CIPARS Farm Surveillance Component: Dairy Cattle

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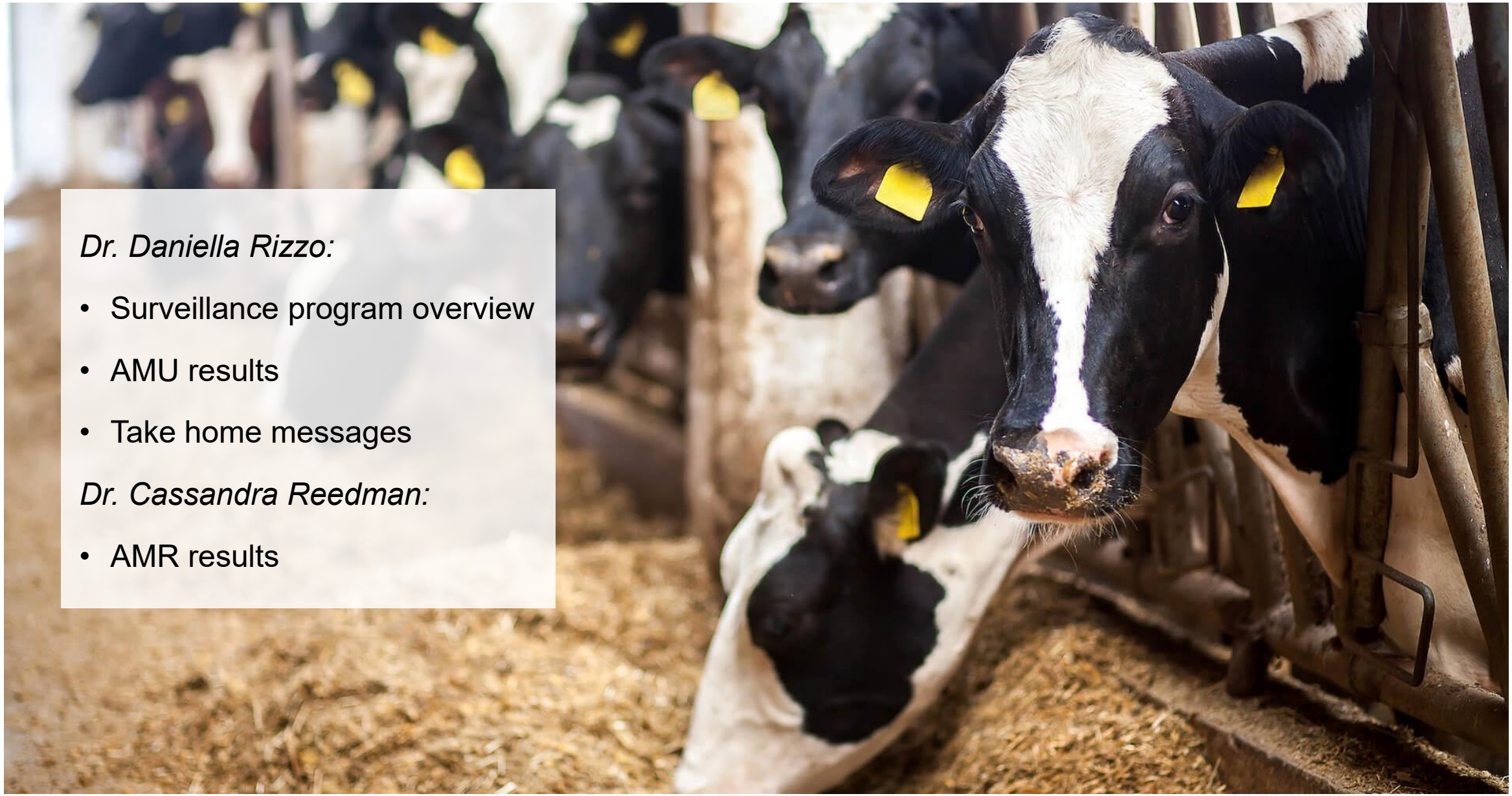
World Antimicrobial Resistance Awareness Week
November 18, 2025

Agenda



Dr. Daniella Rizzo:

- Surveillance program overview
- AMU results
- Take home messages

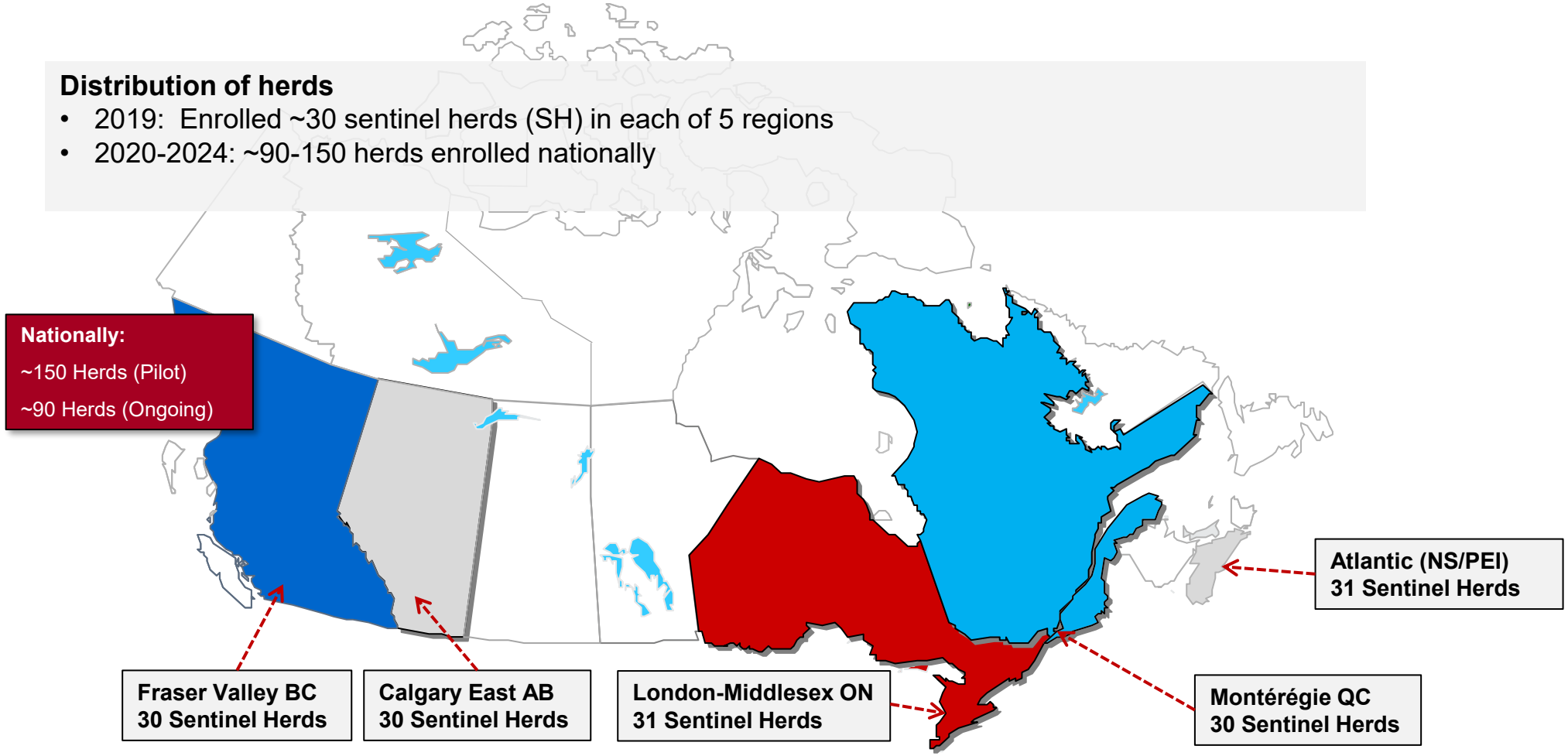
Dr. Cassandra Reedman:

- AMR results

Canadian Dairy Network for Antimicrobial Stewardship and Resistance (CaDNetASR)-2024

Distribution of herds

- 2019: Enrolled ~30 sentinel herds (SH) in each of 5 regions
- 2020-2024: ~90-150 herds enrolled nationally



Component design: https://doi.org/10.3389/fvets.2021.799622

CaDNetASR Herd Demographics, 2024

Similar to the national average

- Overall median (100) and mean (129) are close to the national average of 99 milking cows per farm[1]

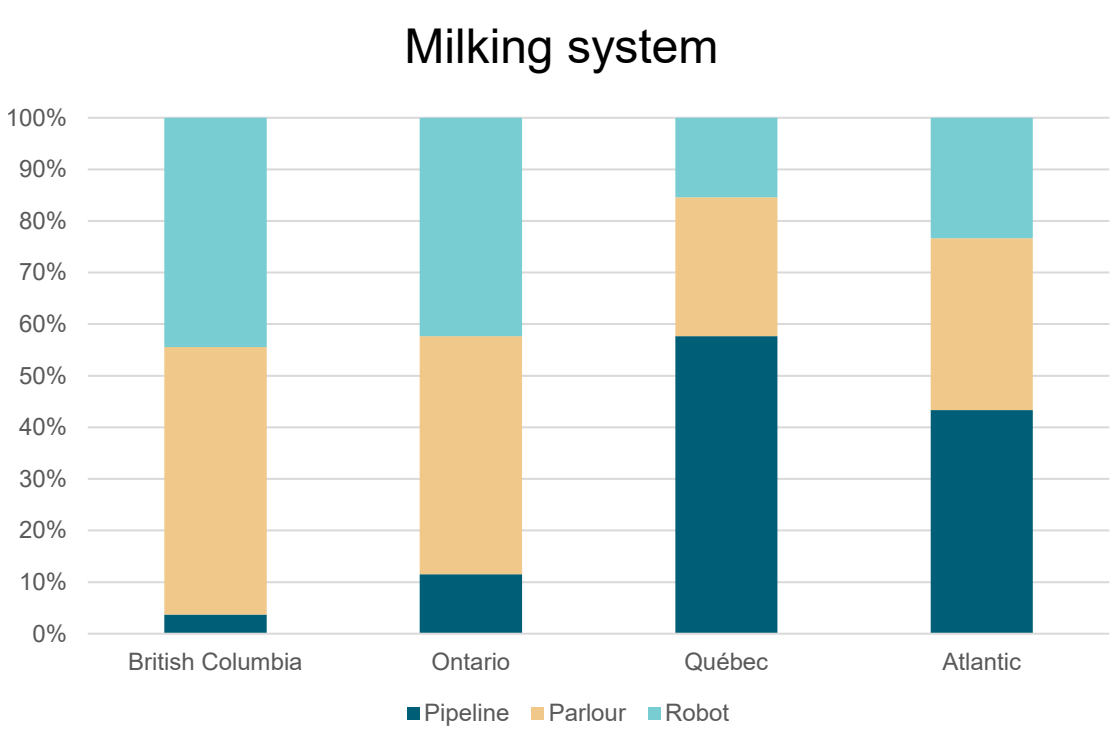
	British Columbia (n = 30)	Ontario (n = 31)	Québec (n = 30)	Nova Scotia/PEI (n = 31)	Overall (n = 122)
Lactating Cows	153 (55 - 339)	107 (51 - 515)	74 (40 - 287)	85 (36 - 357)	100 (36 - 515)
Dry Cows	24 (6 - 58)	17 (8 - 70)	12 (5 - 25)	15 (4 - 47)	15 (4 - 70)
Heifers	126 (0 - 363)	99 (40 - 369)	47 (12 - 178)	65 (20 - 358)	80 (0 - 369)
Calves	19 (1 - 54)	14 (4 - 69)	8 (1 - 16)	10 (1 - 55)	11 (1 - 69)

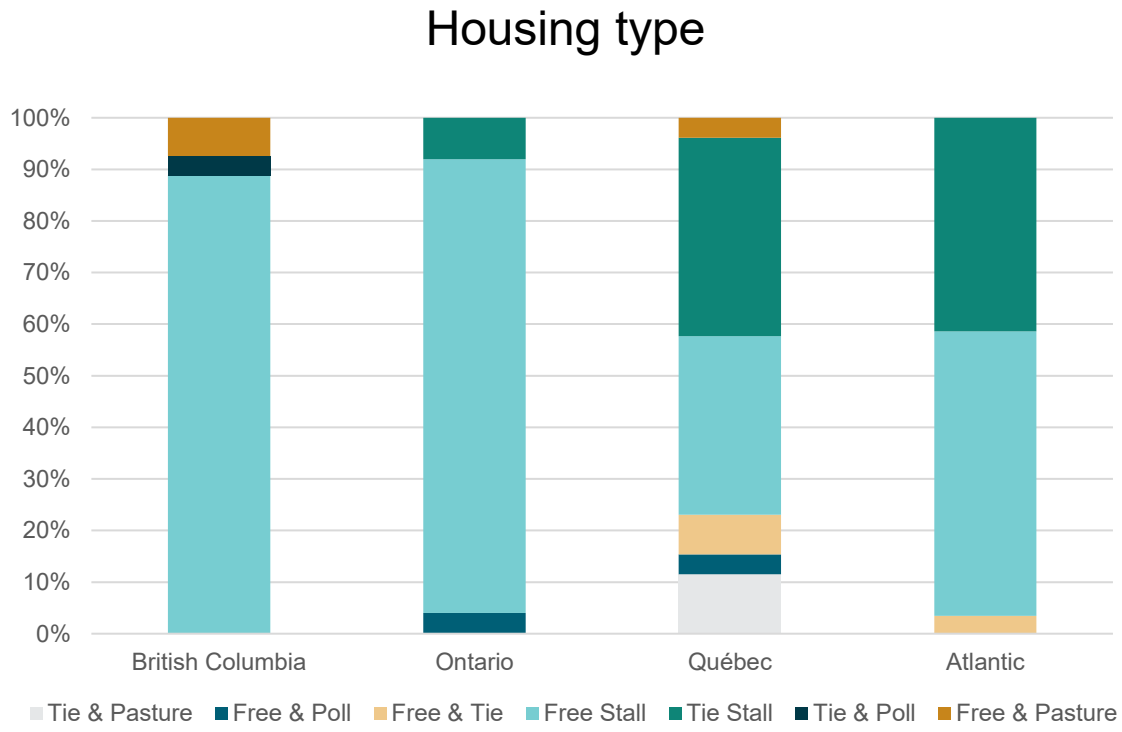
Median (Min – Max)

1: https://dairyfarmersofcanada.ca/en/canadian-goodness/ask-dairy-experts/how-big-average-dairy-farm-canada

CaDNetASR Milking System & Housing Type, 2024

Transition to robotic milking systems over time





Farm-Level Antimicrobial Resistance Results

Relevance of antimicrobial panel

Category	Antimicrobial in panel	Relevant products used on dairy farms
I	Cefriaxone/Ceftiofur	Excenel, Excede, Spectramast (LC and DC), Eficur, Cevaxel
	Ciprofloxacin	A180, Baytril, Forcyl
	Colistin	Special Formula
	Amoxicillin-clavulanic acid	-
	Meropenem	-
II	Ampicillin/penicillin/penicillin-novobiocin	Depocillin, Novodry, Polyflex, Procaine, Procillin, Duplocillin
	Azithromycin/Erythromycin	Draxxin, Micotil, Tylan, Zactran, Zuprevo
	Gentamicin	Cocci scour bolus, Calf scour bolus, Neo sulfalyte
	Cefoxitin/Cephalothin	Metricure, Cefa-Lak, Cefa-Dri
	Trimethoprim-sulfamethoxazole	Borgal, Trimidox, Norovet, Super Booster
	Oxacillin	Dry Clox
	Pirlamycin	Pirsue
	Nalidixic acid	-
	Streptomycin	-
III	Tetracycline	Cyclospray, Tetra-250, Onycin, Oxymycin, Oxyvet, Bio-mycin, Kelamycin, Liquamycin
	Chloramphenicol/Florfenicol	Nuflor, Resflor, Florkem
	Sulfisoxazole/Sulphadimethoxine	After calf bolus, Calfspan, Sustain bolus

