Antimicrobial Use and Stewardship (AUS)

Dairy Sustainability Summit

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24 Mar 2026

Wh

®

This Photo b

Remember SB27 from 2015?

- Put **additional restrictions on antimicrobial use** in California starting in 2018, beyond national regulations in effect at the time

- Highly contentious!

- This topic – *antibiotic resistance* – is here to stay…

Berkner et al. Antibiotic resistance and the environment – there and back again. 2014. EMBO Reports, 15(7).


Got
AUS?

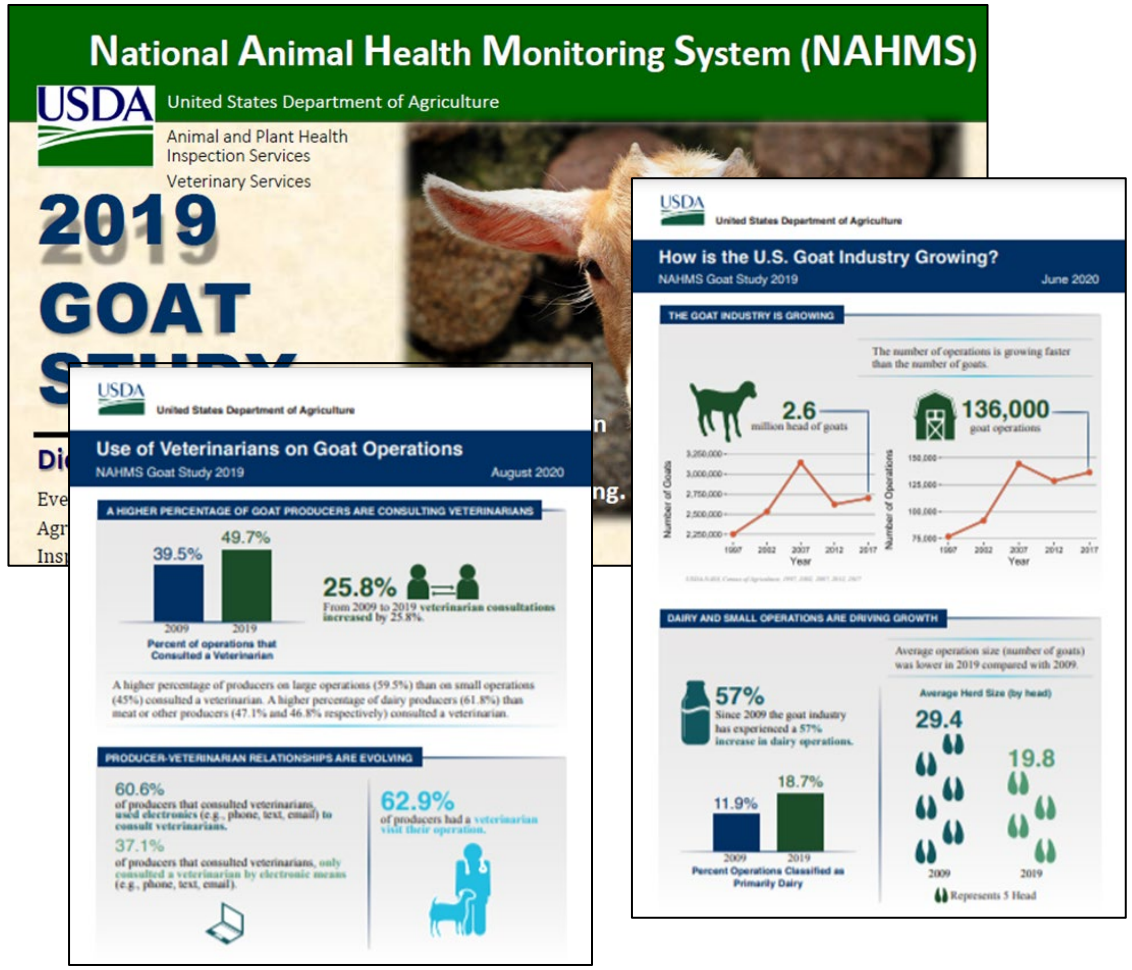
AUS mandates under the law

- Coordinate, don’t duplicate

AUS collaboration with federal efforts

NAHMS 2019 Goat Study

- Collaborated with USDA National Agriculture Statistics Service (NASS) and USDA National Animal Health Monitoring System (NAHMS) to expand the 2019 Goat Study in CA
- Gathered information on the goat industry:
- Nearly 50 field staff from CDFA Animal Health Branch and USDA Veterinary Services from across the state collaborated to complete on-farm visits
- NAHMS analyzed their data
  - National-level information was published by NAHMS
  - State-level Information was shared with AUS as appropriate



NAHMS Feedlot 2021 & NAHMS Sheep 2024

CA-specific results from Goat Study 2019

USDA NAHMS 2019 Goat Study: Veterinarian Use

In the USDA NAHMS Goat study, **56.2%** of California goat operations consulted a veterinarian for any reason related to goat health, productivity, or management in the 12 months prior to survey administration. Details of these results include:

Veterinarian use by operation size

43.5% of small operations (5 - 19 head)

66.7% of medium operations (20 - 99 head)

70.4% of large operations (100 head or more)

Veterinarian use by primary production of the operation

60.5% of meat goat operations

55.0% of dairy goat operations

48.4% of "other" goat operations

USDA NAHMS 2019 Goat Study: Antibiotic Use

In the USDA NAHMS 2019 Goat study, **36.1%** of California goat producers reported ***not*** using antibiotics during the 12 months prior to survey administration.

