Antimicrobial Stewardship Across the Care Continuum Between Veterinary and Human Medicine

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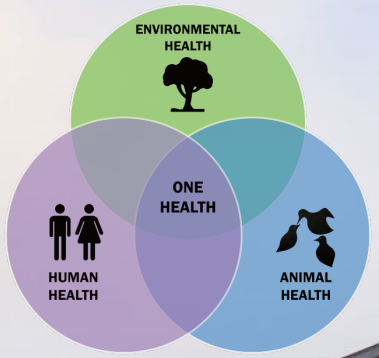


Today's Presentation Overview

- Louisiana Animal Disease Diagnostic Laboratory (LADDL) – We Protect
- Importance of Zoonotic Diseases and the One Health Concept
- LADDL's Role in Disease Diagnosis and Surveillance – An Application of One Health
- Describe the Bacterial Pathogens and Antibiotics Prescribed that are Common to Human and Veterinary Medicine
- Explain the Core Principles of Antimicrobial Stewardship in Veterinary Medicine
- Explain the Judicious Therapeutic Use of Antimicrobials in Veterinary Medicine
- Explore a One Health Approach to Antimicrobial Stewardship Across the Continuum between Veterinary and Human Medicine

LADDL's Mission – We Protect

OUR MISSION

To **safeguard and enhance** standards of **animal and human health** by providing accurate, timely and **state-of-the-art diagnostic testing services** supported by professional advice and outreach to veterinarians, livestock, aquatic and poultry producers, owners, and state and federal health officials

DIAGNOSTICS

- Diagnostic Testing of Clinical Specimens
- Confirm Clinical Diagnosis
- Necropsy, Biopsy and Histopathology/IHC
- Regulatory Testing
- Disease Surveillance - Animal and Human **(ONE HEALTH MISSION)**
- Cremation and Disposal of Animals

RESEARCH

- Basic and Translational

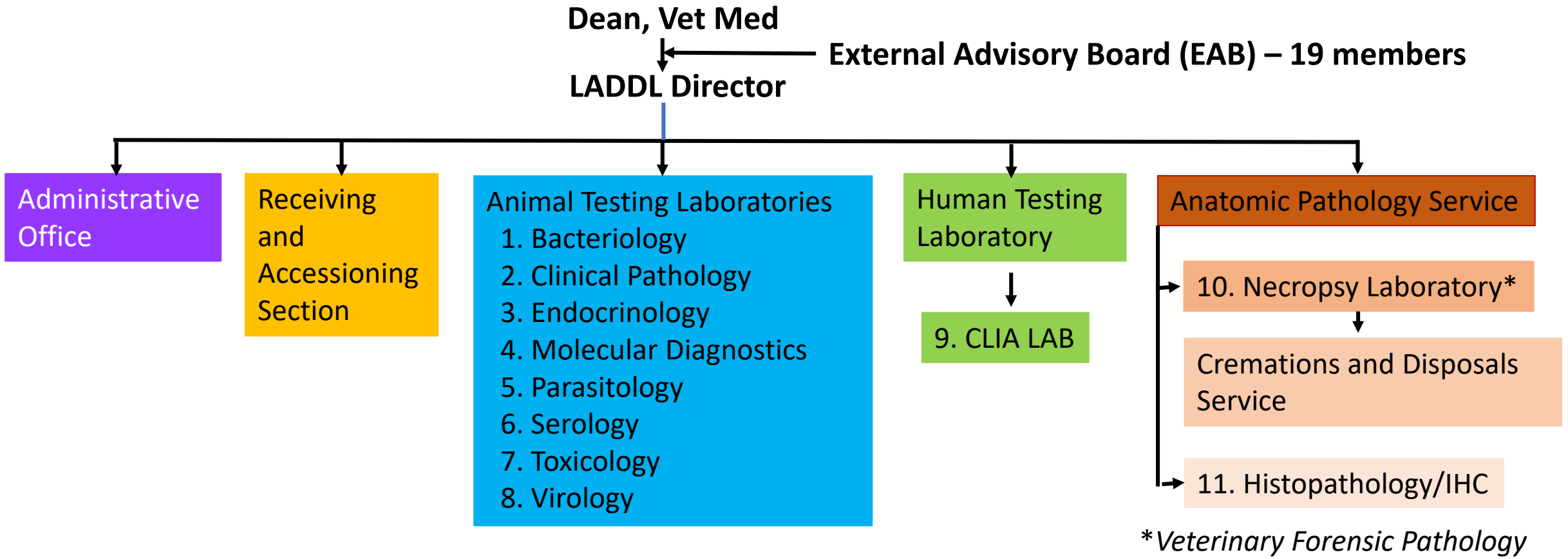
EDUCATION

- DVM Curriculum
- Anatomic and Clinical Pathology Residency Programs

OUTREACH

- Test Interpretation and Advice

LADDL Organizational Chart



**Veterinary Forensic Pathology*

- American Association of Veterinary Laboratory Diagnosticians **(AAVLD)** accredited laboratory - **ONLY ONE IN THE STATE OF LOUISIANA**
- National Animal Health Laboratory Network **LEVEL 1 LABORATORY (NAHLN LEVEL-1)**
- FDA-Veterinary Laboratory Investigation and Response Network **(FDA-VetLIRN)**
- **CLIA Laboratory**
- **Employees: 32 - 40 FTEs** (42-58 personnel – Faculty, Residents, Technical Staff, Postdocs, and Students)

