Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) webinar

CIPARS 2025 Key and Integrated Findings

World Antimicrobial Resistance Awareness Week
November 18th, 2026
Presented by Melissa MacKinnon, PhD, MSc, DACVS-LA, DVM

Canada



Agenda

- Antimicrobial sales data
- AMU/AMR
- Integrated stories
- Summary and conclusion
- Questions and answers

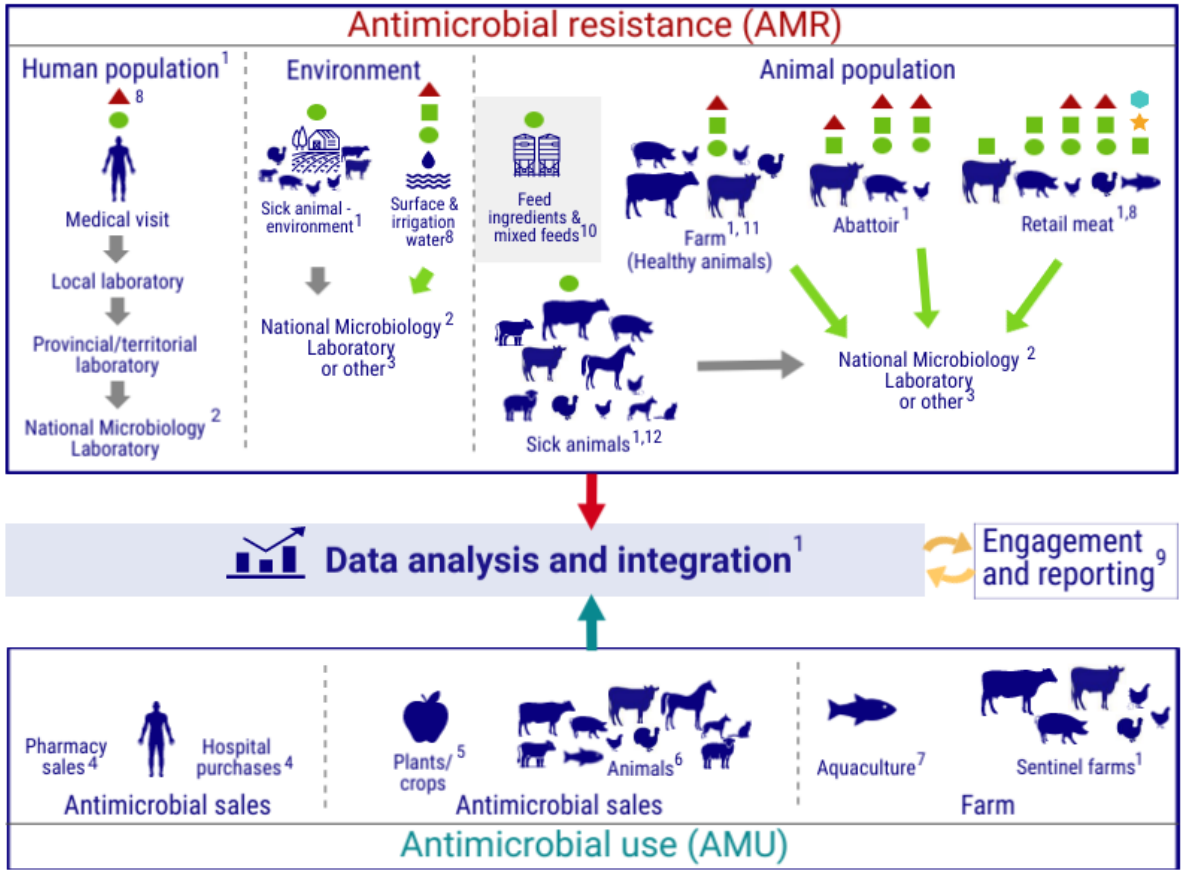
CIPARS is led by the Public Health Agency of Canada in conjunction with multiple federal departments and relevant parties.

5-year trends are 2021-2025.

Any non-CIPARS data sources are referenced on each respective slide.

CIPARS timeline: https://www.canada.ca/en/public-health/services/publications/drugs-health-products/canadian-integrated-program-antimicrobial-resistance-surveillance-over-years-2002-2021.html

Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)



1 Centre for Foodborne and Environmental and Zoonotic Infectious Diseases (CFEZID), Infectious Diseases and Vaccination Programs Branch (IDVPB), Public Health Agency of Canada (PHAC)

2 Bacteriology and Enteric Diseases Division, National Microbiology Laboratory Branch, PHAC

3 Provincial animal health laboratory, university laboratory or private laboratory

4 Surveillance of Human Antimicrobial Use (SHAMU), PHAC. Data source: IQVIA

5 Pesticides Regulatory Directorate, Healthy Environments and Consumer Safety Branch, Health Canada

6 Veterinary Antimicrobial Sales Reporting (VASR), Veterinary Drugs Directorate, Health Canada and CFEZID, PHAC

7 Fisheries and Oceans Canada

8 FoodNet Canada, CFEZID, IDVPB, PHAC

9 CIPARS engagement and reporting including: Annual Stakeholder Webinars, Integrated Findings Reports, Data Visualizations, Farm Surveillance Technical Reports (including health and biosecurity data), Fact sheets, Infographics, Journal publications, VASR Highlights Reports, and CARSS Reports

10 Canadian Food Inspection Agency (CFIA)

11 Layer chicken flocks are sampled periodically. On farm surveillance components provide a platform for additional research studies, including investigations of poultry and bovine pathogens.

12 AMRNet-Vet shares data for bovine respiratory disease bacterial pathogens

- Active surveillance
- Passive surveillance
- AMR data
- AMU data
- Communication
- *Campylobacter*
- *Escherichia coli*
- *Salmonella*
- *Aeromonas*
- *Vibrio*

Integrated antimicrobial sales

Veterinary Antimicrobial Sales Reporting (VASR)

Primary outcome indicators:

- Total quantities of Medically Important Antimicrobials[a] (MIAs) sold (kg and kg adjusted by biomass denominators).
- Quantities of Category I[b] antimicrobials sold (kg and kg adjusted by biomass denominators).
- VASR data includes medically important antimicrobials (MIAs) only (Categories I-III & Uncategorized medically important); antifungals not included.

[a] https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/veterinary-antimicrobial-sales-reporting/list-a.html
[b] https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/categorization-antimicrobial-drugs-based-importance-human-medicine.html

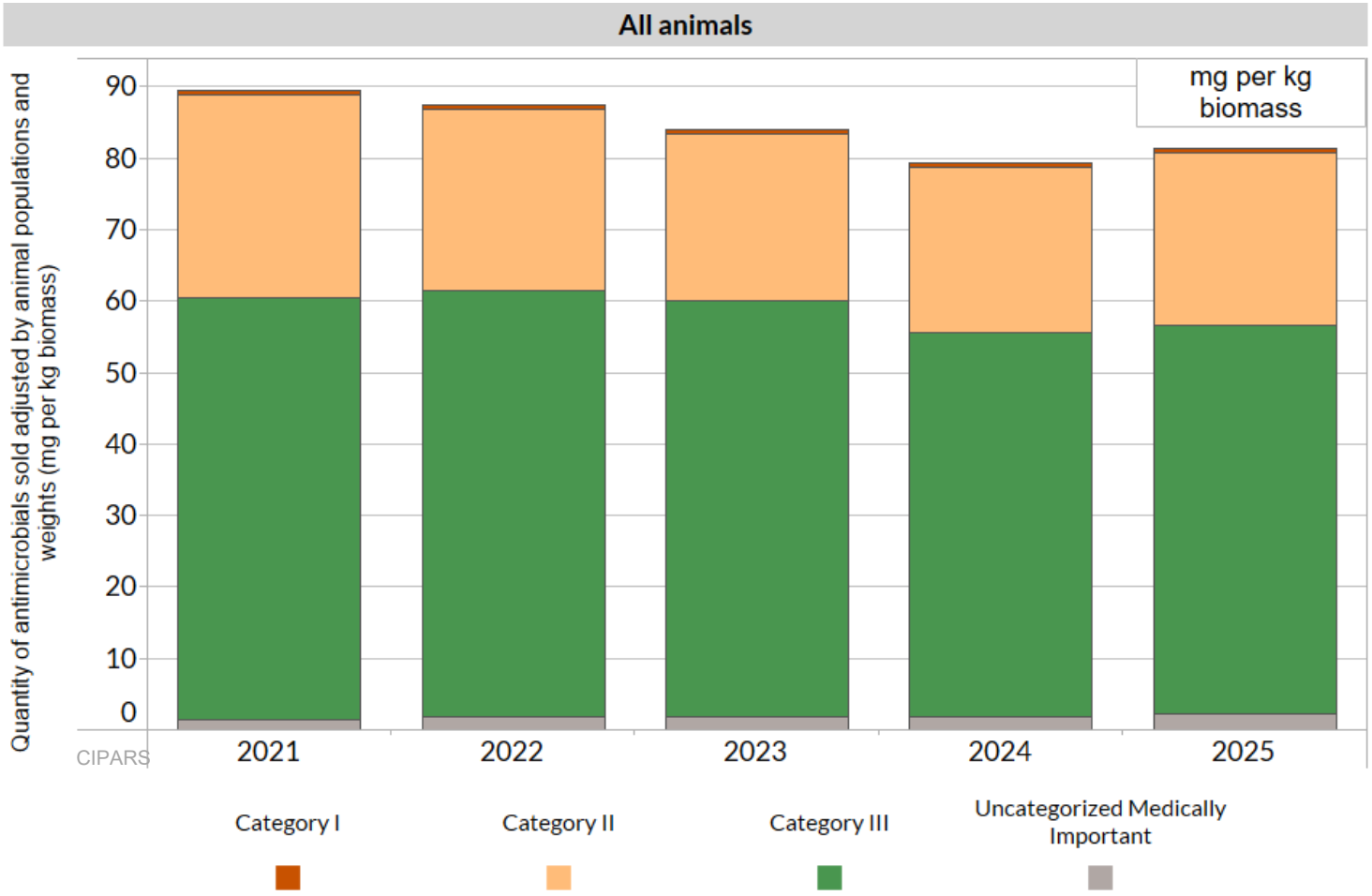
Antimicrobial sales - animal

Group: all animals
Indicator: multiple

- The total quantity of MIAs sold (in mg/kg biomass) increased by 3% between 2024 and 2025; 9% decrease relative to 2021.
- Relative decrease of 17% in the total quantity of MIAs sold between 2018 and 2025.
- Category I sales are <1% of total sales, however, sales increased by 20% relative to 2021.



← Category I trend magnified, 2021-2025



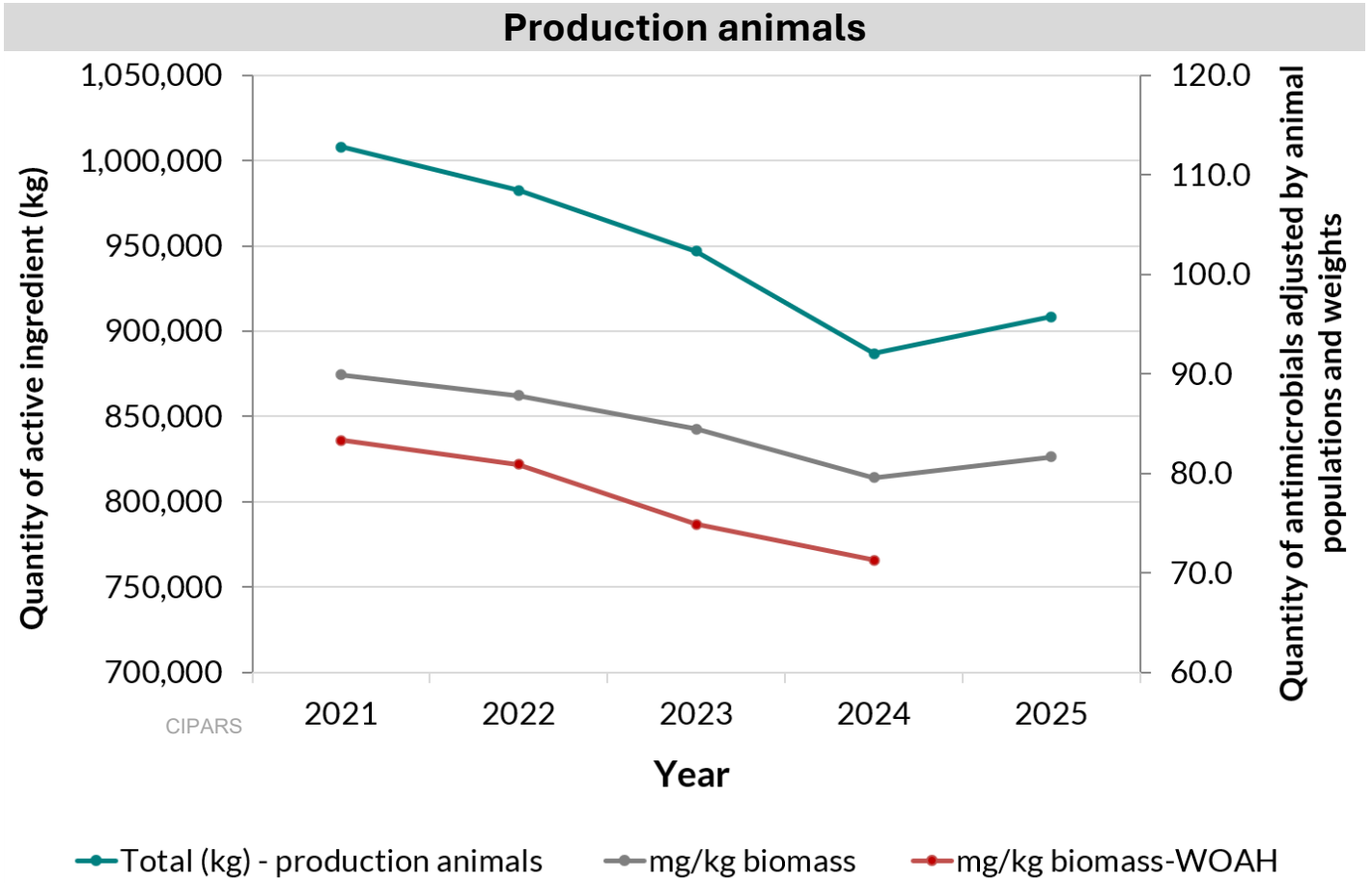
- For the first time since 2020, sales of MIAs increased relative to the previous year (3% increase relative to 2024).
- Category I sales increased by 20% relative to 2021.

Relative to 2021, the quantity of MIAs sold for use in production animals decreased in 2025 by:

- 10% in kilograms (teal line)
- 9% in mg/kg biomass (grey line)

Relative to 2024, the quantity sold increased by 2% in kilograms and 3% in mg/kg biomass.

The red line represents the mg/kg biomass of MIAs sold for use in production animals using the biomass denominator developed for Canada by WOAH.



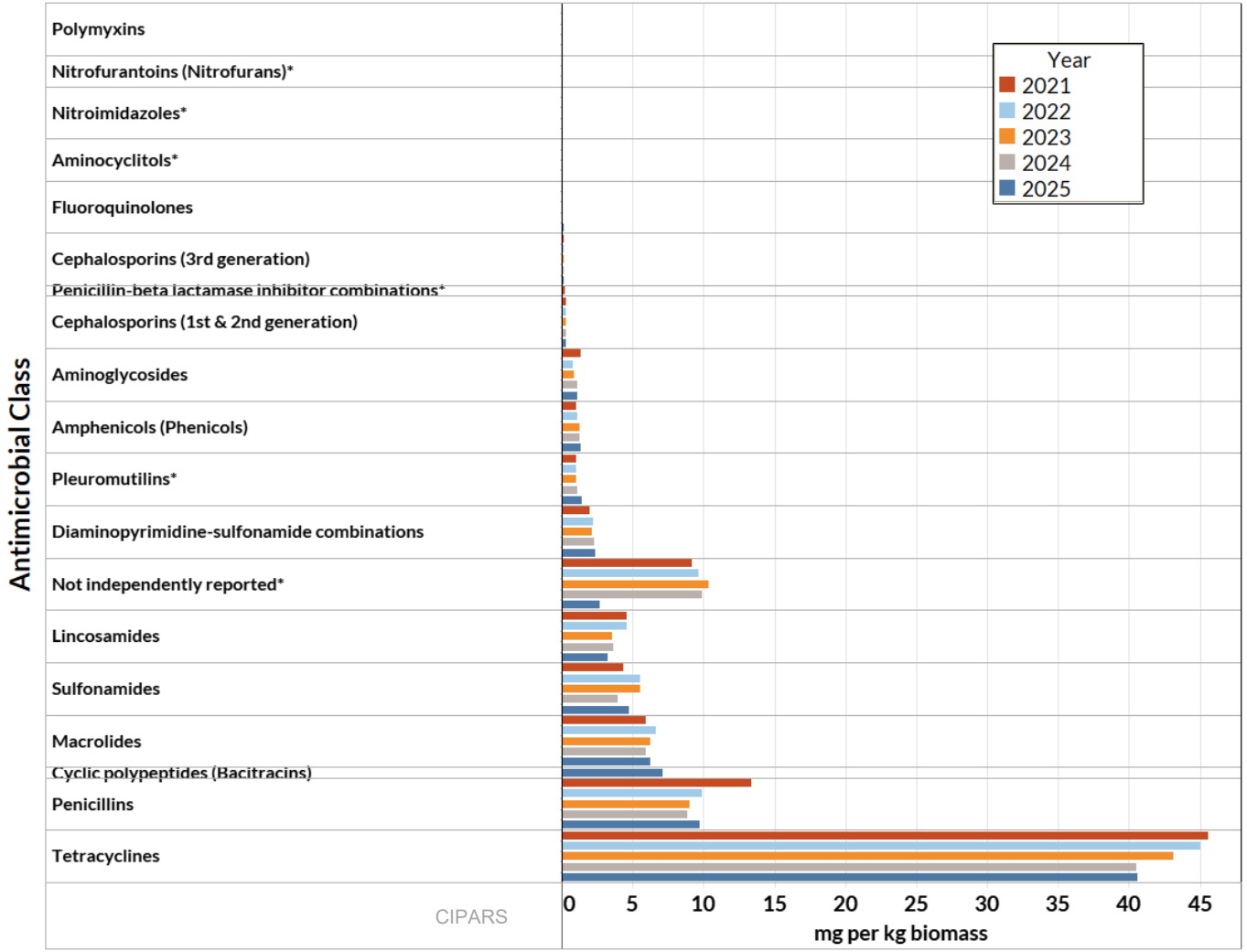
- Across all metrics, total sales of MIAs for production animals decreased by 9-10% in 2025 relative to 2021 and increased by 2-3% relative to 2024.