Producers that reported *not* using antibiotics by operation size

48.0% of small operations (5 - 19 head)

25.3% of medium operations (20 - 99 head)

29.5% of large operations (100 head or more)

Producers that reported *not* using antibiotics by primary production of the operation

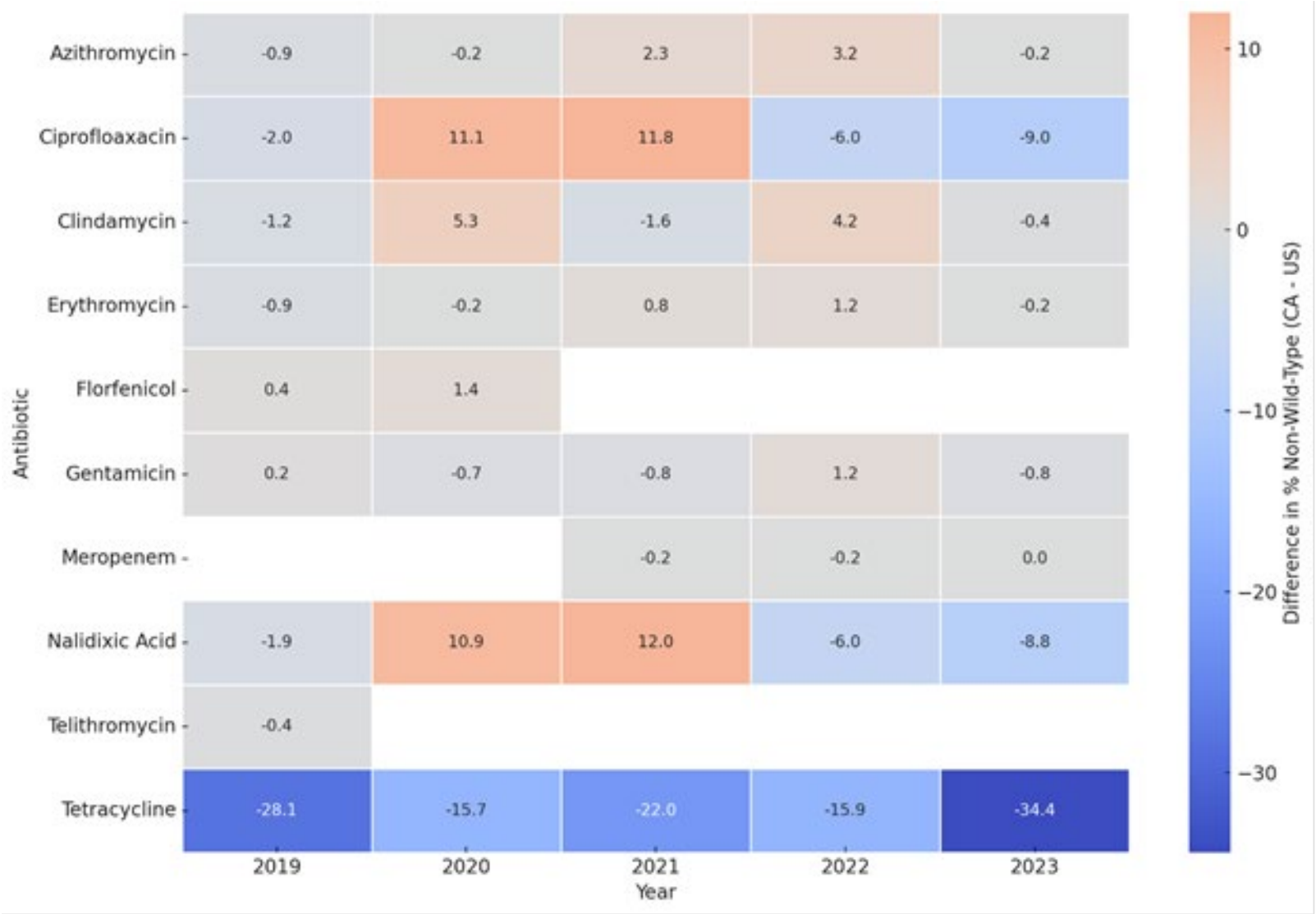
37.1% of meat goat operations

43.7% of dairy goat operations

26.6% of "other" goat operations

NARMS reports – NEW! Unprecedented!

Heat Map of Non-Wild-Type Difference in *Campylobacter* NARMS Cecal Isolates Cattle Slaughtered in California vs. US NARMS Data (excluding CA), 2019-2023



AUS mandates under the law

- Coordinate, don't duplicate ✓
- Develop a **surveillance** (monitoring) program to collect data on:

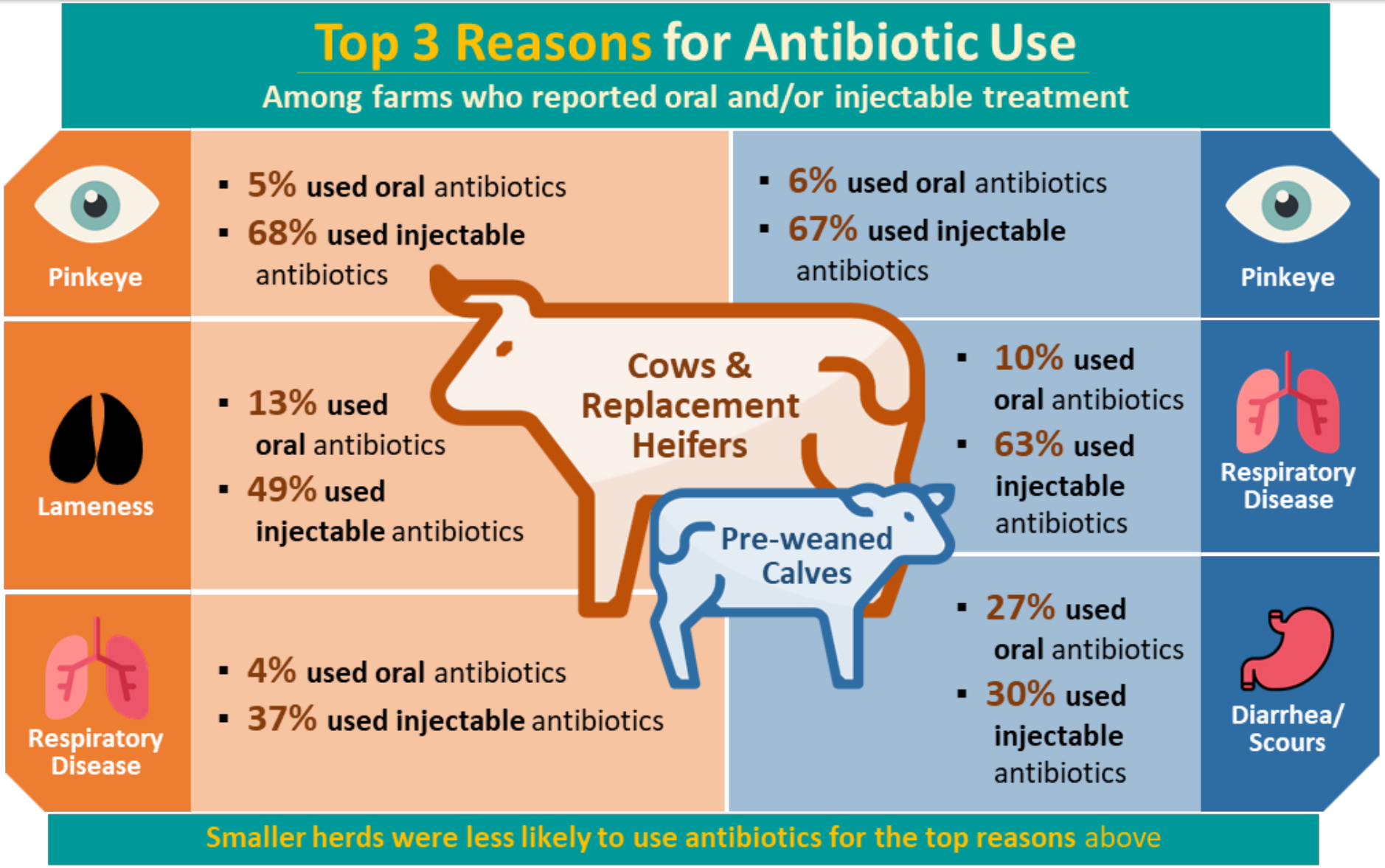
Use of medically important antimicrobial drugs (MIADs)