Categorization system developed by Health Canada's Veterinary Drugs Directorate

2024 Dairy Recovery Summary – Fecal Samples

Pathogen recovery levels are stable

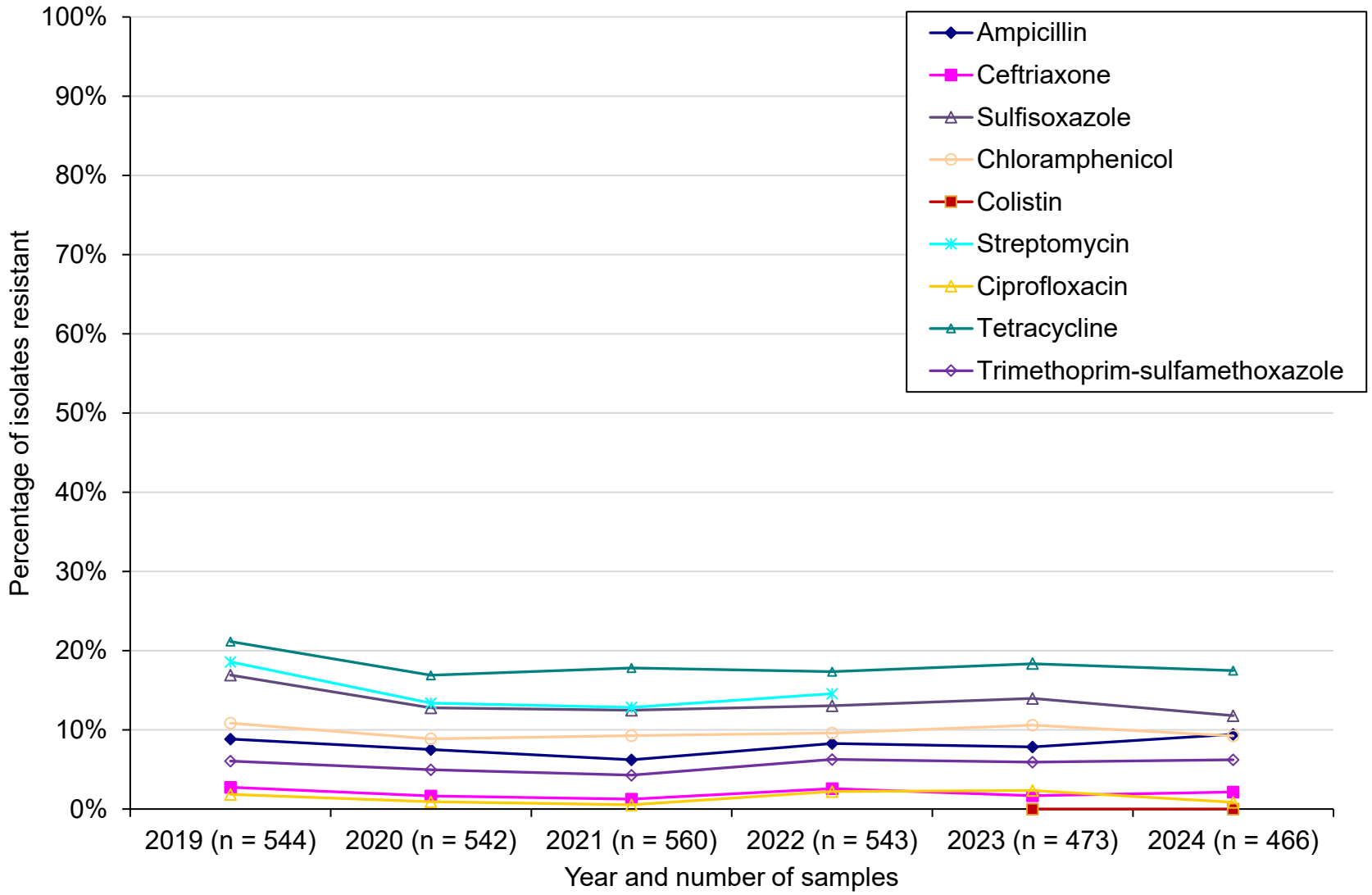
	Escherichia coli		*Salmonella*		*Campylobacter*	
	%	n pos/total	%	n pos/total	%	n pos/total
Calf	100.00%	119/119	0.84%	1/119	23.53%	28/119
Cow	98.36%	120/122	2.46%	3/122	72.13%	88/122
Heifer	100.00%	121/121	2.48%	3/121	57.02%	69/121
All fecal samples combined	99.45%	360/362	1.93%	7/362	51.10%	185/362
Manure Pit	86.89%	106/122	5.74%	7/122	37.70%	46/122
All samples combined	96.28%	466/484	2.89%	14/484	47.73%	231/484

- Samples collected in ON, BC, QC, Atlantic (NS/PEI)
- No samples collected in AB

Temporal trends in national *E. coli* resistance, 2019-2024

E. coli resistance remains low with stable trends

- Graph includes composite manure samples taken from pre-weaned calves, post-weaned heifers, lactating dairy cattle, and the manure pit.



Note: In 2023 there was a panel change, streptomycin is no longer tested, and colistin was added

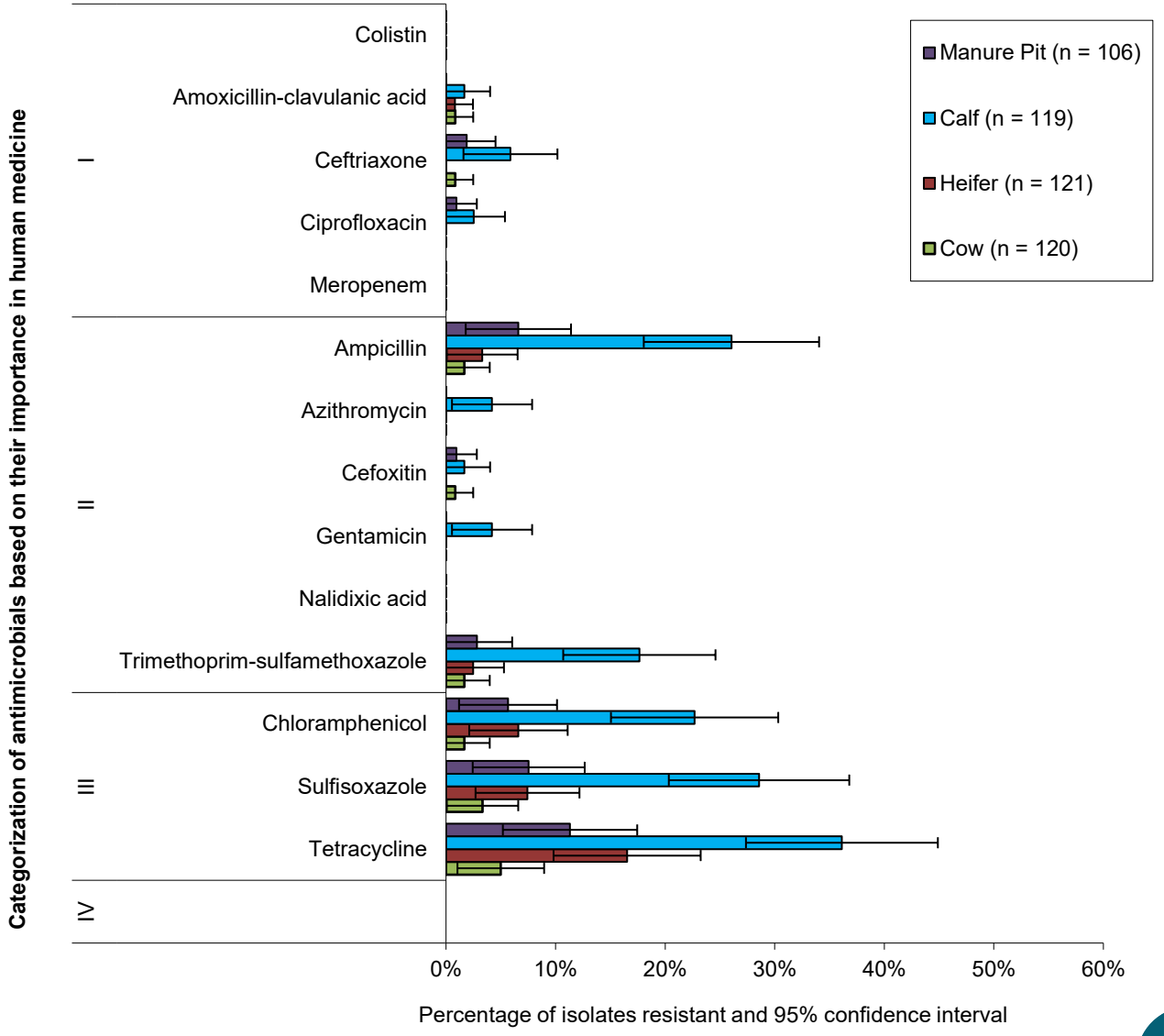
National *E. coli* Resistance by Sample Type, 2024

Resistance is most prevalent among isolates from calves

- Category III antimicrobials had the greatest resistance for all sample types
- This is consistent with what has been reported over the past 5 years

Percent of isolates showing multidrug resistance (≥ 3 antimicrobial classes)

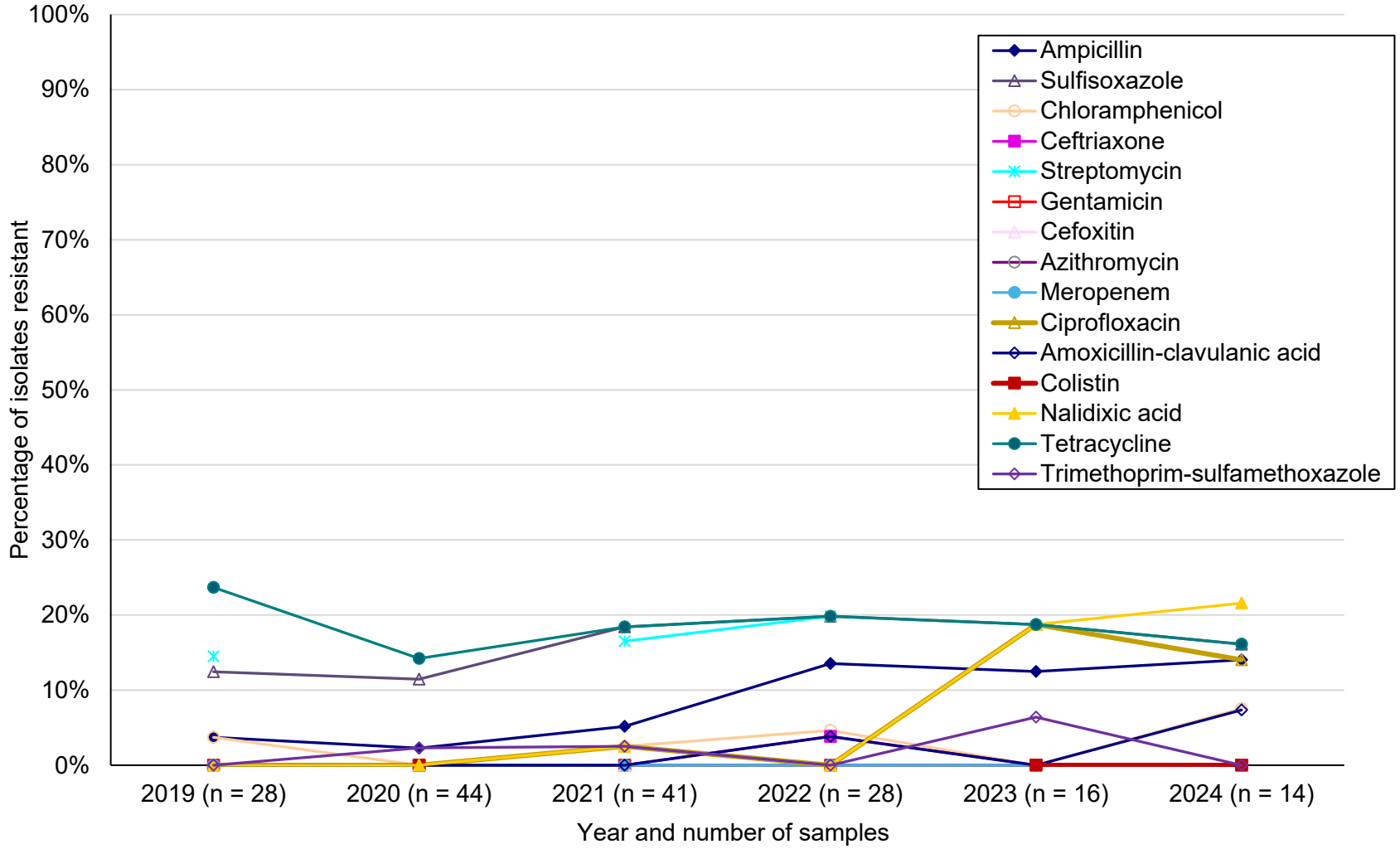
	2020	2021	2022	2023	2024
Manure pit	3%	5%	3%	4%	7%
Heifer	7%	6%	6%	4%	7%
Calf	36%	36%	39%	34%	25%
Cow	4%	4%	4%	5%	2%



Temporal trends in national *Salmonella* resistance, 2019-2024

Monitoring the increase in nalidixic acid and ciprofloxacin resistance

- Much lower *Salmonella* recovery in 2023 and 2024 compared to previous years
- Low sample numbers make trend interpretation difficult
- Ciprofloxacin and nalidixic resistance came from 2 *S.* Enteritidis isolates with an additional *S.* Mbandaka isolate showing resistance to only nalidixic acid



**Isolates represented in these graphs include composite manure samples taken from pre-weaned calves, post-weaned heifers, lactating dairy cattle, and the manure pit.*

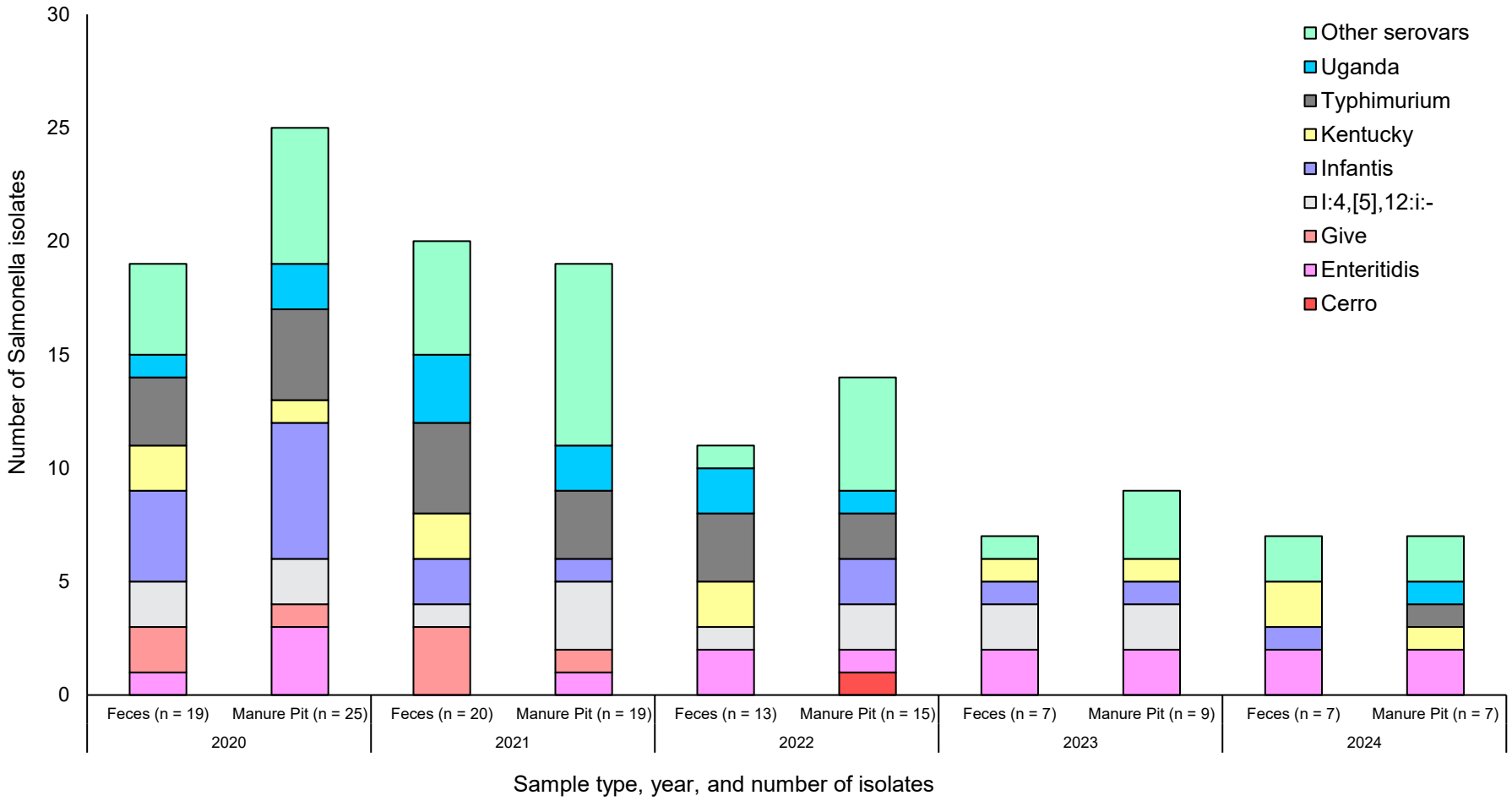
Note: Change to CMV5 panel in 2020 (due to samples being tested in a different lab). In 2023: Streptomycin was no longer tested, and Colistin added

Temporal trends in national *Salmonella* serovar distribution

Fecal vs. manure pit sample types

Consistent recovery of *Salmonella* Infantis, Enteritidis and Kentucky

- *Salmonella* Dublin has not been recovered over the 5 years
- Low overall recovery in 2024

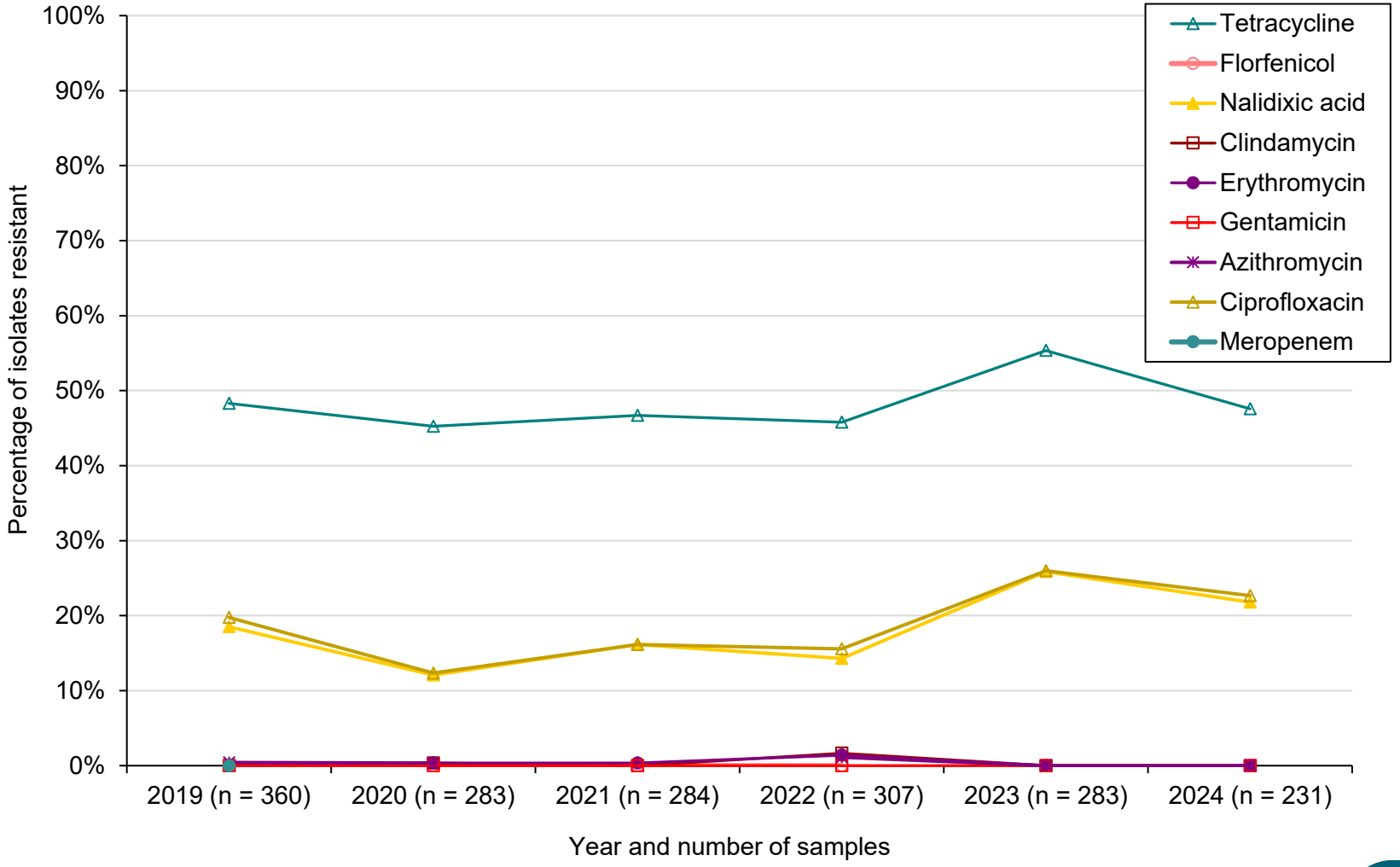


*Feces category includes composite manure samples from lactating cows, heifers and calves, combined.