LADDL Accreditation and Standards

American Association of Veterinary Laboratory Diagnosticians

- **AAVLD Accreditation Program**
  - Purpose is to accredit public veterinary diagnostic laboratories in North America
  - Demonstrate technical and operational competency using a Quality Assurance Program
  - Goal is to provide excellence in veterinary diagnostic services
  - Audit occurs every 5 years - outside auditors
  - LADDL has a full accreditation
- **Clinical and Laboratory Standards Institute (CLSI)**
  - Standards used in both human medicine and veterinary medicine
  - Purpose is to foster excellence in laboratory medicine by developing and implementing clinical laboratory standards.
  - Consensus based approach to medical laboratory standards used globally to foster excellence in laboratory medicine

LADDL Clients and Partnerships

LADDL CLIENTS

- Veterinarians – small, large and mixed practices
- SVM-VTH: small animal, equine, farm animals and zoo & wildlife
- Various commodity groups in the State of Louisiana and surrounding states
- Owners
- Researchers from LSU and other universities
- Pharmaceutical Companies
- **LSU-SHC**

STATE & LOCAL ORGANIZATIONS

State

- Department of Agriculture and Forestry (LDAF)
- Department of Health (LDH)
- LDAF Poultry Laboratory
- Department of Wildlife and Fisheries (LDWF)
- Department of Justice (Animal Welfare)
- Louisiana Mosquito Control Association (LMCA)

Local

- Mosquito Abatement District
- Animal shelters
- Zoos and Aquariums

NATIONAL ORGANIZATIONS

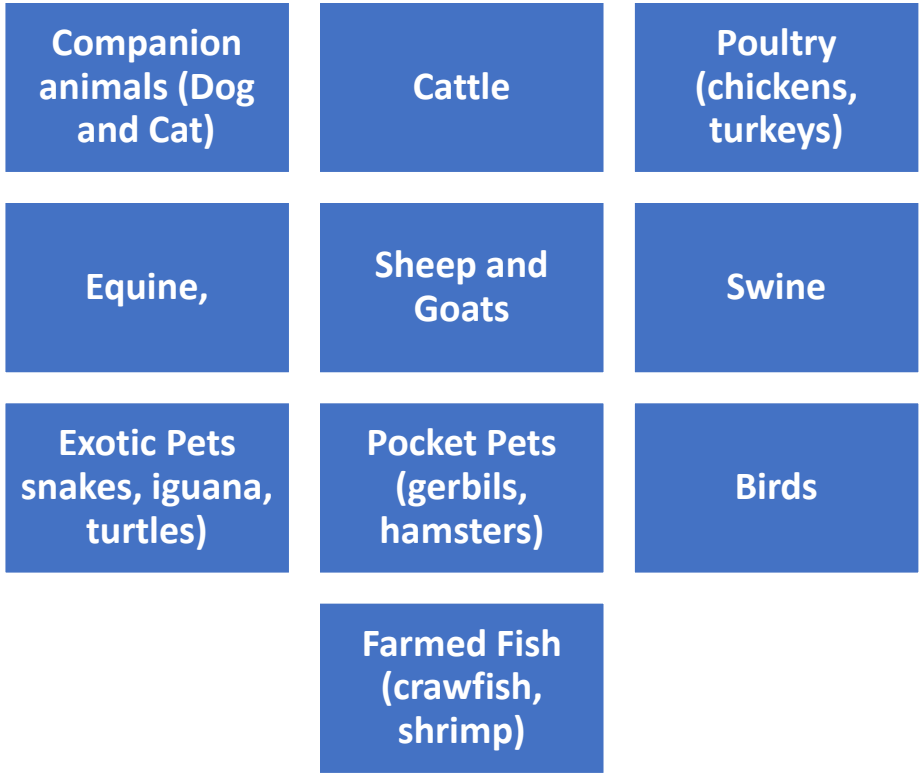
- USDA-NAHLN
- FDA Vet-LIRN
- NVSL/FADDL
- USDA-APHIS and NADC
- CDC
- NOAA
- NAHMS
- Other AAVLD Accredited Diagnostic Labs

Primary mission:

- **To provide accurate, timely and state-of-the-art diagnostic testing service to our clients & partners**
- **Disease surveillance**