Animal management practices and health outcomes

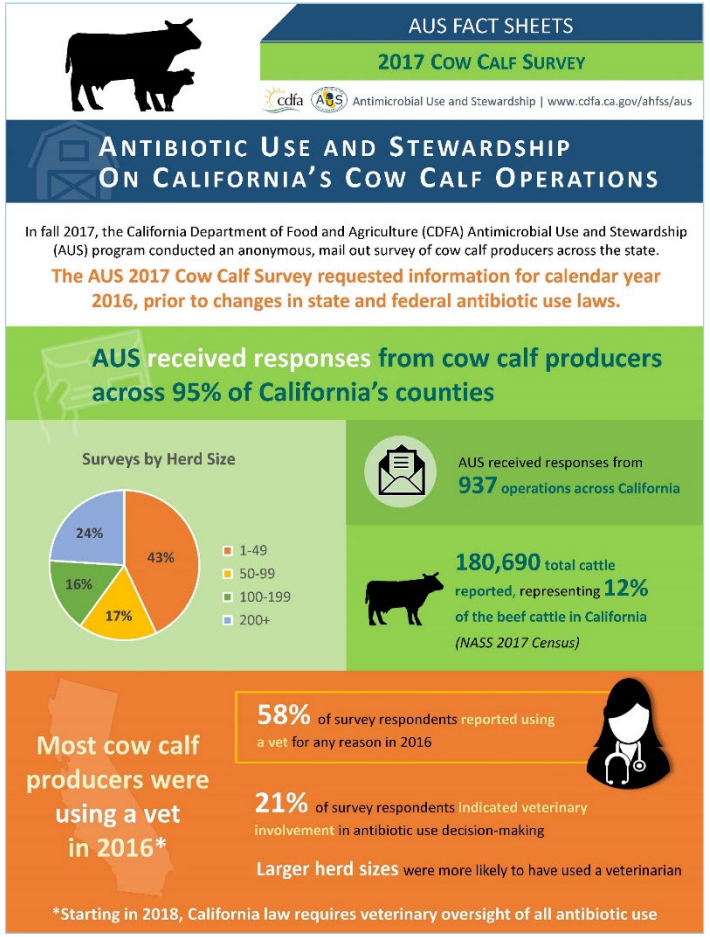
Trends in antimicrobial resistance

Sales of medically important antimicrobial drugs

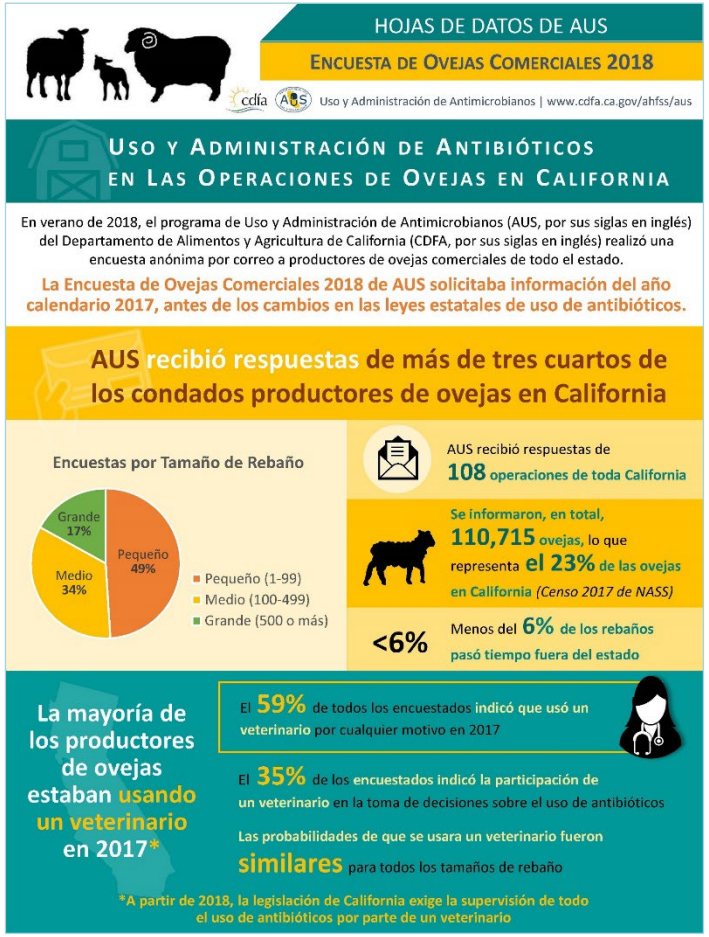
Oral and/or injectable antibiotic use – Cow-calf (2017 survey)



Cow-calf and Sheep Fact Sheets



- One-page fact sheets
- Highlight findings from AUS' Cow Calf and Commercial Sheep surveys
- English + Spanish

