Eliminated the preventative use of Category I antimicrobials (2014)
- 3rd generation cephalosporins
- Fluoroquinolones

STEP 2: Eliminated the preventative use of Category II antimicrobials (2018)
- Streptogramins
- Macrolides
- Penicillins

STEP 3: Reduction of antimicrobial use, with a focus on the preventative use of Category III antimicrobials

AMU Strategy
Chicken Farmers of Canada

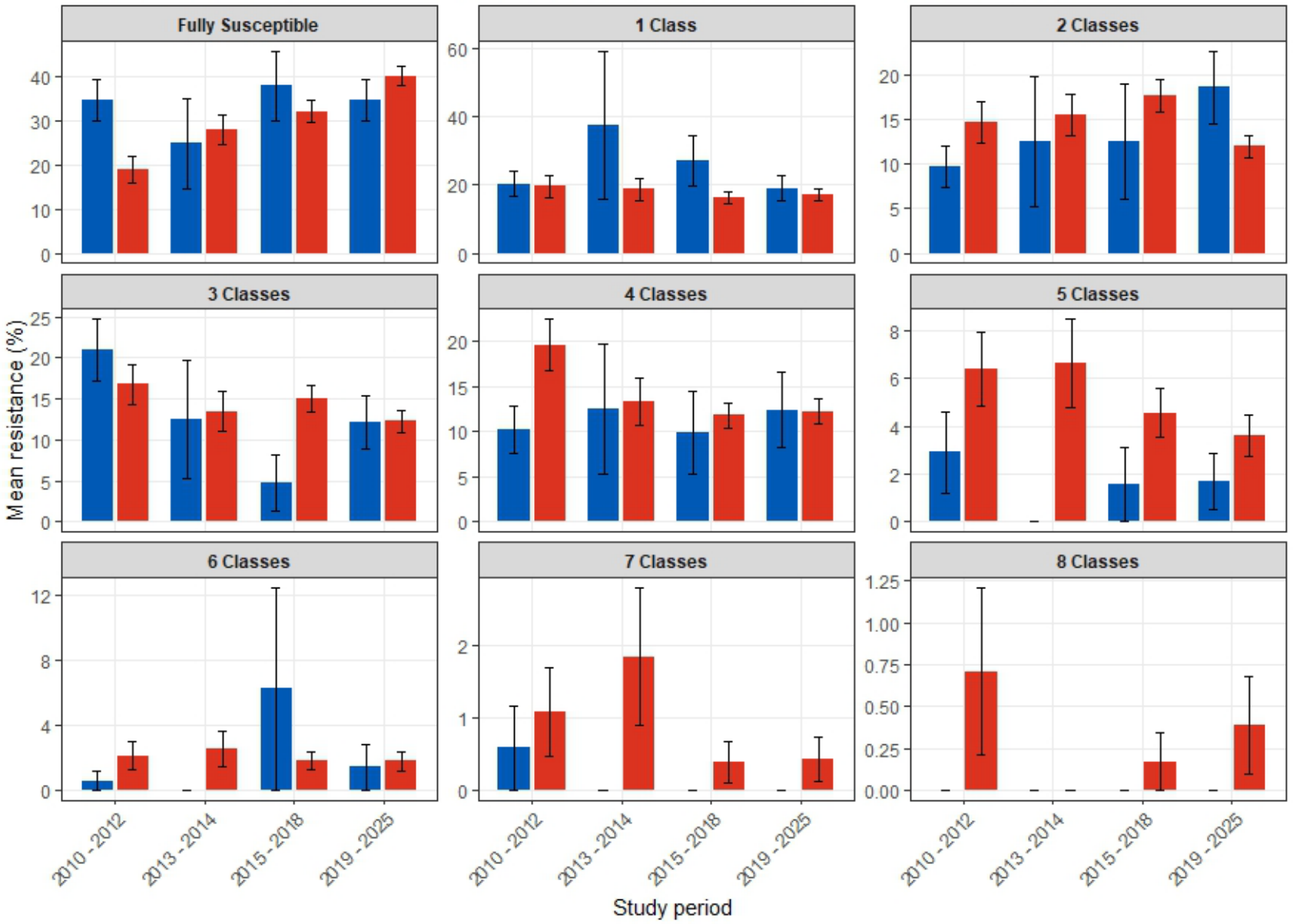
Manuscript in preparation
**In collaboration with the University of Guelph, Population Medicine*

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

	BASELINE 2010 – 2012		STEP 1 2013 – 2014		STEP 2 2015 – 2018		STEP 3 2019 – 2025	
	No MIA	MIA/Conventional	No MIA	MIA/Conventional	No MIA	MIA/Conventional	No MIA	MIA/Conventional
Escherichia coli								
# flocks positive	43	70	4	68	16	149	35	192
# isolates	181	277	16	270	61	591	127	730
Salmonella								
# flocks positive	31	55	3	32	5	77	5	76
# isolates	78	158	7	100	15	250	27	260
Campylobacter								
# flocks positive	15	6	2	13	3	30	4	48
# isolates	44	17	8	47	9	104	16	186

MIA-medically important antimicrobials

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?



