Leveraging NARMS Resources for One-Health AMR Research and Surveillance

- A Site's Updates and Perspectives

2026 GenomeTrakr Meeting

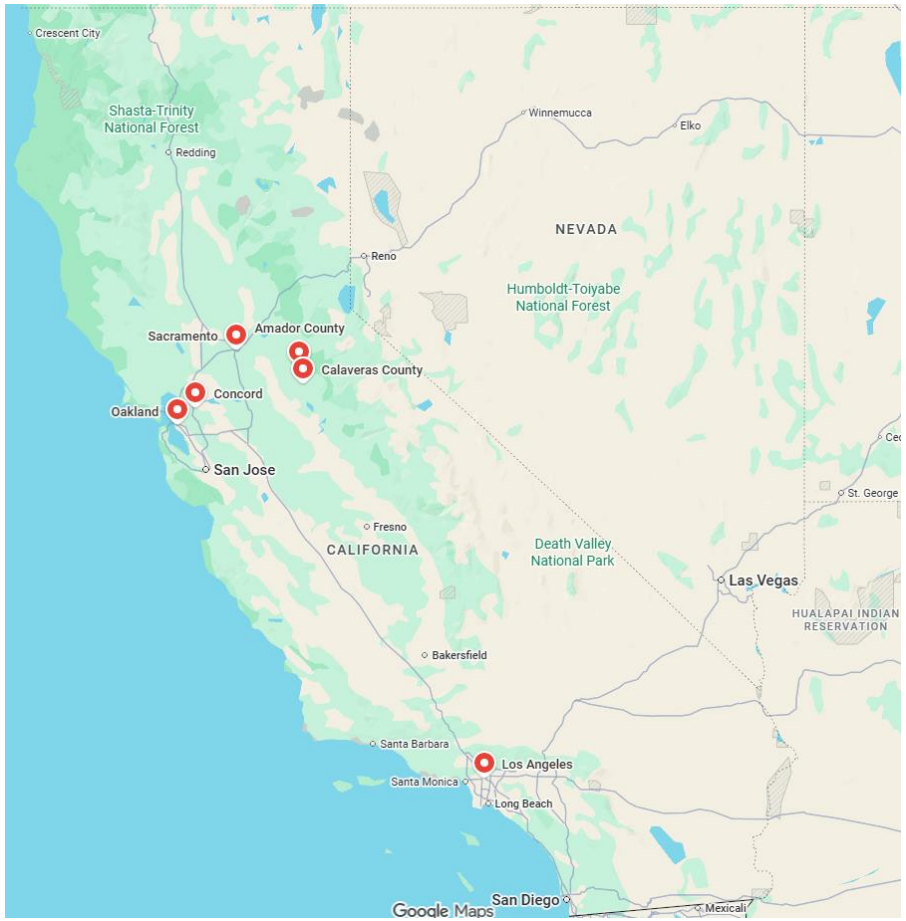
Xunde Li, Yanhong Liu

UC Davis Weill School of Veterinary Medicine

UCDAVIS DEPARTMENT OF ANIMAL SCIENCE

NARMS UC Davis Site

California
2018 ----



Hawaii
2020 - 2025



Distribution of Phenotypic AMR of *Salmonella* by Antimicrobials Use-related Label Claims (CA, 2019)

By no. of Classes Resistant to

No. of classes resistant to	Overall n=132 (%)	Antibiotic use-related production claims (No. (%) of resistant isolates)	
		Reduced n=69 (%)	Conventional n=63 (%)
0	32 (24.24%)	12 (17.39%)	20 (31.74%)
1	17 (12.88%)	5 (7.25%)	12 (19.05%)
2	70 (53.03%)	**45 (65.22%)** [a]	25 (39.68%) [b]
3	3 (2.27%)	1 (1.45%)	2 (1.59%)
4	4 (3.03%)	3 (4.35%)	1 (1.59%)
5	2 (1.52%)	2 (2.90%)	0 (0.00%)
6	1 (0.76%)	0 (2.90%)	1 (0.00%)
7	1 (0.76%)	0 (0.00%)	1 (1.59%)
8	2 (1.52%)	1 (1.45%)	1 (1.59%)
9	0 (0.76%)	0 (10.00%)	0 (0.00%)
≥1	100 (75.76%)	57 (82.61%)	43 (68.25%)
≥2	83 (62.88%)	**52 (75.36%)** [a]	31 (49.21%) [b]
≥3	13 (9.85%)	7 (10.14%)	6 (9.52%)