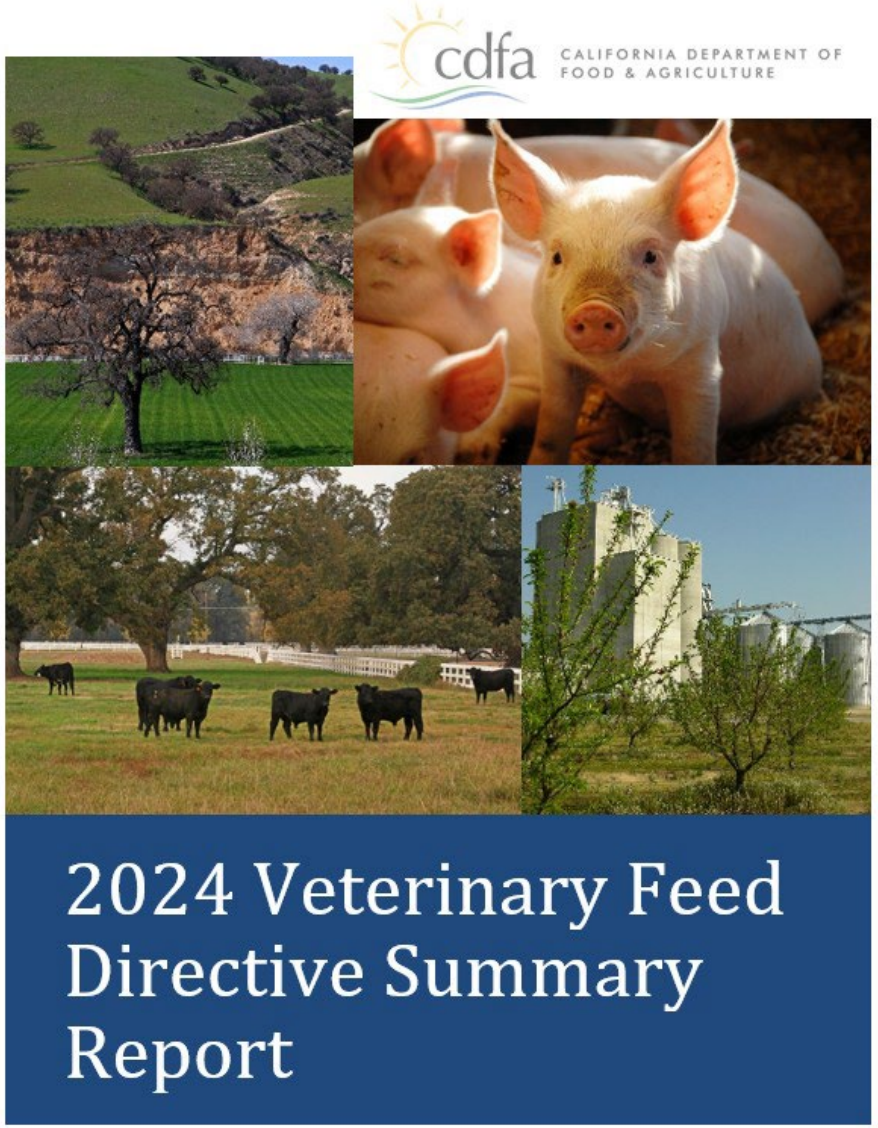


AUS Annual VFD Report

AUS is the first program to **span two CDFA divisions**: the **Inspection Services Division (ISD)**, which handles regulation, inspection, compliance, and enforcement; and the **Animal Health and Food Safety Services Division (AHFSS)**, which focuses on stewardship, surveys and studies, judicious use, and best on-farm practices.

The divisions work cooperatively to promote public health and welfare via a safe and stable food supply for California.