Temporal trends in national *Campylobacter* resistance, 2019-2024

Emerging ciprofloxacin resistance

- Emerging ciprofloxacin resistance beginning in 2023
- 2024 ciprofloxacin resistant isolates: 5 *C. coli*, 53 *C. jejuni*, 1 *C. lari*.
- Tetracycline resistance remains the highest
- 95% of resistant isolates were *C. jejuni*

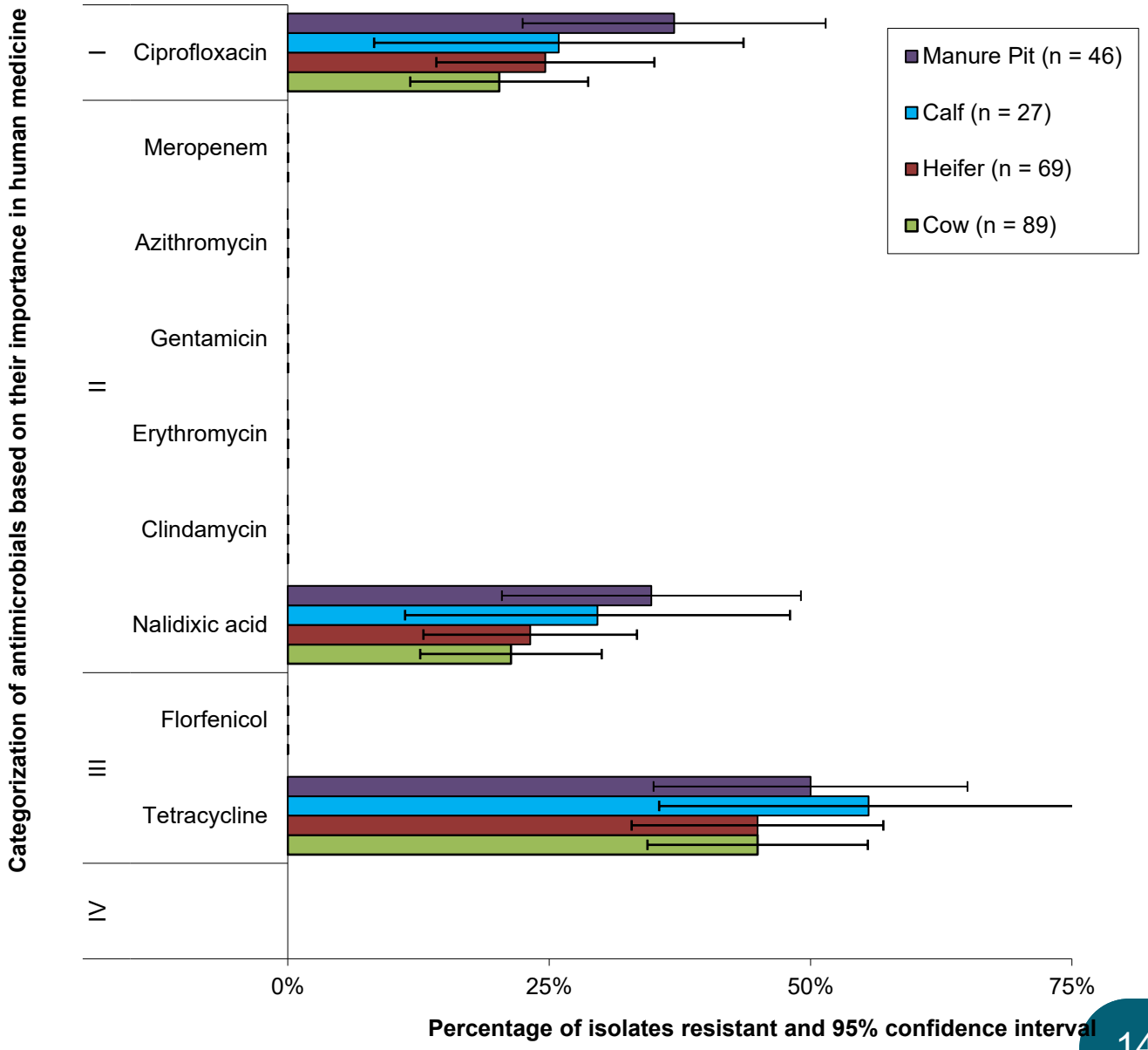


**Isolates represented in these graphs include composite manure samples taken from pre-weaned calves, post-weaned heifers, lactating dairy cattle, and the manure pit.*

National *Campylobacter* resistance by sample type, 2024

Resistance levels are similar across all sample types

- All sample types contributed to the ciprofloxacin, nalidixic acid and tetracycline resistance increase
- While all sample types contribute, the highest levels of resistance are noted in manure pit and calf samples.



2024 Dairy Recovery Summary – Bulk Tank Milk (BTM)

Recovered bacteria include intramammary species of interest, both potential pathogens and contaminants

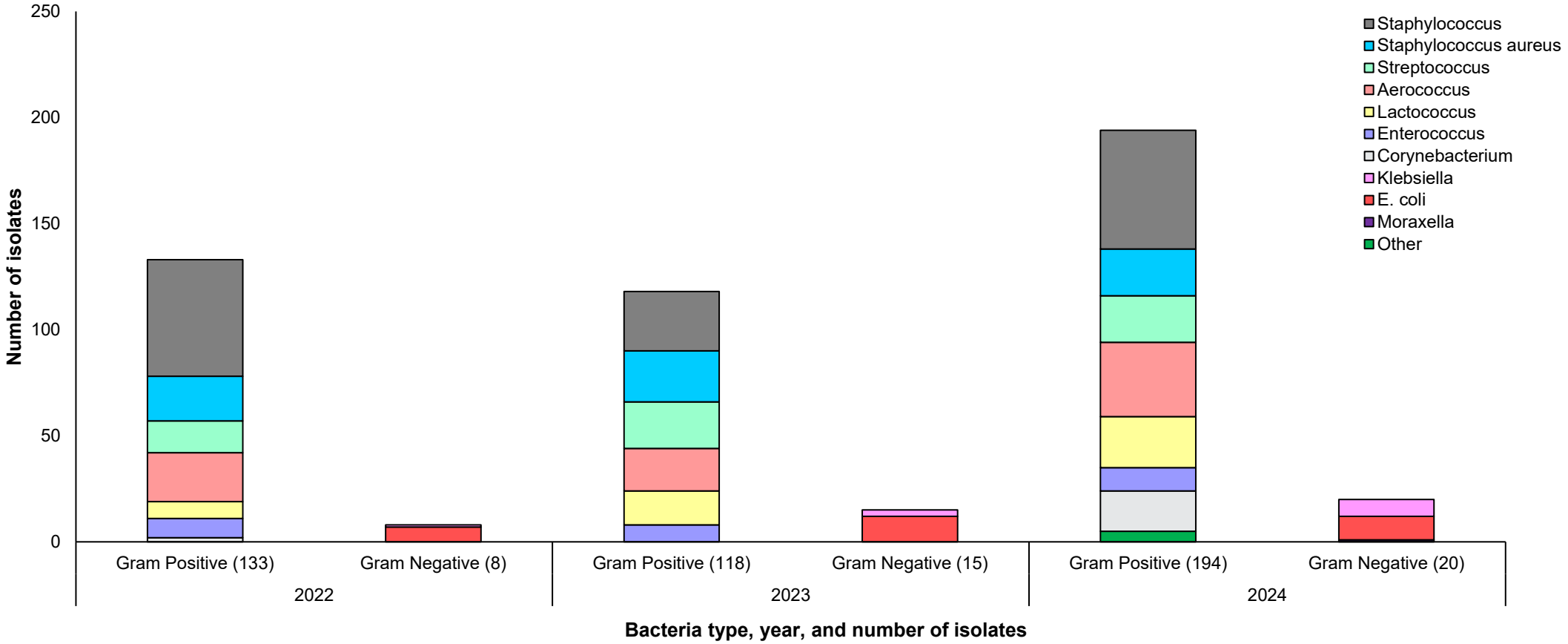
In the 2024 surveillance year, bacterial pathogens were recovered in 114/119 (96%) bulk tank milk samples (a total of 54 unique species)

- Bacteria included:
  - *E. coli*
  - *Aerococcus viridans*
  - *Corynebacterium* spp.
  - *Enterococcus* spp.
  - *Klebsiella* spp.
  - *Lactococcus* spp.
  - *Mammaliicoccus sciuri*
  - *Micrococcus* spp.
  - *Moraxella osloensis*
  - *Raoultella* spp.
  - *Staphylococcus* spp.
  - *Streptococcus* spp.

In 2022, new procedures were implemented for sample storage (glycerol), which have improved bacterial recovery in bulk tank milk samples

Temporal trends in national BTM bacterial recovery distribution

Higher recovery in 2024 with *Staph* being most common bacteria



- Higher recovery of gram-positive bacteria than gram negative, and higher recovery in 2024 compared to previous years
- *Staphylococcus* was the most commonly recovered bacteria with *Staph aureus* being the most common of the *Staph* species.

Bulk Tank Milk: AMR Data Interpretation

Limited breakpoint availability complicates interpretation

- AMR testing has been focused on *E. coli*, *Klebsiella* spp., *Staphylococcus aureus*, and *Streptococcus* spp.
  - Other bacterial species may be tested for AMR in the future
- Not all mastitis causing bacteria or species have available breakpoints – hence data is limited
- We are currently working to collect breakpoints for analysis
- Available breakpoints were obtained from CLSI and EUCAST; prioritizing:
  1. Human breakpoints where available;
  2. Cattle mastitis breakpoints where available
- Mastitis scoping review protocol: https://atrium.lib.uoguelph.ca/items/a8c9abb5-8cdb-4687-afd2-954b7a569728

AMR in G+ Pathogens from Bulk Tank Milk Samples

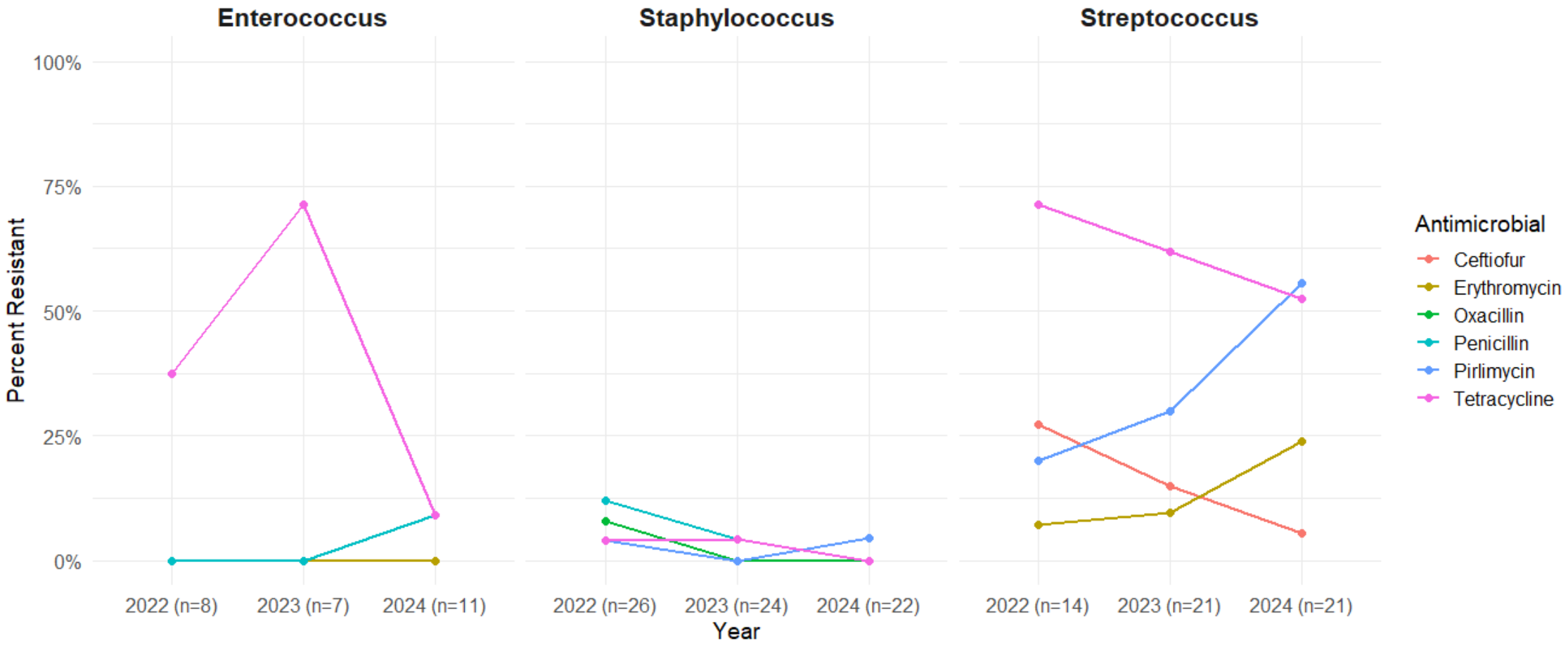
High AMR in *Strep uberis* in 2024

	Enterococcus faecalis n=3	*Enterococcus faecium* n=7	*Enterococcus italicus* n=1	*Staphylococcus aureus* n=22	*Streptococcus dysgalactiae* n=9	*Streptococcus parauberis* n=2	*Streptococcus suis* n=1	*Streptococcus uberis* n=9
Ampicillin	0%	0%	0%		0%	0%		
Penicillin	0%	14%	0%	0%				
Erythromycin	0%	0%	0%	0%	0%	50%	0%	44%
Oxacillin				0%				
Pirlamycin				5%	0%			56%
Penicillin-novobiocin								
Tetracycline	0%	14%	0%	0%	56%	100%	100%	33%
Cephalothin								
Ceftiofur				0%	0%			11%
Sulphadimethoxine								

- Highest resistance seen in tetracycline.
- For *Strep uberis* isolates, there was some level of resistance to all the antimicrobials with available breakpoints. Only 2/9 samples showed no resistance to any antimicrobial.
- **Resistance among gram-negative isolates was very low, of the 19 isolates submitted for antimicrobial susceptibility testing (AST) in 2024:**
  - 1 *Klebsiella* isolate from BC resistant to both ampicillin and tetracycline; 2 *Klebsiella* isolates from BC resistant to only ampicillin.

Comparing AMR in BTM bacteria, 2022-2024

Tetracycline resistance commonly observed across bacteria

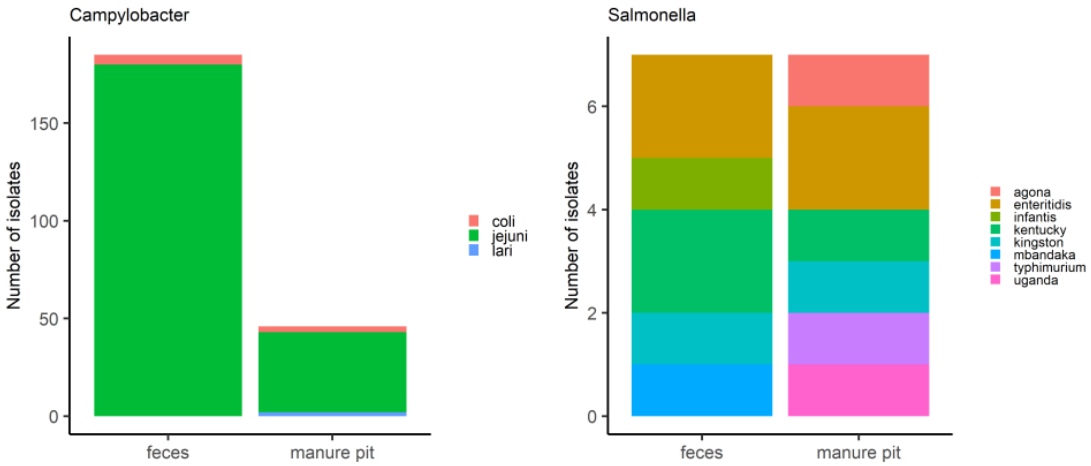


- *Streptococcus* and *Enterococcus* refer to the combined individual species for each bacteria type
- Breakpoints were not always available for every *Streptococcus* spp.; therefore, denominators differ depending on the AM considered.