Escherichia coli

n = 385	n = 1868

Production type
- No MIA flocks
- MIA/conventional flocks

Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

Escherichia coli

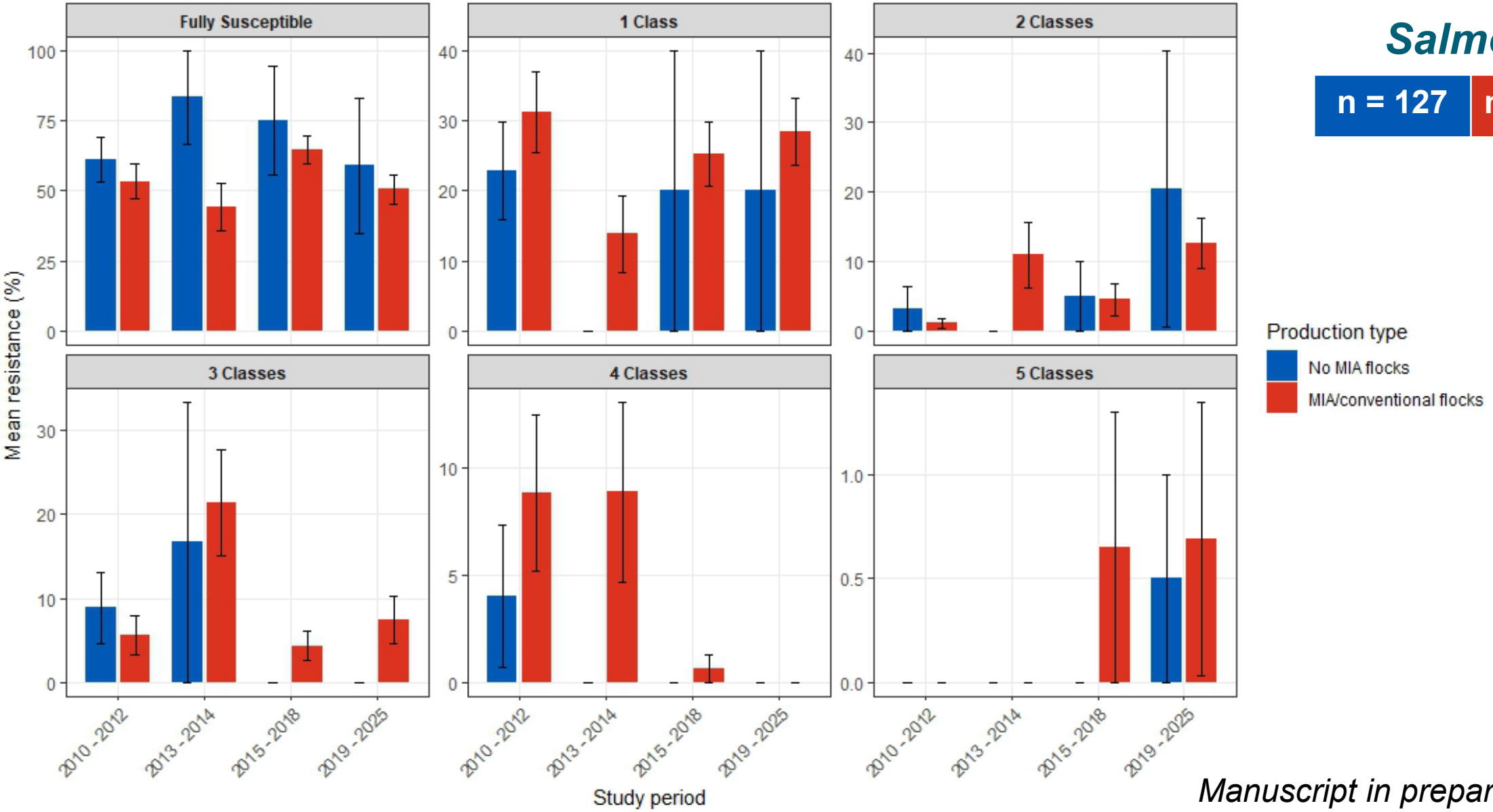
	No MIA flocks				MIA/conventional flocks			
Fully susceptible	35.4%	25.0%	36.1%	35.4%	19.9%	28.2%	31.8%	40.1%
tet	13.3%	6.3%	16.4%	10.2%	15.9%	7.8%	9.0%	7.5%
amp + tet	5.5%	6.3%	9.8%	3.9%	8.3%	8.5%	6.8%	3.8%
amp + sss + sxt + tet	0.0%	0.0%	5.0%	7.9%	10.5%	5.6%	4.7%	5.3%
amp	3.9%	25.0%	6.6%	3.2%	2.2%	8.9%	5.4%	5.1%
amp + sss + sxt	0.0%	0.0%	0.0%	1.6%	1.8%	2.6%	2.5%	5.5%
gen + sss + tet	1.6%	0.0%	3.3%	3.2%	2.2%	4.4%	4.6%	1.5%
amc + amp + cro + fox + tio	17.7%	6.3%	0.0%		7.2%	3.0%	0.5%	
sss + tet	3.3%	0.0%	3.3%	5.5%	2.9%	3.3%	2.5%	1.6%
sss + sxt + tet	0.0%	0.0%	0.0%	0.0%	2.9%	1.1%	2.9%	2.5%
gen + sss	1.1%	6.3%	0.0%	3.2%	0.7%	1.1%	3.6%	1.5%
chl + sss + sxt + tet	0.0%	0.0%	1.6%	0.0%	0.0%	2.2%	2.7%	2.9%
cip + nal	0.6%	0.0%	3.3%	3.2%	0.0%	0.7%	1.5%	3.3%
sss + sxt	0.0%	0.0%	0.0%	0.0%	1.4%	1.1%	1.5%	2.3%
amc + amp + cro + fox + tet + tio	6.6%	0.0%	0.0%		4.3%	1.5%	0.7%	
	2010 - 2012	2013 - 2014*	2015 - 2018	2019 - 2025	2010 - 2012	2013 - 2014	2015 - 2018	2019 - 2025

Rare — Extremely high

*Less than 20 samples; grey cells – ceftiofur (TIO) was removed from the panel in 2019-2025 data
Fully susceptible – high level is considered desirable

Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

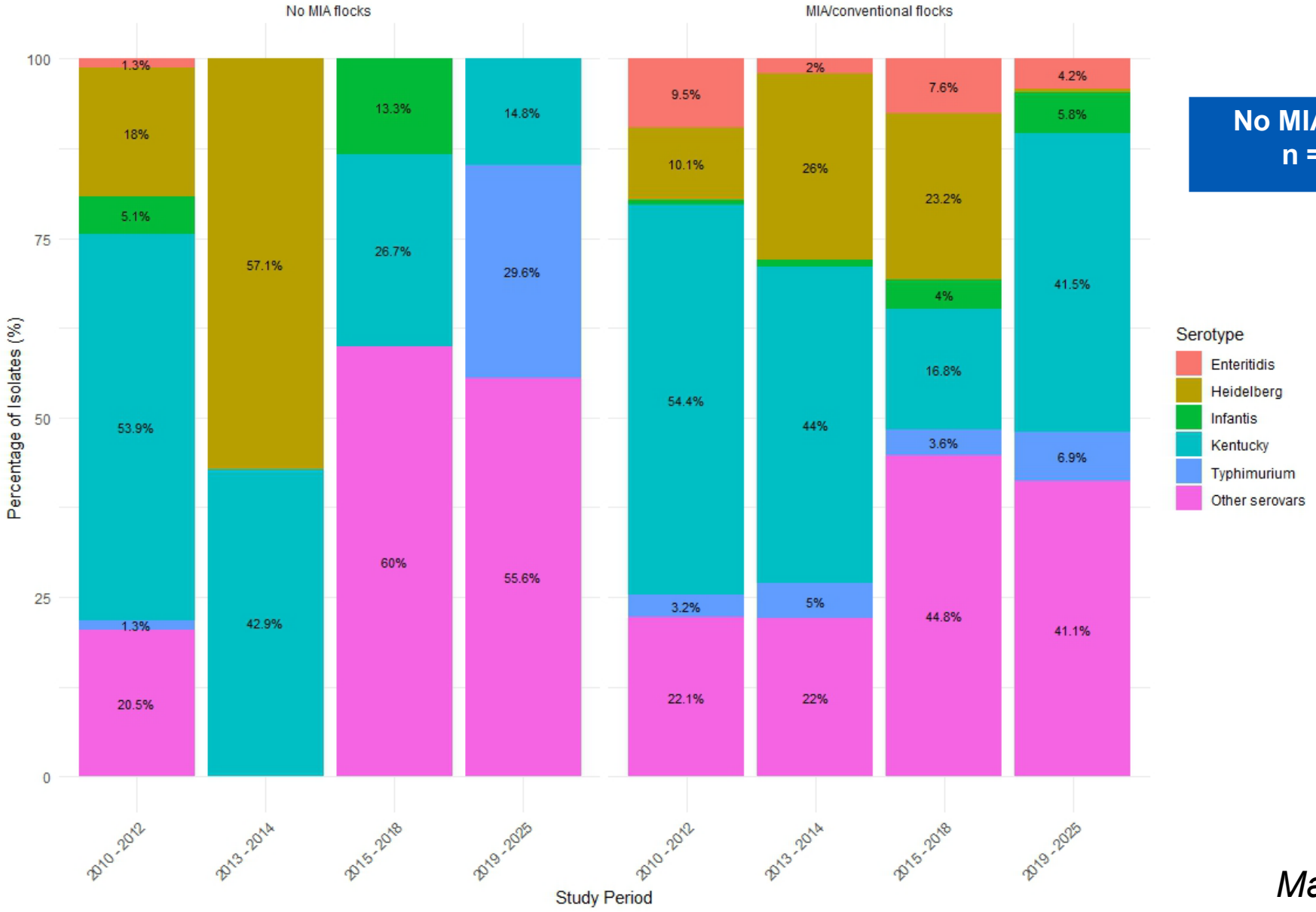


Salmonella

n = 127	n = 768

Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?



No MIA flocks, n = 127

MIA/conventional flocks, n = 768

Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

Salmonella

	No MIA flocks				MIA/conventional flocks			
Fully susceptible	60.3%	85.7%	66.7%	63.0%	53.2%	43.0%	64.4%	55.0%
tet	16.7%	0.0%	26.7%	14.8%	31.0%	14.0%	24.8%	25.4%
sss + tet	2.6%	0.0%	0.0%	14.8%	0.0%	7.0%	4.0%	6.5%
amc + amp + cro + fox + tio	9.0%	14.3%	0.0%		5.7%	11.0%	2.8%	
amc + amp + cro + fox + tet + tio	5.1%	0.0%	0.0%		7.6%	7.0%	0.0%	
gen + sss	0.0%	0.0%	6.7%	0.0%	0.0%	0.0%	0.0%	3.5%
cip + nal + sss + tet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%
amp	6.4%	0.0%	0.0%	0.0%	6.4%	0.0%	0.0%	0.4%
sss + sxt	0.0%	0.0%	0.0%	3.7%	0.6%	0.0%	0.0%	1.9%
amc + amp + cro + tet + tio	0.0%	0.0%	0.0%		0.0%	7.0%	0.0%	
gen + sss + tet	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	0.4%	0.8%
sss + sxt + tet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	1.2%
chl + sss + sxt + tet	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.8%	0.0%
amc + amp + cro + fox	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%
amc + amp + cro + tio	0.0%	0.0%	0.0%		0.0%	3.0%	0.0%	
	2010 - 2012	2013 - 2014*	2015 - 2018	2019 - 2025	2010 - 2012	2013 - 2014	2015 - 2018	2019 - 2025