https://www.cdfa.ca.gov/ahfss/aus/vfdresources/



Weaned dairy heifers

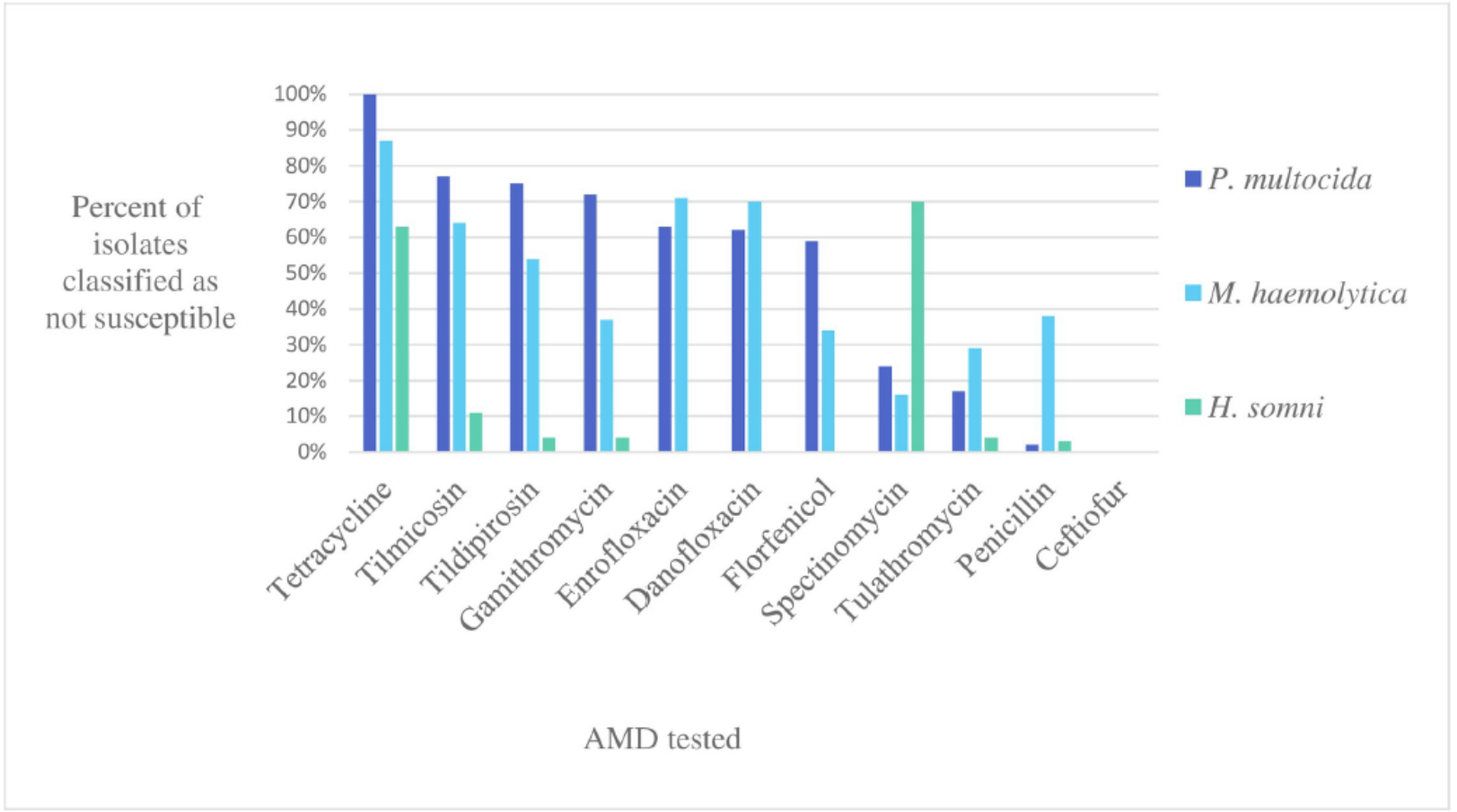


Fig 1. Percent of respiratory isolates classified by CLSI breakpoints as not susceptible (resistant or intermediate) to 11 antimicrobial drugs tested by broth microdilution method. *P. multocida* (n = 145), *M. haemolytica* (n = 119), *H. somni* (n = 97). AMD = antimicrobial drug.

https://doi.org/10.1371/journal.pone.0260292.g001

Depenbrock, et al. "In-vitro antibiotic resistance phenotypes of respiratory and enteric bacterial isolates from weaned dairy heifers in California." 2021. PLoS ONE: 16(11): e0260292. https://doi.org/10.1371/journal.pone.0260292

Research & CAHFS

- Research studies
  - Both AMU & AMR in multiple species / prod'n classes
  - Stewardship projects to develop outreach

Total AUS Funds Spent by:		$'s	%
Cattle	$	3,673,213.91	36%
Non Cattle	$	3,231,793.25	32%
CAHFS	$	3,207,548.66	32%
Sub Totals	$	10,112,555.82	
Non UC $s	$	1,819,269.78	18%
UC $s	$	8,293,286.04	82%
Totals	$	10,112,555.82	

- Topics relevant to cattle have included
  - *Salmonella* Dublin
  - BRD
  - mastitis
  - fecal *E. coli*

AUS ACHIEVEMENTS SINCE PROGRAM INCEPTION
through June 30, 2023

Awarded over **$6,100,000** to support AUS-focused research

Nearly **$2,600,000** to fund antimicrobial susceptibility testing capacities at CAHFS

Over **8,430** bacterial isolates tested in AUS-funded projects

Over **23** peer-reviewed papers published on AUS-funded research

Over **2,530** producers and farms engaged

Over **3,270** attendees reached

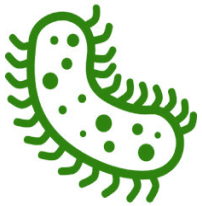
June 2023: FDA follows California in bringing MIADs under veterinary oversight nationally

AUS mandates under the law

- Coordinate, don't duplicate ✓
- Develop a **surveillance** (monitoring) program to collect data on:

Use of medically important antimicrobial drugs (MIADs) ✓

Animal management practices and health outcomes ✓

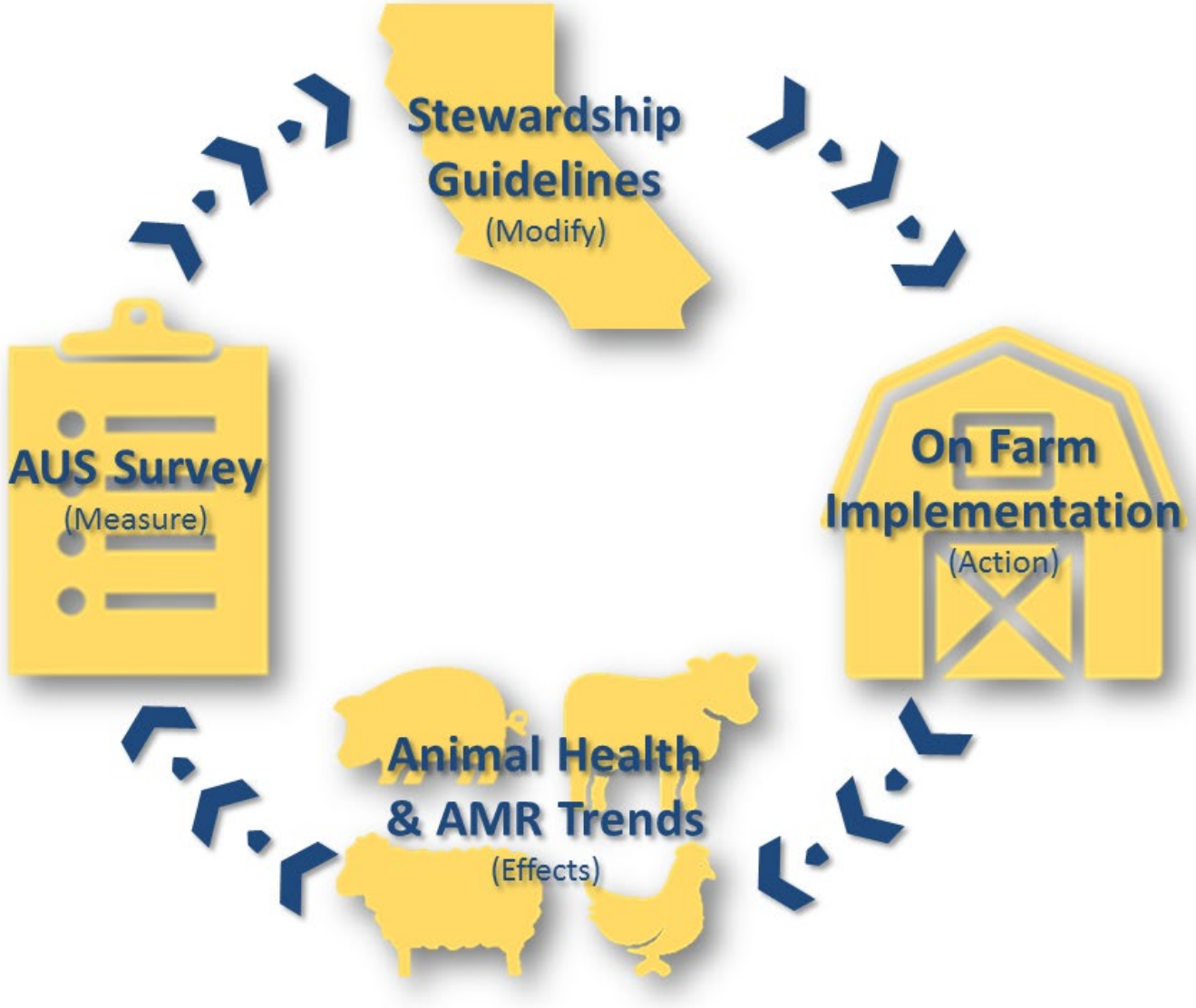


Trends in antimicrobial resistance ✓

Sales of medically important antimicrobial drugs ✓

- Develop a **stewardship** program and outreach/educational materials based on scientifically validated information

How is AUS fulfilling the law?