By Antimicrobials Resistant to

Antimicrobial		Antibiotic use-related production claims (No. (%) of resistant isolates)	
Class	Agent	Reduced n=69 (%)	Conventional n=63 (%)
Aminoglycosides	GEN	1 (1.45%)	2 (3.17%)
	STR	46 (66.67%)	33 (52.38%)
B-lactam combination agents	AMC	0	1 (1.59%)
Cephems	FOX	0	1 (1.59%)
	AXO	1 (1.45%)	4 (6.35%)
Folate pathway antagonists	FIS	16 (23.19%)	10 (15.87%)
	COT	1 (1.45%)	2 (3.17%)
Macrolides	AZI	0	0
Penems	MER	0	0
Penicillins	AMP	3 (4.35%)	7 (11.11%)
Phenicols	CHL	3 (4.35%)	2 (3.17%)
Quinolones	NAL	6 (8.70%)	3 (4.35%)
	CIP	6 (8.70%)	4 (6.35%)
Tetracyclines	TET	**52 (75.36%)** [a]	30 (47.62%) [b]

GEN=gentamicin, STR=streptomycin, AMC=amoxicillin-clavulanic acid, FOX=cefoxitin, AXO=ceftriaxone, FIS=sulfisoxazole, COT=trimethoprim-sulfamethoxazole, AZI=azithromycin, MER=meropenem, AMP=ampicillin, CHL=chloramphenicol, NAL=nalidixic acid, CIP=ciprofloxacin, TET=tetracycline

Highlight the Importance of Long-Term Retail Food Surveillance to Monitor Spatiotemporal AMR Trends Related to Antibiotics Use

International Journal of Food Microbiology
Volume 421, 16 August 2024, 110785

Phenotypic and genotypic characterization of antimicrobial resistance of non-typhoidal *Salmonella* from retail meat in California

Bakytzhan Bolkenov [a], Katie Y. Lee [b], Edward R. Atwill [b], Maurice Pitesky [b], Maribel Rickard [c], Melody Hung-Fan [c], Marzieh Shafi [c], Kurtis Lavelle [b], Anny Huang [b], Jade Sebti [b], Macie M. Tanaka [b], Xiang Yang [a] ✉, Xunde Li [b] ✉

Prevalence and Phenotypic Resistance of *Campylobacter* by Cut Types of Retail Chicken from Hawaii (2020 – 2022)

% (n/N) of Retail Chicken Tested Positive for *Campylobacter*

Samples collected from Hawaii (2020 – 2022)						National Average	
Breast(CB)	Gizzard(CG)	Heart(CH)	Liver(CL)	All Giblets*	All Chicken	2020	2021
11.83% (22/186)[a]	16.67% (4/24)	25.00% (3/12)	33.33% (8/24)	25.00% (15/60)[b]	15.04% (37/246)	12.7% (199/1561)	28.2% (510/1808)