Antimicrobial sales - animal

Group: all animals
Indicator: mg/kg biomass

- Tetracycline sales predominate each year with 95% sold for use in pigs and beef cattle.
  - ➢ 54% pigs, 41% beef cattle
- Between 2024 and 2025, tetracycline sales were stable (less than 1% relative decrease).
- 2025 is the first year that bacitracins are not included in 'Not Independently Reported'.

While tetracycline sales predominate each year, sales were stable between 2024 and 2025.

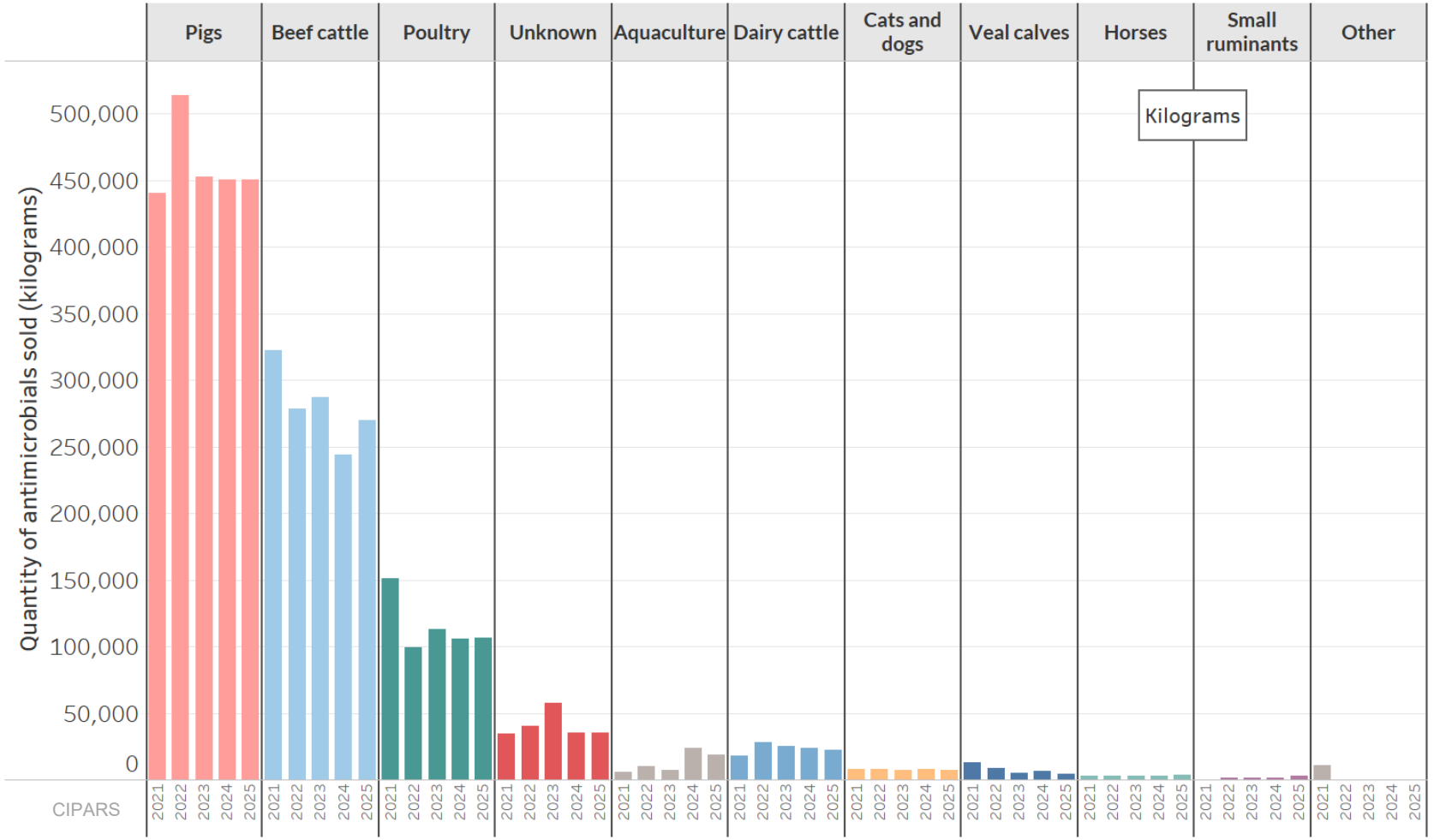


*Antimicrobial classes with fewer than three companies reporting are grouped together as Not Independently Reported (NIR) to prevent identification of individual company's sales volumes. Classes included in NIR vary by year.
Classes included in all years - aminocoumarins, carbapenems, diaminopyrimidines, fusidic acid, glycopeptides, orthosomycins, pseudomonic acids, streptogramins, and therapeutic agents for tuberculosis.
Pleuromutilins and nitroimidazoles removed in 2021, penicillin-beta lactamase inhibitors added in 2022, nitrofurantoins and aminocylitols added in 2024; aminocylitols and bacitracins removed in 2025.

In kilograms, pigs have the highest quantity of MIAs sold.

In 2025, a group for unknown species was introduced.

- Most sales in this group are antimicrobials destined for compounding.
- Previously, these antimicrobials were included in “Other” or were not reported by species.



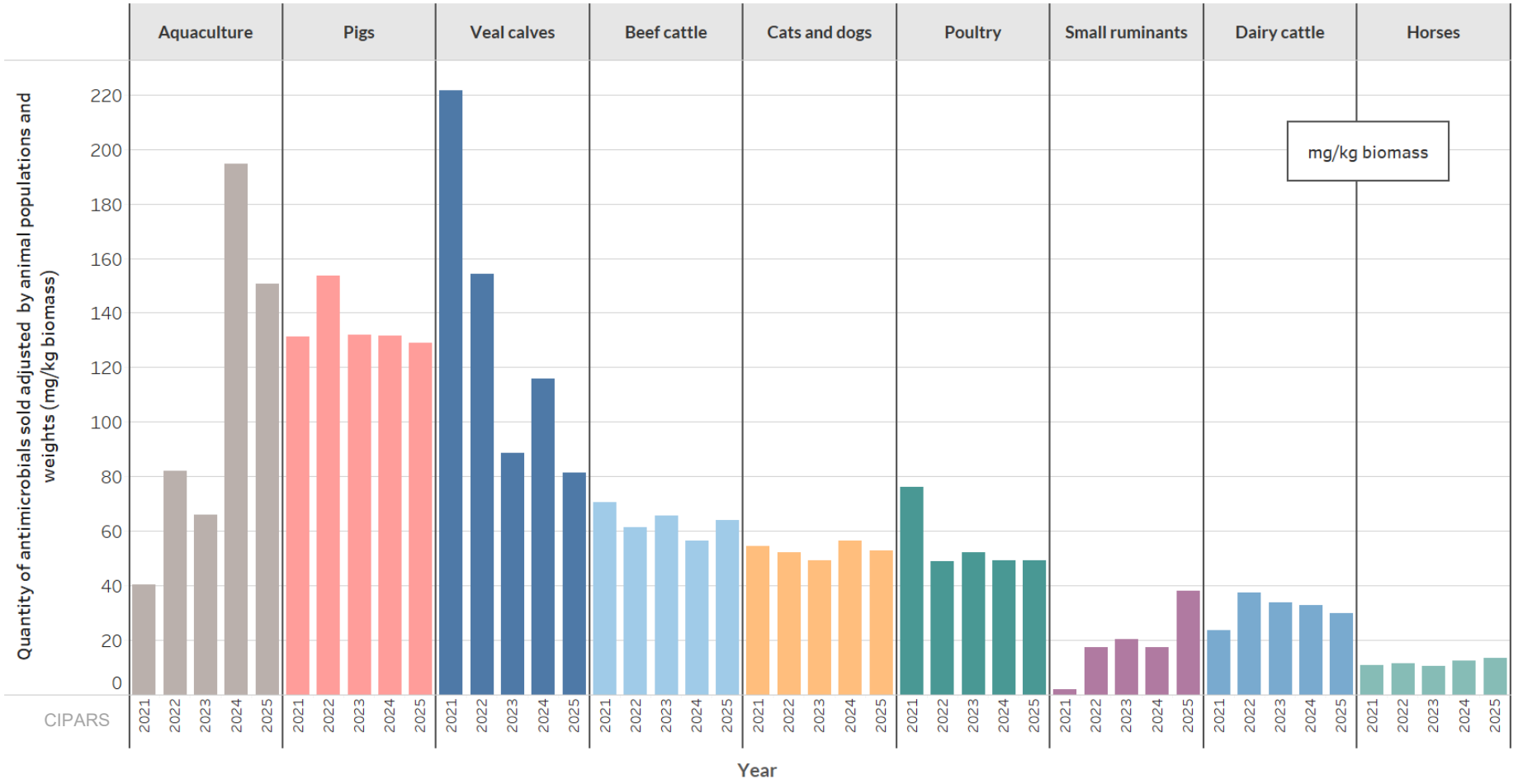
Note: reported sales by species are estimates and reflect the average annual sales for each species group.

- In kilograms, estimated sales were primarily for pigs, beef cattle and poultry.

Antimicrobial sales - animal

Group: all animals
Indicator: mg/kg biomass

- 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 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.



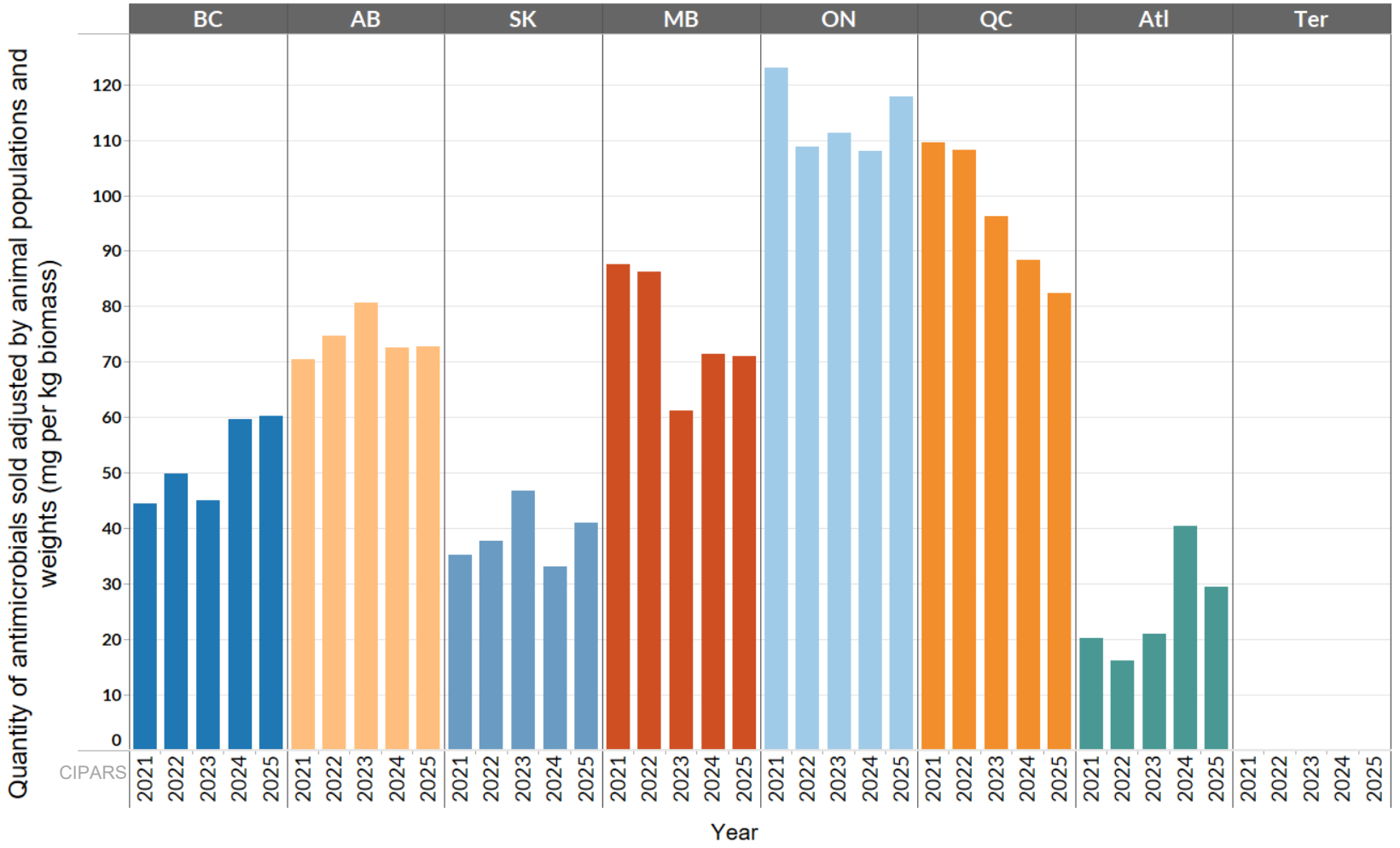
Note: Since biomass cannot be estimated for unknown or other species, they are excluded from this analyses. Also, reported sales by species are estimates and reflect the average annual sales for each species group.

- For aquaculture, the total estimated MIAs sold remain high relative to previous years.
- Estimated Category I sales for beef and dairy cattle increased in 2025 relative to 2024.

Antimicrobial sales - animal

Group: all animals
Indicator: mg/kg biomass

- Continued relative decreases in sales of MIAs in Quebec between 2021 and 2025 (27% decrease).
- Relative increases in sales of MIAs between 2024 and 2025 in:
  - ON – 10%
  - SK – 8%
- In 2025, sales of MIAs by compounders (data not shown) remain highest in Quebec (45% of total compounder sales) and Ontario (27% of total compounder sales).

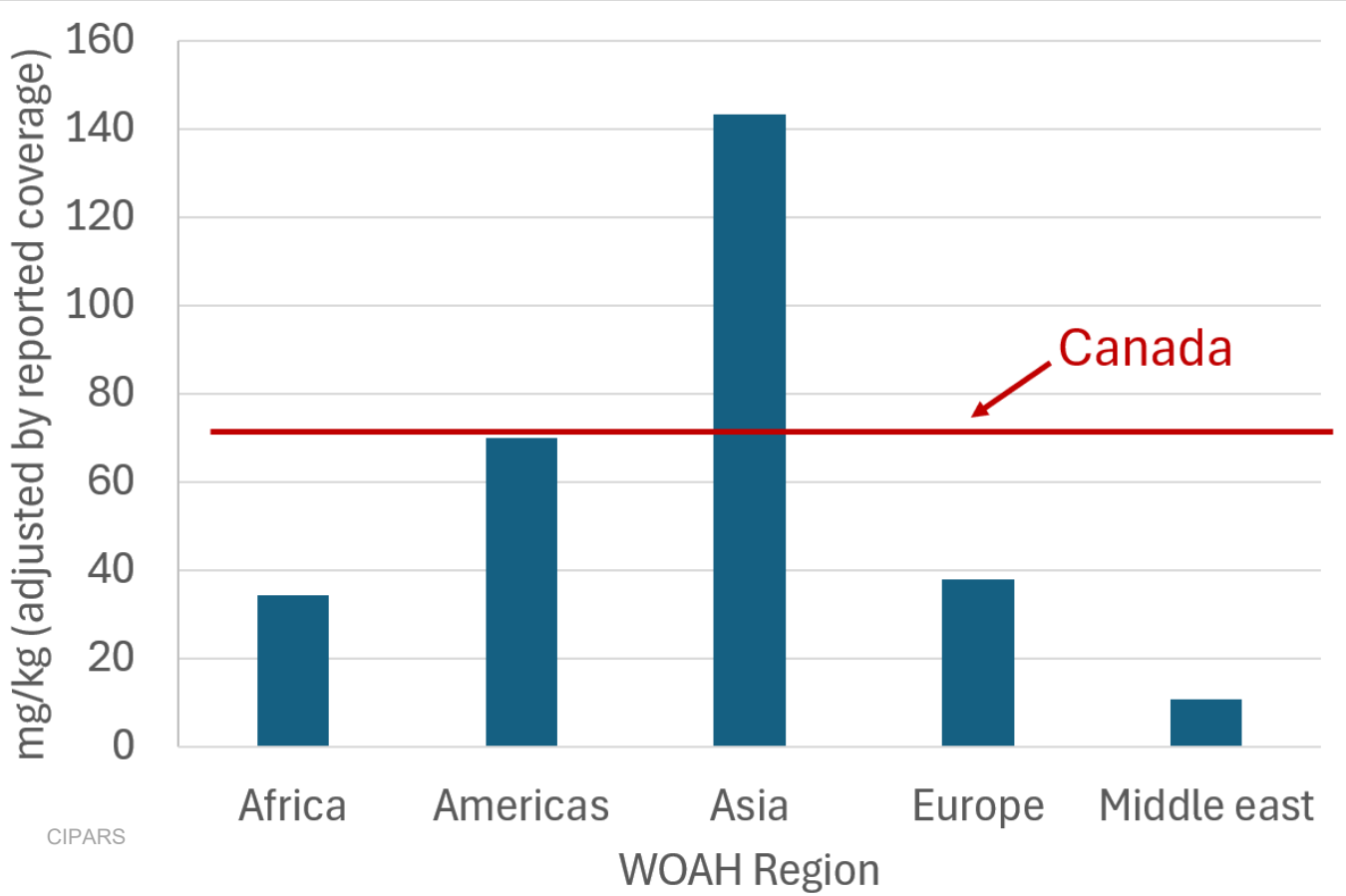


- There were differences in trends in quantities of MIAs sold across the provinces (after adjusting for biomass).