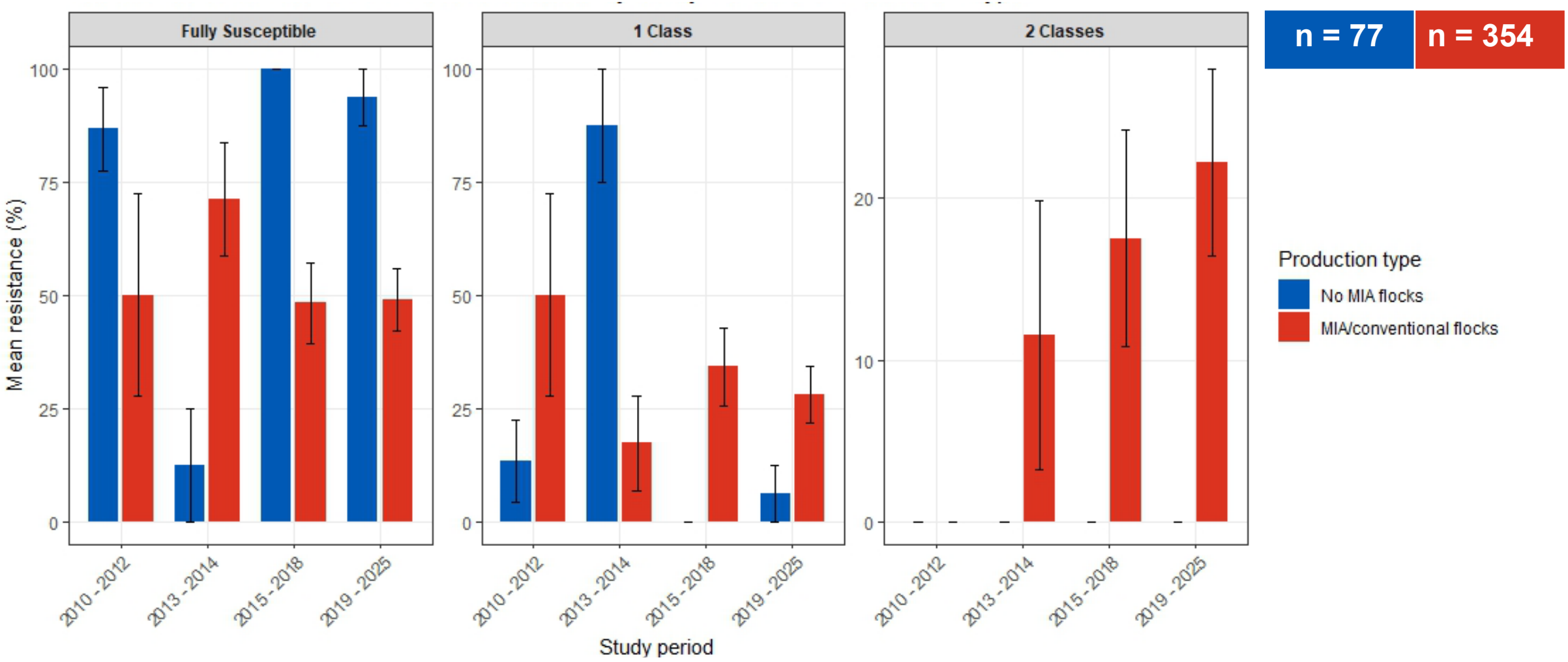


*Less than 20 samples; grey cells – ceftiofur (TIO) was removed from the panel in 2019-2025 data
Fully susceptible – high level is considered desirable

Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

Campylobacter



Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

Campylobacter

	No MIA flocks				MIA/conventional flocks			
	2010 - 2012	2013 - 2014*	2015 - 2018*	2019 - 2025	2010 - 2012	2013 - 2014	2015 - 2018	2019 - 2025
Fully susceptible	86.4%	12.5%	100.0%	93.8%	58.8%	70.2%	49.0%	46.8%
tet	13.6%	87.5%	0.0%	6.2%	41.2%	17.0%	29.8%	24.2%
cip + nal + tet	0.0%	0.0%	0.0%	0.0%	0.0%	12.8%	13.5%	19.9%
cip + nal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	7.0%
ery + azm + tet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%
cli + ery + azm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%
cli + ery + azm + tet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%

Rare — Extremely high

*Less than 20 samples
Fully susceptible – high level is considered desirable

Manuscript in preparation

Research – what is the status of AMR in flocks not treated with medically important antimicrobials?

Take away messages

- The objective of this study was to investigate antimicrobial resistance over a 15-year period among conventional flocks and flocks raised without the use of medically important antimicrobials (No MIAs) in Ontario
- The study years were categorized according to the Antimicrobial Use (AMU) Strategy published by Chicken Farmers of Canada
- *E.coli* and *Salmonella* samples from conventional farms, the percentage of isolates that were fully susceptible increased in recent years, while No MIAs flocks remained stable
- *Campylobacter* samples from conventional farm, the percentage of isolates that were fully susceptible decreased over the years, while No MIAs flocks remained stable
- Conventional farms had more diverse antimicrobial resistance patterns compared No MIAs flocks

AMU Strategy
Chicken Farmers of Canada

Manuscript in preparation

Take away messages

Public health/food safety

- ***Salmonella*** persists across the poultry (broiler chickens and turkey) production chain. CIPARS will continue to monitor trends using WGS.
  - Prioritize ***S.* Enteritidis** and ***S.* Infantis** in control and elimination programs.
  - Tracking of *Salmonella* sources across the food chain and identifying potential sources.
- **Ciprofloxacin-resistant *Campylobacter*** continues to be detected.
  - CIPARS will continue to monitor or investigate potential sources of resistant *Campylobacter,* particularly given limited current fluoroquinolone use.
- **Medically important antimicrobials used decreased in broilers but remained stable in turkeys.** Poultry antimicrobial sales (VASR) **remained stable** from 2024 to 2025.
  - Combining farm-level, sales and industry data provides a more complete picture of AMU stewardship and related AMR trends.

Take away messages

Infection prevention and control

- **Bacterial diseases remain a significant poultry health concern**, and viral diseases may contribute to secondary bacterial infections.
  - ***Enterococcus cecorum*** remains a concern in broilers; a common indication for penicillins;
    - Elevated resistance to ampicillin in indicator bacteria (*E. coli*) observed in two provinces.
  - Disease diagnoses increased in turkeys despite stable overall AMU (yolk sacculitis and septicemia).
  - Yolk sacculitis and septicemia remain common indications for trimethoprim-sulfonamides;
    - Elevated resistance to trimethoprim-sulfamethoxazole in indicator bacteria (*E. coli*) from broiler chickens observed in two provinces.
- **Vaccination, biosecurity and other preventive measures can reduce reliance on antimicrobials**.
  - CIPARS will monitor these practices alongside flock-level and long-term national AMU and AMR trends.