Canadian Dairy Network of Antimicrobial Stewardship and Resistance

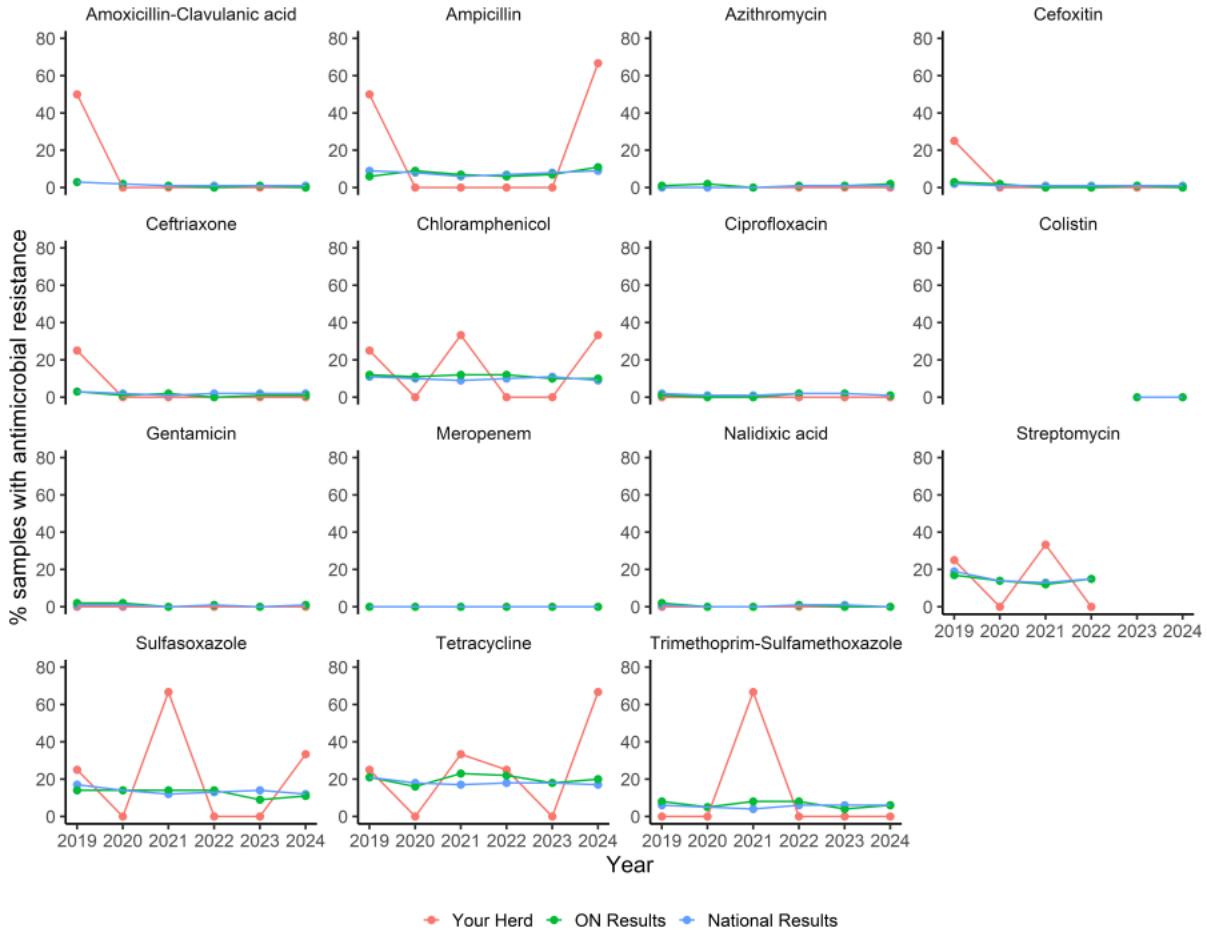
Your antibiotic resistance report 2024

Figure 1. National Speciation and Serotype Results 2024



Note: Feces represents calf, heifer, and lactating cow fecal samples combined.

Antimicrobial	Cow Manure	Calf Manure	Heifer Manure	Manure Pit	All Samples	National results
Ceftriaxone	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	2% (10/466)
Ciprofloxacin	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	1% (4/466)
Colistin	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	0% (0/466)
Amoxicillin-Clavulanic acid	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	1% (5/466)
Meropenem	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	0% (0/466)
Ampicillin	0% (0/1)	100% (1/1)	100% (1/1)	-	67% (2/3)	9% (44/466)
Azithromycin	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	1% (5/466)
Gentamicin	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	1% (5/466)
Cefoxitin	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	1% (4/466)
Trimethoprim-Sulfamethoxazole	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	6% (29/466)
Nalidixic acid	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/3)	0% (0/466)
Streptomycin	-	-	-	-	-	-
Tetracycline	0% (0/1)	100% (1/1)	100% (1/1)	-	67% (2/3)	17% (81/466)
Chloramphenicol	0% (0/1)	0% (0/1)	100% (1/1)	-	33% (1/3)	9% (43/466)
Sulfasoxazole	0% (0/1)	0% (0/1)	100% (1/1)	-	33% (1/3)	12% (55/466)



Canadian Dairy Network of Antimicrobial Stewardship and Resistance

Your antibiotic resistance report 2024

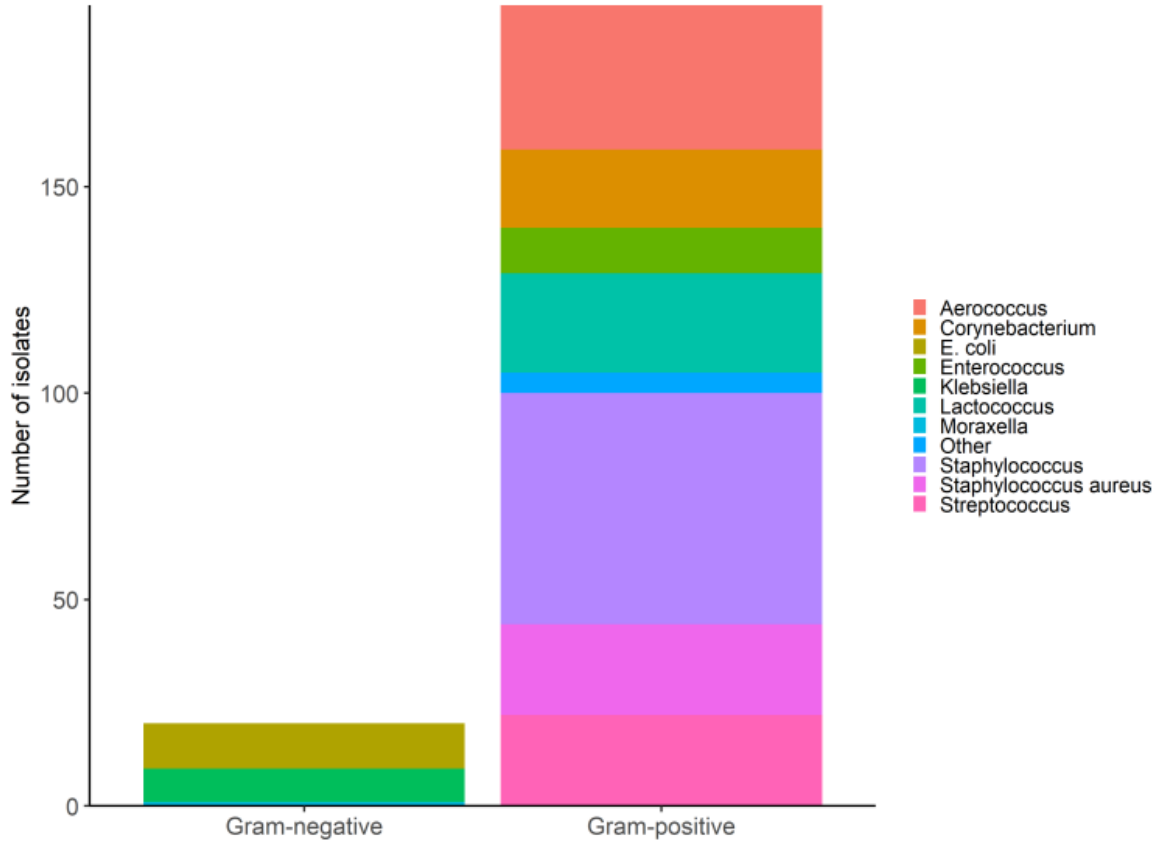
Table 6. Bulk Tank Milk Bacteria Recovered

Sample Type	Gram Negative	Gram Positive
Bulk Tank Milk	-	Staphylococcus aureus, Streptococcus uberis

Table 8. Gram Positive Bacteria

Antimicrobial	Bacteria 1	Bacteria 2	Bacteria 3
	Staphylococcus aureus	***Streptococcus uberis***	-
Ceftiofur	0/1	0/1	-
Ampicillin	-	0/1	-
Penicillin	0/1	-	-
Penicillin-Novobiocin	-	-	-
Erythromycin	0/1	0/1	-
Cephalothin	-	-	-
Oxacillin	0/1	-	-
Pirlamycin	0/1	0/1	-
Tetracycline	0/1	0/1	-
Sulphadimethoxine	-	-	-

Figure 5. National Mastitis Bacteria Results 2024



Farm-Level Antimicrobial Use Results

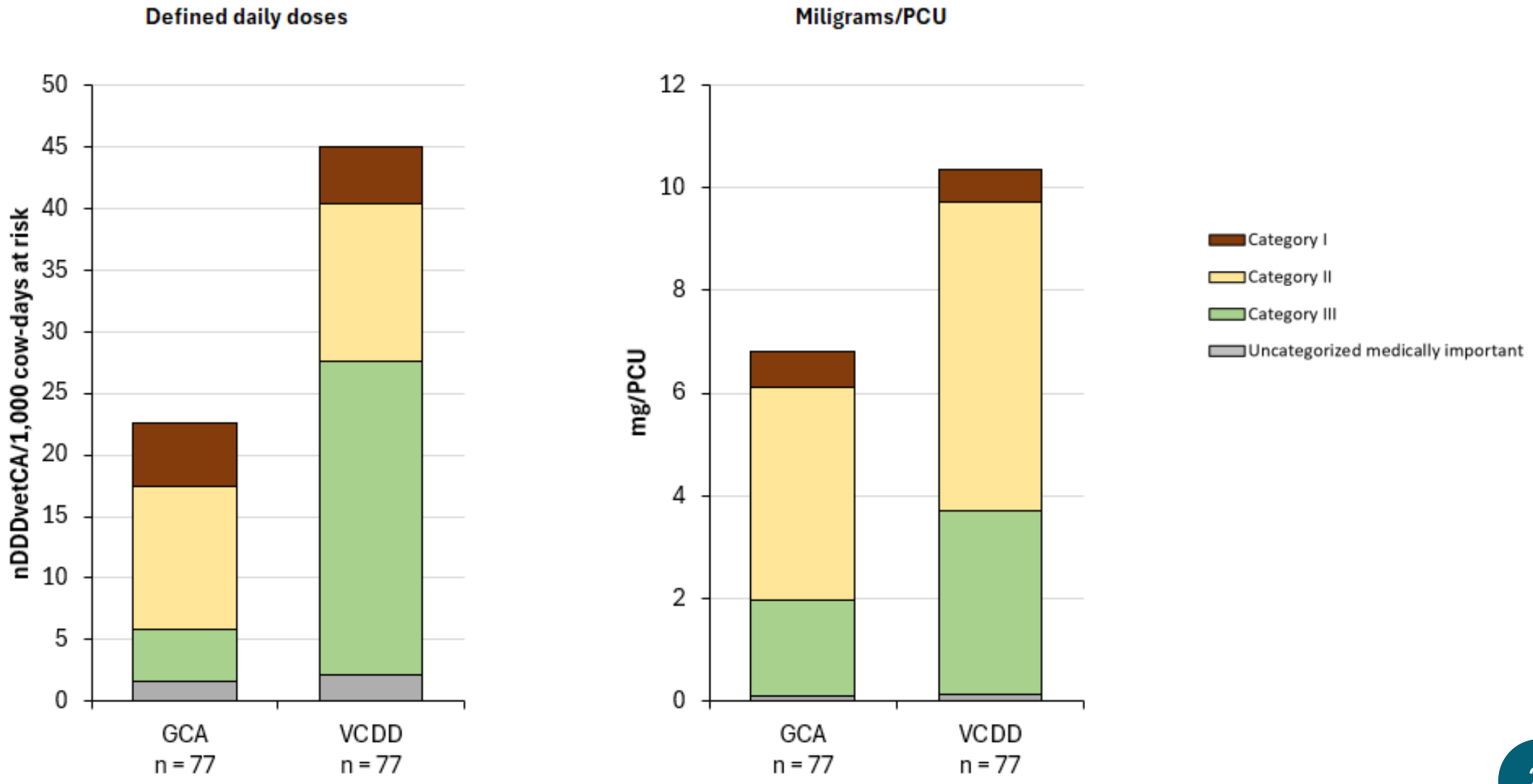
Comparison of methods to measure farm-level AMU

Measuring Antimicrobial Use

- Tracking or measuring AMU is critical to monitor changing patterns in AMU
  - Collecting this data was challenging as there was no existing framework
  - CaDNetASR did a garbage can audit (GCA) in 2019
  - Vet Clinic Dispensing Data (VCDD) explored for the period of 2019-2022
  - How this data is reported matters
    - Dose-based indicator (DDD)
    - Weight-based indicator (mg/PCU)

Comparison of Methods to measure farm-level AMU

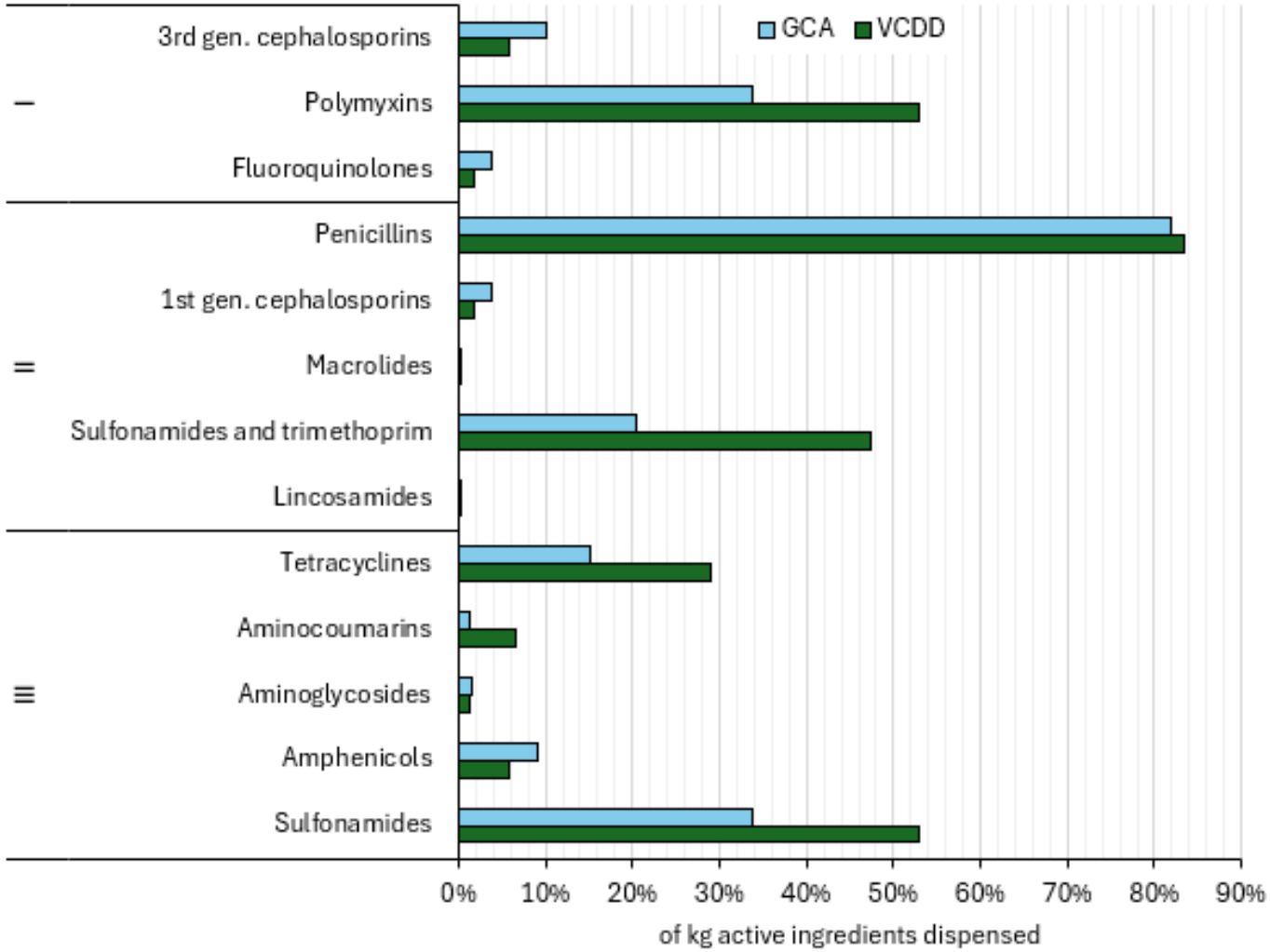
GCA VCDD Comparison



Rizzo et al. in preparation

Comparison of Methods to measure farm-level AMU

GCA VCDD Comparison- by AM class



Rizzo et al. in preparation

Next Steps

- Continue to explore methods to increase accuracy of AMU data through 2023/2024 data collection
  - Inclusion of feed mill data
  - Integration of prescription data
- Use findings to help tailor interpretations of surveillance data
  - Apply not only to global surveillance findings, but also herd/regional-level reporting
- Develop a sustainable method for AMU surveillance in dairy
  - Assess the potential to scale up AMU monitoring