Veterinary Diagnostic Medicine: Many Species/Patients, Many Types of Clients

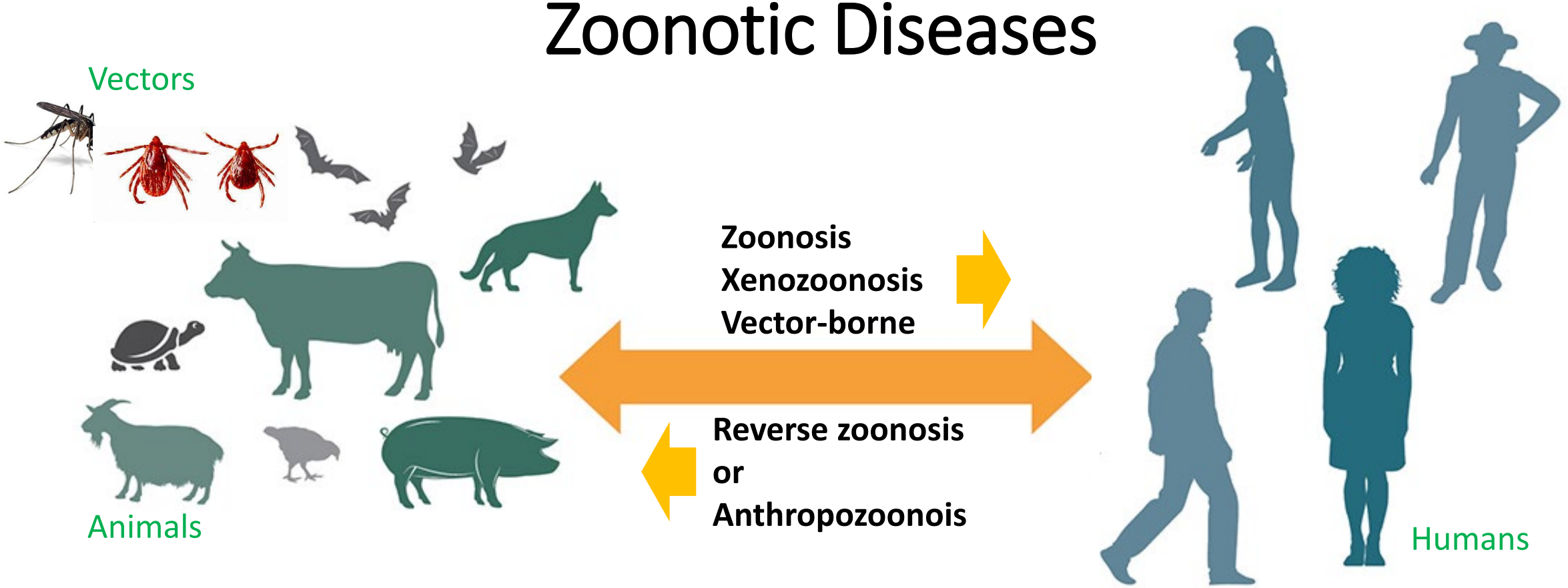
Species



Types of Clients

- Vet Med Teaching Hospital
- Private Veterinary Clinics
- State and Federal Animal Health Officials
- Owners
- Farmers
- Zoo
- Aquatic Marine

Zoonotic Diseases



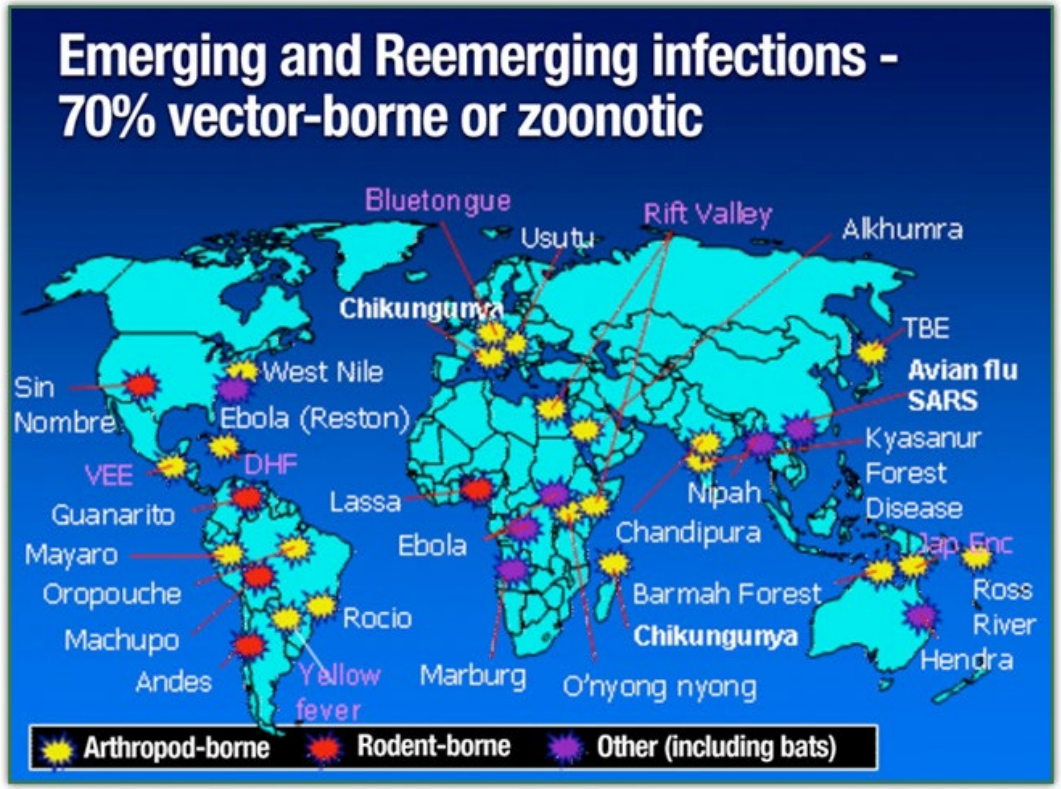
Viruses: Rabies, Hendra, Nipah, Hantavirus, Ebola, Avian Influenza, Swine Influenza, Monkeypox, Herpes B, Rift Valley fever etc.; Herpes simplex and Hepatitis A (Human to Monkey)
Parasites: Malaria (*Plasmodium*)

Bacteria: *E. coli*, Salmonella, Leptospira, Anthrax, Lyme Disease, **Q Fever (*Coxiella burnetii*), Brucellosis**
Fungi: Ringworm
Prions: BSE

List of Emerging and Re-Emerging Infectious Diseases

Pathogens Newly Recognized in the Past Two Decades (EIDs)

Acanthamebiasis
Australian bat lyssavirus
Babesia, atypical
Bartonella henselae
Ehrlichiosis
Encephalitozoon cuniculi
Encephalitozoon hellem
Enterocytozoon bieneusi
Hendra or equine morbilli virus
Human herpesvirus 6 and 8
Lyme borreliosis
Parvovirus B19
Chikungunya virus
Nipah virus
SARS-CoV (2002) and SARS-CoV-2 (2019)
MERS-CoV (2012)
Porcine Deltacoronavirus (PDCoV; 2014)
Schmallenberg virus (2011)
Swine enteric alphacoronavirus (SeACoV) or swine acute diarrhea syndrome virus (SADS-CoV; 2017)