Acknowledgement

- Producers and veterinarians, participating abattoirs
- CIPARS and FoodNet Canada Farm Working Group
- PulseNet Canada
- Provincial and national poultry marketing boards
- Saskatchewan Agriculture
- Research collaborators and funding sources
  - Chicken Farmers of Canada
  - University of Calgary
  - University of Guelph, Population Medicine (Dr. Michele Guerin): Ontario Ministry of Food and Agribusiness; National Sciences and Engineering Research Council
- Health Canada
- Canadian Food Inspection Agency
- Other partners and collaborators providing support to CIPARS

Where can I find more information

- CIPARS Interactive data visualizations

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

- CARSS Interactive data visualizations

https://health-infobase.canada.ca/carss/amu/results.html?ind=06

- CIPARS publication's webpage

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

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Annexes

Regional/provincial AMR summary – Broiler chickens

Province/region	British Columbia					Prairies					Ontario					Quebec				
Year	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25
***Salmonella*, number of isolates**	**48**	**36**	**61**	**34**	**19**	**50**	**39**	**42**	**57**	**55**	**18**	**41**	**52**	**38**	**46**	**78**	**84**	**69**	**57**	**47**
Ampicillin	17%	8%	23%	8%	0%	13%	17%	10%	18%	15%	0%	0%	4%	0%	9%	3%	0%	0%	7%	0%
Ceftriaxone	17%	8%	17%	8%	0%	13%	17%	8%	8%	7%	0%	0%	0%	0%	9%	1%	0%	0%	4%	0%
Ciprofloxacin	4%	11%	27%	3%	0%	2%	0%	5%	0%	15%	17%	0%	8%	5%	9%	0%	0%	0%	0%	0%
Gentamicin	8%	0%	2%	0%	0%	0%	19%	2%	0%	6%	0%	0%	0%	11%	9%	11%	10%	9%	9%	10%
Nalidixic acid	2%	0%	6%	3%	0%	0%	19%	2%	0%	6%	0%	0%	0%	11%	9%	10%	10%	9%	9%	10%
Tetracycline	41%	53%	38%	8%	60%	56%	57%	32%	40%	23%	53%	45%	13%	27%	20%	73%	58%	56%	46%	45%
Trimethoprim-sulfamethoxazole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	3%	4%	0%	2%	1%	2%	6%	5%	4%
***Escherichia coli*, number of isolates**	**73**	**48**	**103**	**59**	**55**	**182**	**88**	**106**	**166**	**140**	**114**	**114**	**116**	**137**	**131**	**116**	**118**	**103**	**91**	**95**
Ampicillin	53%	54%	40%	39%	24%	18%	26%	21%	34%	37%	28%	20%	37%	37%	44%	52%	50%	43%	58%	52%
Ceftriaxone	9%	6%	4%	5%	9%	3%	1%	1%	7%	10%	3%	0%	7%	7%	10%	2%	3%	5%	1%	5%
Ciprofloxacin	10%	13%	18%	3%	11%	6%	7%	8%	8%	10%	4%	5%	4%	6%	5%	3%	5%	9%	7%	2%
Gentamicin	35%	17%	27%	15%	13%	15%	28%	19%	18%	17%	9%	9%	15%	13%	11%	17%	12%	15%	12%	14%
Nalidixic acid	10%	6%	11%	3%	0%	5%	7%	6%	7%	6%	3%	4%	4%	6%	4%	3%	3%	8%	5%	2%
Tetracycline	38%	44%	39%	47%	31%	26%	36%	28%	36%	26%	30%	31%	41%	41%	45%	45%	42%	41%	62%	42%
Trimethoprim-sulfamethoxazole	4%	2%	14%	2%	5%	2%	6%	3%	5%	5%	19%	19%	39%	32%	28%	36%	33%	41%	52%	31%
***Campylobacter*, number of isolates**	**33**	**26**	**63**	**12**	**30**	**34**	**30**	**31**	**22**	**30**	**30**	**28**	**38**	**33**	**29**	**26**	**39**	**8**	**14**	**12**
Azithromycin	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	5%	0%	0%	0%
Ciprofloxacin	38%	33%	37%	0%	17%	24%	25%	34%	29%	10%	11%	43%	30%	15%	24%	15%	41%	50%	0%	17%
Gentamicin	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Tetracycline	27%	11%	37%	100%	80%	47%	50%	37%	5%	57%	33%	57%	37%	27%	62%	42%	56%	50%	0%	17%

Legend	20 or fewer isolates recovered	Rare	Very low	Low	Moderate	High	Very high	Extremely high
		0-0.1%	0.1% to 1%	>1% to 10%	>10% to 20%	>20% to 50%	>50% to 70%	>70%

Regional/provincial AMR summary by multidrug resistance measurements, broiler chickens