Group: all animals
Indicator: mg/kg (adjusted by reported coverage)

2024 data reported to ANIMUSE (WOAH)

- 119 participating countries
- **Canada**: 71.3 mg/kg (using WOAH's denominator)
- **The Americas**[a]: 69.9 mg/kg
- Proportionally, Canada sells **more** tetracyclines, macrolides, sulfonamides and lincosamides, and **less** fluoroquinolones than the Americas overall.



[a]Canada and 19 other countries including the US
Source: WOAH-ANIMUSE Interactive Report - https://amu.woah.org/amu-system-portal/home

- In 2024, Canada's sales (mg/kg-WOAH) were higher than the average for the Americas.

Antimicrobial sales – animal, human, plants/crops

Groups: people and animals
Indicator: multiple

Indicator: kg (unadjusted for biomass)

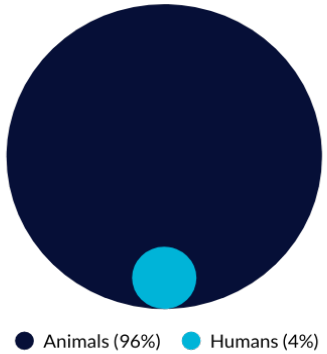
77% Production animals
<1% Cats and dogs
22% Humans
<1% Plants/crops

~3.6x

Populations

~21x

more animals than people in Canada



Indicator: mg/population-adjusted biomass

~1.1x

more medically important antimicrobials were sold for use in all people than for use in all animals **after adjusting for underlying biomass**

CIPARS

For humans and animals, only systemic routes are included (oral and parenteral). Antifungal information not included on this slide.
Indicators used: Humans – kilograms (unadjusted) & mg/population adjusted biomass; Animals – kilograms (unadjusted) & mg/kg biomass; Crops – kilograms (unadjusted)
Data sources: Human hospital purchases and community pharmacy dispensations: PHAC-SHAMU (IQVIA); Crops: Health Canada's Pesticide Regulatory Directorate; Human population: Statistics Canada

- There were ~1.1x more MIAs sold for humans compared to animals after adjusting using an updated comparable biomass denominator.
- Sales for humans decreased by 1% and increased by 3% for animals, between 2024 and 2025.

In 2025 (using biomass adjusted results):

- 19x more 3rd & 4th gen cephalosporins sold for use in humans than animals.
- 31x more fluoroquinolones sold for use in humans than animals.
- 13x more tetracyclines sold for use in animals than humans.

Human

2021	2022	2023	2024	2025
0.46	0.46	0.46	0.49	0.54
2.13	2.30	2.25	2.35	2.38
4.22	4.35	4.13	3.96	4.00
15.14	17.85	20.11	22.19	22.93

mg adjusted for biomass
0.00 — 25.00

Antimicrobial Class	All Animals 2021	2022	2023	2024	2025
carbapenems			0.00		
cephalosporins (3rd & 4th generation)	0.12	0.12	0.13	0.13	0.12
fluoroquinolones	0.05	0.08	0.09	0.10	0.13
penicillin beta-lactamase inhibitor combinations	0.27	0.28	0.27	0.27	0.27

CIPARS

[a]Note the quantity of carbapenems sold for use in animals in 2023 were <0.01 mg/kg biomass. Prior to 2023 there were no reported sales of carbapenems for use in animals.
Data sources: PHAC-SHAMU (IQVIA) and CIPARS; data include antimicrobials for systemic use only; see appendix for more details

- There are very different relative uses of antimicrobial classes between animals and humans.
- Substantially more Category I antimicrobials were sold for use in humans than in animals.

- Total quantity sold in 2025: **2,182,192 kgs**
- These were all triazoles (biologically active compounds with antifungal properties).
- Have many uses, including as antifungals and retardants on plants and crops.
- None of the antifungal active ingredients sold for use on plants/crops are approved for veterinary or human use (although there are other triazoles approved for use in animals and people).
- Like antibacterials, resistance can develop and is a concern.

Data on antifungals intended for use in humans and animals are not currently available.
Data on antifungal sales for plants/crops provided by Health Canada's Pesticide Regulatory Directorate

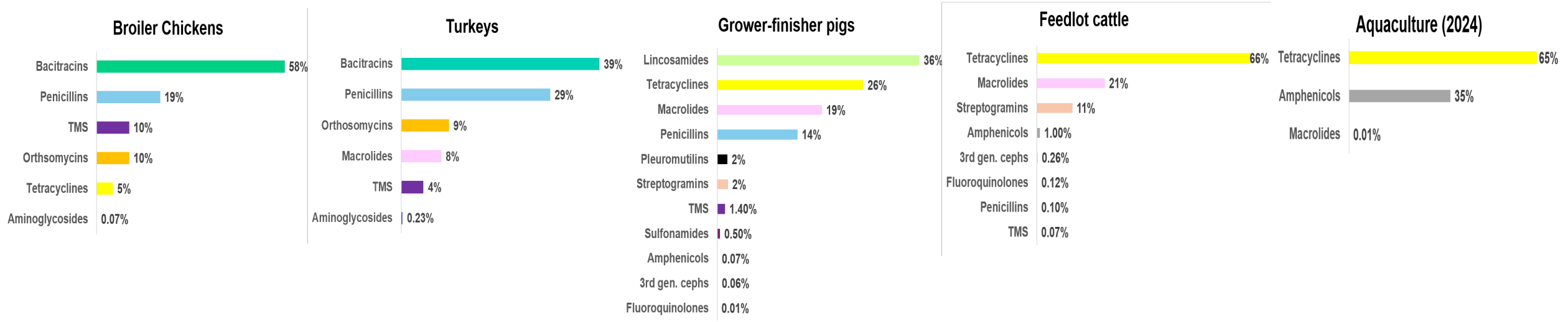
Antifungal active ingredient
difenoconazole
ipconazole
mefentrifluconazole
metconazole
myclobutanil
paclobutrazol
propiconazole
prothioconazole
tebuconazole
tetraconazole
triticonazole
uniconazole-p

- The quantity of antifungals sold as pesticides on plants/crops in 2025 was greater than the total quantity of medically important antibacterials sold for humans, animals, and plants/crops combined.

Integration of sales and farm AMU data

Terrestrial sentinel farms and aquaculture operations

Indicator: percentage of use in kg



Terrestrial farm data are from CIPARS sentinel farms.
Aquaculture data is from Fisheries and Oceans Canada's publicly available data and represents all aquaculture operations in Canada. Latest data available for aquaculture are from 2024.

- There were differences in the relative use of antimicrobial classes between species.
- There are similarities and differences in the reported antimicrobial classes between VASR and the farm components.

AMR and integrated AMU/AMR

Data from sentinel farms, abattoirs, and retail meat

Primary outcome indicators:

- **Antimicrobial use** (nDDDvetCA/1000 animal-days at risk)
  - Total antimicrobial use
  - Use of Category I, II and III antimicrobials

- **Antimicrobial resistance (%)** – details of statistical significance testing is available in the appendix
  - Ceftriaxone
  - Ciprofloxacin:
    - *E. coli/Salmonella:* interpretation is not susceptible (intermediate and resistant), but reported as resistant
    - *Campylobacter*: interpretation and reporting as resistant
  - Multidrug resistance (resistance to 3 or more antimicrobial classes)

- **AMR determination method and antimicrobials tested**

Bacteria	Broth microdilution (Sensititre)	Antimicrobial resistance prediction from whole genome sequencing	Number of antimicrobials/antimicrobial classes tested
Escherichia coli	All components[a]		14 antimicrobials/ 11 antimicrobial classes
Salmonella	Farm: broiler chickens, turkeys, grower-finisher pigs, feedlot cattle[a]	All other components[a]	14 antimicrobials/ 11 antimicrobial classes
Campylobacter	All components[a]		9 antimicrobials/ 7 antimicrobial classes
CIPARS	[a]Please refer to the CIPARS diagram for details		

Ciprofloxacin resistance

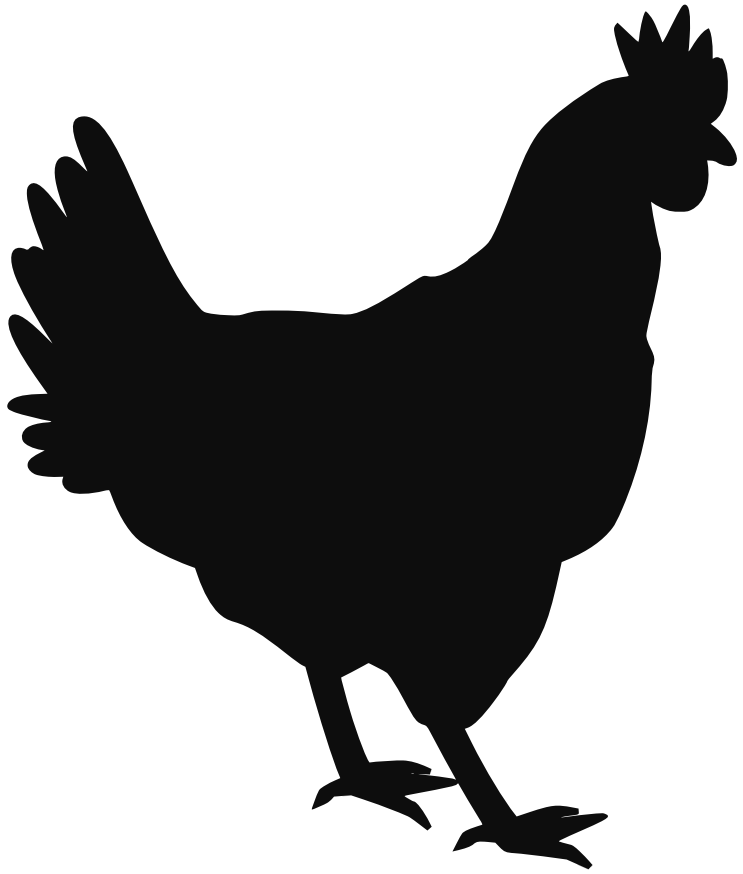
Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 60%)
Escherichia coli	Farm	1.3	0.6	-0.7%	
	Abattoir	0	0	0%	
	Retail	0	1	1%	
Salmonella	Farm	0	0	0%	
Campylobacter	Farm	29	51	**23%**	
	Abattoir	13	42	29%	

CIPARS

[a]Bold values indicate statistically significant differences; [b]Percent difference=Percent 2025-2021

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%

- Key take aways.
- **Statistical significance: *p*-value ≤ 0.05** (2025 compared to 2021 unless otherwise noted).
- Substantial: ≥ 20% absolute difference.



Broiler chickens on farm

Chickens at abattoir

Retail chicken

Ceftriaxone resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 15%)
Escherichia coli	Farm	4	9	**5%**	
	Abattoir	2	4	2%	
	Retail	3	7	**3%**	
Salmonella	Farm	9	5	**-4%**	
	Abattoir	2	15	**13%**	
	Retail	3	8	5%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: Partial farm sampling in one province impacted the national-level estimates

- Increasing trend across all components except for *Salmonella* at farm.
- *E. coli* (farm and retail): significant increase.
- *Salmonella* (farm): significant decrease and the only component with a decrease.
- *Salmonella* (abattoir): significant increase from low to moderate.

Ciprofloxacin resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 45%)
Escherichia coli	Farm	6	7	1%	
	Abattoir	12	16	4%	
	Retail	8	6	-2%	
Salmonella	Farm	5	7	2%	
	Abattoir	2	34	**32%**	
	Retail	8	33	**26%**	
Campylobacter	Farm	22	17	-6%	
	Abattoir	20	37	**17%**	
	Retail	25	42	**17%**	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: Partial farm sampling in one province impacted the national-level estimates

- *Salmonella* (abattoir and retail): significant and substantial increase from low to high.
- *Campylobacter* (abattoir and retail)*:* significant increases.

Multidrug resistance (MDR)

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 30%)
Escherichia coli	Farm	22	25	4%	
	Abattoir	23	25	1%	
	Retail	23	18	-4%	
Salmonella	Farm	9	8	0%	
	Abattoir	2	21	**19%**	
	Retail	4	13	**9%**	
Campylobacter	Farm	0	0	0%	
	Abattoir	0	1	1%	
	Retail	0	0	0%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: Partial farm sampling in one province impacted the national-level estimates

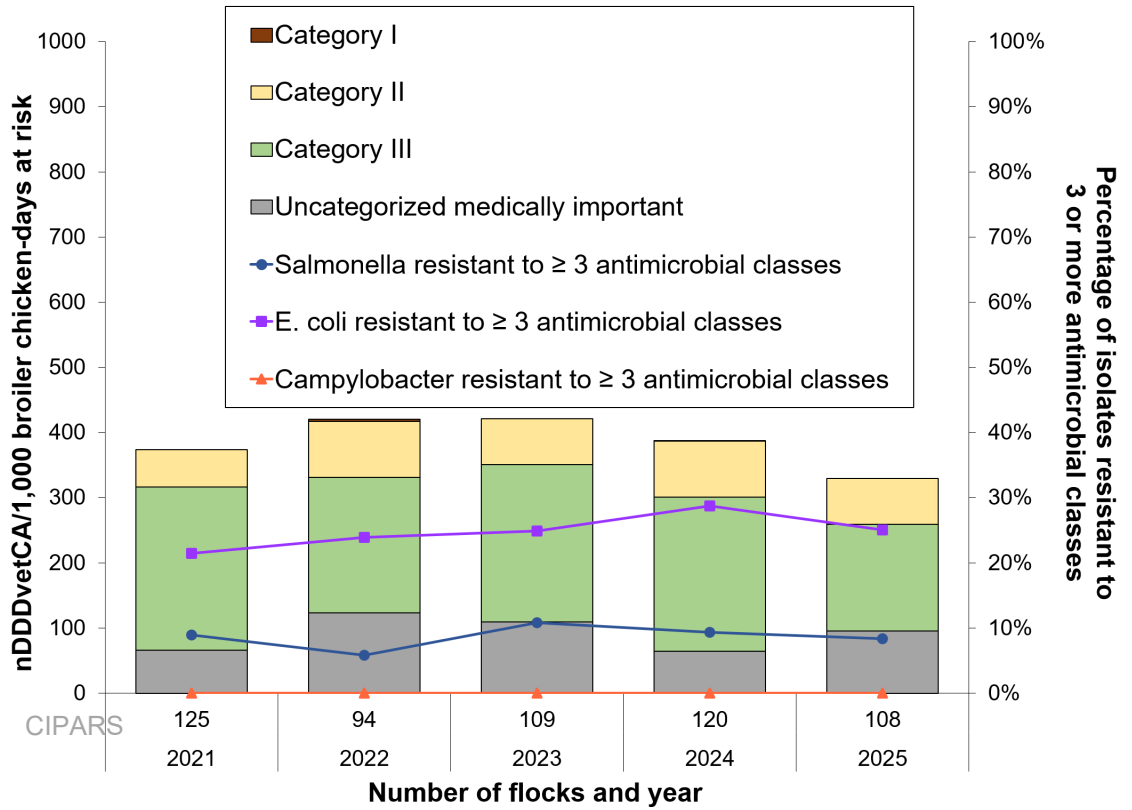
- *E. coli* (farm and abattoir): remained high.
- *Salmonella* (abattoir and retail): significant increases. Increase from low to high at abattoir and low to moderate at retail.
- *Campylobacter*: remained rare to very low.

Reported AMU:
nDDDvetCA/1000 broiler chicken-days at risk

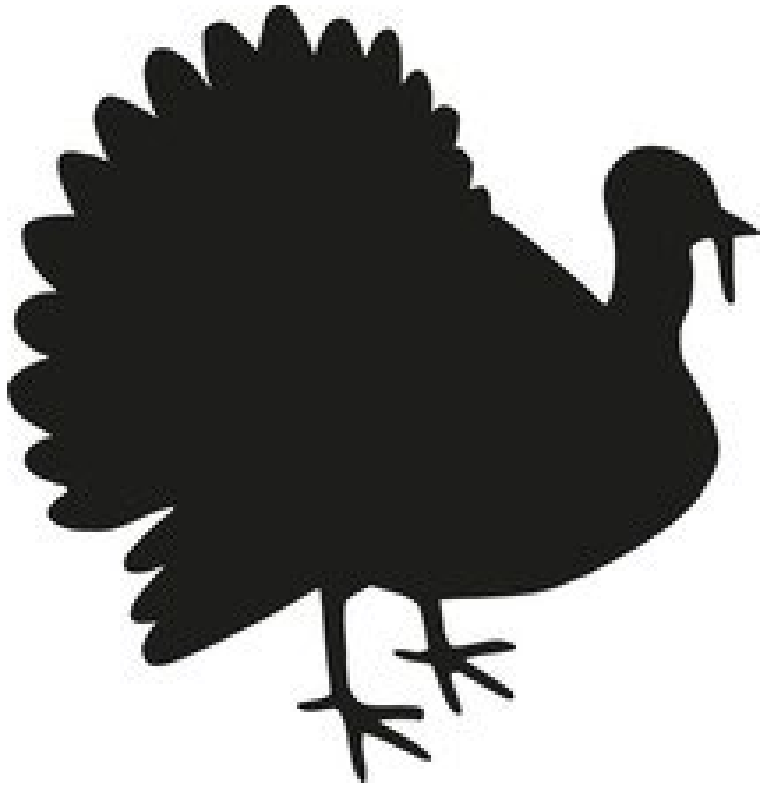
	2021	2025	Percent change[a]
Total AMU	373	329	12% decrease
Category I	0	0	No change
Category II	57	70	23% increase
Category III	251	164	35% decrease
Uncategorized	66	95	45% increase

CIPARS

[a]Percent change=((Value 2025-Value 2021)/Value 2021)*100



- Relative to 2021:
  - Reported decrease in total AMU (-12%), and Category III (-35%) use.
  - Reported increase in Category II (23%) and in uncategorized (45%) use.
- No significant changes in multidrug resistance for farm isolates.