*Collecting and testing chicken giblets started in 2021

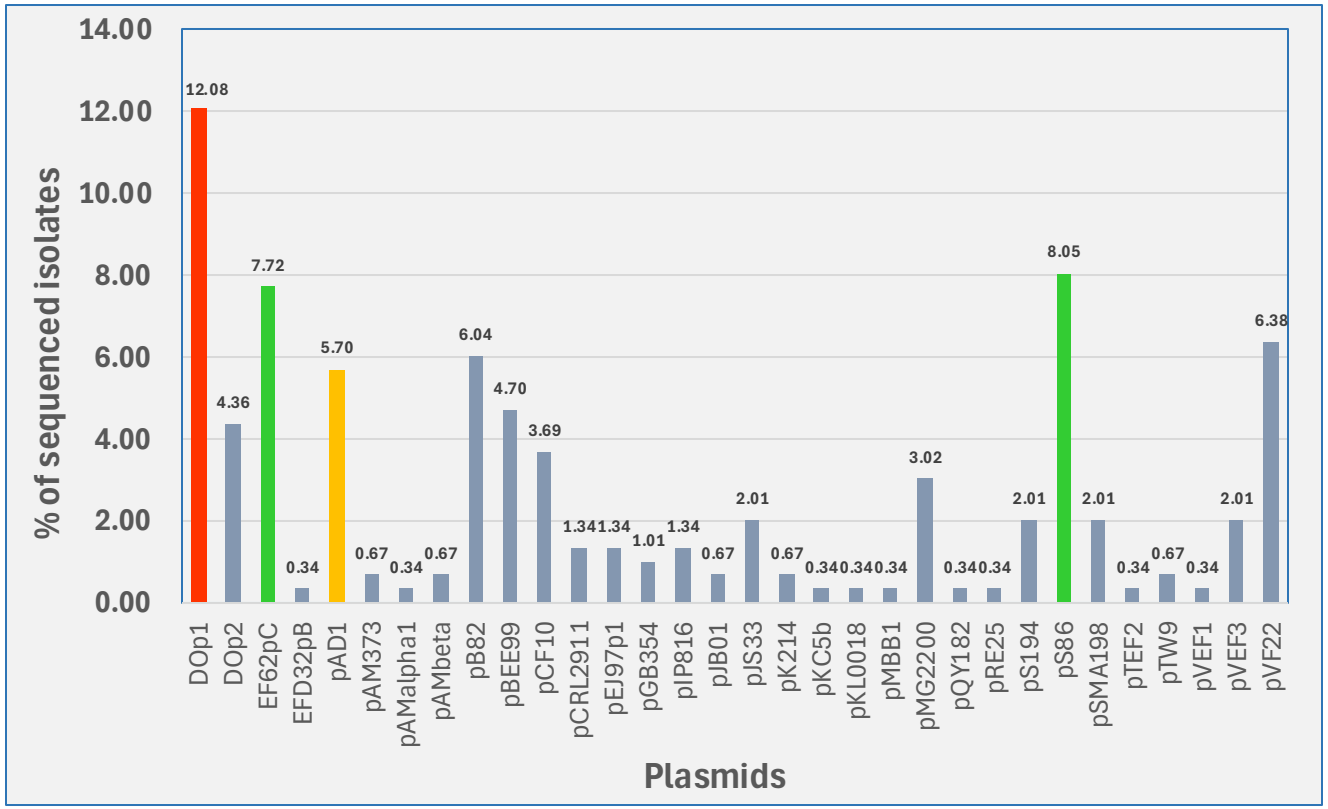
Distribution of Resistant *Campylobacter* Isolates

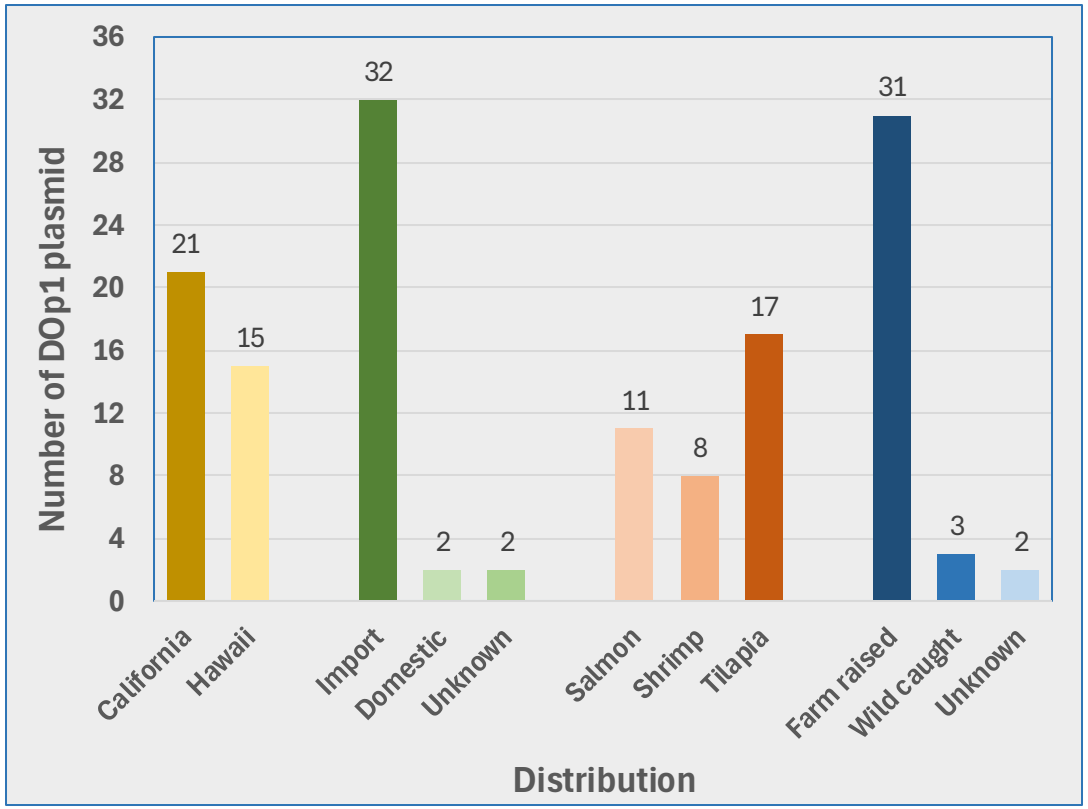
Antimicrobial		% (n) of resistant isolates of each meat type						National Average	
Class	Agent	Breast(CB) (n=22)	Gizzard(CG) (n=4)	Heart(CH) (n=3)	Liver(CL) (n=8)	All Giblets (n=15)	All Chicken (n=37)	2020 (n=199)	2021 (n=507)
Macrolides	AZI	0	0	0	0	0	0	0.5% (1)	0.6% (3)
	ERY	0	0	0	0	0	0	1.0% (2)	0.6% (3)
Quinolones	CIP	31.8% (7)	25.0% (1)	0	25.0% (2)	20.0% (3)	27.0% (10)	23.6% (47)	20.1% (102)
	NAL	31.8% (7)	25.0% (1)	0	25.0% (2)	20.0% (3)	27.0% (10)	23.1% (46)	20.1% (102)
Lincosamide	CLI	0	0	0	0	0	0	1.0% (2)	0.4% (2)
Phenicol	FFN	0	0	0	0	0	0	0	0
Aminoglycosides	GEN	0	0	0	0	0	0	0	0.6% (3)
Carbapenem	MER	0	0	0	0	0	0	0	0
Tetracycline	TET	54.6% (12)	50.0% (2)	33.3% (1)	62.5% (5)	53.3% (8)	54.1% (20)	43.7% (87)	(44.7% (223)