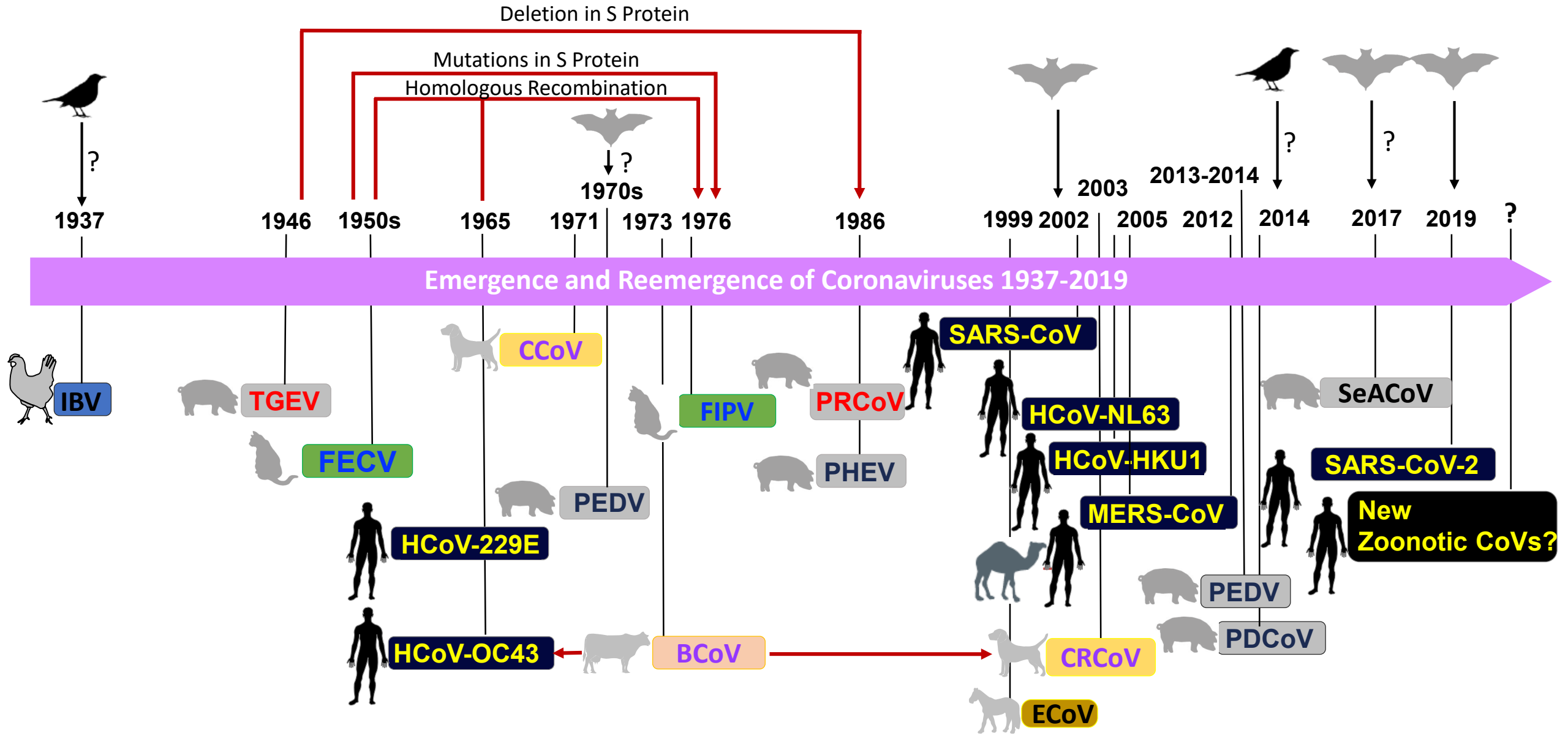


Re-Emerging Pathogens

Enterovirus 71
Clostridioides difficile
Mumps virus
Streptococcus, Group A
Staphylococcus aureus
West Nile virus
Bluetongue virus (BTV)
Equine encephalosis virus (EEV)
African swine fever virus
EHV-1 (neurologic [EHM])
Porcine epidemic diarrhea virus ([PEDV]; 2013 in USA)
Measles (USA)
Zika virus (2007, 2015)
Monkeypox (2021)