Turkeys on the farm

Retail turkey

Ceftriaxone resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 10%)
Escherichia coli	Farm	1	2	1%	
	Retail	3	2	-1%	
Salmonella	Farm	2	**0**	-2%	
CIPARS	Retail	0	**0**	0%	

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

- No significant differences.
- Resistance ranged from rare to low.

Ciprofloxacin resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 55%)
Escherichia coli	Farm	2	5	**4%**	
	Retail	17	9	-8%	
Salmonella	Farm	2	7	**5%**	
	Retail	8	9	1%	
Campylobacter	Farm	19	19	0%	
CIPARS	Retail	——	24	——	

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: Ground turkey was not tested for *Campylobacter* at retail in 2021.

- *E. coli* and *Salmonella* (farm)*:* resistance was low, yet significant increases.
- *Campylobacter:* moderate to high resistance.

Multidrug resistance (MDR)

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 30%)
Escherichia coli	Farm	16	13	-2%	
	Retail	17	12	-5%	
Salmonella	Farm	4	3	-1%	
	Retail	25	0	**-25%**	
Campylobacter	Farm	9	2	-7%	
CIPARS	Retail	——	0	——	

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: Ground turkey was not tested for *Campylobacter* at retail in 2021.

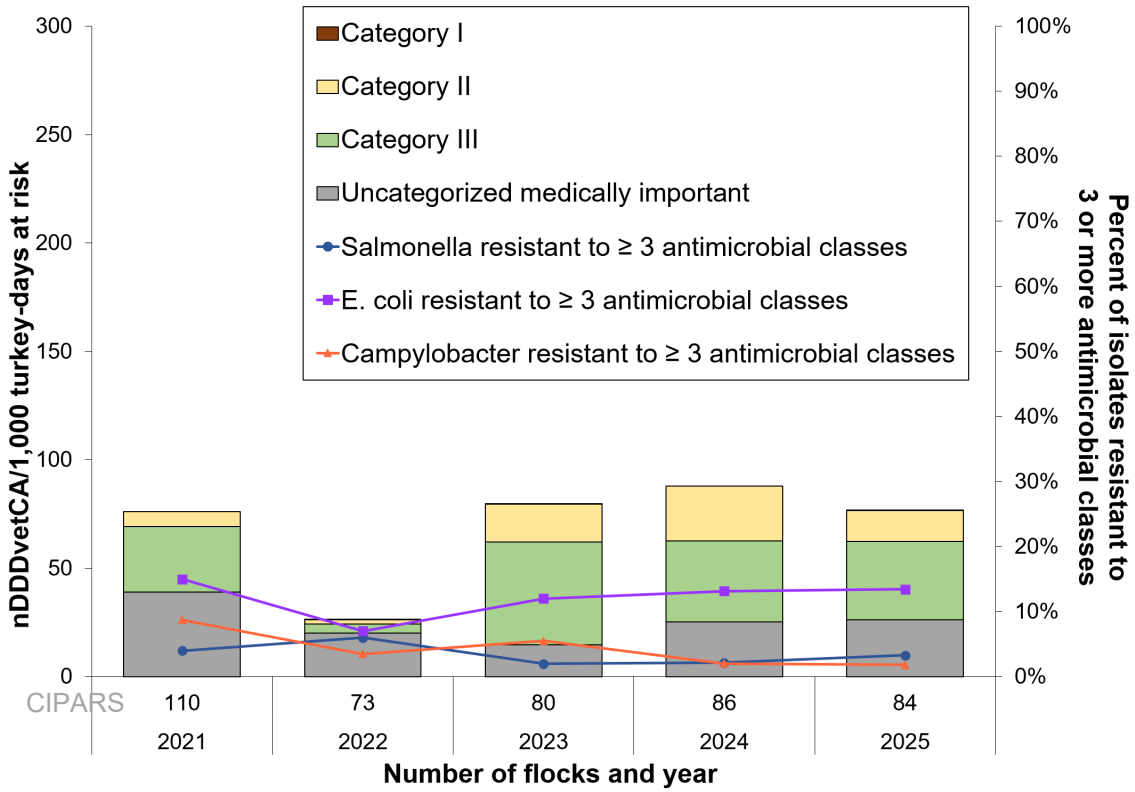
- Resistance decreased for all components.
- *Salmonella* (retail): Significant and substantial decrease.

Reported AMU:
nDDDvetCA/1000 turkey-days at risk

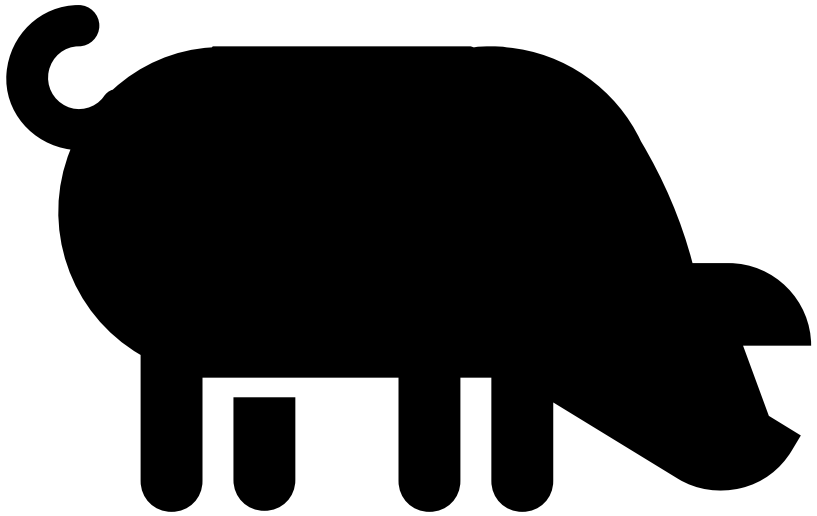
	2021	2025	Percent change[a]
Total AMU	76	77	1% increase
Category I	0.001	0.01	Not calculated[b]
Category II	7	14	112% increase
Category III	30	36	19% increase
Uncategorized	39	26	33% decrease

[a]Percent change=((Value 2025-Value 2021)/Value 2021)*100
[b]Percent change may not be calculated when reported AMU was very small.

CIPARS



- Relative to 2021, absolute increases in AMU were small.
  - Reported increase in total AMU (1%), and Category I, II (112%) and III (19%) use.
- No significant changes in multidrug resistance on farm.



Grower-finisher pigs on farm

Pigs at abattoir

Retail pork

Ceftriaxone resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 55%)
Escherichia coli	Farm	2	2	0%	
	Abattoir	2	3	1%	
	Retail	0	1.5	1%	
Salmonella	Farm	5	9	5%	
	Abattoir	3	0.8	-3%	
	Retail	0	6	6%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: The number of *Salmonella* isolates at retail ranged from 2-18

- No significant differences.
- Resistance was very low to low.

Ciprofloxacin resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 55%)
Escherichia coli	Farm	3	3	0%	
	Abattoir	4	8	4%	
	Retail	8	5	-3%	
Salmonella	Farm	0.6	4	3%	
	Abattoir	1.3	0	-1%	
	Retail	50	6	-44%	
Campylobacter	Farm	14	22	8%	
	Abattoir	10.3	17	7%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: The number of *Salmonella* isolates at retail ranged from 2-18

- No significant differences.
- *E. coli and Salmonella*: resistance ranged from rare to low.
- *Campylobacter* (farm and abattoir): increases, with resistance ranging from moderate to high.

Multidrug resistance (MDR)

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 100%)
Escherichia coli	Farm	21	19	-2%	
	Abattoir	21	26	5%	
	Retail	17	22	5%	
Salmonella	Farm	37	38	2%	
	Abattoir	25	28	2%	
	Retail	100	39	-61%	
Campylobacter	Farm	28	19	**-10%**	
	Abattoir	19	22	2%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: The number of *Salmonella* isolates at retail ranged from 2-18

- Multidrug resistance ranged from moderate to high.
- *Campylobacter* (farm): significant decrease from high to moderate.

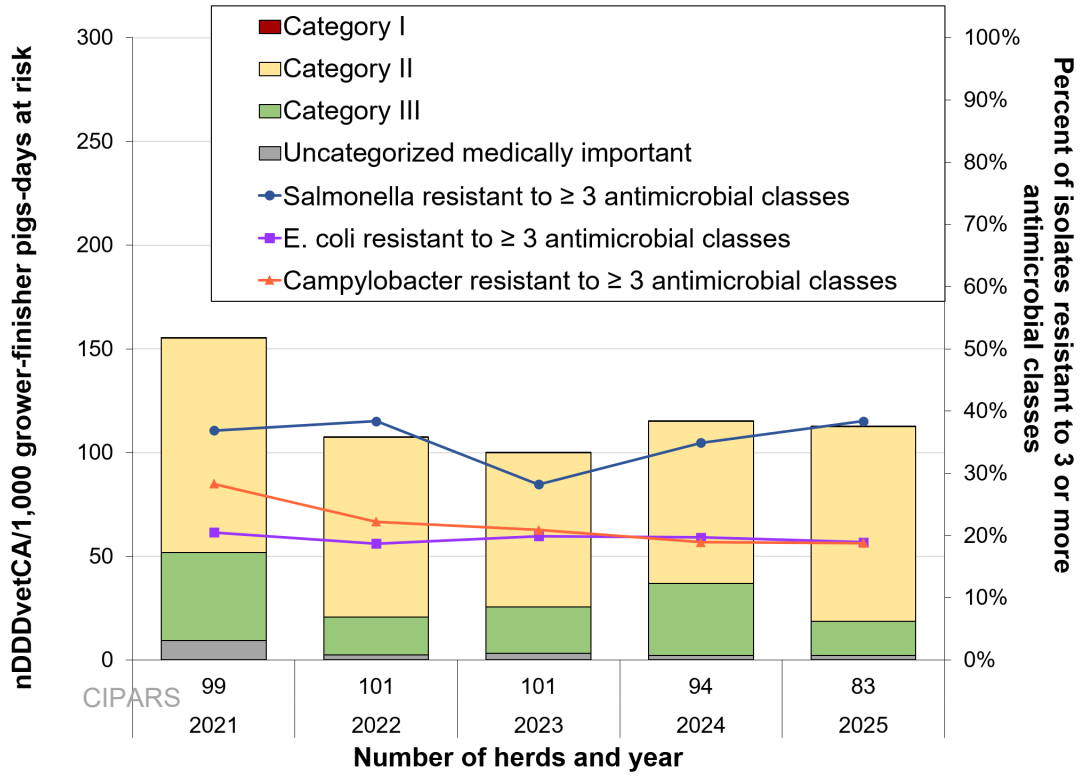
Grower-finisher pigs on farm

Reported AMU:
nDDDvetCA/1000 grower-finisher pig-days at risk

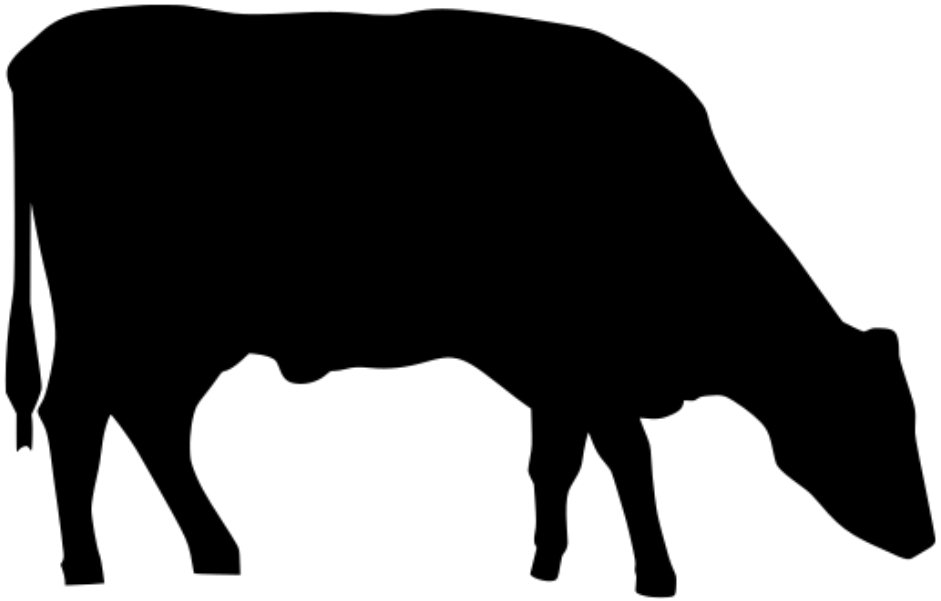
	2021	2025	Percent change[a]
Total AMU	155.20	112.66	27% decrease
Category I	0.08	0.15	77% increase
Category II	103.35	93.79	9% decrease
Category III	42.31	16.59	61% decrease
Uncategorized	9.46	2.14	77% decrease

CIPARS

[a]Percent change=((Value 2025-Value 2021)/Value 2021)*100



- Relative to 2021:
  - Reported increase in Category I use (77%).
  - Reported decreases in total AMU (-27%), and Category II (-9%) and III (-61%) use.
- Significant decrease in resistance from high to moderate in *Campylobacter* on farm.



Feedlot cattle

Cattle at abattoir

Retail beef

Ceftriaxone resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 40%)
Escherichia coli	Farm	1	0	-1%	
	Abattoir	0	0	0%	
	Retail	0.4	0.6	0%	
Salmonella	Farm	0	0	0%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: The number of *Salmonella* isolates at farm ranged from 9-17

- No significant differences.
- Resistance was rare to very low.

Ciprofloxacin resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 60%)
Escherichia coli	Farm	1.3	0.6	-0.7%	
	Abattoir	0	0	0%	
	Retail	0.4	1.2	1%	
Salmonella	Farm	0	0	0%	
Campylobacter	Farm	29	51	**23%**	
	Abattoir	13	42	**29%**	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: The number of *Salmonella* isolates at farm ranged from 9-17

- *Campylobacter:* significant and substantial increase from moderate to high (abattoir) or high to very high (feedlot).
- *E. coli*: resistance ranged from rare to low.

Multidrug resistance (MDR)

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0% to 40%)
Escherichia coli	Farm	10	8	-2%	
	Abattoir	5	6	1%	
	Retail	4	7	3%	
Salmonella	Farm	7	8	1%	
Campylobacter	Farm	9	6	-3%	
	Abattoir	3	6	3%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: The number of *Salmonella* isolates at farm ranged from 9-17

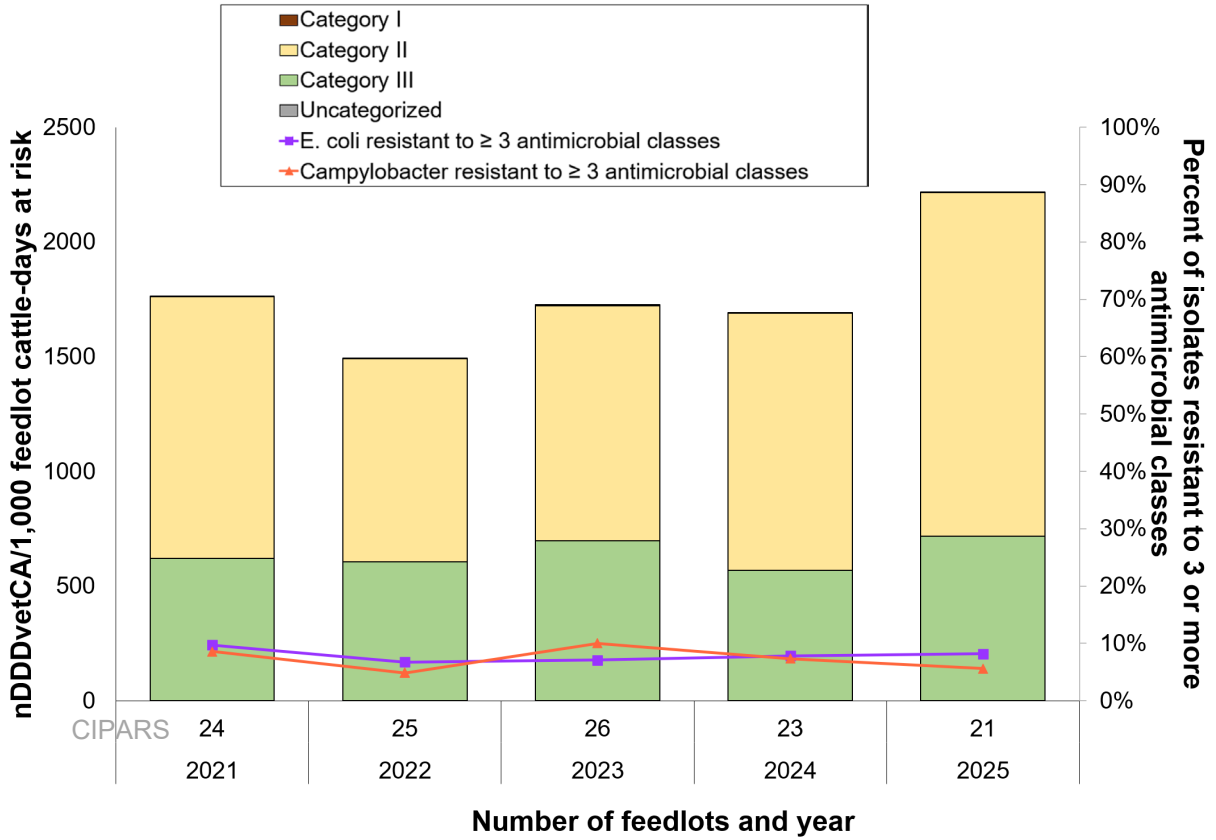
- No significant differences.
- Resistance was low.