GEN=Gentamicin, AZI=Azithromycin, ERY=Erythromycin, MER=Meropenem, NAL=Nalidixic acid, CIP=Ciprofloxacin, TET=Tetracycline, CLI=Clindamycin, FFN=Florfenicol

Detection and Distribution of Plasmids from Seafood *Enterococcus* Isolates (2020 – 2024)

(CA=147, HI=151; Salmon=75, Shrimp=132, Tilapia=91)





32 plasmids detected; most in < 2% sequenced isolates.

Top 3 plasmids by % prevalence:

DOp1 (12.08%): harbor tet(M) (hybridization/combination pAD1+DOp1-type could carry optrA gene)

EF62pC (7.72%): wild-type naturally present; carry virulence factors contributing survival and infection

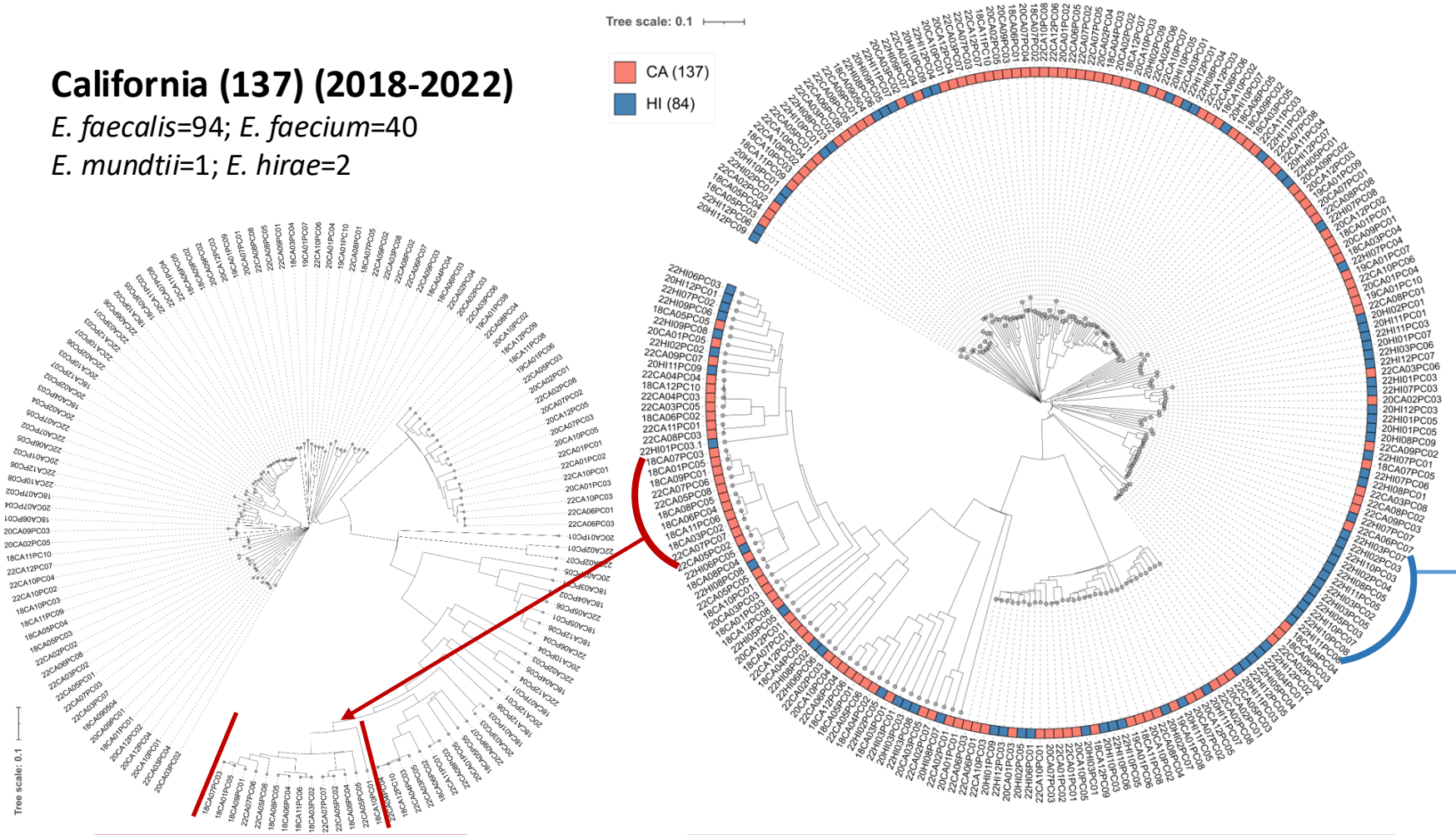
pS86 (8.05%): "cryptic" does not carry obvious phenotypic traits (such as antibiotic resistance)

Phylogenomics of *Enterococcus* Isolates from Pork (2018 – 2022)

California (137) (2018-2022)

E. faecalis=94; *E. faecium*=40

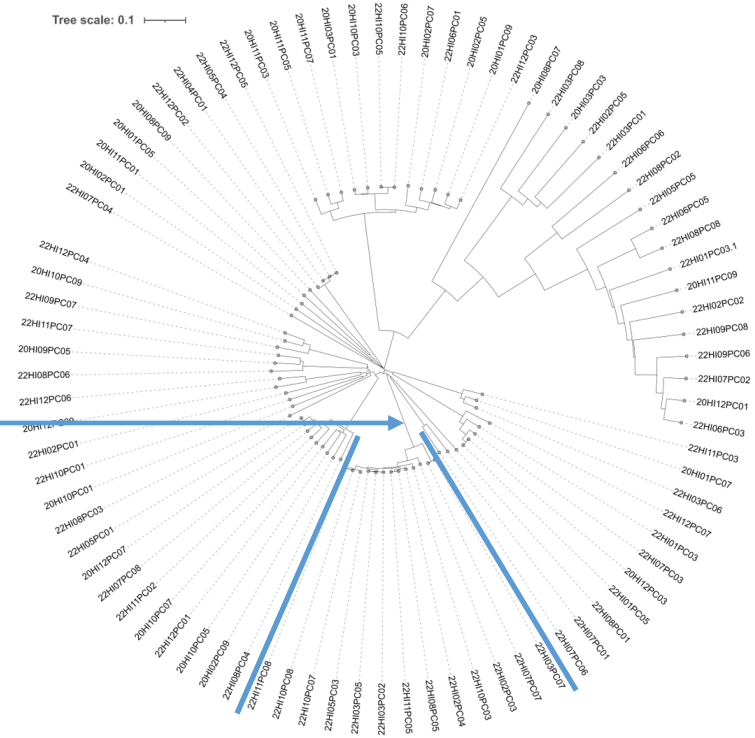
E. mundtii=1; *E. hirae*=2



Hawaii (84) (2020-2022)

E. faecalis=66; *E. faecium*=17

E. hirae=1



A group of *E. faecium* (11):

ARGs: efmA

Plasmids: pNB2354p-1

Virulence: sgrA

Geographic variations in *Enterococcus* genomes

Accessory genome clusters of similar AMR traits

A group of *E. faecalis* (12):