AMU Reporting

Canadian Dairy Network of Antimicrobial Stewardship and Resistance

Your antimicrobial use report 2019-2022

Figure 3. Ranking of your farm in 2022 compared to all other farms

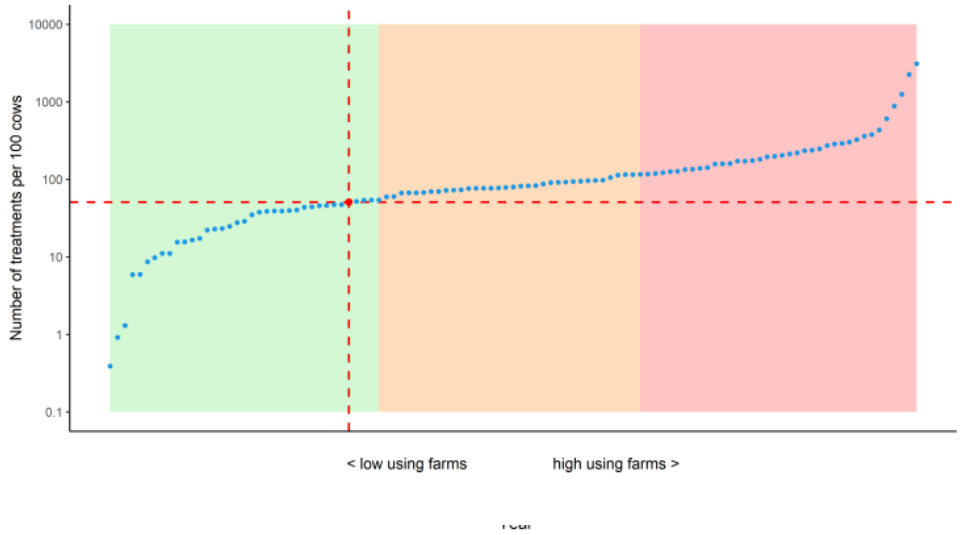


Figure 7. Antimicrobial use per production category

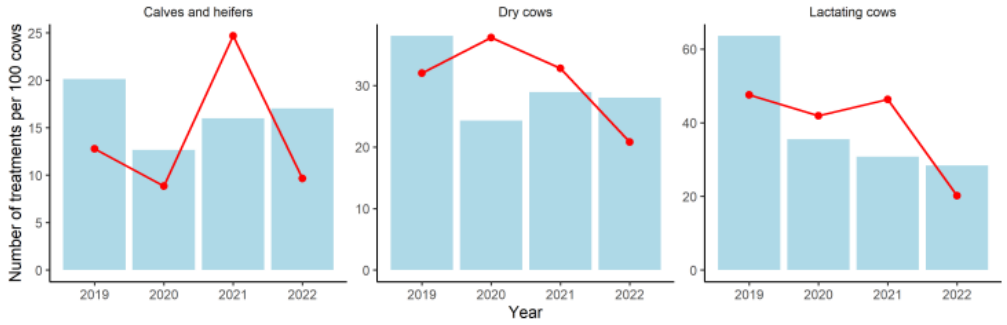


Figure 1. Your antibiotic use over time compared to the average of all other farms

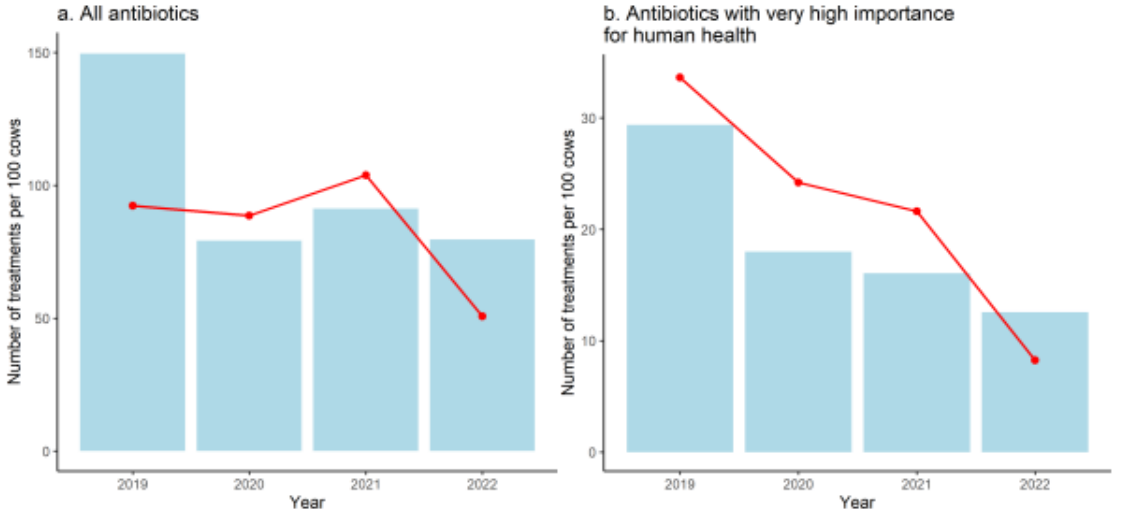
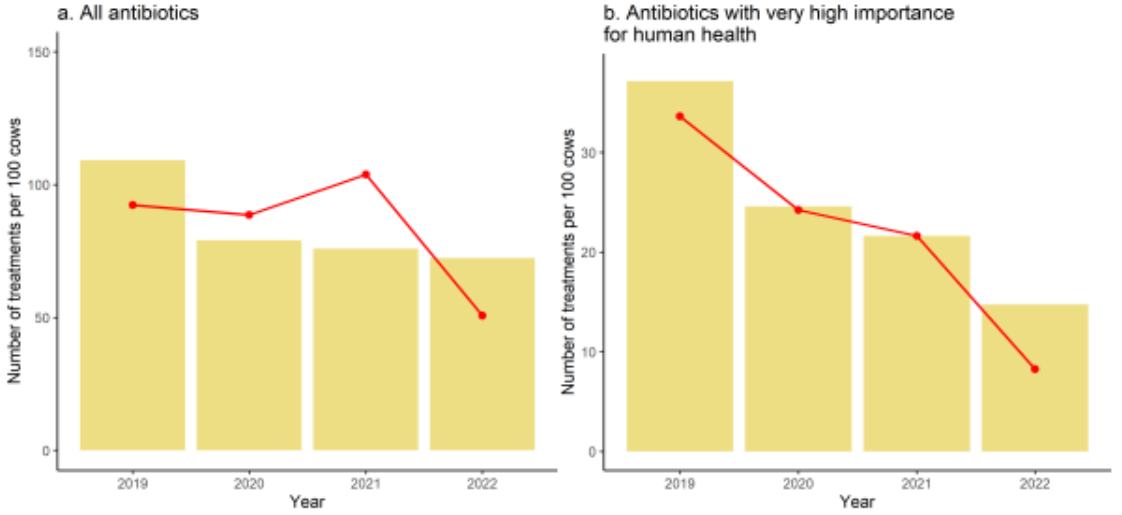


Figure 2. Your antibiotic use over time compared to the average of farms in BC



Questionnaire data: reasons for AMU

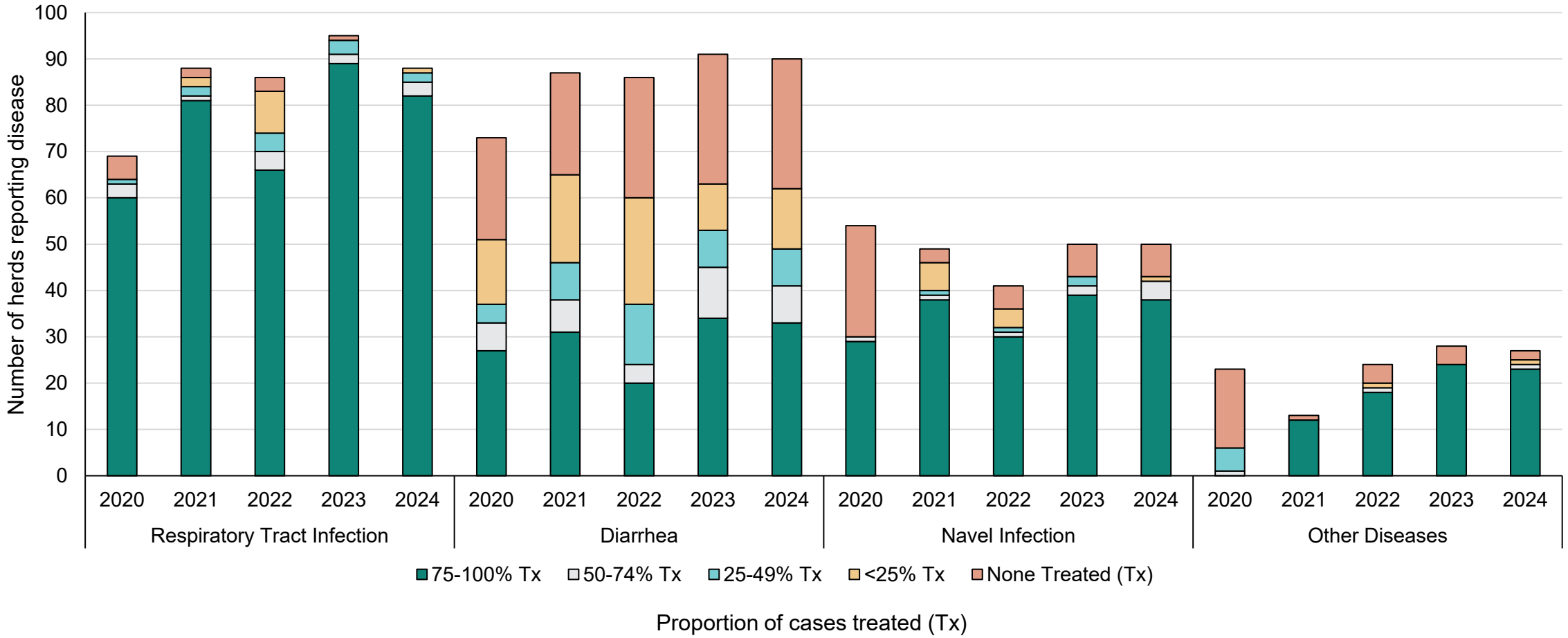
Questionnaire data is collected annually at the farm visit

- During the annual farm visit, a surveillance questionnaire is applied
- This questionnaire collects information on:
  - Herd demographics (number of animals, milking system, housing type, etc.)
  - Vaccination and biosecurity information
  - Reasons for antimicrobial use by disease category and production group

Questionnaire data: reasons for AMU - calves

Respiratory disease is a major driver of use in dairy calves

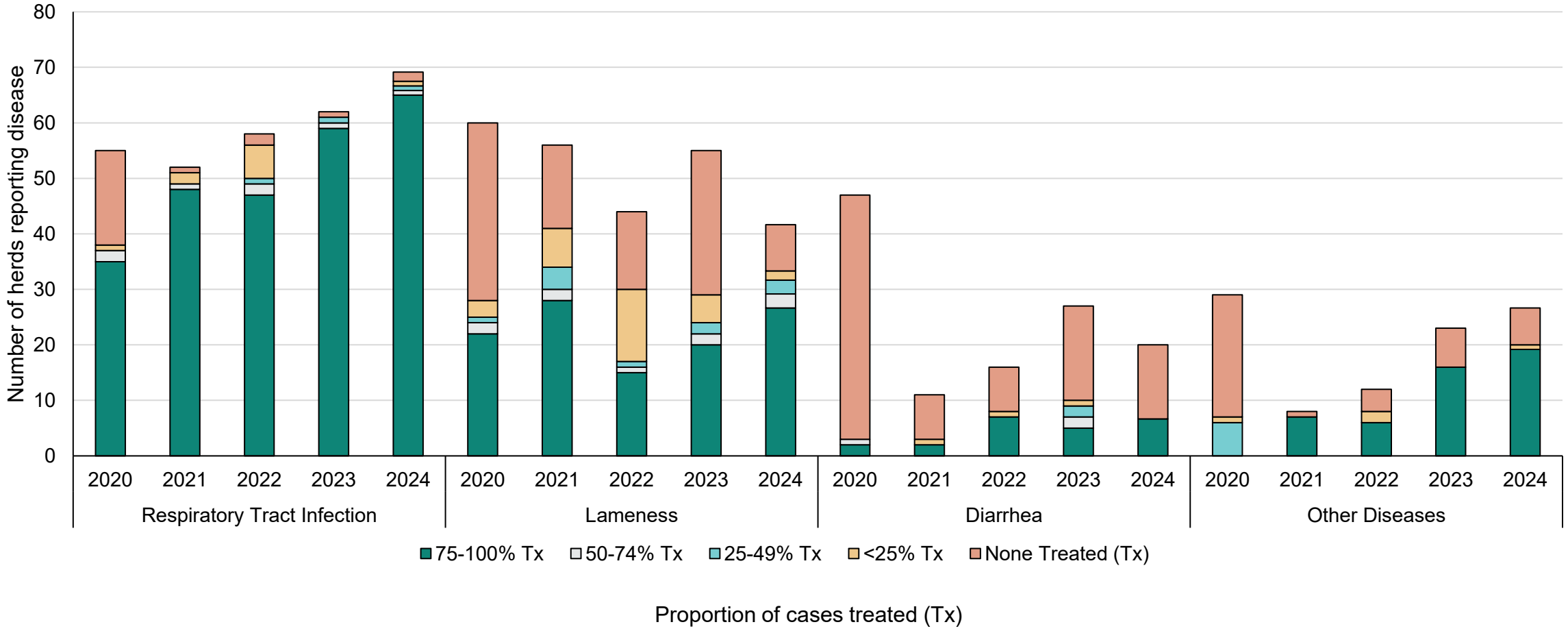
- Respiratory and intestinal infections in calves were reported by a majority of farms



Questionnaire data: reasons for AMU - heifers

Respiratory tract infections remain high drivers of use in heifers

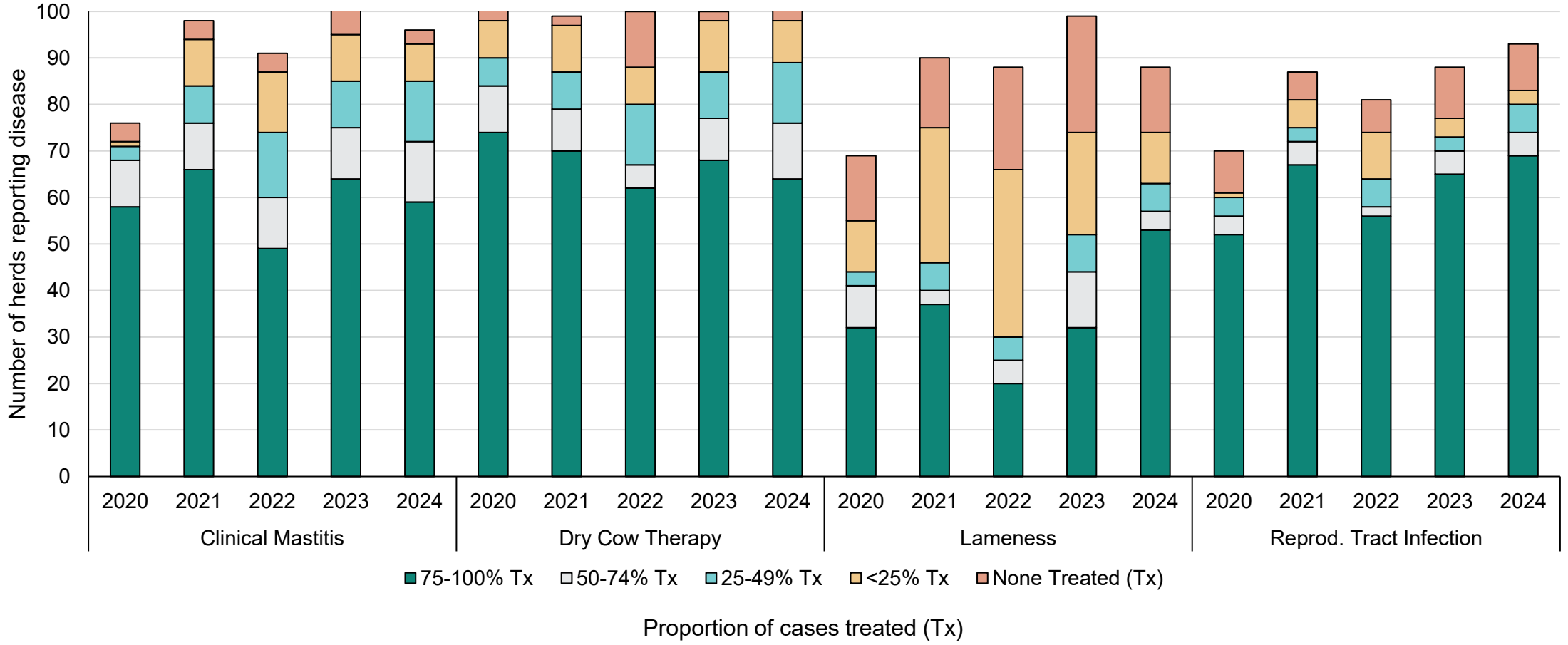
- Lameness and respiratory tract infections were reported by just over half of participating farms



Questionnaire data: reasons for AMU - cows

Clinical mastitis and dry cow therapy remain drivers of use in cows

- Clinical mastitis, dry cow therapy lameness and reproductive tract infections were reported by most of farms



Take-Home Messages – Antimicrobial Use

While differences exist between AMU data collection methods- VCDD remains the most practical/accurate

Accessing AMU data for the oral route of administration (including feed and medicated milk replacers) is challenging

Methods to increase AMU data accuracy are being continuously explored

Mastitis and dry cow therapy remain the main drivers of AMU in lactating cattle

Respiratory tract infections most often listed as reason for AMU across animal groups

Take-Home Messages – Antimicrobial Resistance

E.coli resistance is low with stable trends, but most prevalent in isolates from calves

Low *Salmonella* recovery in 2024. No recovery of *S.* Dublin to date

Emerging ciprofloxacin resistance among *Campylobacter* isolates

Large proportion of bulk tank milk sample isolates resistant to tetracycline

Coming soon!