Province/region	British Columbia					Prairies					Ontario					Quebec				
Year	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25
***Salmonella*, number of isolates**	**48**	**36**	**61**	**34**	**19**	**50**	**39**	**42**	**57**	**55**	**18**	**41**	**52**	**38**	**46**	**76**	**84**	**69**	**57**	**47**
Fully susceptible	52%	47%	53%	81%	40%	41%	41%	65%	59%	66%	31%	49%	75%	68%	66%	18%	32%	37%	46%	42%
MDR ≥ 3	17%	8%	25%	8%	0%	12%	12%	10%	14%	15%	0%	0%	2%	11%	9%	3%	2%	6%	7%	4%
MDR ≥ 5	9%	8%	18%	0%	0%	0%	0%	0%	0%	7%	0%	0%	2%	0%	9%	0%	0%	0%	4%	0%
MDR ≥ 7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
***Escherichia coli*, number of isolates**	**73**	**48**	**103**	**59**	**55**	**182**	**88**	**106**	**166**	**140**	**114**	**114**	**116**	**137**	**131**	**116**	**118**	**103**	**91**	**95**
Fully susceptible	26%	33%	32%	32%	45%	53%	39%	49%	37%	49%	44%	55%	30%	34%	31%	20%	22%	23%	17%	24%
MDR ≥ 3	37%	27%	34%	22%	20%	13%	23%	14%	22%	21%	16%	18%	23%	27%	30%	31%	29%	29%	49%	26%
MDR ≥ 5	9%	6%	2%	2%	0%	2%	1%	1%	5%	8%	0%	0%	7%	7%	5%	1%	1%	2%	3%	2%
MDR ≥ 7	3%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	3%	1%	0%	0%	0%	0%	0%	0%
***Campylobacter*, number of isolates**	**33**	**26**	**63**	**12**	**30**	**34**	**30**	**31**	**22**	**30**	**30**	**28**	**38**	**33**	**29**	**26**	**39**	**8**	**14**	**12**
Fully susceptible*	61%	58%	52%	0%	17%	41%	53%	29%	68%	43%	73%	43%	34%	73%	31%	46%	38%	50%	93%	83%
MDR ≥ 3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
MDR ≥ 5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
MDR ≥ 7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Legend	20 or fewer isolates recovered	Rare	Very low	Low	Moderate	High	Very high	Extremely high
		0-0.1%	0.1% to 1%	>1% to 10%	>10% to 20%	>20% to 50%	>50% to 70%	>70%

Legend	20 or fewer isolates recovered	Few	Some	Many	Most	Nearly all
		0%-20%	>20% to 40%	>40% to 60%	>60% to 80%	>80% to 100%

Note: For fully susceptible isolates, dark green cells indicate a desirable outcome: a high proportion of isolates were susceptible to all tested antimicrobials.

Regional/provincial AMR summary – Turkeys

Province/region	British Columbia					Prairies					Ontario					Quebec				
Year	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25
***Salmonella*, number of isolates**	**25**	**2**	**17**	**11**	**9**	**57**	**22**	**27**	**58**	**48**	**101**	**66**	**60**	**61**	**48**	**62**	**74**	**73**	**50**	**50**
Ampicillin	13%	0%	0%	0%	0%	11%	0%	15%	12%	14%	4%	9%	8%	7%	2%	0%	0%	1%	0%	0%
Ceftriaxone	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	9%	4%	7%	0%	0%	0%	0%	0%	0%
Ciprofloxacin	0%	0%	6%	0%	50%	0%	0%	0%	2%	8%	5%	9%	0%	0%	2%	0%	0%	0%	0%	0%
Gentamicin	0%	0%	6%	0%	0%	8%	0%	13%	3%	9%	5%	12%	2%	5%	2%	0%	4%	0%	2%	7%
Nalidixic acid	0%	0%	6%	0%	15%	0%	0%	0%	2%	8%	5%	9%	0%	0%	0%	0%	0%	0%	0%	0%
Tetracycline	17%	0%	54%	64%	44%	9%	33%	10%	22%	13%	55%	70%	21%	41%	17%	40%	56%	25%	42%	25%
Trimethoprim-sulfamethoxazole	0%	0%	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	2%	0%	2%	3%	1%	0%	0%	4%
***Escherichia coli*, number of isolates**	**59**	**8**	**76**	**32**	**64**	**112**	**40**	**32**	**84**	**62**	**142**	**132**	**110**	**118**	**124**	**116**	**109**	**100**	**108**	**84**
Ampicillin	15%	25%	28%	13%	30%	32%	13%	31%	31%	29%	19%	18%	27%	19%	18%	33%	36%	27%	28%	32%
Ceftriaxone	0%	0%	0%	0%	2%	4%	0%	0%	0%	3%	0%	0%	0%	0%	1%	0%	0%	0%	1%	2%
Ciprofloxacin	0%	13%	5%	19%	9%	3%	2%	6%	6%	9%	3%	3%	2%	5%	2%	0%	0%	1%	2%	2%
Gentamicin	24%	0%	18%	25%	16%	29%	20%	9%	18%	13%	13%	9%	13%	11%	20%	9%	9%	10%	7%	5%
Nalidixic acid	0%	13%	5%	6%	3%	2%	0%	0%	2%	2%	2%	3%	1%	3%	1%	0%	0%	1%	1%	1%
Tetracycline	45%	50%	58%	38%	44%	52%	53%	44%	48%	50%	54%	48%	57%	51%	42%	41%	46%	36%	49%	48%
Trimethoprim-sulfamethoxazole	2%	13%	1%	6%	5%	11%	2%	0%	2%	7%	12%	4%	9%	8%	6%	9%	7%	8%	19%	14%
***Campylobacter*, number of isolates**	**36**	**0**	**34**	**12**	**21**	**53**	**16**	**2**	**22**	**11**	**80**	**52**	**38**	**50**	**41**	**71**	**47**	**35**	**63**	**37**
Azithromycin	0%	ND	0%	0%	10%	0%	25%	0%	0%	0%	3%	0%	0%	0%	0%	36%	0%	34%	0%	3%
Ciprofloxacin	33%	ND	34%	25%	43%	6%	50%	0%	33%	9%	17%	8%	24%	50%	7%	24%	6%	23%	19%	22%
Gentamicin	0%	ND	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Tetracycline	25%	ND	8%	58%	52%	22%	50%	0%	58%	45%	70%	28%	27%	50%	46%	23%	61%	31%	23%	35%