Zoonotic Diseases

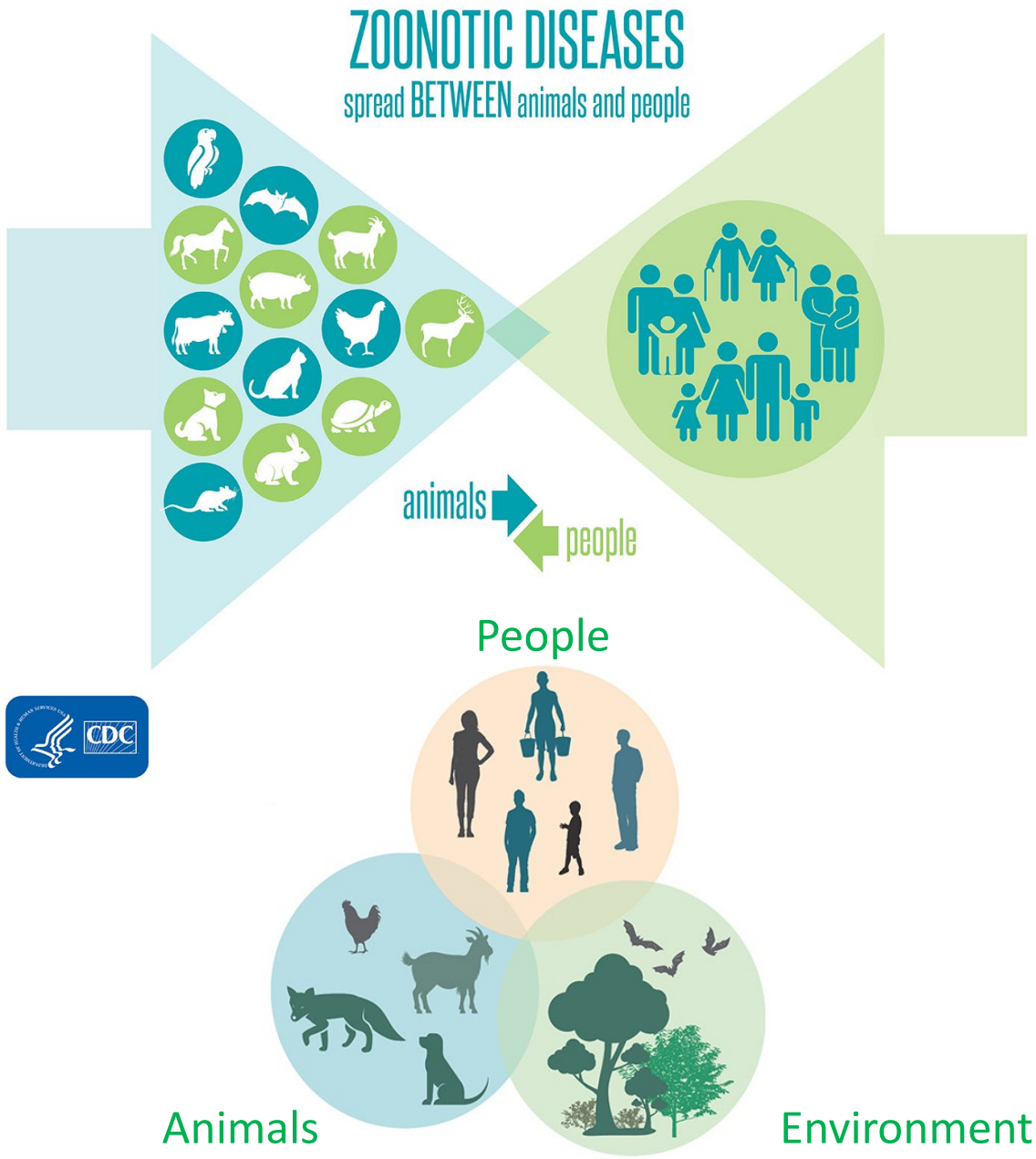
Emergence and Reemergence of Coronaviruses



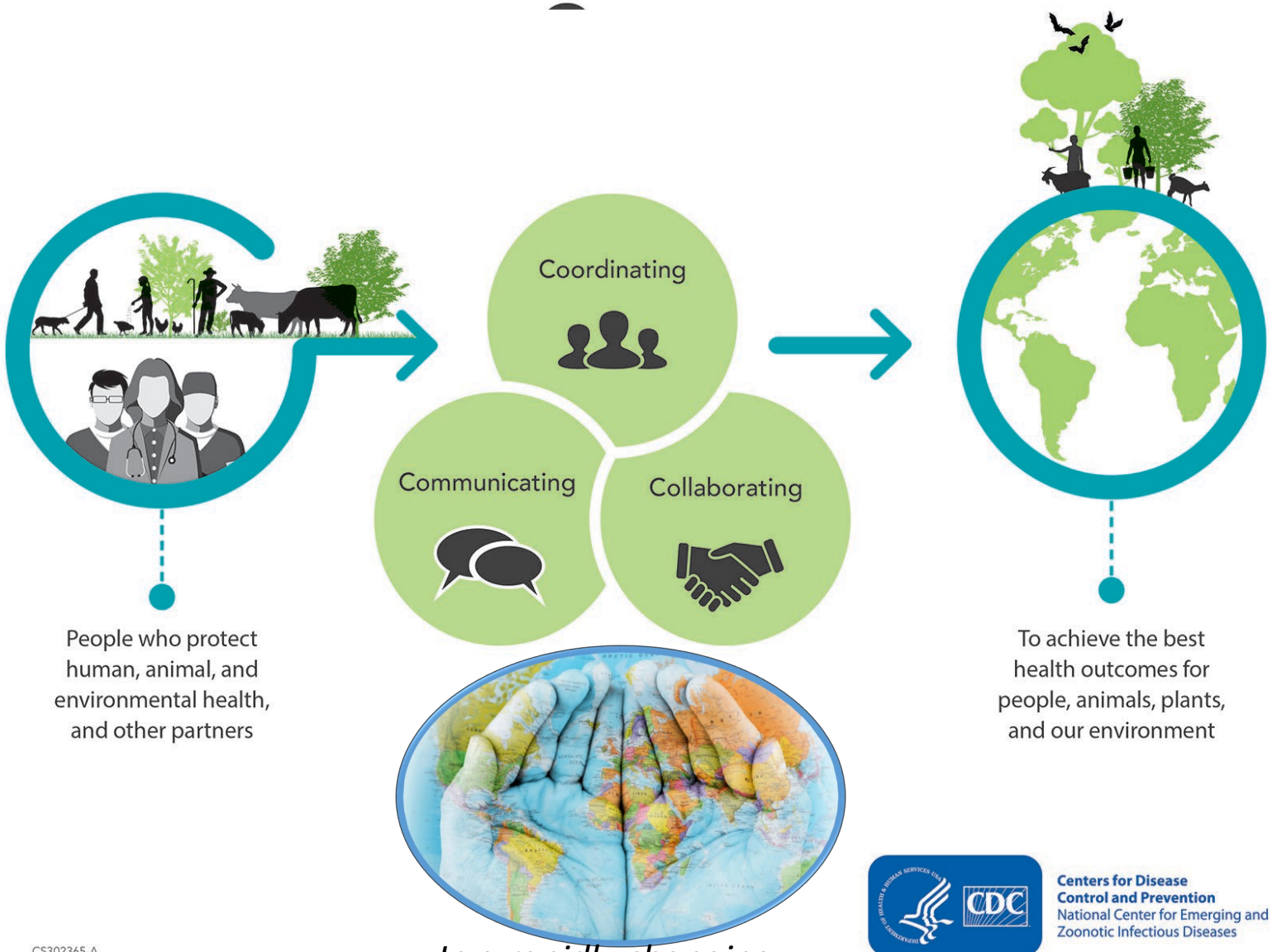
Balasuriya, Go, and Carossino (2022) Coronaviridae, Vet. Microbiology