2023-2024 AMU Data

Industry report

Stakeholder meeting

Acknowledgements

- PHAC-CIPARS
- CaDNetASR contributors
  - Prince Edward Island Laboratory
  - Field workers
  - Regional project managers
  - Academic and federal collaborators
- Dairy Farmers of Canada

Questions?

Annex

CaDNetASR veterinary dispensing data

- ~150 herds participate in the CaDNetASR program each year
- Veterinary dispensing data was obtained for ~75% of herds
- 2019-2022 data will be presented, 2023 data is pending
- **Two indicators will be presented:**
  - Defined daily doses (DDD) per 1,000 cow-days at risk
  - Milligrams per population correction unit (mg/PCU)

Example

Herd A: In 2020, used 60 bottles of a ceftiofur product on 200 lactating cows.

AMU indicator 1: mg/PCU (population correction)

- For each product, mg active ingredient is defined (for this example product: 4000 mg ceftiofur per bottle)
- Corrected for average weight at treatment (650 kg per lactating cow)

$$\frac{\sum total\ annual\ mg\ dispensed}{\sum population\ corrected\ unit} = \frac{60\ bottles\ \times 4000\ mg\ = 240{,}000\ mg}{200\ cows\ \times 650\ kg = 130{,}000\ PCU} = 1.8\ mg/PCU$$

AMU indicator 2: defined daily doses

- Each product has been assigned a 'DDD' (for this example product: 650 mg per cow per day)
- Corrected for number of animals at risk (200 cows across the whole year)

$$\frac{\sum total\ annual\ DDD}{\sum(herd\ size \times 365)} = \frac{240{,}000\ mg\ /\ 650\ mg = 370\ doses}{200\ cows\ \times 365 = 73{,}000\ cow\ days\ at\ risk} \times 1{,}000\ = 5.1\ DDD\ /\ 1{,}000\ cow\ days\ at\ risk$$

Antimicrobials used on dairy farms

Category 1
Very high importance

Cephalosporins (3rd and 4th gen)

Excenel
Excede 200
Eficur
Ceftiocyl
Cevaxel
Spectramast (LC and DC)

Fluoroquinolones

A180
Baytril
Baytril oral
Forcyl

Polymixins

Special Formula

Category 2
High importance

Aminoglycosides

Cocci scour bolus
Calf scour bolus
Neo sulfalyte
Gentocin

Cephalosporins (1st and 2nd gen)

Metricure
Cefa-Lak
Cefa-Dri
ToDay

Macrolides

Draxxin
Micotil
Tylan
Zactran
Zuprevo

Lincosamides

Pirsue
LS100

Trimethroprim-Sulfamethoxazole

Borgal
Trimidox
Norovet TMPS
Super booster

Penicilins

Depocillin
Dupcillin
Dry Clox
Novodry
Polyflex
Procaine
Procillin

Category 3
Medium importance

Phenicols

Florkem
Nuflor
Resflor

Sulfonamides

After calf bolus
Calfspan
Sustain bolus

Tetracyclines

Bio-mycin
Cyclospray
Kelamycin
Liquamycin
Tetra-250
Onycin
Oxymycin (LA and LP)
Oxyvet (100 and 200)

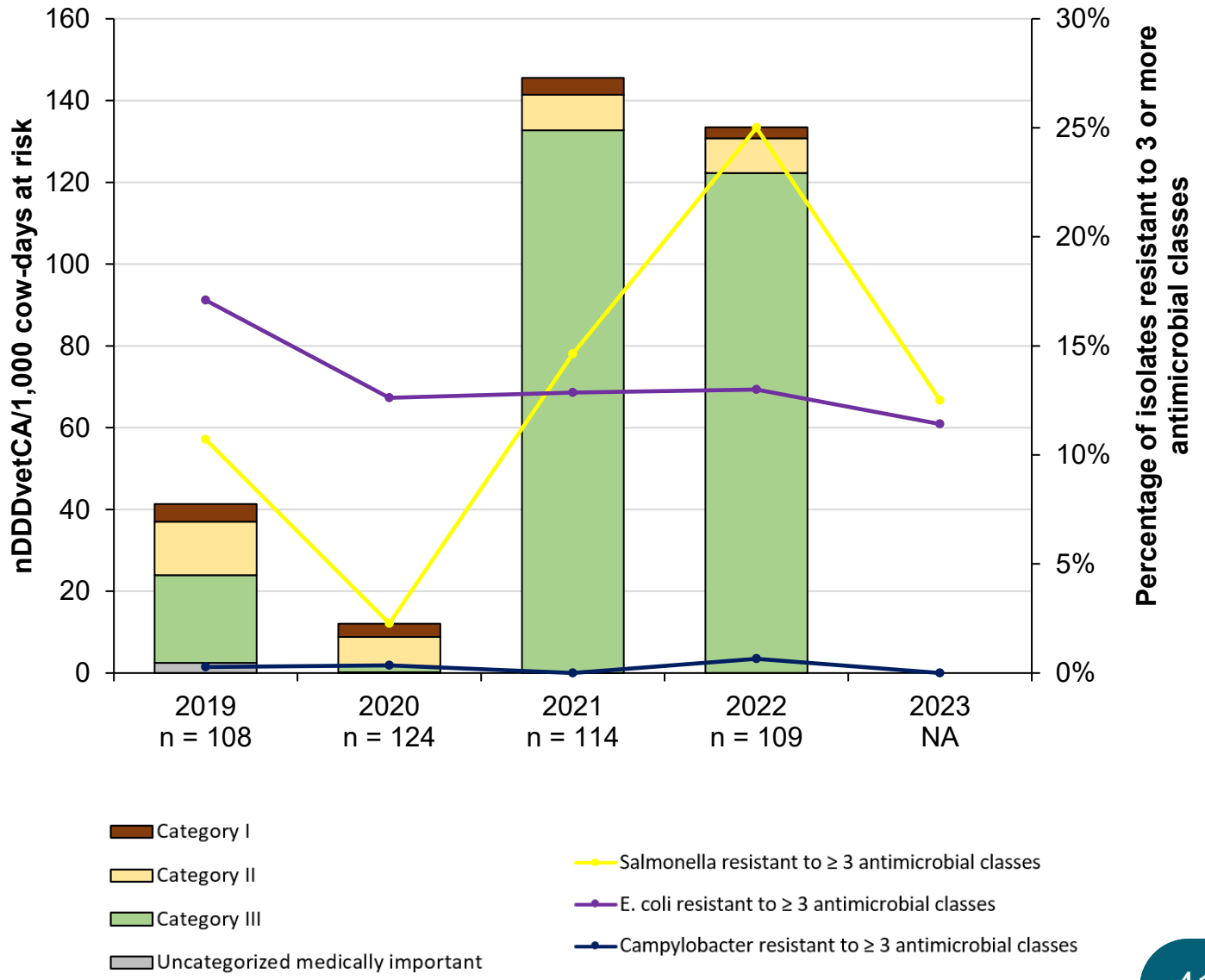
Trimethoprim

Categorization system developed by Health Canada's Veterinary Drugs Directorate

Integrated findings AMU and multiclass AMR

AMU increase due to increased reporting oral tetracyclines in feed and water

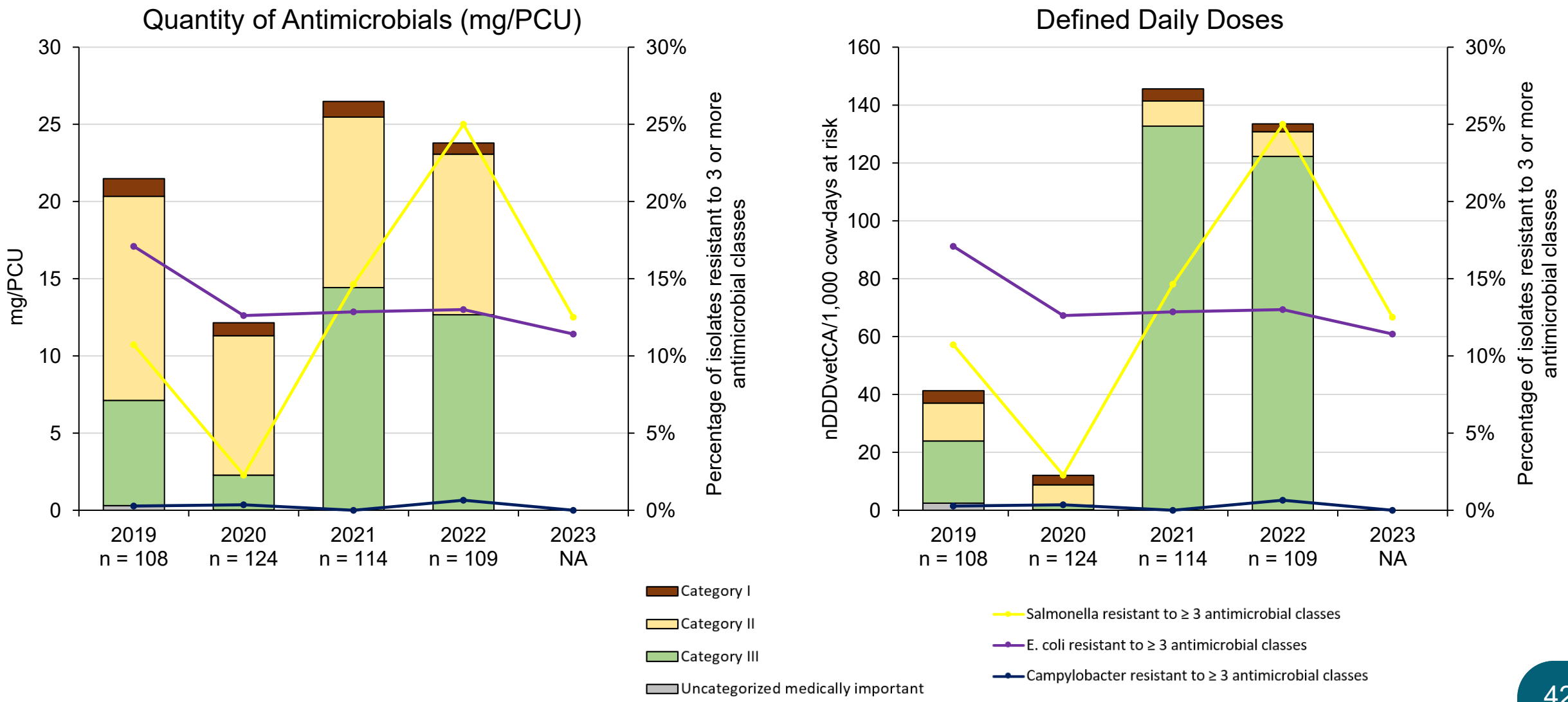
- AMU includes all production classes (calves, heifers, lactating cows, dry cows)
- Multiclass resistance covers fecal samples (not bulk tank milk)



Source: 2019 – 2022 CaDNetASR veterinary dispensing data

Comparing AMU indicators

AMU impacted by indicator used

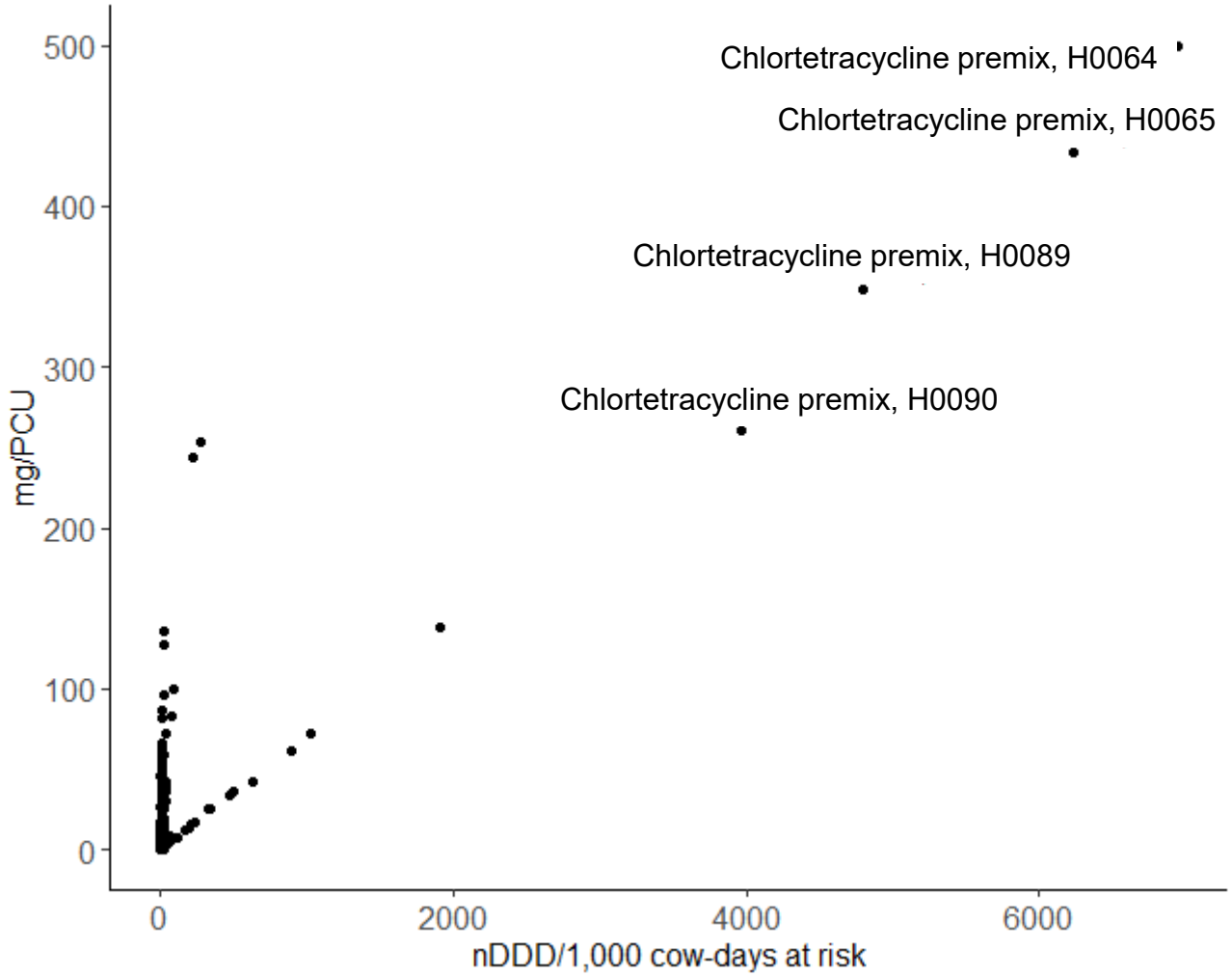


Source: 2019 – 2022 CaDNetASR veterinary dispensing data

Comparing AMU indicators

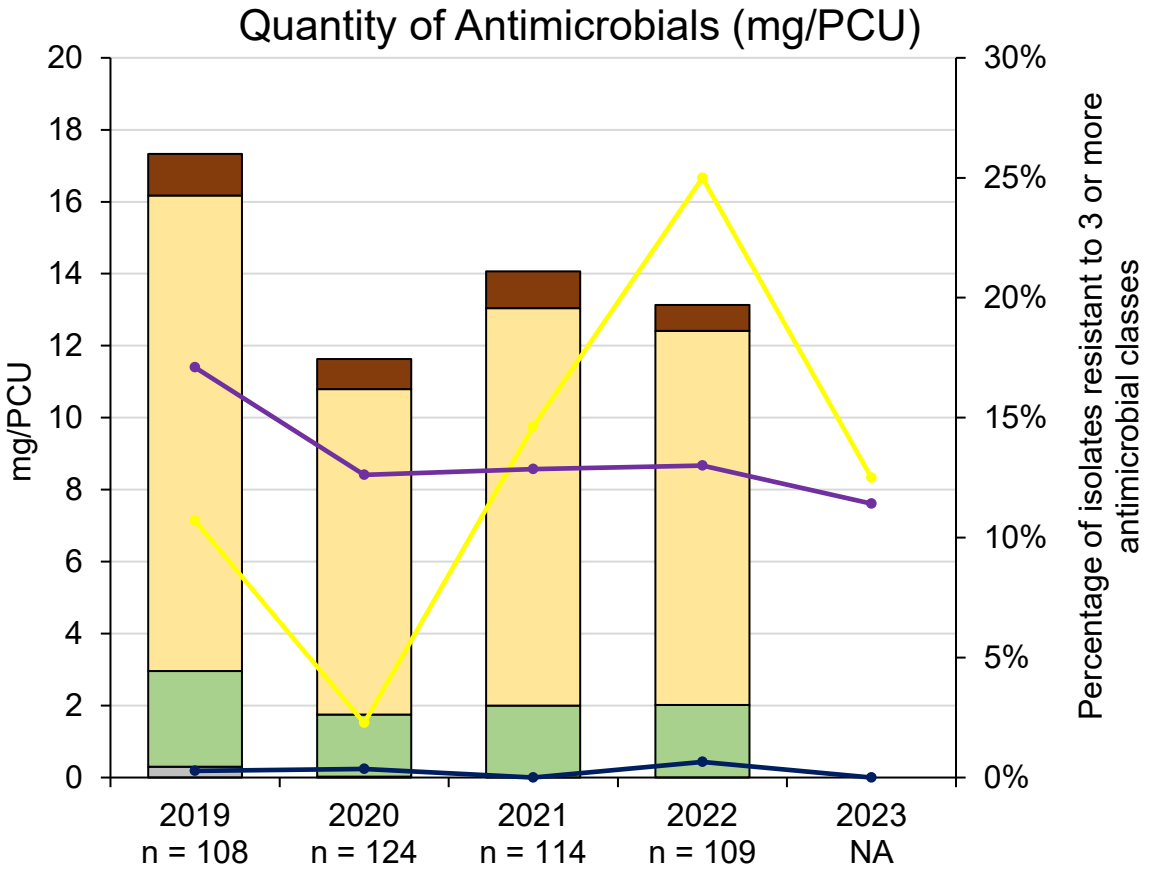
Category 3 oral tetracyclines impact the differences between the AMU indicators