Reported AMU:
nDDDvetCA/1000 feedlot cattle-days at risk

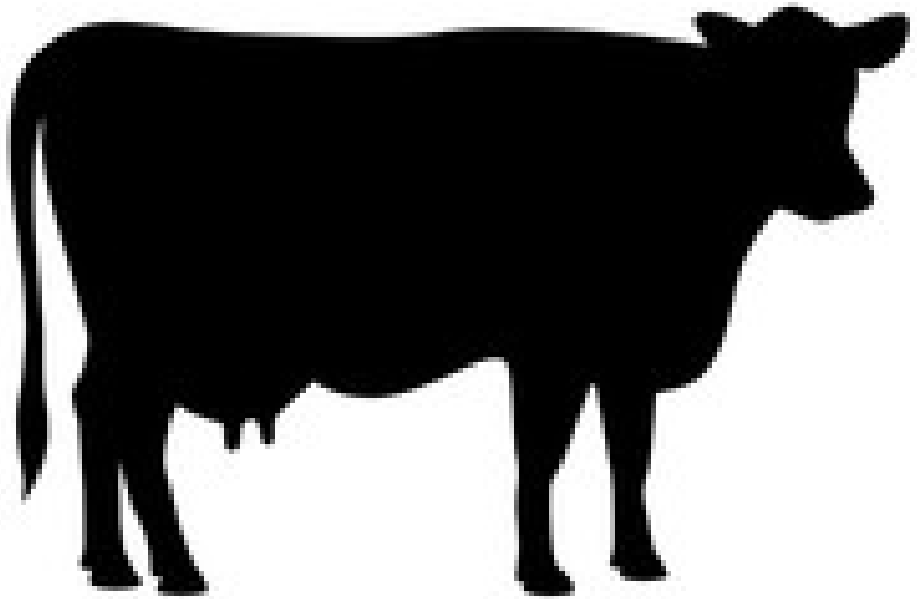
	2021	2025	Percent change[a]
Total AMU	1763.96	2218.76	26% increase
Category I	2.94	3.75	28% increase
Category II	1141.20	1497.67	31% increase
Category III	619.81	717.33	16% increase
Uncategorized	0.00	0.00	No change

CIPARS

[a]Percent change = ((Value 2025-Value 2021) / Value 2021)*100



- The largest quantity of reported antimicrobial use within CIPARS components.
- Relative to 2021, increases in reported use for all Categories of antimicrobials (16% to 31%).
- Multidrug resistance was low on feedlots.



Dairy cattle on farm

Ceftriaxone resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 10%)
Escherichia coli	Farm	1.3	3	1%	
Salmonella	Farm	0	0	0%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

*Inclusive of calf, heifer, lactating cows, and manure pit samples

- Resistance was rare to low.

Ciprofloxacin resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 30%)
Escherichia coli	Farm	0.6	2	**1%**	
Salmonella	Farm	2	22	**20%**	
Campylobacter	Farm	17	22	5%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

*Inclusive of calf, heifer, lactating cows, and manure pit samples

- *E. coli:* resistance was very low to low.
- *Salmonella:* significant and substantial increase in resistance.
- *Campylobacter:* increase in resistance from moderate to high (not statistically significant).

Multidrug resistance (MDR)

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 20%)
Escherichia coli	Farm	13	11	-2%	
Salmonella	Farm	5	15	10%	
Campylobacter	Farm	0	0	0%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

*Inclusive of calf, heifer, lactating cows, and manure pit samples

- *E. coli*: moderate multidrug resistance.
- *Salmonella*: increase from low to moderate.
- *Campylobacter*: only observed in 2022 (0.7%).

AMU and AMR – human *Salmonella* and *Campylobacter*



CIPARS, FoodNet Canada (FNC) and Surveillance of Human AMU (SHAMU) from IQVIA data

Primary outcome indicators:

- **Antimicrobial purchases/dispensations**: DDDs/1000 inhabitants per year
  - Total antimicrobial use
  - Use of Category I, II and III antimicrobials

- **Antimicrobial resistance (%)** – details of statistical significance testing is available in the appendix
  - Ceftriaxone
  - Ciprofloxacin
    - *Salmonella* and *Campylobacter*: interpretation is not susceptible (intermediate and resistant), but reported as resistant
  - Multidrug (resistance to 3 or more antimicrobial classes)

- **AMR determination method and antimicrobials tested**
  - Non-typhoidal *Salmonella*: *a*ntimicrobial resistance prediction from whole genome sequences (WGS)
    - 14 antimicrobials from 11 antimicrobial classes
  - *Campylobacter* (from FNC sentinel sites): antimicrobial resistance prediction from WGS
    - 9 antimicrobials from 7 antimicrobial classes

Ceftriaxone resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 10%)
Salmonella (non-typhoidal) CIPARS	Diagnostic	3	3	0%	

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

- No significant differences.
- Resistance was low.

Ciprofloxacin resistance

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 40%)
Salmonella (non-typhoidal)	Diagnostic	16	38	**22%**	
Campylobacter	Diagnostic	25	41	**16%**	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: FNC *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change

- *Salmonella*: significant and substantial increase from moderate to high.
- *Campylobacter*: significant increase and remained high.

Multidrug resistance (MDR)

Bacteria	Component	2021 (%)	2025 (%)	Percent difference[a]	Five-year trend (vertical scale: 0 to 15%)
Salmonella (non-typhoidal)	Diagnostic	9	11	**2%**	
Campylobacter	Diagnostic	1	0	-1%	

CIPARS

[a]Percent difference=Percent 2025-2021. Bold values indicate statistically significant differences.

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%

Note: FNC *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change

- *Salmonella*: statistically significant, yet small increase (2%) from low to moderate.
- *Campylobacter*: multidrug resistance not detected in 2025.

Reported AMU: nDDDvetCA/1000 inhabitants per year

	2021	2025	Percent change[a,c]
Total AMU	4301.22	5489.15	28% increase
Category I	823.75	1077.56	31% increase
Category II	1810.90	2383.66	32% increase
Category III	1207.27	1536.19	27% increase
Not independently reported (NIR)[b]	459.29	491.74	7% increase

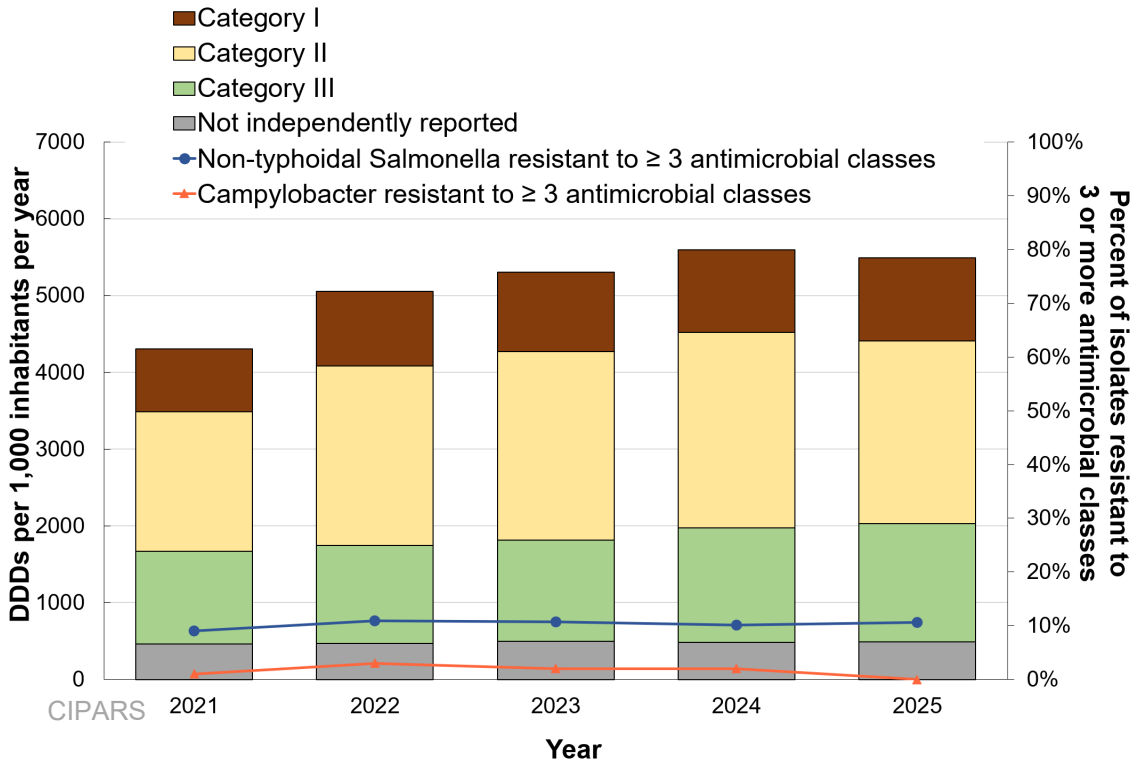
CIPARS

[a]Percent change=((Value 2025-Value 2021)/Value 2021)*100

AMU data source: PHAC-SHAMU (IQVIA)

[b]NIR includes: aztreonam, bacitracin, ceftobiprole-medocaril, ceftolozane-tazobactam, chloramphenicol, daptomycin, fosfomycin, fusidic acid, linezolid, metronidazole, nitrofurantoin and vancomycin

[c]Quantity of antimicrobials are returning to pre-pandemic levels



Note: FNC *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change

- Relative to 2021, total quantities of antimicrobials purchased by human hospitals and dispensed by community pharmacies increased (28% in DDDs per 1,000 inhabitants); a return to pre-pandemic quantities.
- Multidrug resistant *Salmonella* significantly increased (2%) from low to moderate.

Additional surveillance components – Antimicrobial resistance



Retail seafood (*Escherichia coli)*



Farm environment (*Salmonella*) (from diagnostic animal samples)



Feed ingredients and mixed feeds (*Salmonella*) (Canadian Food Inspection Agency)

Water (*E. coli*, *Salmonella*, *Campylobacter*)

Escherichia coli (2023-2025)

			Indicator		
Sample type	**Year**	**Recovery (n)**	**Ceftriaxone (%)**	**Ciprofloxacin (%)**	**Multidrug resistance (%)**
Salmon	2023	1	0	0	0
	2024	1	0	0	0
	2025	4	0	25	0
Shrimp	2023	1	0	0	0
	2024	4	0	25	25
CIPARS	2025	0	Not recovered	Not recovered	Not recovered

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%

- *E. coli*: between 1 and 4 isolates were recovered each year.
- Salmon: 3 of 4 isolates in 2025 originated from Asia, including the isolate with ciprofloxacin resistance (4th: unknown country of origin).

Salmonella (2021-2025)

	Indicator			
	Isolates (n)	Ceftriaxone (%)	Ciprofloxacin (%)	Multidrug resistance (%)
Chicken Farm Environment	28	0	4	0
Pig Farm Environment	7	14	0	29
Turkey Farm Environment	43	0	5	5

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%

No meropenem or colistin resistance was detected

- Resistance to Category I antimicrobials detected in the farm environment of chickens, pigs and turkeys.
- Multidrug resistance: 4 isolates from the farm environment of pigs and turkeys.
- Pig farm environment: *S.* Infantis isolate resistant to 6 antimicrobial classes.

In 2025, 31 unique *Salmonella* isolates from 22 positive samples in the CFIA's monitoring programs

- Top three serovars: *S.* Mbandaka (n=4), *S.* Infantis (n=3) and *S.* Senftenberg (n=3)
- Regions: Quebec (n=17), Prairies (n=9) and Ontario (n=5)
- Most were isolated from mixed feeds (n=23)

In 2025, 2 *Salmonella* isolates were resistant to one or more antimicrobials

- *S.* Johannesburg isolate from poultry complete feed for egg-laying chickens: **SSS-TET** (MB)
- *S.* Worthington isolate from swine complete feed for adult sows: **TET** (QC)

- Between 2018 and 2024, a small number of *Salmonella* isolates were resistant to one or more antimicrobials (n=6)
  - All resistant isolates from mixed feeds were in feed intended for chickens (n=4)

- Resistance to one or more antimicrobials: 2 *Salmonella* isolates from mixed feeds.
- In 2025, 1st time a resistant isolate was detected in mixed feed intended for swine.

		Indicator		
Bacteria	Year	Ceftriaxone (%)	Ciprofloxacin (%)	Multidrug resistance (%)
Escherichia coli	2022			
	2023	0	2	3
	2024	0	10.3	3
	2025	0	5	5
Salmonella	2022	0	0	0
	2023	0	0	0
	2024	0	0	0
	2025	0	6	6
Campylobacter	2022		16	0
	2023		4	0
	2024		0	0
	2025		0	0

CIPARS

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%

- Ceftriaxone resistance was not detected.
- *E. coli*: ciprofloxacin resistance was low to moderate and multidrug resistance was low.
- *Salmonella*: ciprofloxacin resistance and multidrug resistance detected in 2025.
- *Campylobacter*: ciprofloxacin resistance was not observed in 2024 and 2025.

Other resistances of interest

- Mobile colistin resistance
- Carbapenemase-producing organisms

Humans

- 2025: 7 non-typhoidal *Salmonella* isolates with *mcr*-1.1 detected (total non-typhoidal *Salmonella* isolates n=6,806).
- 2017-2024: 17 non-typhoidal *Salmonella* isolates with mobile colistin resistance detected (n=44,417).

Human Diagnostic Isolates, Surveillance year: 2025

Source	Serovar	Region	Resistance gene	AMR pattern
Stool	Infantis	Prairies	*mcr*-1.1	AMP-CHL-CIP-COL-CRO-GEN-NAL-SSS-TET
Stool	Kentucky	Ontario	*mcr*-1.1	AMP-AZM-CHL-CIP-COL-NAL-SSS-SXT-TET
Stool	I 4,[5],12:i:-	Ontario	*mcr*-1.1	AMP-CHL-CIP-COL-SSS-TET
Stool	I 4,[5],12:i:-	Prairies	*mcr*-1.1	AMP-CHL-COL-SSS-TET
Stool	Enteritidis	Atlantic	*mcr*-1.1	CIP-COL-NAL
Blood	Rough-O:l,v:1.7	Quebec	*mcr*-1.1	COL
Unknown	Typhimurium	Atlantic	*mcr*-1.1	COL-SSS-TET

CIPARS

Animal and food sources

- 2025: In retail seafood, 2 *Aeromonas* isolates with *mcr*-3.6 detected; one domestic salmon and one imported shrimp sample.
- 2017-2024: Previously detected in 2 *Aeromonas* isolates from retail seafood (2023-2024) and 2 non-typhoidal *Salmonella* isolates from horse diagnostic sample (2017) and abattoir chicken (2019).

Retail Seafood Isolates, Surveillance year: 2025

Source	Bacteria	Region	Resistance gene	AMR pattern
Shrimp	*Aeromonas*	Vietnam	*mcr*-3.6	COL-TET
Salmon	*Aeromonas*	Canada	*mcr*-3.6	COL

CIPARS

- Humans: mobile colistin resistance was rarely detected in non-typhoidal *Salmonella*. However, a greater number were detected in 2025 (n=7) compared to any individual year from 2017-2024.
- Animal and food: mobile colistin resistance was detected in 2 *Aeromonas* isolates from domestic retail salmon and imported retail shrimp sources.



Seafood (2025)

- Three *Vibrio* isolates from imported retail shrimp (routine CIPARS retail seafood surveillance).
- Three isolates (*Enterobacter* n=1, *Klebsiella* n=2) from imported retail scallops (GRDI seafood study).

Surveillance year: 2025

Bacteria	Source	Origin	Resistance gene	AMR pattern
Vibrio	Shrimp	Vietnam	*blaNDM-1*	AMC-AMP-CHL-CIP-CRO-FOX-MEM-SSS-STR-SXT-TET
	Shrimp	Vietnam	*blaNDM-18*	AMC-AMP-CHL-CRO-FOX-MEM-SSS-STR-SXT-TET
	Shrimp	Vietnam	*blaNDM-1; blaIMP-15*	AMC-AMP-CIP-CRO-FOX-MEM-SSS-STR-SXT
Enterobacter	Scallop	China	*blaNDM-5*	AMC-AMP-AZM-CIP-CRO-FOX-GEN-MEM-SSS-STR-SXT-TET
Klebsiella	Scallop	China	*blaNDM-1*	AMC-AMP-CHL-CIP-CRO-FOX-MEM-SSS-STR-SXT-TET
	Scallop	China	*blaNDM-1*	AMC-AMP-CHL-CIP-CRO-FOX-MEM-SSS-STR-SXT-TET

CIPARS

Human, animal, food and environment sources

- Last detection of carbapenemase-producing *Salmonella* in 2018.

- Imported seafood: detected 6 carbapenemase-producing isolates from shrimp and scallops.
- Isolates resistant to 7-9 antimicrobial classes including 2-3 additional Category I antimicrobials.
- No carbapenemase-producing non-typhoidal *Salmonella* detected since 2018.

Follow-up and new integrated stories



Ciprofloxacin-resistant non-typhoidal *Salmonella* and the D87Y mutation in the *gyrA* gene



Extended-spectrum beta-lactamase-producing non-typhoidal *Salmonella*



Ciprofloxacin-resistant *Campylobacter*

- Trends are for 2018 to 2025 unless otherwise stated.
- For these stories, ‘Diagnostic’ refers to combined animal diagnostic and farm environment diagnostic data.

Context (2018-2025)

Salmonella Enteritidis

- Most common or second most common serovar in chicken components and humans.
- Chicken components: 11% to 58% of all non-typhoidal *Salmonella* serovars.
- Humans: 31% to 44% of non-typhoidal *Salmonella* serovars.
- Turkeys: Rarely recovered on farm, but 1% to 33% of all non-typhoidal *Salmonella* serovars at retail and in diagnostic data.