Legend	20 or fewer isolates recovered	Rare	Very low	Low	Moderate	High	Very high	Extremely high
		0-0.1%	0.1% to 1%	>1% to 10%	>10% to 20%	>20% to 50%	>50% to 70%	>70%

Regional/provincial AMR summary by multidrug resistance measurements, turkeys

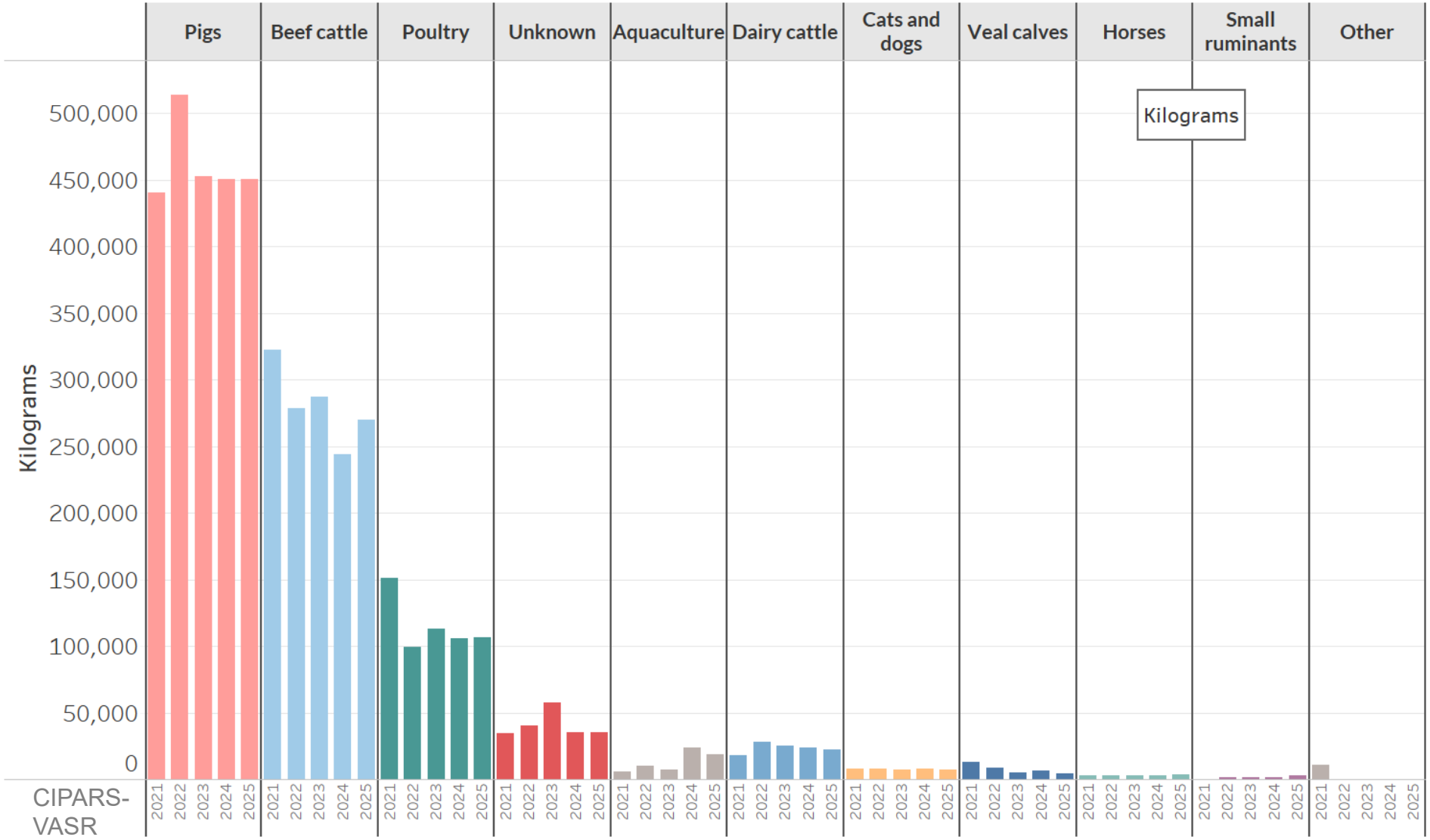
Province/région	Colombie-Britannique					Prairies					Ontario					Québec				
Année	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25	'21	'22	'23	'24	'25
***Salmonella*, Nombre d'isolats**	**48**	**36**	**61**	**34**	**19**	**50**	**39**	**42**	**57**	**55**	**18**	**41**	**52**	**38**	**46**	**76**	**84**	**69**	**57**	**47**
Entièrement sensible	69%	100%	47%	36%	25%	87%	67%	65%	64%	63%	42%	24%	72%	51%	78%	57%	42%	74%	53%	71%
MRM ≥ 3	0%	0%	0%	0%	0%	9%	0%	0%	2%	9%	5%	9%	4%	7%	2%	0%	4%	0%	0%	0%
MRM ≥ 5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	9%	4%	7%	0%	0%	0%	0%	0%	0%
MRM ≥ 7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
***Escherichia coli*, Nombre d'isolats**	**59**	**8**	**76**	**32**	**64**	**112**	**40**	**32**	**84**	**62**	**142**	**132**	**110**	**118**	**124**	**116**	**109**	**100**	**108**	**84**
Entièrement sensible	48%	50%	28%	44%	38%	36%	42%	41%	40%	37%	39%	39%	35%	38%	41%	41%	34%	45%	38%	40%
MRM ≥ 3	12%	25%	12%	16%	14%	21%	13%	9%	17%	21%	15%	5%	15%	12%	11%	11%	5%	7%	11%	11%
MRM ≥ 5	0%	0%	0%	3%	6%	3%	0%	0%	1%	0%	1%	0%	1%	1%	3%	0%	0%	0%	2%	1%
MRM ≥ 7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
***Campylobacter*, Nombre d'isolats**	**36**	**0**	**34**	**12**	**21**	**53**	**16**	**2**	**22**	**11**	**80**	**52**	**38**	**50**	**41**	**71**	**47**	**35**	**63**	**37**
Entièrement sensible	64%	0%	68%	42%	43%	79%	25%	100%	41%	45%	27%	67%	47%	34%	49%	23%	32%	17%	65%	46%
MRM ≥ 3	0%	0%	0%	0%	10%	0%	25%	0%	0%	0%	4%	0%	0%	6%	0%	25%	0%	17%	0%	0%
MRM ≥ 5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%
MRM ≥ 7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Legend	20 or fewer isolates recovered	Rare	Very low	Low	Moderate	High	Very high	Extremely high
		0-0.1%	0.1% to 1%	>1% to 10%	>10% to 20%	>20% to 50%	>50% to 70%	>70%