How data becomes guidance…

Cow Calf Pinkeye: Strategies for Management

References: Sheedy et al. 10.1016/j.animal.2021.10024

Also known as bovine keratoconjunctivitis (IBK)

Signs:
- Tearing
- Closed or squinted eye
- Reddening of the white part of the eye
- Eye ulcers

Possible consequences:
- Slower rate of weight gain due to pain
- Production loss
- Cost of treatment

GENERAL STRATEGY

Consider the logistics of management and the **costs** of treating pinkeye (expense, labor) while making a strategic **plan with your veterinarian** for reducing pinkeye in your herd

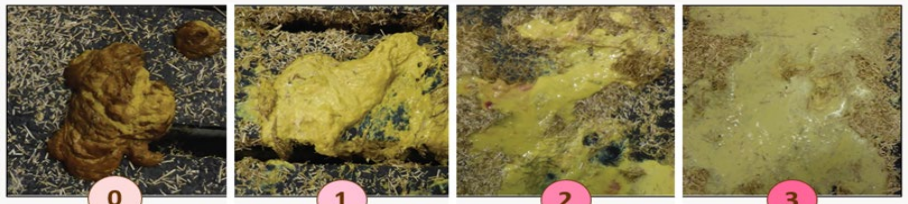
RISK FACTORS

Age	Calves are affected more often than older cattle
Breed	Hereford cattle are more at risk due to lack of pigment around their eyes
Season	Warm months and increased sunlight favor infection
Flies	Face flies increase the risk of pinkeye

Beef Cattle Scours: Strategies for Management

Visual description of fecal consistency score. A score of **≥2** indicates the presence of diarrhea.

From: Renaud D.L. et al. Technical note: Is fecal consistency scoring an accurate measure of fecal dry matter in dairy calves? J Dairy Sci, 103 (11) 2020



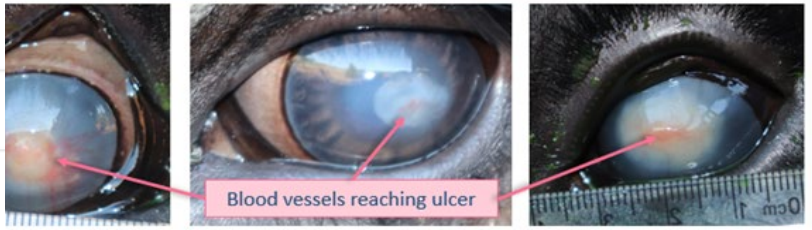
0	1	2	3
normal	**soft**	**runny**	**watery**
Firm but not hard	Does not hold form, piles but spreads slightly	Spreads readily	Liquid consistency, splatters

Please note: Follow-up testing may be necessary to provide accurate pathog

**bacteria, †viruses, ‡protozoa*

	Typical age at onset (in days)	Clinical signs	Vaccine Availability	Notes
*E. coli**	1-7	Causes fluid loss from diarrhea or fluid pooling in intestines	Vaccines are available for pregnant dams; oral antibodies are available for calves	Suspect when very young calves die suddenly. The most serious type of *E. coli* is enterotoxigenic *E. coli (identified as F5/* K99).
Cryptosporidium‡	5-30	Watery diarrhea, can see mucus, up to 7 days duration	No vaccines are available	Resistant to disinfectants; clean facilities with soap and water and expose to UV light
Coronavirus†	7-10	Severe diarrhea lasting 7-10 days; dehydration, weakness; may see blood in feces	Vaccines are available for pregnant dams and calves	High death rate if other pathogens are also involved
Rotavirus†	14-21	Non-bloody diarrhea lasting 4-8 days; calves may have a fever, be depressed, lie down	Vaccines are available for pregnant dams and calves	
*Salmonella**	14-60	Diarrhea with fresh blood and mucus; may also see pneumonia or swollen joints	Vaccines are available but have not shown benefits in field trials. Anecdotally, vaccines for calves lead to improved outcomes.	Antibiotic resistance is common

NO LONGER NECESSARY



How to show these successes?