Zoonotic Diseases and One Health

- Approximately 60% of human infectious diseases are Zoonotic
- Past 30 years - Approximately 75% of new emerging human infectious diseases have been zoonotic
- 80% of pathogens of bioterrorism concern originate in animals
- The convergence of people, animals, and our environment has created a new dynamic in which the health of each group is inextricably interconnected
- Thus, the health of people is closely connected to the health of animals and our shared environment **(One Health)**



One Health Initiative



In a rapidly changing world

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

- The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together. This way, new and better ideas are developed that address root causes and create long-term, sustainable solutions

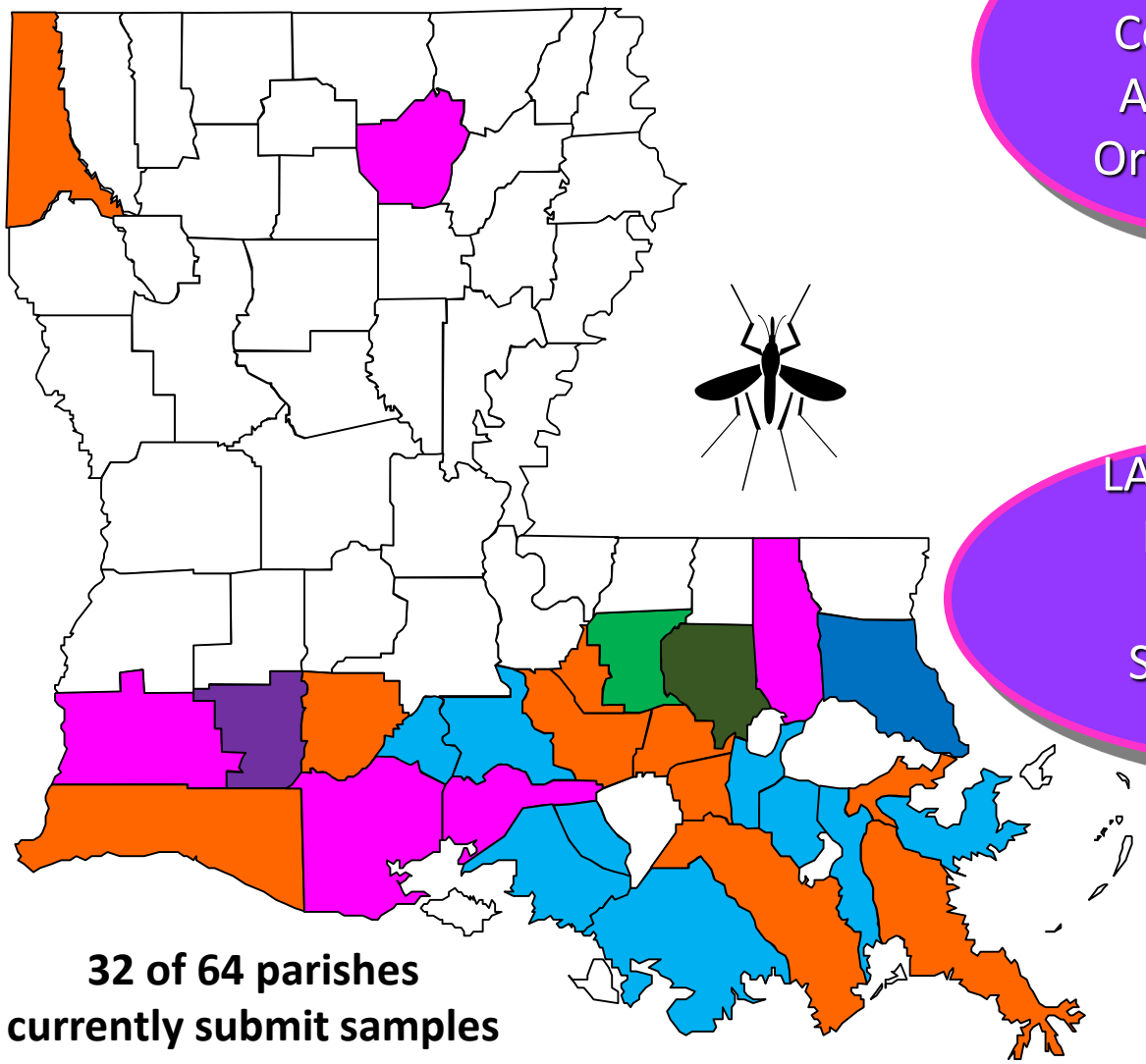
LADDL One Health: Disease Surveillance Programs in the State of Louisiana

1. **Mosquito** surveillance program (32 Parishes) – since 2000
2. USDANAHLN surveillance program for **foreign animal diseases (FADs**; FMD, CSF, ASFV, **HPAI**, ENDV, etc.) and emerging infectious diseases in animals – since 2002
3. National **Poultry Improvement Plan (NPIP)** surveillance program – since 2014
4. FDA-Vet-LIRN **Antimicrobial Resistance (AMR)** by whole genome sequencing (WGS) – since 2017
5. USDA-NAHLN **AMR** program –since 2019
6. **Mosquitos' insecticide resistance** surveillance program – since 2019
7. **Tick** surveillance program – since 2019
8. The **chronic wasting disease (CWD)** surveillance program – since 2019
9. Surveillance of **SARS-CoV-2** in dogs, cats, and zoo animals (large cats) – since 2020
10. **Sole provider** for diagnosis and surveillance of **rabies** in animals in LA – since 2020