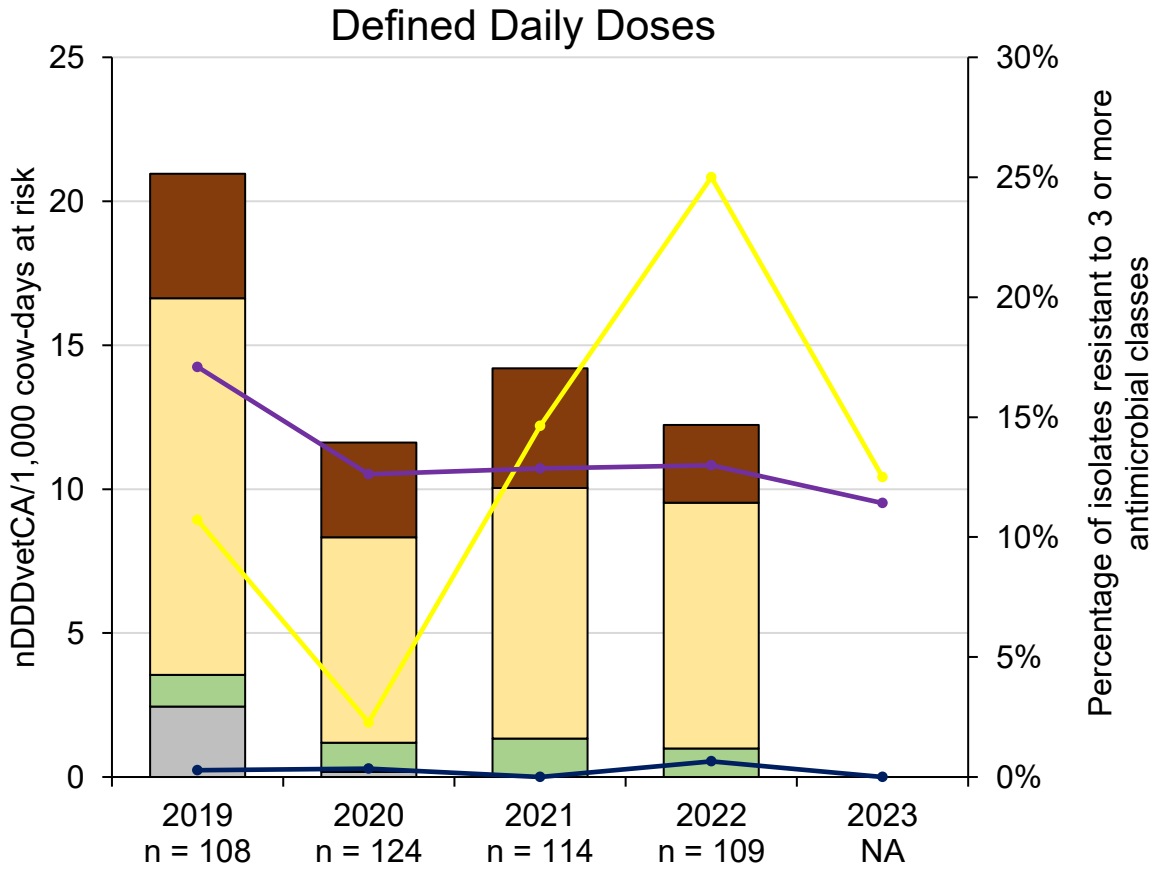
- Chlortetracycline premix products
- Low DDD (90 mg per animal per day)
- Typically administered to groups of animals
- Purchased and used in large quantities
- Few herds responsible for increase in total Category III use



Source: 2019 – 2022 CaDNetASR veterinary dispensing data

Comparing AMU indicators– removing oral tetracycline



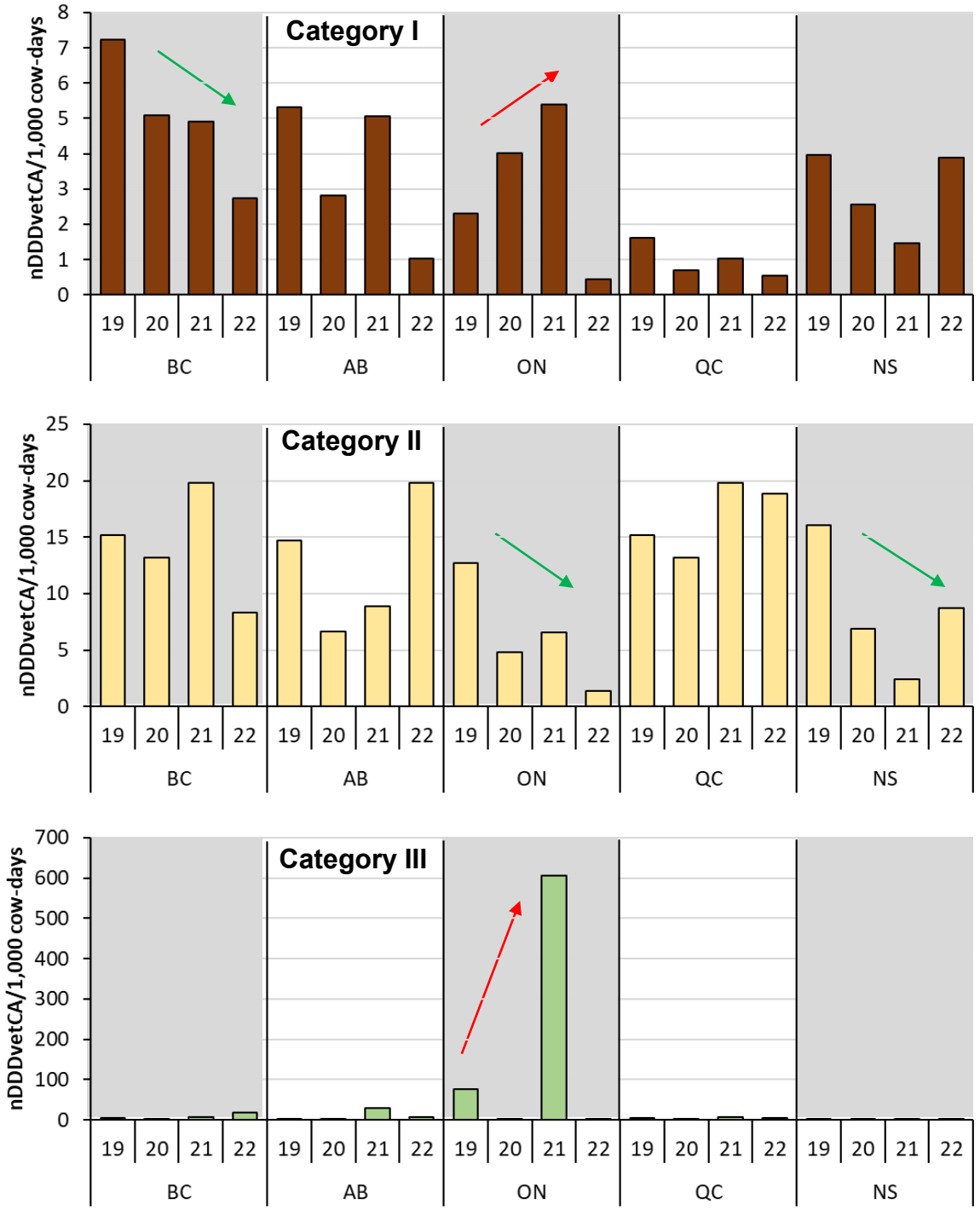


Source: 2019 – 2022 CaDNetASR veterinary dispensing data

AMU per province

Proportion of farms using Category I decreased

- Includes all production classes (calves, heifers, lactating cows, dry cows)
- Proportion of farms using Category I antimicrobials has decreased between 2019 (94%) and 2022 (85%)
- Proportion of farms using Category II antimicrobials has remained stable between 2019 (99%) and 2022 (98%)
- Despite the under reporting prior to 2021, proportion of farms using Category III antimicrobials has decreased between 2019 (84%) and 2022 (77%)



Source: 2019 – 2022 CaDNetASR veterinary dispensing data

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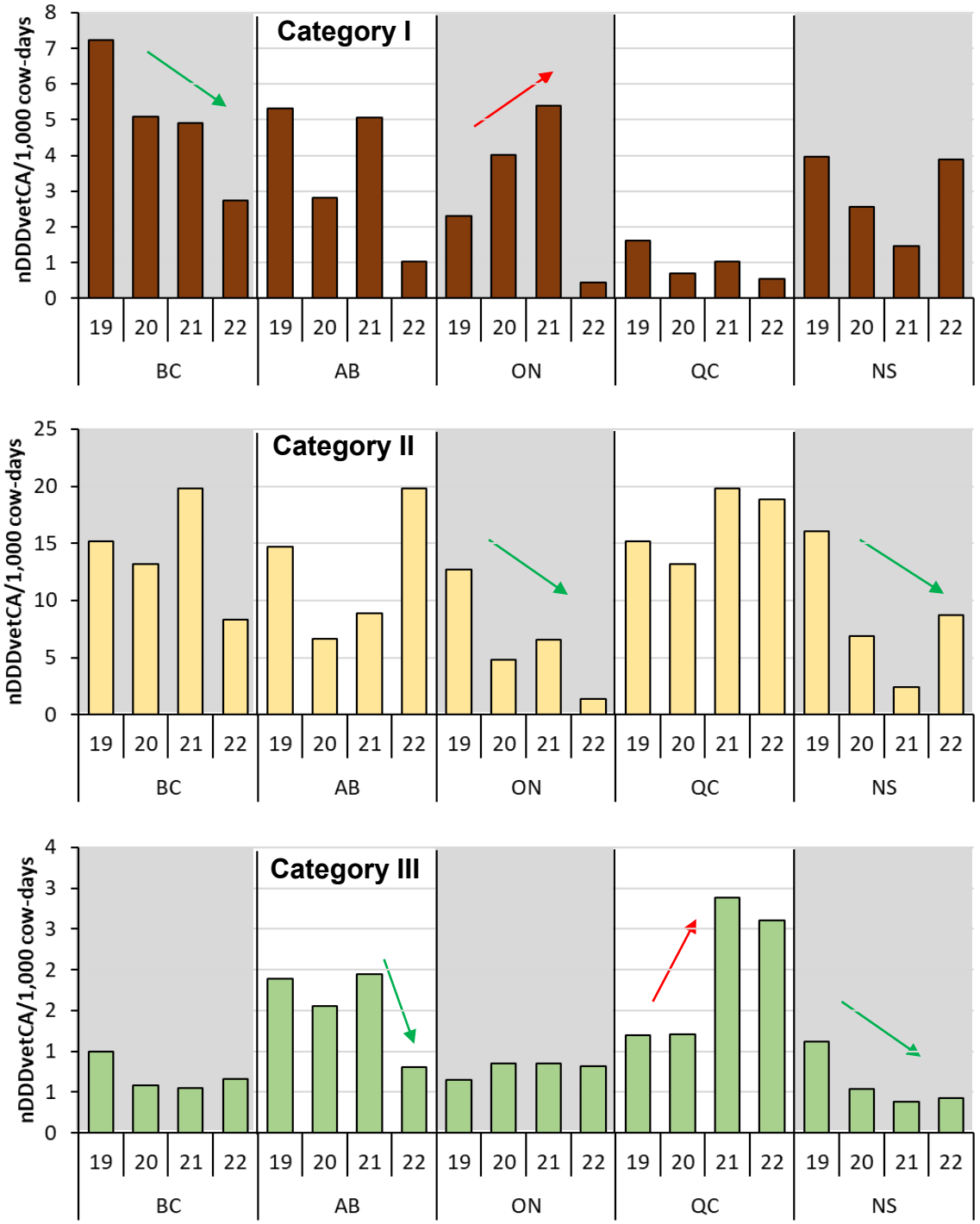
Without oral tetracycline



Source: 2019 – 2022 CaDNetASR veterinary dispensing data

AMU per antimicrobial class

Reduction in cephalosporins and fluoroquinolones 2019-2022

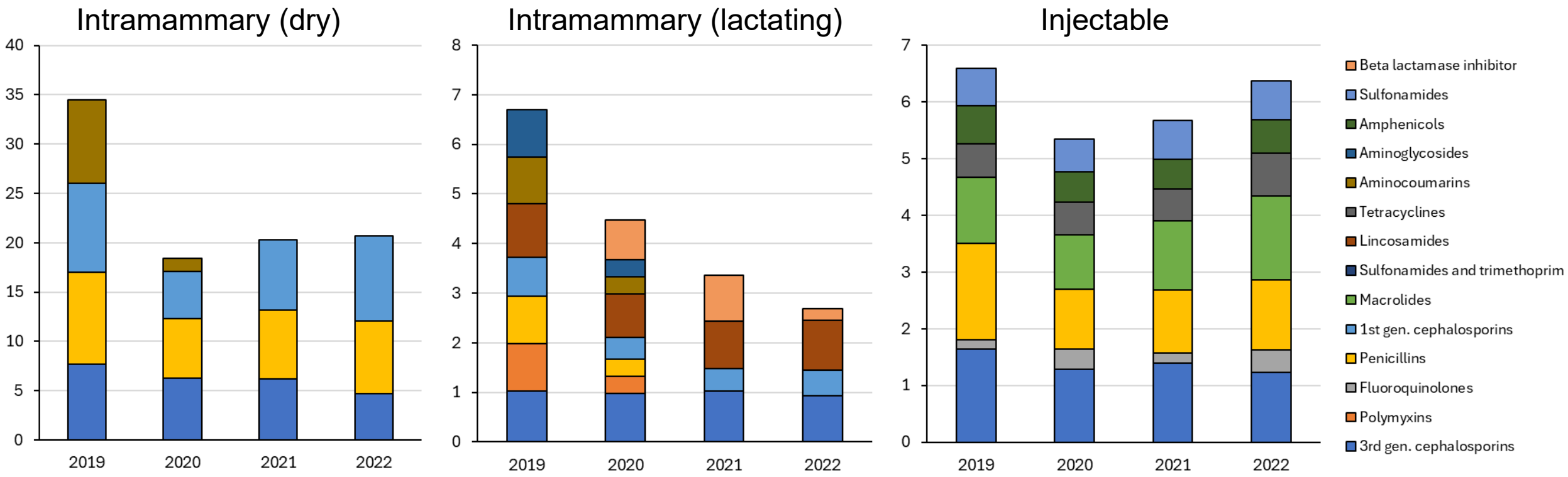
DDDvetCA/1,000 cow-days at risk

		2019	2020	2021	2022	% change (2019 - 2022)
Category I	3rd gen. cephalosporins	3.82	3.16	4.12	2.67	-30%
	Polymyxin B	0.47	0.08	0.00	0.00	-100%
	Fluoroquinolones	0.03	0.05	0.02	0.03	5%
Category II	Penicillins	6.47	3.93	3.92	3.64	-44%
	1st gen. cephalosporins	3.73	1.90	2.82	3.38	-9%
	Macrolides	0.56	0.44	0.61	0.58	3%
	Sulfonamides and trimethoprim	0.53	0.45	0.54	0.54	3%
Category III	Lincosamides	0.24	0.24	0.17	0.20	-16%
	Tetracyclines	20.71	0.91	132.0	121.5	487%
	Aminocoumarins	2.45	0.18	0.00	0.00	-100%
	Aminoglycosides	1.56	0.19	0.64	0.20	-87%
	Amphenicols	0.46	0.39	0.36	0.40	-13%
	Sulfonamides	0.32	0.18	0.35	0.35	10%
	Beta lactamase inhibitor	0.00	0.00	0.02	0.00	N/A

Source: 2019 – 2022 CaDNetASR veterinary dispensing data

AMU per antimicrobial class, stratified by route of administration

Less antibiotic products available for intramammary treatments dry and lactating cows