2019 Report to the Legislature

Antimicrobial Use and Stewardship (AUS) Program

Report to the Legislature

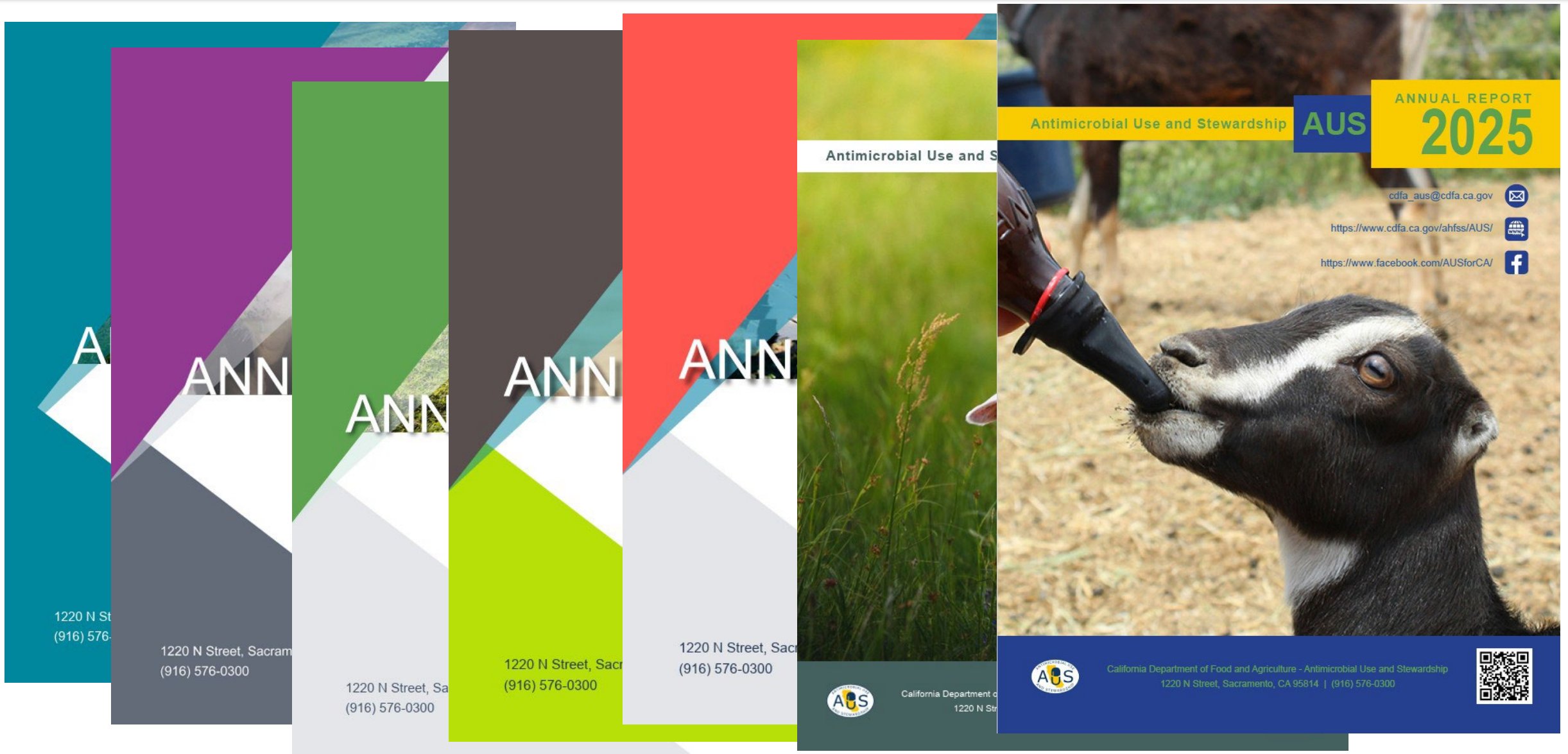
California Department of Food and Agriculture

January 2019

AUS Annual Reports

- Not required by law
- Done because we value ***transparency*** and want the Legislature and our stakeholders (including you!) to know what we are doing and how we continue to implement the law
  - We do great work! And we want everyone to know about it!

AUS Annual Reports



General stewardship resources

- Fly control and monitoring
- Vaccine handling guidelines
- Stewardship planning checklist and workbook
- Guidance on Veterinary Feed Directives (VFDs)
- Antibiograms

Work with the dairy industry, specifically

- Dairy surveys and research studies (UCD)
- Selective dry cow therapy economic calculator
  - *Calculate economic benefits using your farm's own numbers / costs*
- Communities of Practice
  - Farm worker engagement in improving management practices
- Free, online farmworker training modules – NEW!

- H5N1 research, including transmission, milk acidification, wildlife, flies

How to Utilize MIC Results

Individual animal

MIC report

Used to make treatment decisions specific to a particular animal

Antibiograms **should not** replace the need for culture & sensitivity as determined by clinical judgement.

Group of animals

Antibiogram

Antibiogram: An analysis of cumulative antimicrobial susceptibility data specific to production group, pathogen, region and time period

Isolates from **sick animals**

Indicates resistance trends and may guide initial empiric therapy.

Isolates from presumed **healthy animals** or the **environment**

Used to demonstrate baseline resistance trends.

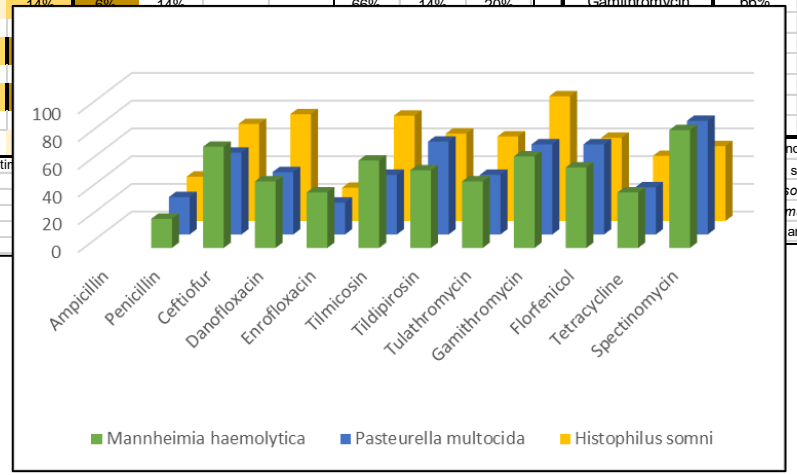
Examples of CAHFS antibiograms

Mannheimia haemolytica Respiratory Sites Cattle CAHFS Clinical Isolates July 1, 2020 - June 30, 2021

	Breakpoints[a]			Percentage of isolates for each concentration of antimicrobial (ug/mL)											(N=97)		
Antimicrobial	Susceptible	Intermediate	Resistant	0.12	0.25	0.5	1	2	4	8	16	32	64	128	% S	% I	% R
Penicillins																	
Ampicillin	≤0.03	0.06-0.12	≥0.25		18%	1%	15%	17%	21%	6%	20%	2%			See below[b]		
Penicillin	≤0.25	0.5	≥1	5%	16%	7%	10%	17%	19%	7%	19%				21%	7%	72%
Cephalosporins																	
Ceftiofur	≤2	4	≥8		14%		34%	25%	2%	7%	18%				73%	2%	25%
Fluoroquinolones																	
Danofloxacin	≤0.25	0.5	≥1	17%	31%	30%	9%	13%							48%	30%	22%
Enrofloxacin	≤0.25	0.5-1.0	≥2	25%	15%	13%	15%	17%	15%						40%	28%	32%
Macrolides																	
Tilmicosin	≤8	16	≥32					30%	12%	21%	19%	18%			63%	19%	18%
Tildipirosin	≤4	8	≥16				21%	13%	22%	14%	17%	13%			56%	14%	30%
Tulathromycin	≤16	32	≥64							18%	30%	33%	19%	0%	48%	33%	19%
Gamithromycin	≤4	8	≥16				18%	29%	19%								
Phenicols																	
Florfenicol	≤2	4	≥8		23%	8%	20%	7%	16%								
Tetracyclines																	
Tetracycline	≤2	4	≥8			9%	18%	13%	20%								
Aminoglycosides																	
Spectinomycin	≤32	64	≥128														

The percentage of susceptible (light/beige), intermediate (medium/gold) and resistant (dark/brown) isolates are shown for each antim
Solid bold line marks breakpoint for resistance.
Numbers to the right of shaded area have an MIC > than highest concentration tested and are resistant.
[a] CLSI Cattle *Mannheimia haemolytica* breakpoints for respiratory sites.
[b] New criteria indicates this isolate is susceptible to ampicillin/amoxicillin (if MIC < 0.06) which current methods can't evaluate.
Percentage of isolates in each interpretaive category may not equal 100% due to rounding.