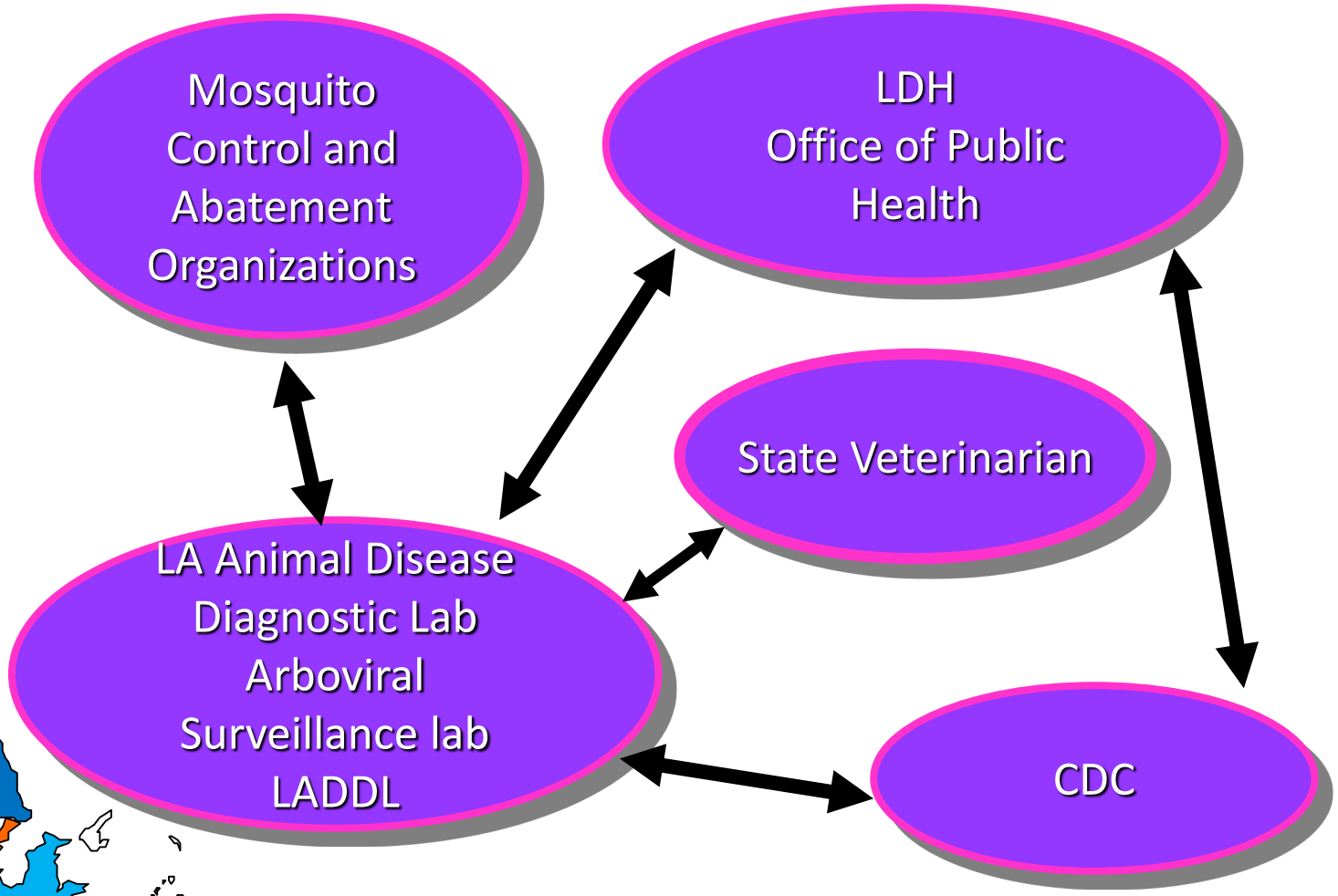
Arbovirus Surveillance Program in Louisiana – Laboratory Surveillance

- **LADDL participates in the National Arbovirus Surveillance Program**
  - Division of Vector-Borne Infectious Diseases, CDC, Fort Collins, CO
- **Detect or predict changes in transmission dynamics of arboviruses in Louisiana**
- **Determine risk of disease to human population before disease appears**
- **Four Arboviruses in Louisiana**
  - Eastern Equine Encephalitis virus (EEE)
  - St. Louis encephalitis virus (SLE)
  - West Nile virus (WNV)
  - LaCrosse virus
- **25 Mosquito Species in Louisiana are positive for WNV**
  - Culex (6 species), Aedes (3), Anopheles(3), Psorophora (4), Coquillettidia (1), Ochlerotatus (6), and Uranotaenia (2)
- **Components of Surveillance Program - enzootic transmission cycle**
- **Mosquito pools – virus detection**
  - ~48,000 pools / year (50-100 mosquitoes/pool
  - RT-PCR for WNV, SLE, EEE, Chikungunya (2014) and Zika (2016)
- **Wild Birds - antibody or virus detection**
  - ~800 birds tested by RT-PCR for WNV per year
- **Dead Birds – virus detection by RT-PCR**
- **Sentinel Chickens antibody detection**
  - Tested for IgM antibodies for exposure to WNV
  - Approximately 2500 birds tested per year
- **Equine – antibody detection**
  - ~100 horses tested yearly for IgM antibodies to WNV and EEE

Arbovirus Surveillance Program in Louisiana



32 of 64 parishes currently submit samples



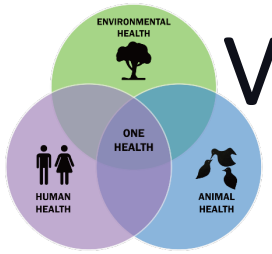
Multiple Agencies Working Together

LADDL / ONE HEALTH: CLIA Laboratory Established at LADDL during SARS-Cov-2 Pandemic ONE HEALTH

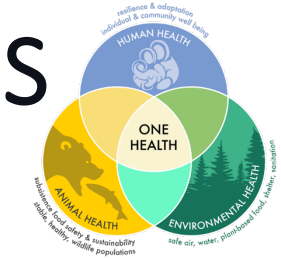
- Clinical Lab Improvement Amendment/CLIA Certificate of Compliance in 2020
  - Clinical laboratory for testing of human for **SARS-CoV-2**
- Established a Testing platform using the TaqPath COVID-19 RT-PCR on Nasal Swabs
  - LSU students/Veterinary Students
  - Patients at the LSU Student Health Center
- Established a Testing platform for **Mpox** using Monkey pox Virus RT-PCR.