Legend	20 or fewer isolates recovered	Few	Some	Many	Most	Nearly all
		0%-20%	>20% to 40%	>40% to 60%	>60% to 80%	>80% to 100%

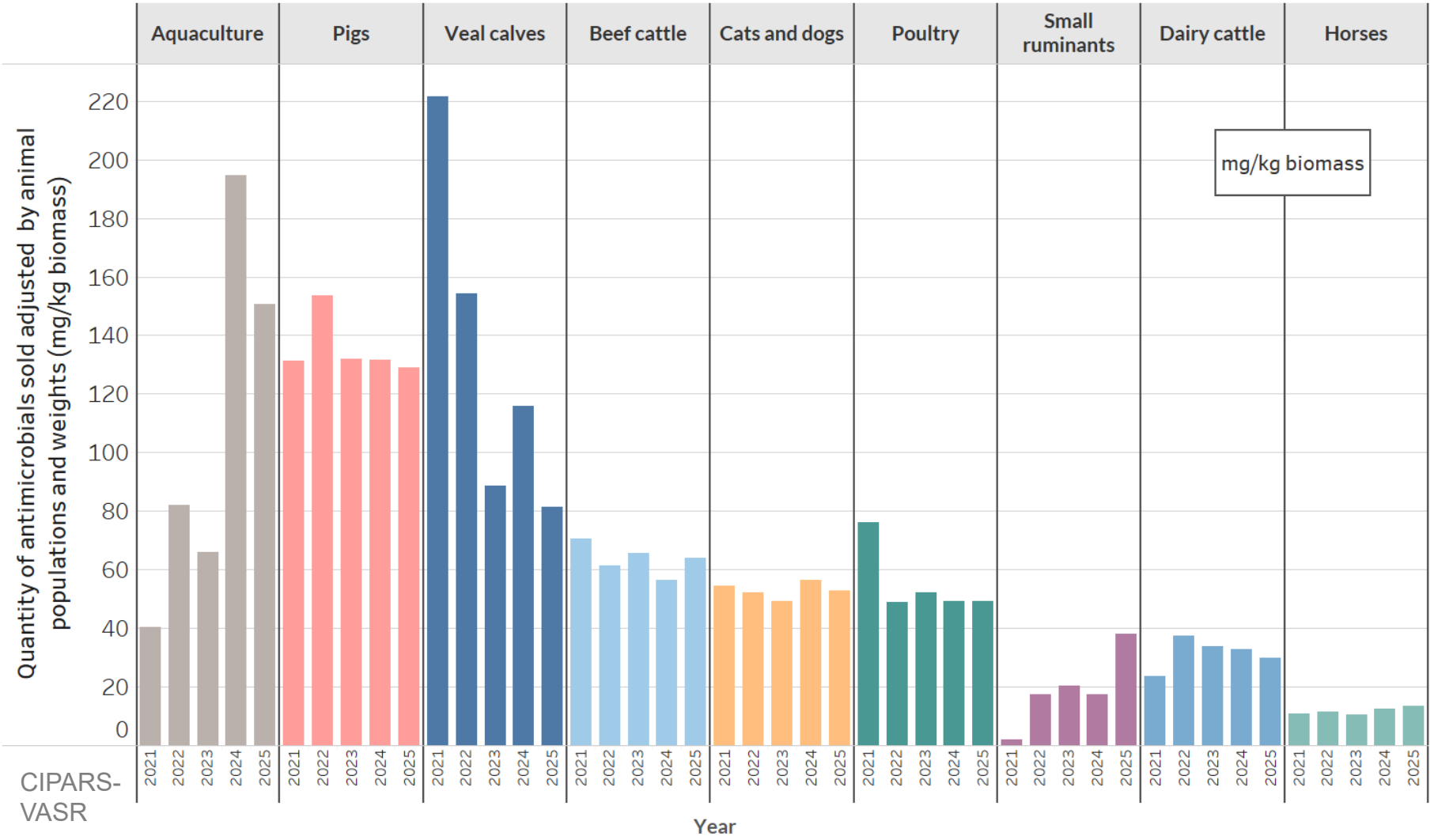
Note: For fully susceptible isolates, dark green cells indicate a desirable outcome: a high proportion of isolates were susceptible to all tested antimicrobials.

In kg, reported sales of medically important antimicrobials from manufacturers and importers are primarily for pigs, beef cattle, and poultry



- After pigs, beef cattle and poultry, the highest quantity of sales in 2025 was for unknown species
  - These sales for unknown species reflect reported quantities of raw ingredients destined for compounding

After adjusting for biomass, sales (in 2025) of medically important antimicrobials (MIAs) from manufacturers and importers were primarily for aquaculture, pigs, and veal calves



- After adjusting for biomass, aquaculture continues to have the highest quantity of MIAs sold in 2024 and 2025; sales decreased by 23% in 2025 relative to 2024
- Category I sales are <1% of total sales, however, sales increased by 20% relative to 2021.
  - Category I sales for beef cattle have increased annually since 2020; 11% increase relative to 2024
  - Category I sales for dairy cattle increased by 20% relative to 2024