Detailed table



Bar chart

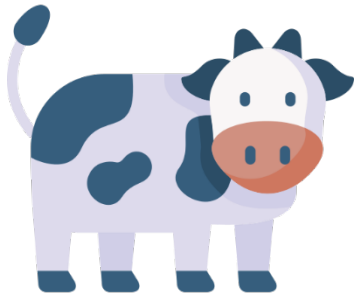
CAHFS Bovine Respiratory Pathogens Antibiogram July 2020 - June 2021

	Mannheimia haemolytica (n=97)			*Pasteurella multocida* (n=82)			*Histophilus somni* (n=41)*		
Antimicrobial[a]	% S	% Int	% R	% S	% Int	% R	% S	% Int	% R
Penicillins									
Ampicillin	See below[b]			See below[b]			See below[b]		
Penicillin	21%	7%	72%	27%	2%	71%	32%	20%	48%
Cephalosporins									
Ceftiofur	73%	2%	25%	59%	15%	26%	70%	20%	10%
Fluoroquinolones									
Danofloxacin[c]	48%	30%	22%	45%	25%	30%	77%	9%	14%
Enrofloxacin	40%	28%	32%	23%	39%	38%	24%	31%	45%
Macrolides									
Tilmicosin[d]	63%	19%	18%	43%	26%	31%	76%	18%	6%
Tildipirosin	56%	14%	30%	67%	19%	14%	63%	17%	20%
Tulathromycin	48%	33%	19%	43%	36%	21%	61%	20%	19%
Gamithromycin	66%	14%	20%	65%	27%	8%	90%	2%	7%
		16%	26%	65%	13%	22%	60%	19%	21%
		20%	40%	34%	10%	56%	47%	20%	33%
		15%	0%	82%	6%	12%	54%	41%	5%

nd R (Resistant) based on CLSI cattle-specific breakpoints for each drug/bug combination.
susceptible to ampicillin/amoxicillin (IF MIC < 0.06) which current methods can't evaluate.
somni in cattle, extrapolated from *Mannheimia haemolytica* CLSI breakpoints.
multocida or *Histophilus somni* in cattle, extrapolated from *Mannheimia haemolytica* CLSI breakpoints.
analysis, isolate recovery timeframe extended (January 2020 - June 30, 2021).

Simple table

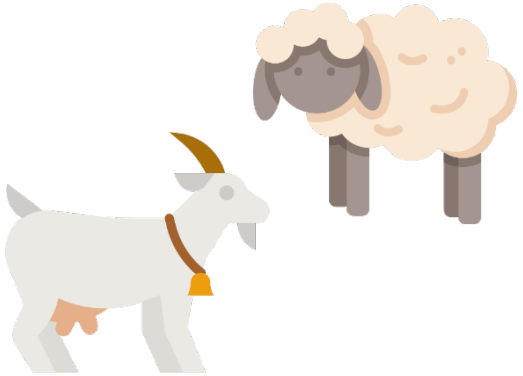
Antibiograms so far…



- **Bovine respiratory**
  - *Mannheimia haemolytica* (n=34 in 2025)
  - *Pasteurella multocida* (n=46)
  - *Histophilus somni* (n=30)

40-45 veterinarians

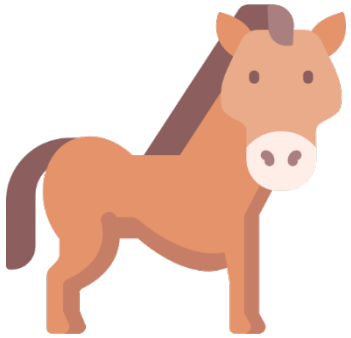
per release (‘24-’25)



- **Goat and sheep respiratory**
  - *Mannheimia haemolytica* (two-year period ending in 2024: goats n=43, sheep n=30)

24-38 veterinarians

per release (2024)

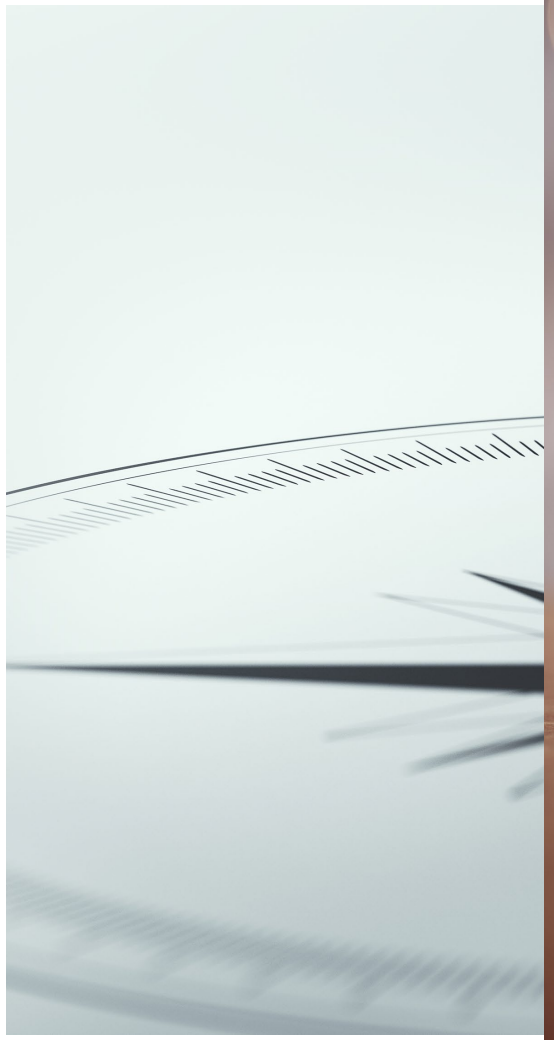


- **Equine respiratory**
  - *Streptococcus equi* ssp. *zooepidemicus* (n=32)

26-30 veterinarians

per release (‘24-’25)

In summary…




Got
AUS?

We would love to hear from you!

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