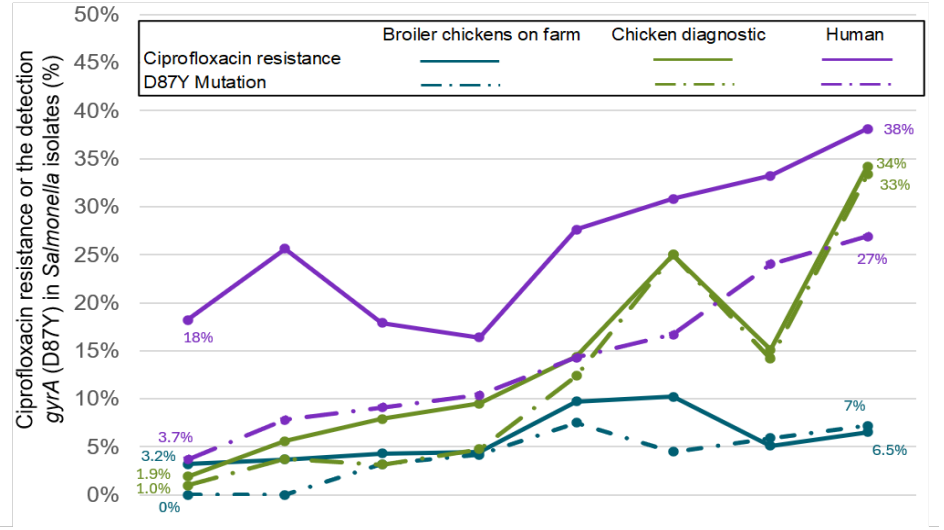
Salmonella Infantis

- Less common and variable serovar for chickens, turkeys and humans (when recovered).
- Chicken components: 1% to 17% of all non-typhoidal *Salmonella* serovars. Recovery increasing at abattoir and retail.
- Humans: 3% to 5% of non-typhoidal *Salmonella* serovars.
- Turkeys: 1% to 12% of non-typhoidal *Salmonella* serovars. Recovery increased in 2025 at farm and retail.

Ciprofloxacin-resistant *Salmonella* and the D87Y mutation in the *gyrA* gene

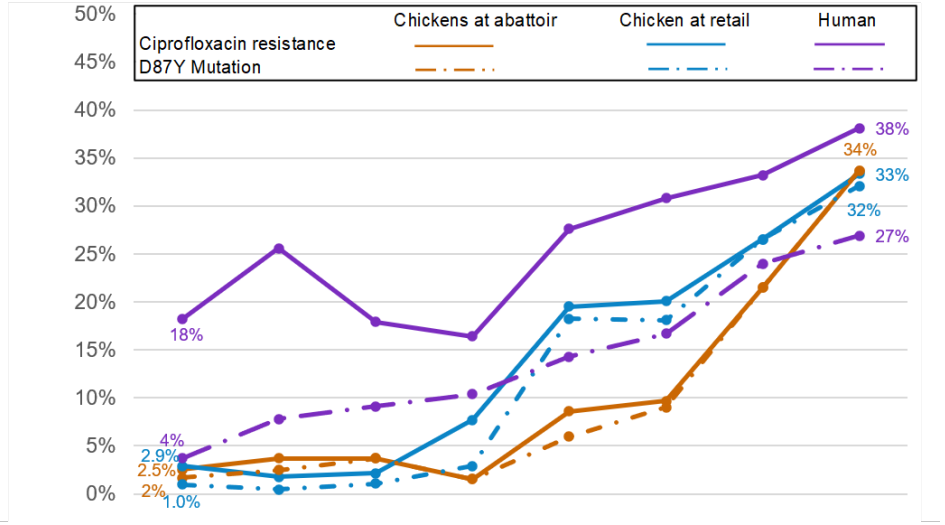
Ciprofloxacin-resistant *Salmonella* & *gyrA* (D87Y)

Broiler chickens, chicken(s) & human



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Broiler chickens on farm	282	314	189	192	200	224	186	167
Chicken diagnostic samples	208	216	191	148	97	132	106	120
Human	6791	6200	4842	3278	4484	5845	6171	6806

Number of isolates by surveillance component and year



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Chickens at abattoir	118	162	81	128	151	155	121	95
Chicken at retail	206	223	92	104	159	199	132	159
Human	6791	6200	4842	3278	4484	5845	6171	6806

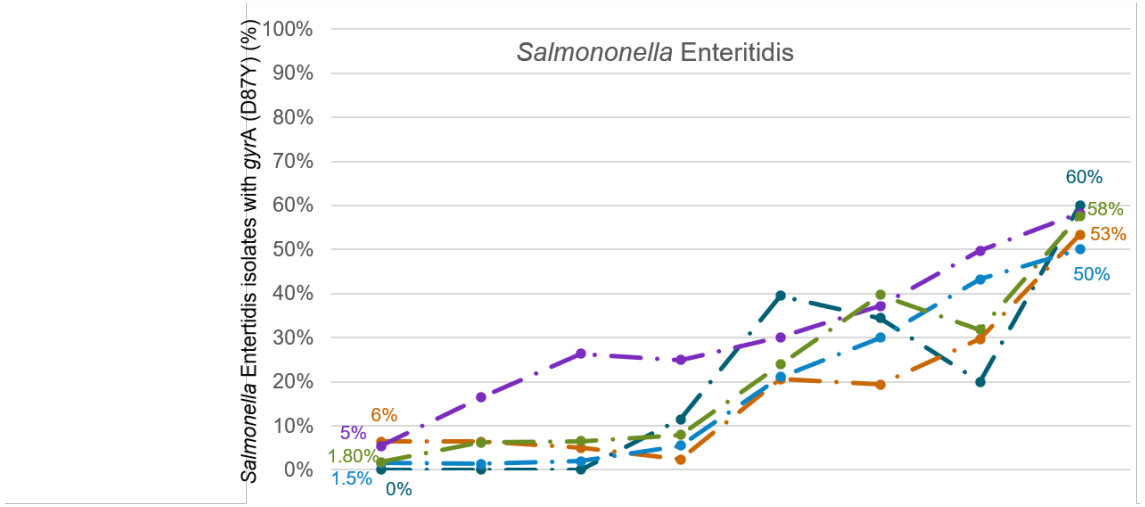
Number of isolates by surveillance component and year

Note: farm ciprofloxacin resistance data are adjusted for flock while D87Y mutation data are unadjusted.

- The detection of ciprofloxacin resistance and D87Y mutation increased substantially in humans, and chicken isolates from abattoir, retail and diagnostic samples.
- Prediction of ciprofloxacin resistance was almost or entirely on account of the D87Y mutation (chicken abattoir and retail).
- D87Y mutation was only found in *S.* Enteritidis and *S.* Infantis isolates from chicken.

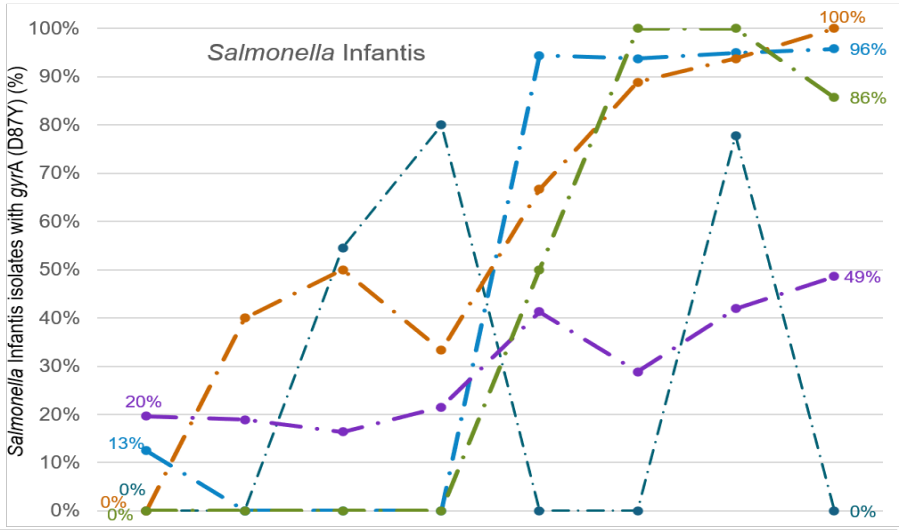
Ciprofloxacin-resistant *Salmonella* & *gyrA* (D87Y)

Broiler chickens, chicken(s) & human



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Broiler chickens on farm	79	46	31	35	38	29	20	20
Chickens at abattoir	31	31	20	43	34	31	37	30
Chicken at retail	65	74	51	55	57	70	37	56
Chicken diagnostic	111	129	92	88	46	78	44	59
Human	2818	2359	1488	1188	1857	2352	2688	2870

Number of isolates by surveillance component and year



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Broiler chickens on farm	4	0	11	5	3	9	9	2
Chickens at abattoir	5	5	4	3	3	9	16	16
Chicken at retail	8	6	2	0	18	16	20	24
Chicken diagnostic	7	2	3	3	2	2	1	7
Human	301	281	219	144	138	215	241	257

Number of isolates by surveillance component and year

- Not detected in 2017 in chicken isolates (earliest year with WGS data).
- Substantial increase in the D87Y mutation in human and chicken *S.* Enteritidis and *S.* Infantis isolates (note: small *S.* Infantis sample sizes for animal components).
  - Exception: different trend in *S.* Infantis at farm, but when detected, the frequency of the D87Y mutation was very high.

gyrA (D87Y) in other hosts (2018-2025)

Since 2019, the D87Y mutation was detected in small numbers in a variety of different hosts from farm, retail and diagnostic samples.

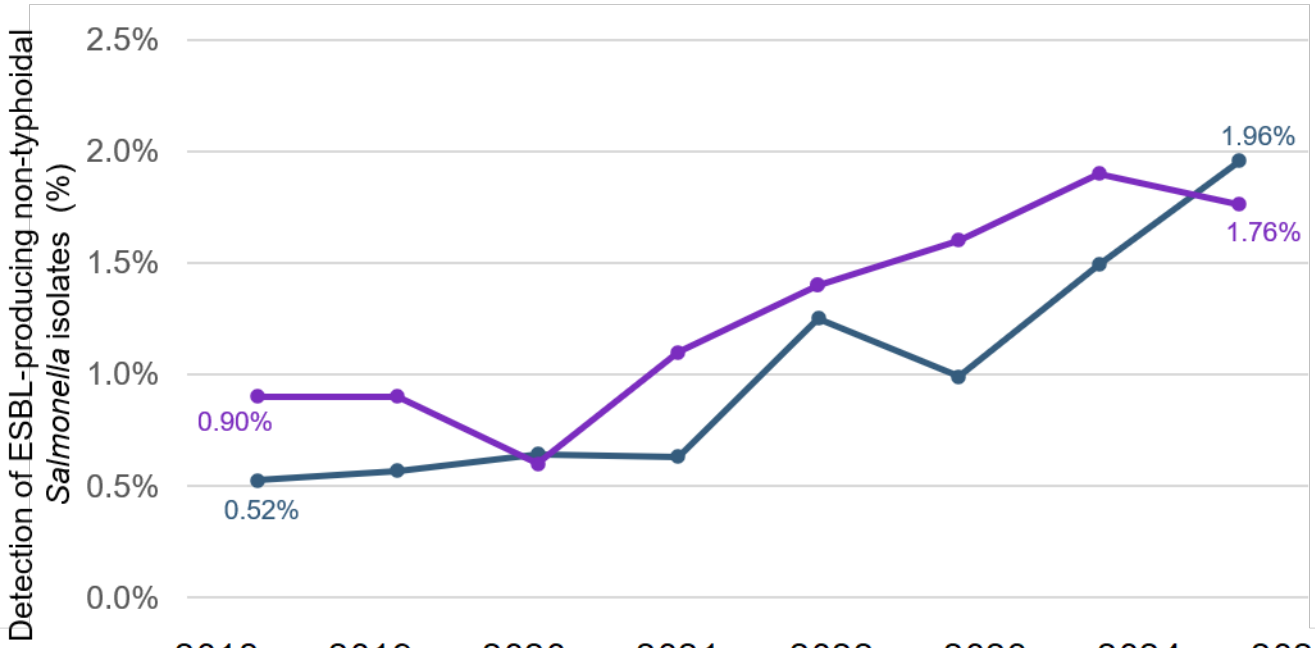
Host species	Component	First Detection	Serovars with *gyrA* (D87Y) (number of isolates)
Turkey	Diagnostic	2019	*S.* Enteritidis (9), *S.* Infantis (8)
Turkey	Retail	2019	*S.* Enteritidis (4), *S.* Infantis (2)
Turkey	Farm	2021	*S.* Enteritidis (3), *S.* Infantis (10)
Cattle	Diagnostic	2022	*S* . Enteritidis (5), *S* . Dublin (1)
Dairy cattle	Farm	2023	*S* . Enteritidis (12)

A small number of *S.* Enteritidis isolates with the D87Y mutation were detected starting in 2019 in diagnostic samples from cats, dogs, horses, pigs, sheep, bison, raccoon, avian*, avian farm environment* and primate*.

*Host not specified



Extended-spectrum beta-lactamase (ESBL)-producing non-typhoidal *Salmonella*



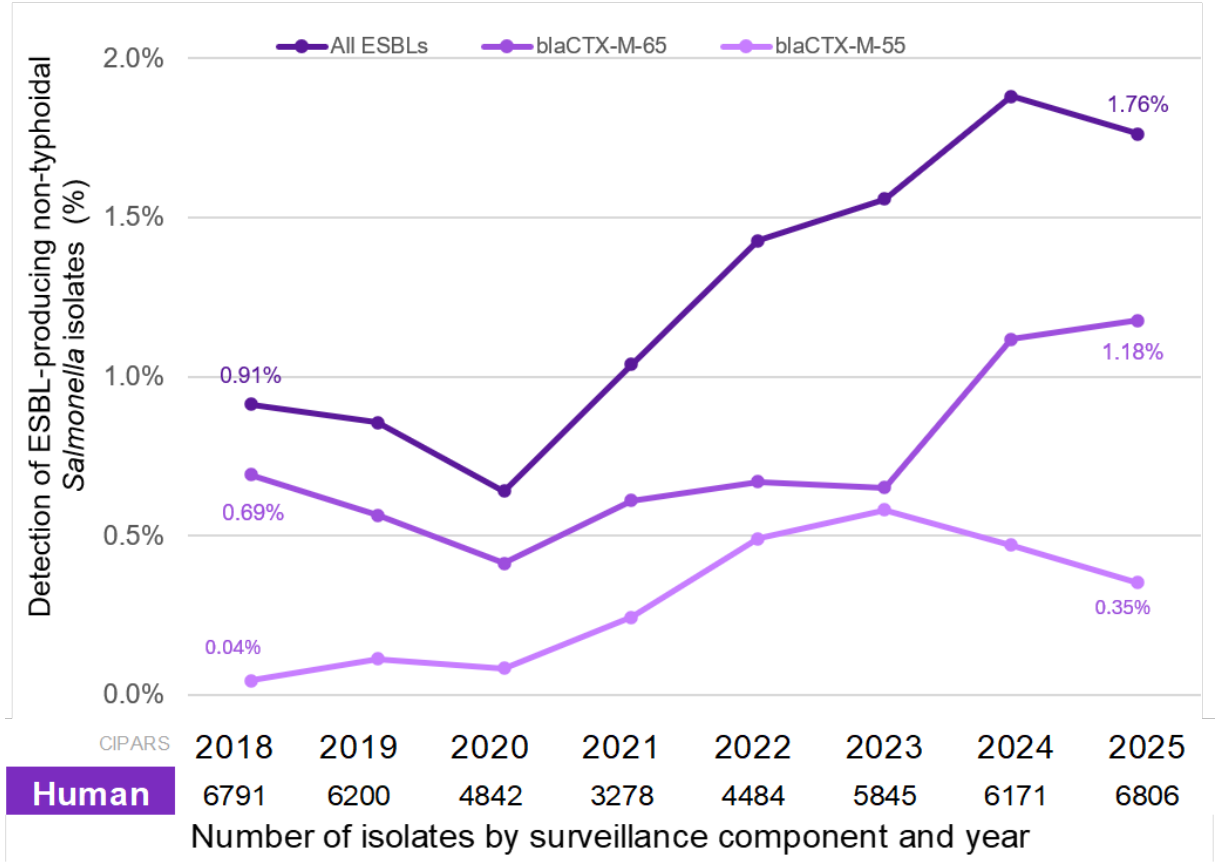
CIPARS

	2018	2019	2020	2021	2022	2023	2024	2025
Animals, Food and the Environment	2479	2815	2180	2219	2076	2220	2012	1891
Human	6791	6200	4842	3278	4484	5845	6171	6806

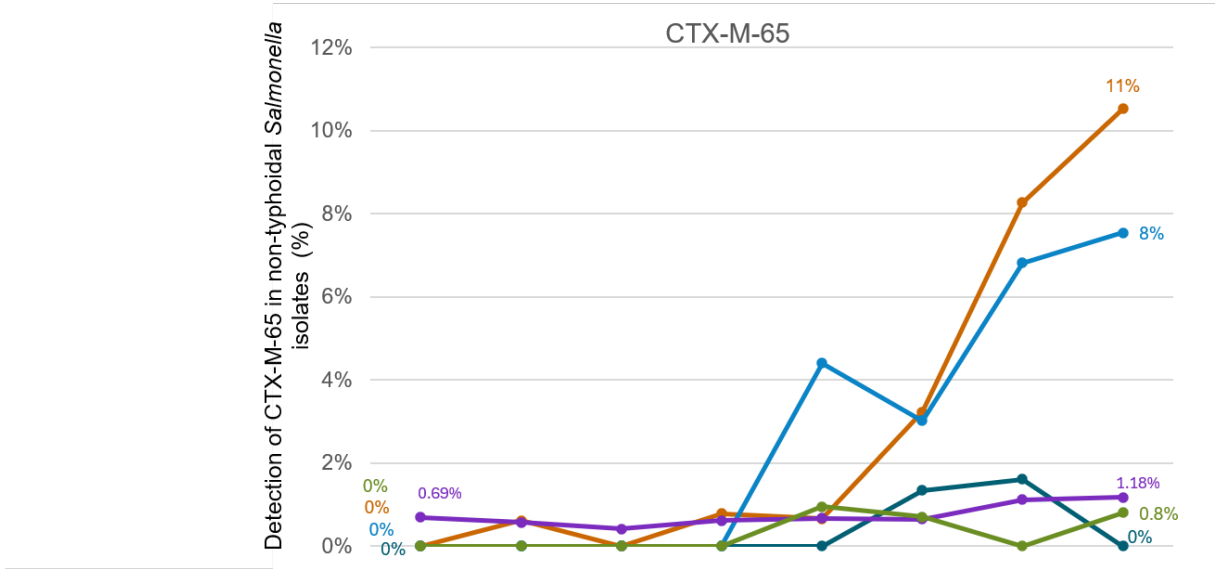
Number of isolates by surveillance component and year

- The frequency of ESBL-producing non-typhoidal *Salmonella* continued to increase in animal, food and environment samples.
- The frequency of ESBL-producing non-typhoidal *Salmonella* in humans has increased since 2018 but decreased slightly in 2025.