ARGs: tetM

Plasmids: DOp1

Virulence: cpsA-F, ebpA-C, fsrA-C

Evaluation of Genotype Prediction of *Salmonella* Phenotypic Resistance (CA, 2018 – 2019)

Antimicrobial		2018			2019		
Class	Agent	No. phenotypic resistance	No. genotypic resistance	**Sensitivity (%)**	No. phenotypic resistance	No. genotypic resistance	**Sensitivity (%)**
Aminoglycosides	GEN	3	1	33.33	3	2	66.67
	STR	15	14	93.33	79	78	98.73
B-lactam combination agents	AMC	1	1	100	1	1	100
Cephems	FOX	1	1	100	1	1	100
	AXO	4	4	100	5	5	100
Folate pathway antagonists	FIS	7	7	100	26	26	100
	COT	0	0	N/A	1	1	100
Macrolides	AZI	0	0	N/A	0	0	N/A
Penems	MER	0	0	N/A	0	0	N/A
Penicillins	AMP	10	10	100	10	10	100
Phenicols	CHL	1	1	100	5	5	100
Quinolones	NAL	5	5	100	9	9	100
	CIP	0	0	N/A	0	0	N/A
Tetracyclines	TET	17	17	100	82	82	100
Overall				**95.31**			**96.85**

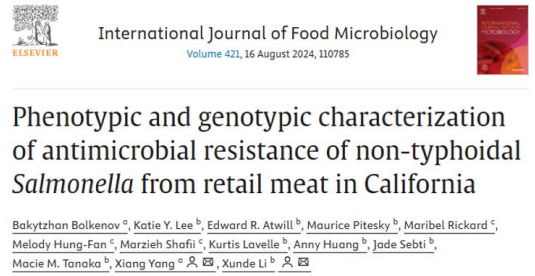
GEN=gentamicin, STR=streptomycin, AMC=amoxicillin-clavulanic acid, FOX=cefoxitin, AXO=ceftriaxone, FIS=sulfisoxazole, COT=trimethoprim-sulfamethoxazole, AZI=azithromycin, MER=meropenem, AMP=ampicillin, CHL=chloramphenicol, NAL=nalidixic acid, CIP=ciprofloxacin, TET=tetracycline


frontiers in Microbiology

ORIGINAL RESEARCH
published: 16 March 2022
doi: 10.3389/fmicb.2022.835699

Antimicrobial Resistance Profiles of Non-typhoidal *Salmonella* From Retail Meat Products in California, 2018

Katie Yen Lee[1,2*], Edward Robert Atwill[1], Maurice Pitesky[1], Anny Huang[1], Kurtis Lavelle[2], Maribel Rickard[3], Marzieh Shafii[3], Melody Hung-Fan[3] and Xunde Li[1,2*]


International Journal of Food Microbiology
Volume 421, 16 August 2024, 110785

Phenotypic and genotypic characterization of antimicrobial resistance of non-typhoidal *Salmonella* from retail meat in California

Bakytzhan Bolkenov [a], Katie Y. Lee [b], Edward R. Atwill [b], Maurice Pitesky [b], Maribel Rickard [c], Melody Hung-Fan [c], Marzieh Shafii [c], Kurtis Lavelle [b], Anny Huang [b], Jade Sebti [b], Macie M. Tanaka [b], Xiang Yang [a], Xunde Li [b]

Fostering/Enhancing Partnerships













UCDAVIS
Western Center for
Agricultural Health and Safety







Acknowledgements

- These works were made possible, in part, by the U.S. Food and Drug Administration through grants of the NARMS Cooperative Agreement Program.
- The views expressed in this presentation are those of the authors and do not necessarily reflect the official policies of the Department of Health and Human Services; nor does any mention of trade names, commercial practices, or organization imply endorsement by the US Government.
- The FDA Center for Veterinary Medicine (CVM) performed antimicrobial susceptibility testing (AST) and shared results.
- Thanks the NARMS leaderships for review, comments, suggestions, and clear manuscripts, abstracts, and slides.
- UC Davis 100K Pathogen Genome Project assisted WGS and bioinformatics of *Enterococcus*.

Congratulations!





Contents lists available at ScienceDirect

Journal of Food Protection

journal homepage: www.elsevier.com/locate/jfp

Review

National Antimicrobial Resistance Monitoring System: Three Decades of Advancing Public Health Through Integrated Surveillance of Antimicrobial Resistance https://www.sciencedirect.com/science/article/pii/S0362028X2600222X