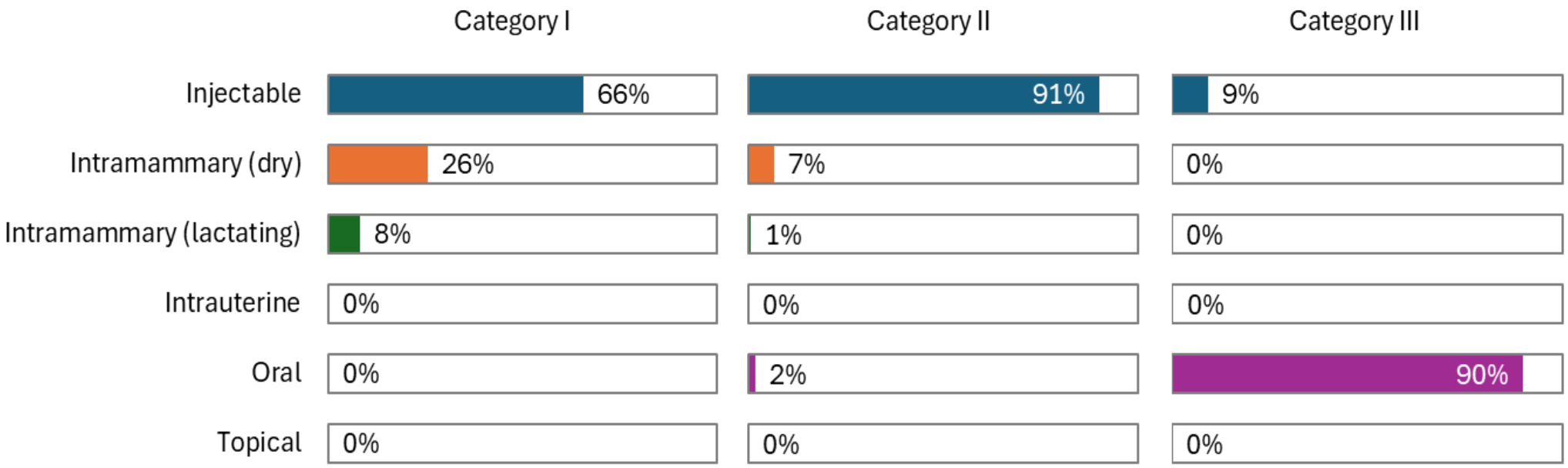
DDDvetCA/1,000 cow-days at risk

Source: 2019 – 2022 CaDNetASR veterinary dispensing data

Administration routes & category of importance

Most Category I and II products are injectables

Percentage of total kg active ingredients sold

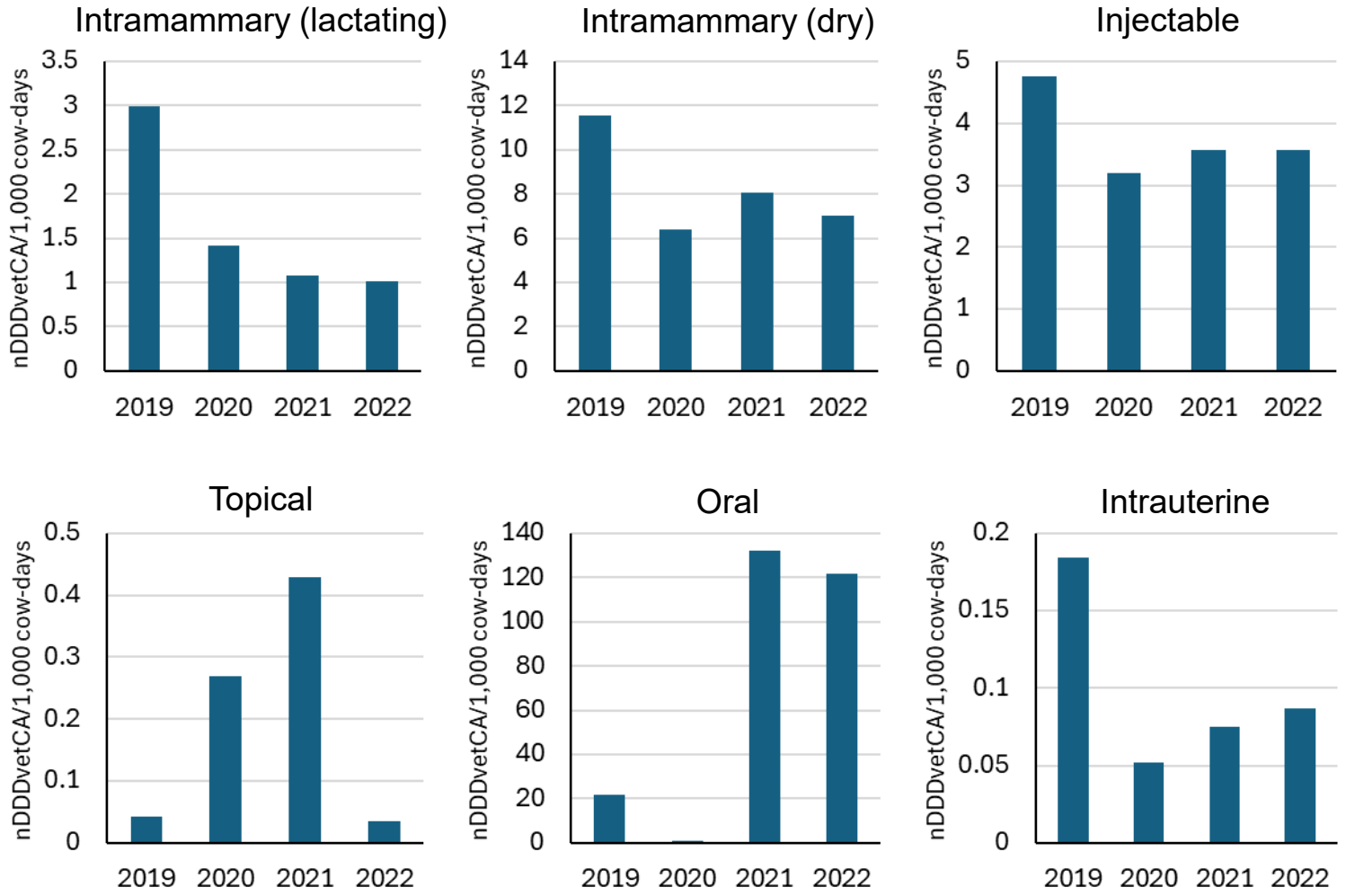


Source: 2022 CaDNetASR veterinary dispensing data

AMU per administration route

Reduction in intramammary and injectable use

- Includes all production groups (calves, heifers, lactating cows, dry cows)
- Oral and topical products are almost exclusively Category III

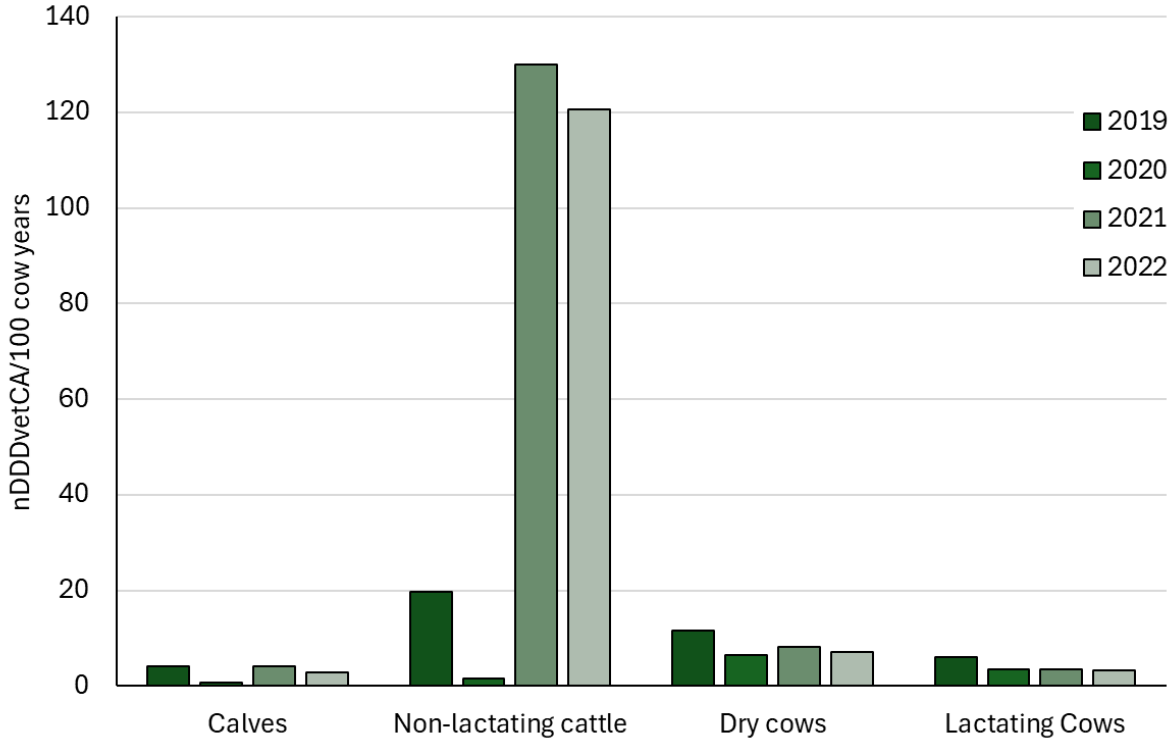


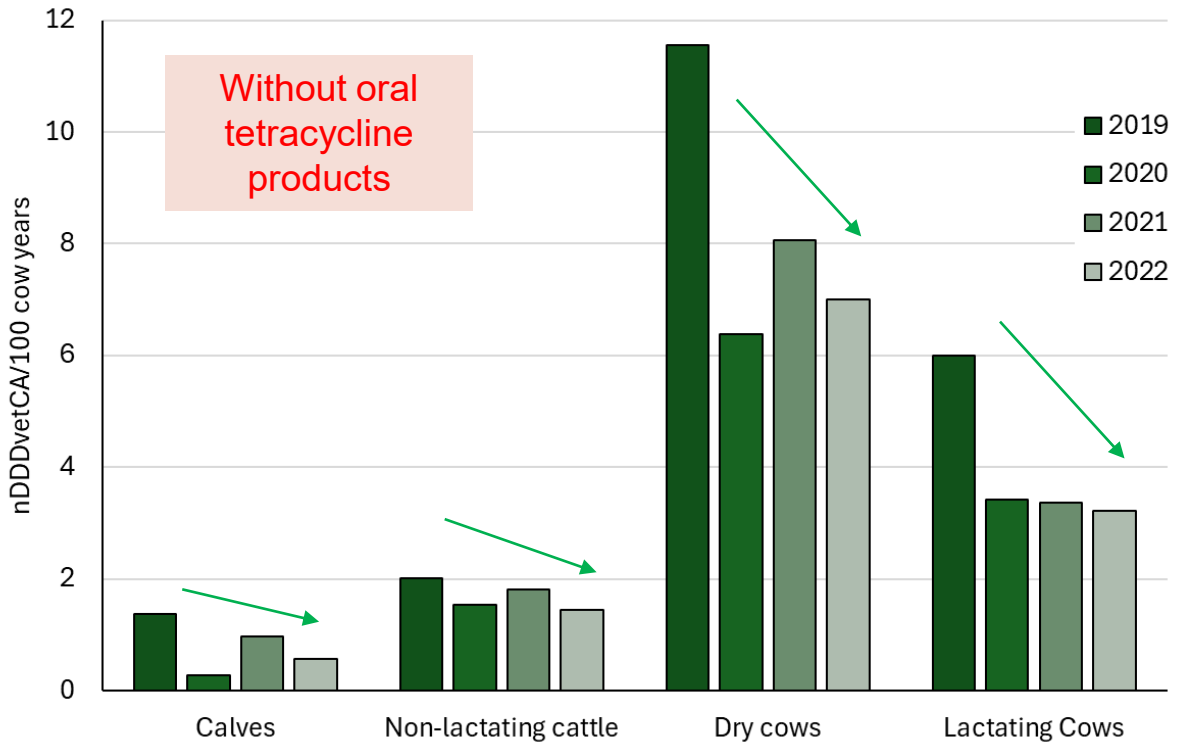
Source: 2019 – 2022 CaDNetASR veterinary dispensing data

AMU per production class

Decrease across production groups when excluding oral tetracycline

- Majority of use is attributed to dry cow therapy
- Non-lactating cattle includes products with designation ‘not for use in dairy/lactating cows’ which are frequently used in calves and heifers



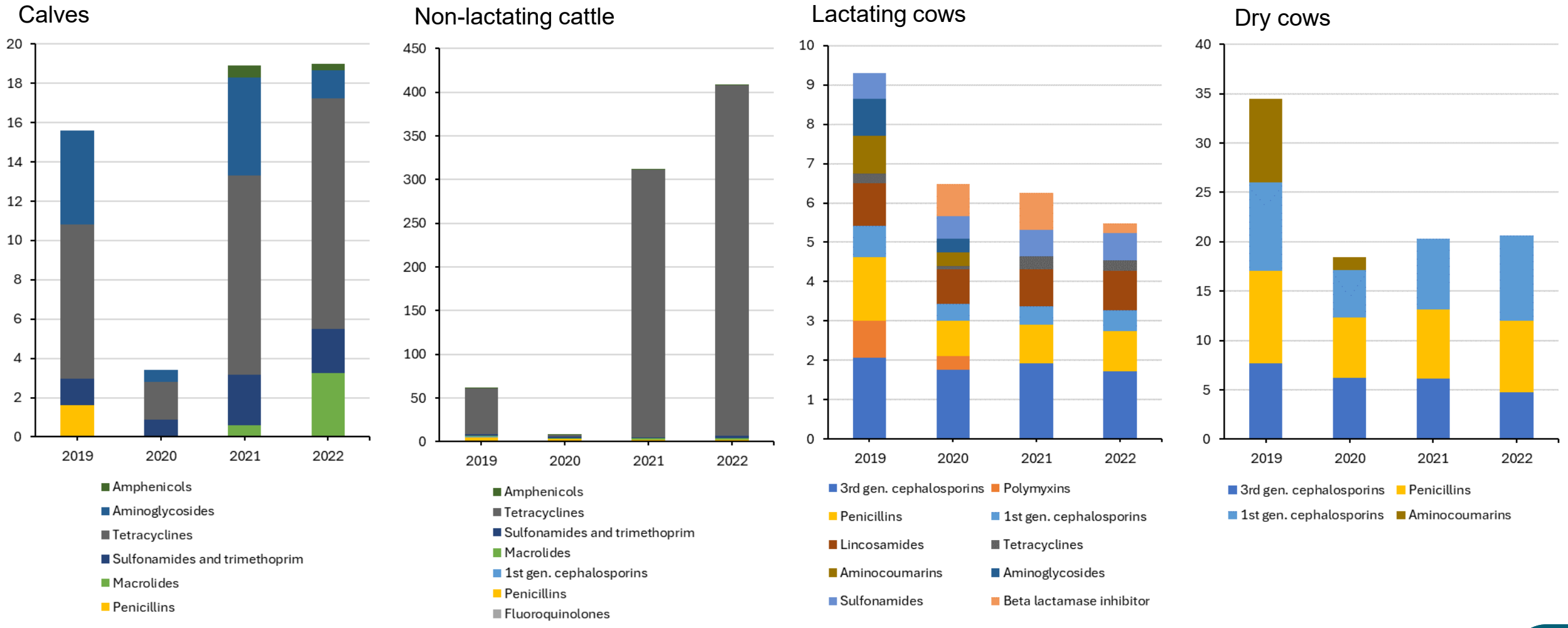


Source: 2019 – 2022 CaDNetASR veterinary dispensing data

AMU per antimicrobial class, stratified by production group

Tetracyclines used mainly in calves and non-lactating cattle

DDDvetCA/1,000 cow-days at risk



Source: 2019 – 2022 CaDNetASR veterinary dispensing data

Veterinary Antimicrobial Sales Reporting: Dairy Cattle

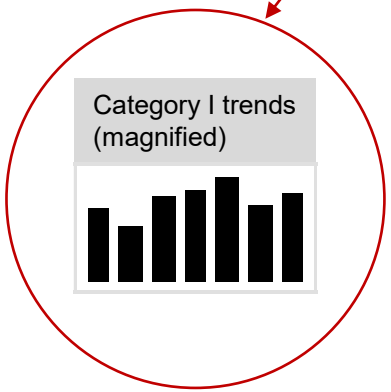
Similar conclusions drawn from VASR data

Sales for dairy cattle are primarily Category II and III antimicrobials.

- Top classes (as of 2024) include tetracyclines, TMS, and penicillins

Sales are primarily for use by injection, followed by use in water and in feed.

Category I antimicrobial sales are for intramammary use and use by injection.



Category of Importance	Trends (mg/kg biomass) 2018-2024
Category I (very high importance)	
Category II (high importance)	
Category III (medium importance)	
Uncategorized Medically Important	

*Uncategorized medically important antimicrobial sales not shown due to confidentiality

Veterinary Antimicrobial Sales Reporting: Dairy Cattle

Putting our dairy data into perspective

National veterinary sales data (VASR), 2024

kg sold

1. Pigs
2. Beef cattle
3. Poultry
4. Aquaculture
5. Dairy cattle
6. Cats and dogs
7. Veal calves
8. Horses
9. Small ruminants

mg/kg biomass

1. Aquaculture
2. Pigs
3. Veal calves
4. Beef cattle
5. Cats and dogs
6. Poultry
7. Dairy cattle
8. Small ruminants
9. Horses

Take-Home Messages – Antimicrobial Use

First presentation of comprehensive results since the start of program

Total category I and II use has fluctuated between 2019 and 2022

Fewer herds used Category I antimicrobials in 2022 (vs. 2019)

Dry cow therapy remains responsible for majority of antimicrobial use

Differences between provinces present

Underreporting of oral tetracyclines prior to 2021 complicates comparisons over time

Accessing feed mill data (including medicated milk replacers) is challenging

Respiratory tract infections most often listed as reason for use across animal groups