ESBL-producing non-typhoidal *Salmonella*



- Predominant ESBLs in humans: CTX-M-65 and CTX-M-55.
- Together contribute to between 77% and 87% of ESBLs detected.
- CTX-M-65 is increasing, and almost all were detected in *S.* Infantis (95%).
- Most CTX-M-55 were detected in *Salmonella* I 4,[5],12:i:- (52%).



	2018	2019	2020	2021	2022	2023	2024	2025
Broiler chickens on farm	282	314	189	192	200	224	186	167
Chickens at abattoir	118	162	81	128	151	155	121	95
Chicken at retail	206	223	92	104	159	199	132	159
Chicken diagnostic	223	256	224	168	106	143	132	125
Human	6791	6200	4842	3278	4484	5845	6171	6806

Number of isolates by surveillance component and year

- Chickens: almost all ESBLs were CTX-M-65 (97%), most were in *S.* Infantis (89%).
- Sharp increases in CTX-M-65 detected in chicken isolates from abattoir and retail.
- In 2025, CTX-M-65 detected in 63% of *S.* Infantis isolates from chickens at abattoir and in 50% of *S.* Infantis isolates from retail chicken.

ESBLs in other hosts (2018-2025)

- Top 2 ESBLs detected were CTX-M-65 (n=84 isolates) and CTX-M-55 (n=55).

- CTX-M-65 detection was less common in samples from turkeys (n=13) compared to chickens (n=71).
  - Only detected in *S.* Infantis (93%) and *S.* Kentucky (7%).

- CTX-M-55 detected in pigs (n=35), cattle (n=19), dogs (n=1) and chickens (n=1).
  - Most commonly detected in *Salmonella* I 4,[5],12:i:- (44%) and less commonly in 13 additional serovars.

- 6 other ESBLs were detected in many other hosts and *Salmonella* serovars.
  - SHV-12 (n=11), CTX-M-1 (n=9), CTX-M-27 (n=6), CTX-M-14 (n=4), SHV-2 (n=2), CTX-M-15 (n=1).



Ciprofloxacin-resistant *Campylobacter*

Context

FoodNet Canada Data

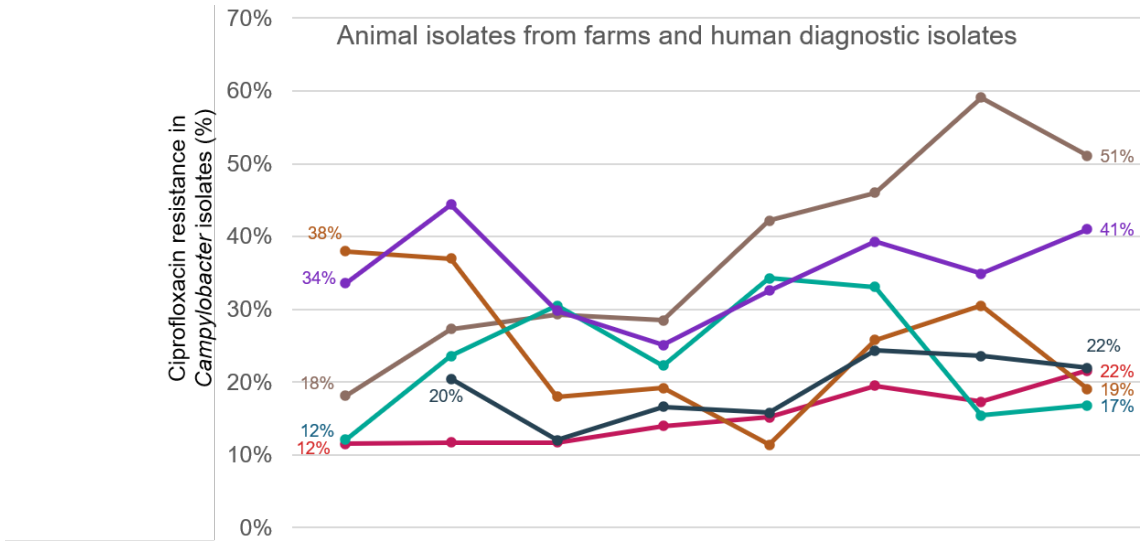
FNC human *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change.

Campylobacter species

The predominate *Campylobacter* species varies by host and component

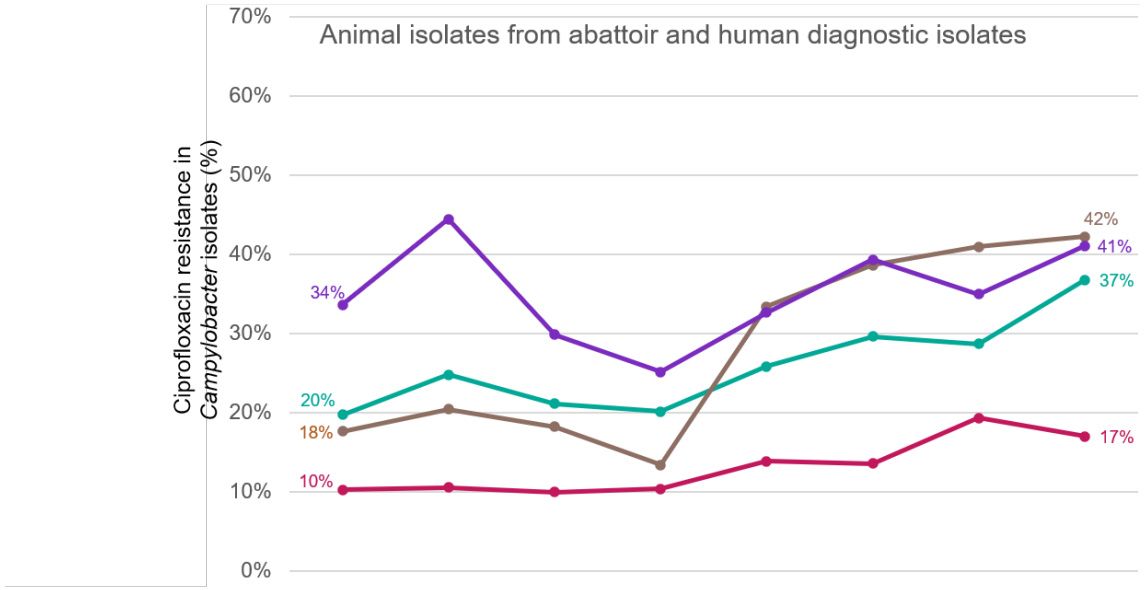
Predominant *Campylobacter* species

Campylobacter jejuni	*Campylobacter coli*
Humans	Feedlot cattle
Chicken components (farm, abattoir and retail)	Grower-finisher pigs on farms
Dairy cattle on farms	Pigs at abattoir
Cattle at abattoir (most years)	



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Feedlot cattle	94	162	92	247	184	149	93	120
Grower-finisher pigs	483	447	349	367	365	425	376	292
Turkeys	191	214	90	240	115	109	147	110
Broiler chickens	122	142	78	123	123	140	81	101
Dairy cattle		360	285	284	307	283	231	325
Human	387	493	380	439	322	274	332	309

Number of isolates by surveillance component and year



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Cattle	108	103	22	60	63	70	88	83
Pigs	235	210	101	167	205	192	148	173
Chickens	215	208	90	170	159	159	180	158
Human	387	493	380	439	322	274	332	309

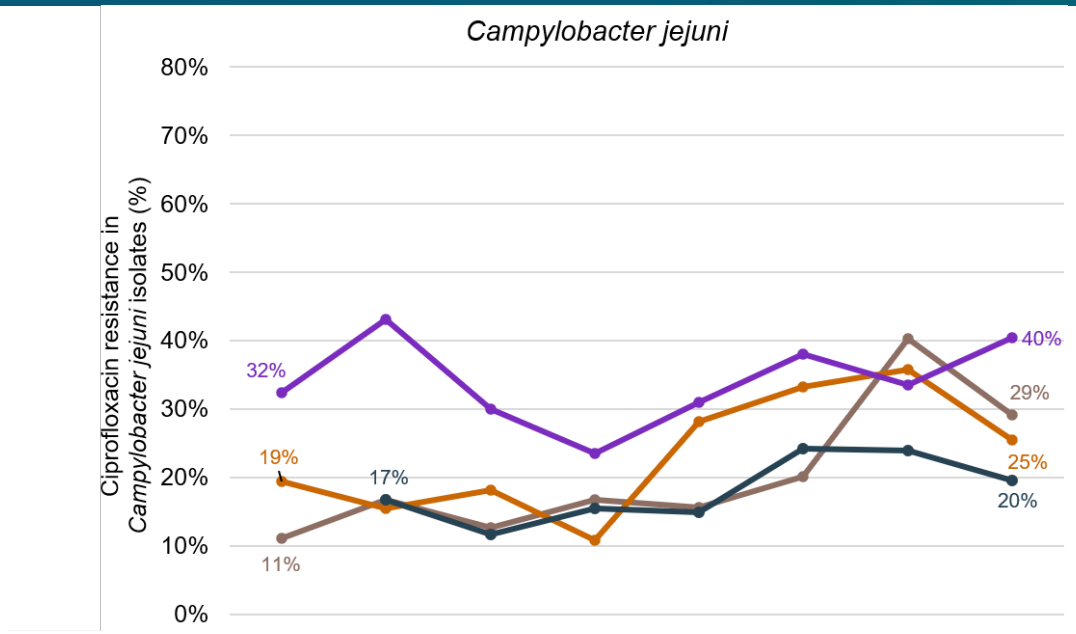
Number of isolates by surveillance component and year

FNC human *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change.

- *Campylobacter:* monitoring increasing ciprofloxacin resistance in multiple components, especially feedlot cattle and cattle at abattoir.
- Feedlot cattle: decrease in ciprofloxacin resistance in 2025 but remains high.

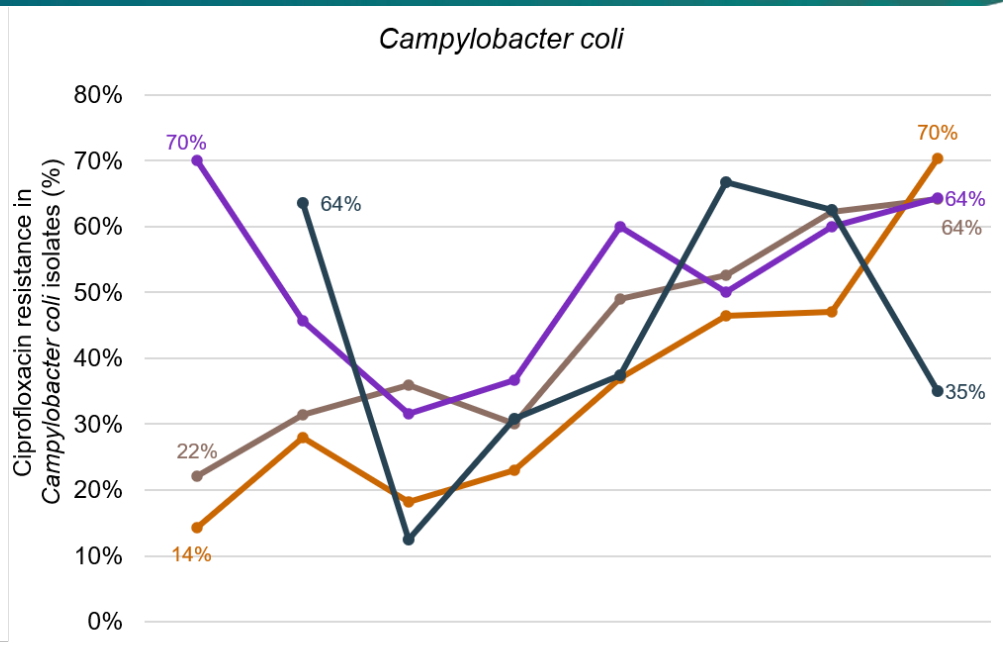
Ciprofloxacin-resistant *Campylobacter*

Cattle and humans



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Feedlot cattle	27	41	25	75	38	33	21	46
Dairy cattle		333	264	265	296	277	221	301
Cattle at abattoir	77	71	11	46	32	42	53	51
Human	373	443	350	400	287	244	310	287

Number of isolates by surveillance component and year

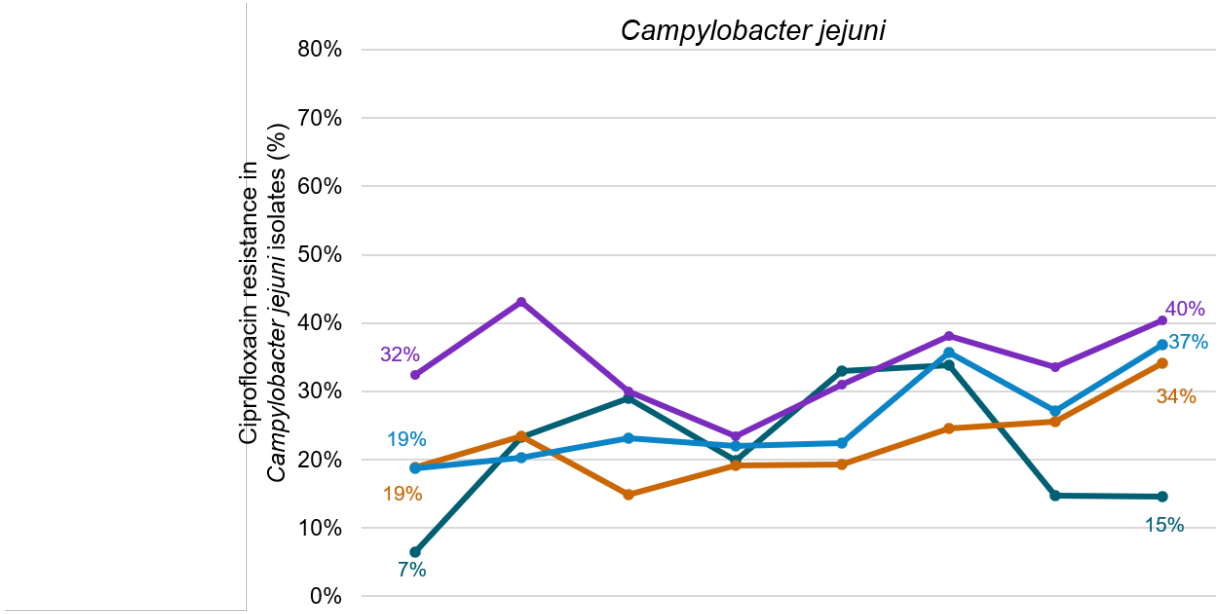


CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Feedlot cattle	67	121	67	169	146	116	69	72
Dairy cattle		22	16	13	8	6	8	20
Cattle at abattoir	28	25	11	13	27	28	34	27
Human	10	35	19	30	25	24	15	14

Number of isolates by surveillance component and year

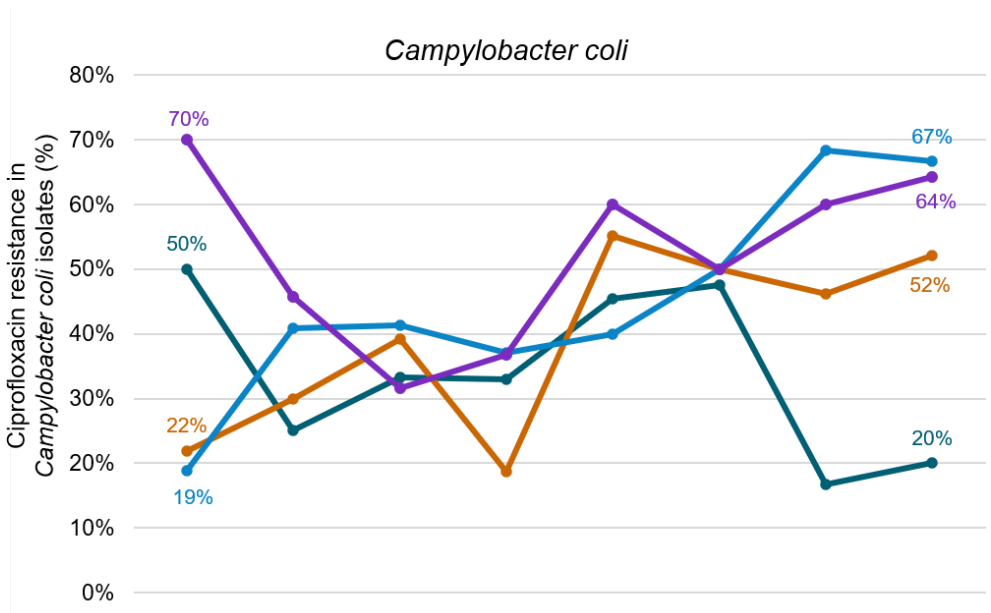
FNC human *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change.

- Cattle (feedlot and abattoir): substantial increases in *C. coli*.
- Cattle (feedlot): increases in *C. jejuni*.
- Cattle (all components): decreases in *C. jejuni* between 2024 and 2025.
- Human: variable trends.



CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Broiler chickens on farm	108	133	108	103	112	118	57	89
Chickens at abattoir	181	184	67	151	130	134	150	135
Chicken at retail	213	251	92	141	156	179	181	141
Human	373	438	350	395	287	241	309	287

Number of isolates by surveillance component and year

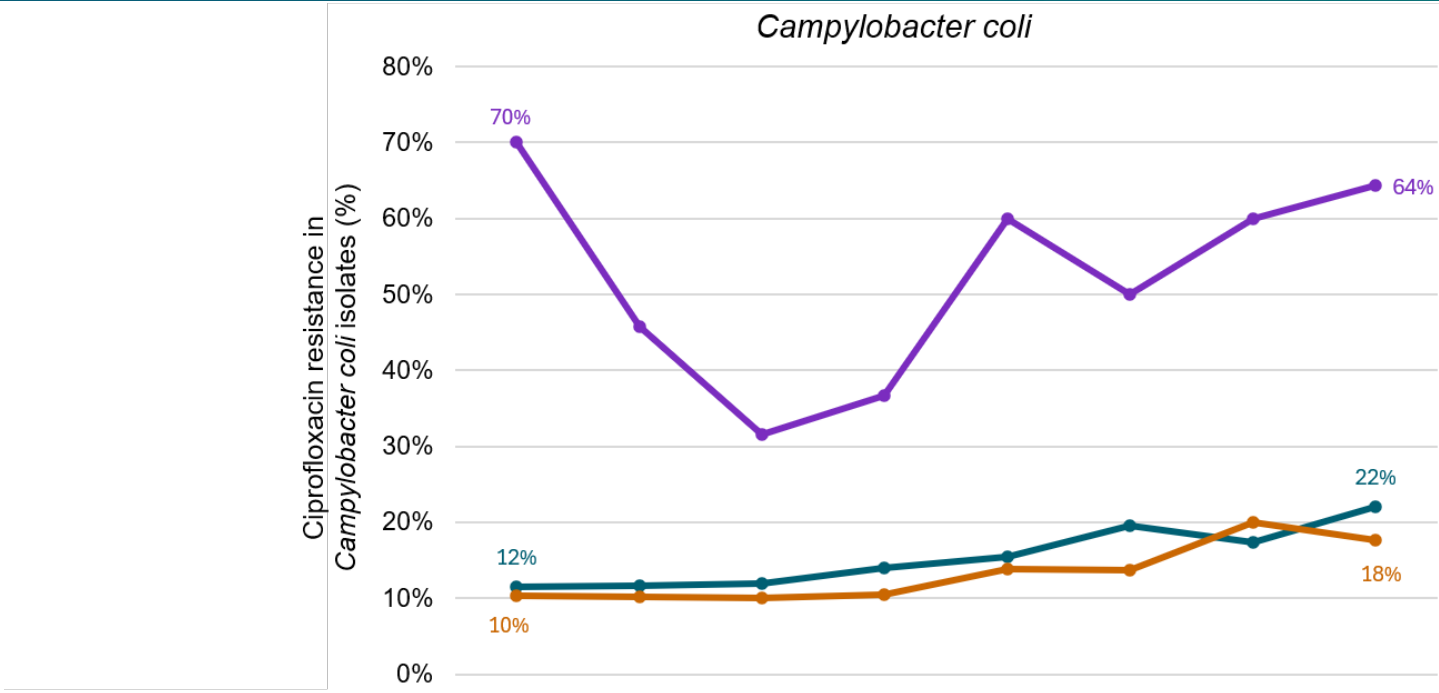


CIPARS	2018	2019	2020	2021	2022	2023	2024	2025
Broiler chickens on farm	14	9	10	20	11	21	24	10
Chickens at abattoir	32	20	23	16	29	22	26	23
Chicken at retail	37	44	29	35	40	32	19	27
Human	10	35	18	30	25	25	15	14

Number of isolates by surveillance component and year

FNC human *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change.

- Chicken (abattoir and retail): substantial increase in *C. coli* and increase in *C. jejuni*.
- Chicken (farm): decrease in *C. jejuni* and *C. coli* since 2023.



	2018	2019	2020	2021	2022	2023	2024	2025
Grower-finisher pigs on farm	482	447	343	367	359	418	371	287
Pigs at abattoir	234	206	100	164	196	190	140	164
Human	10	35	19	30	25	24	15	14

Number of isolates by surveillance component and year

FNC human *Campylobacter* data for 2023, 2024 and 2025 are preliminary and subject to change.

- Pigs (farm and abattoir): increases in *C. coli*.
- *C. jejuni* rarely isolated in pigs.
- Turkeys (data not presented): variable trend.

Summary and take away messages

Encouraging trends observed

- VASR: Total sales of medically important antimicrobials for **all animals** decreased 9% in 2025 relative to 2021 (in mg/kg biomass).
- Farm: Overall decrease in reported antimicrobial use in broiler chickens and grower-finisher pigs relative to 2021.
- Many components with encouraging AMR indicators. For example:
  - Ceftriaxone resistance remained rare to low in *E. coli* and *Salmonella* from all turkey components,
  - Ciprofloxacin resistance remained rare to low in *E. coli* and *Salmonella* from all pig components, and
  - Multidrug resistance remained low in *E. coli, Salmonella* and *Campylobacter* from all feedlot cattle components.

Trends being monitored

- VASR: Total sales of medically important antimicrobials for **all animals** increased 3% in 2025 relative to 2024 (in mg/kg biomass).
- VASR: Canada's sales for **all animals** were higher than the average for the Americas.
- There were ~1.1x more MIAs sold for humans compared to animals, adjusted for biomass.
  - Substantially more Category I antimicrobials were sold for use in humans than in animals, adjusted for biomass.
- Farm: Overall increase in reported antimicrobial use in feedlot cattle relative to 2021 despite low multidrug resistance.
- Multidrug resistance: Significant increases in *Salmonella* from chicken at abattoir and retail and increases in *Salmonella* from dairy cattle on farm.

Concerning trends related to Category I antimicrobials

Why it is important?

- Category I antimicrobials can be used for treatment of invasive *E. coli*, *Salmonella* and *Campylobacter* infections in humans and alternatives are limited as resistance emerges.
- ESBL, *mcr*, and carbapenemase genes are transferable antimicrobial resistance genes that can facilitate the spread of resistance between bacteria.

- VASR: Category I sales are <1% of total sales, however, sales for **all animals** increased by 20% in 2025 relative to 2021.
  - Compared to 2024, estimated Category I sales for beef and dairy cattle increased in 2025.

- Farm: Increase in reported Category I use in feedlot cattle and grower-finisher pigs.

Concerning trends related to Category I antimicrobials

- Substantial increase in ciprofloxacin resistance and the detection of D87Y from human and chicken (abattoir, retail and diagnostic) non-typhoidal *Salmonella* isolates.
- CTX-M-65 is increasing in non-typhoidal *Salmonella* isolates from humans and sharply increasing in chicken isolates from retail and abattoir.
- Substantial increases in ciprofloxacin resistance in *Campylobacter coli* in feedlot cattle, cattle at abattoir, chickens at abattoir and retail chicken.
- Mobile colistin resistance was detected in non-typhoidal *Salmonella* isolates from humans and *Aeromonas* isolates from domestic retail salmon and imported retail shrimp.
- Carbapenemase genes were detected in imported retail shrimp and scallops.

Acknowledgements

Since its establishment in 2002, CIPARS has relied on the support of many groups, organizations and individuals. CIPARS is grateful for this support. The acknowledgements listed here recognize collaborations during the 2018-2025 surveillance years.

Human (AMR):
- NML, Division of Bacteriology and Enteric Diseases and PulseNet Canada
- Provincial Public Health Laboratories
- FoodNet Canada Sentinel Sites (*Campylobacter*)
- National Enteric Surveillance Program (NESP)

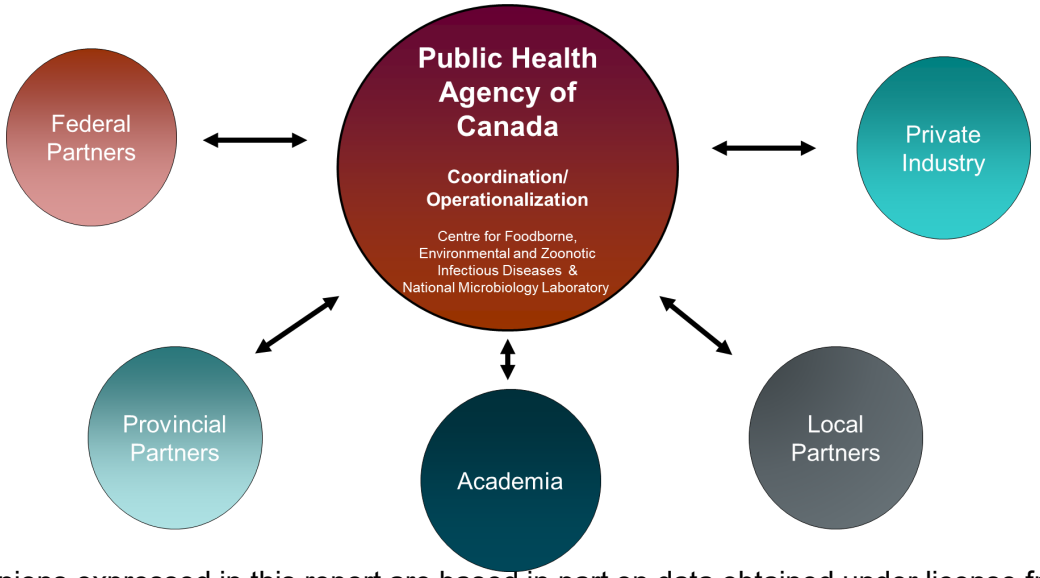
Farm (AMR and AMU):
- Veterinarians, producers and component groups, and academic and federal partners who participate in the farm program
- Saskatchewan Agriculture
- Feedlot Cattle Surveillance - partial funding current & past: Canadian Agricultural Partnership in Alberta and Ontario, Alberta Cattle 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 – partial funding: Dairy Farmers of Canada Dairy Research Cluster as part of the Canadian Agricultural Partnership
- Fisheries and Oceans Canada (DFO)

Abattoir:
- Canadian Food Inspection Agency, abattoir operators, samplers and personnel

Retail and Water:
- Health Units and institutions that participate in FoodNet Canada
- Alberta Irrigation Districts Association
- Alberta Agriculture and Irrigation
- Participating water treatment plants

Clinical Animal Isolates:
- Provincial Animal Health Laboratories

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



Antimicrobial Use - humans:
- SHAMU (PHAC AMR Task Force) and IQVIA. The statements, findings, conclusions, views, and opinions expressed in this report are based in part on data obtained under license from IQVIA Solutions Canada Inc. concerning the following information service(s): Compuscript, from January, 2021 to December, 2025. All Rights Reserved. The statements, findings, conclusions, views, and opinions expressed herein are not necessarily those of IQVIA Inc. or any of its affiliated or subsidiary entities.

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

Feed Ingredients and Mixed Feeds:
- Canadian Food Inspection Agency

Sources for more information

- CIPARS webpage:

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

- CIPARS interactive data visualizations:

https://health-infobase.canada.ca/cipars/

- FoodNet Canada webpage:

https://www.canada.ca/en/public-health/services/surveillance/foodnet-canada.html

- FoodNet Canada interactive data visualizations:

https://health-infobase.canada.ca/foodnet-canada/

- VASR webpage:

https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/veterinary-antimicrobial-sales-reporting.html

Appendix

Canada

Antimicrobials are grouped into categories based on their importance to human medicine

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

Example: ionophores



*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

Categorization of antimicrobials: https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/categorization-antimicrobial-drugs-based-importance-human-medicine.html

List of certain antimicrobial active pharmaceutical ingredients: https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/veterinary-antimicrobial-sales-reporting/list-a.html

Antimicrobial sales – animal, human

Groups: people and animals
Indicator: mg adjusted for biomass

Human					Antimicrobial Class	All Animals				
2021	2022	2023	2024	2025		2021	2022	2023	2024	2025
0.46	0.46	0.46	0.49	0.54	carbapenems			0.00		
2.13	2.30	2.25	2.35	2.38	3-4 gen cephalosporins	0.12	0.12	0.13	0.13	0.12
4.22	4.35	4.13	3.96	4.00	fluoroquinolones	0.05	0.08	0.09	0.10	0.13
15.14	17.85	20.11	22.19	22.93	penicillin beta-lactamase inhibitor combinations	0.27	0.28	0.27	0.27	0.27
14.19	13.94	14.34	14.51	14.50	1-2 gen cephalosporins	0.31	0.31	0.29	0.31	0.28
0.07	0.06	0.06	0.06	0.07	aminoglycosides	1.30	0.74	0.71	1.06	1.11
1.95	1.78	1.66	1.48	1.31	lincosamides	4.61	4.57	3.57	3.62	3.21
2.18	3.08	3.18	3.67	3.40	macrolides	5.93	6.63	6.22	5.93	6.23
19.26	26.51	28.14	28.13	26.57	penicillins	12.07	9.43	8.08	8.18	9.29
5.77	5.84	5.92	6.31	6.09	sulfonamides	4.20	4.52	4.07	4.22	4.97
2.63	2.60	2.62	2.86	3.08	tetracyclines	45.58	45.01	43.04	40.50	40.53
6.44	6.61	7.28	7.75	7.95	other	11.38	11.58	12.34	11.72	11.93

CIPARS

mg adjusted for biomass
0.00 — 75.00

- The only medically important antimicrobial class sold for use on crops are aminoglycosides (Source: HC-PRD)
- Data for humans and animals (food animals, horses, cats and dogs) are for systemic use only (oral and parenteral)

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
Data sources: SHAMU (IQVIA) and CIPARS

- There was a different spectrum of antimicrobials sold for use in animals compared to people.

Testing for statistical significance between surveillance years

The choice of statistical test accounted for the sampling methodology of a particular component and the statistical power of the dataset.
A *p*-value of ≤0.05 was interpreted as statistically significant for all components.

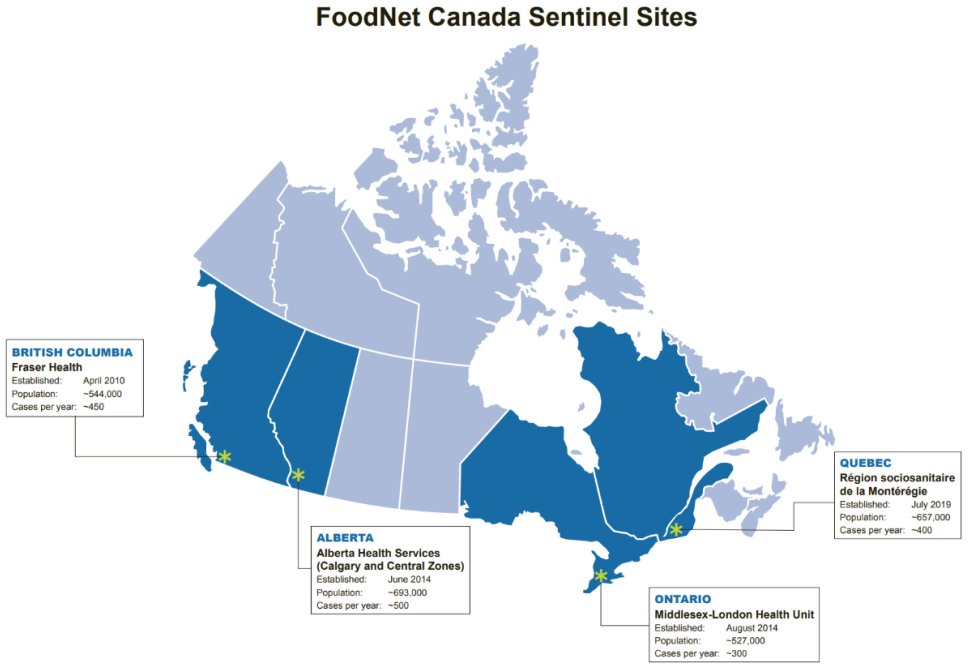
- **Human:** Fisher's exact text
- **Farm** (broiler chickens, turkeys, grower-finisher pigs, feedlot cattle): Generalized estimating equations (GEE) to account for clustering of resistant isolates within farming operations. Herd ID was used as the cluster variable and surveillance year was included as an independent categorical predictor.
- **Farm** (dairy): Mixed effect logistic regression models with Herd ID as a random effect to adjust for clustering at the farm level and surveillance year as an independent categorical predictor.
- **Abattoir:** Binary logistic regression models with surveillance year as an independent categorical predictor.
- **Retail and Water:** Fisher's exact test

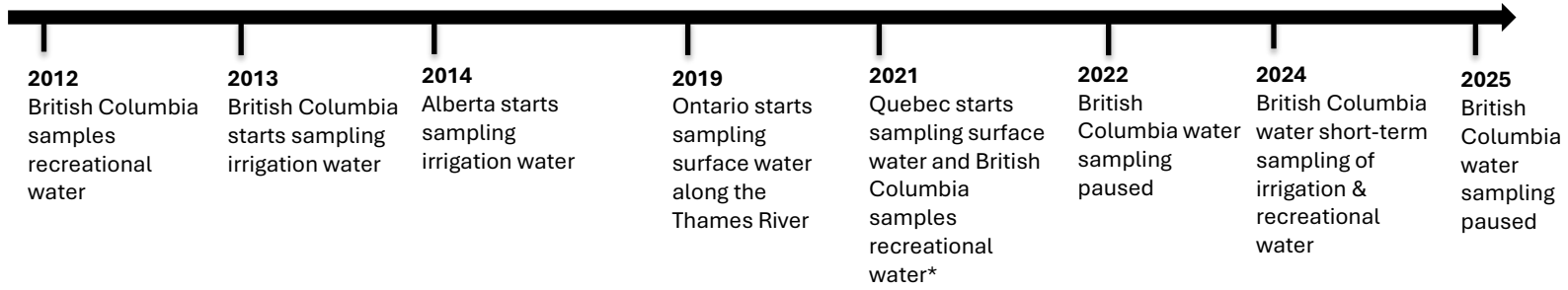
FoodNet Canada (FNC) Water sampling

FNC Water sampling objective: to understand pathogen levels and the transmission of enteric pathogens from water sources.

Overall methods:

- Active water sampling in four¥ sentinel sites
- Types of water sampled depends on the local water system within the site, and have included recreational, surface and irrigation
- The core pathogens tested include: STEC, *Salmonella* and *Campylobacter*
- Supports CIPARS attribution activities
- AMR testing for CIPARS





¥Sampling in some years included fewer than four sentinel sites

*outside of sentinel site boundaries due to the COVID-19 pandemic