LADDL/ONE HEALTH: High Path Avian Influenza H5N1

- Member of USDA-APHIS National Animal Health Network Laboratory (NAHLN) as a Level 1 Center
- Test for Foreign Animal Diseases and Other Diseases
  - Testing for Avian Influenza (High Path) H5N1
    - Poultry Industry
    - Zoo population
    - Wild Bird Population
    - 312 commercial flocks, 432 backyard flocked in 47 states with over 58 million birds affected
    - 5,900 wild birds from 49 states
    - Fewer than 10 human cases of H5N1 (Poultry industry workers) *Current U.S. Bird Flu Situations in Humans CDC CDC Website



Veterinary Diagnostic Laboratories (VDLs) in the US Participate in One Health Mission



- The **veterinary diagnosticians and VDLs** play a vital role in the protection and safety of humans, animals, and the environment. Cross-disciplinary collaborations among multiple professions - veterinary medicine, human medicine, environmental, wildlife, and public health **create innovative programs** to improve animal and human health, achieving the goals of the One Health Initiative.

- **VDLs** play a major role in disease **surveillance, prediction and prevention in the US**
  - Expansion of cutting-edge molecular testing and NGS
  - Detect or discover new and undiagnosed pathogens (e.g., metagenomics)
  - Participate in the Zoonoses and One Health programs
  - Document human pathogens in wildlife and animal-origin pathogens in humans
  - Human testing - CLIA certification
  - Improve infrastructures and translational research (R&D)
  - Build a new infectious disease workforce
    - Train field personnel, veterinarians, scientists, pathologists, laboratory technicians, public health workers

Antimicrobial Resistance and One HEALTH

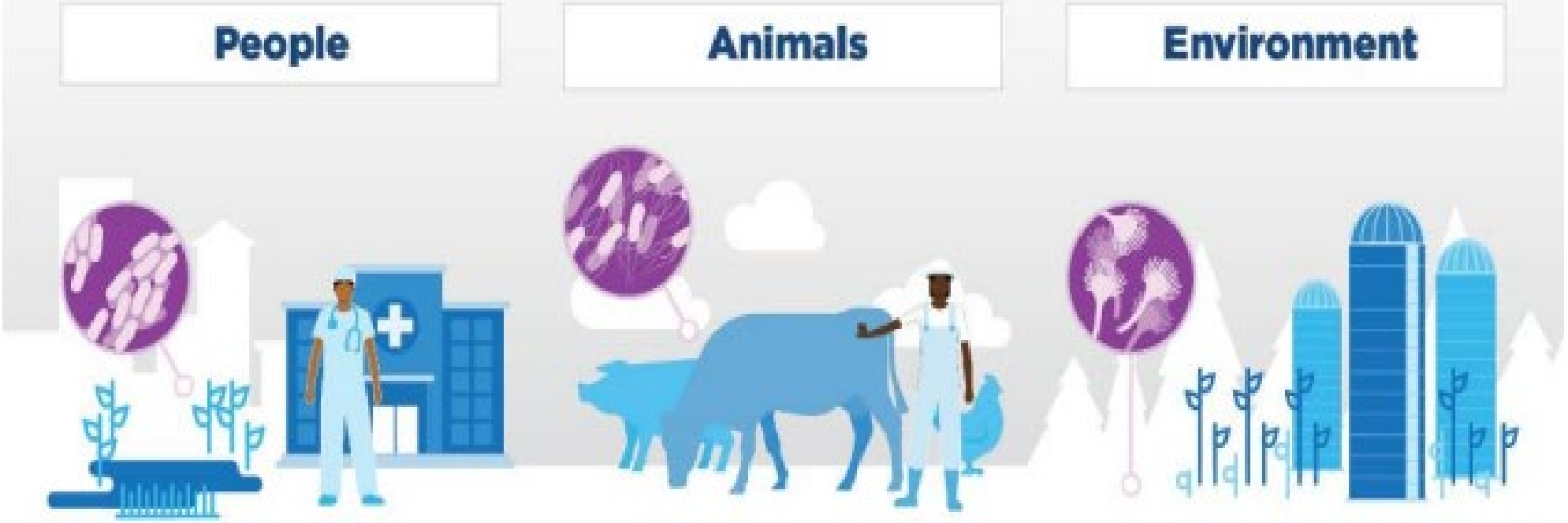
ONE HEALTH Antibiotic Use

- **Antimicrobial resistance is a global One Health Issue**
- **Antimicrobial use in animals, people, and the environment all contribute to the emergence of resistance**
- **Resistance spreads across species and settings**
- **Antimicrobial resistance has become one of the greatest sustained public health challenges of our time**
- **Increased and lack of investment in and development of new –generation antimicrobials**

A ONE HEALTH CHALLENGE

The Interconnected Threat of Antibiotic Resistance

Antibiotic Resistance Affects Humans, Animals & The Environment



(Source: CDC's 2019 AR Threats Report)

Challenges in Forecasting Antimicrobial Resistance : Emerging Infectious Diseases

- "**Antimicrobial resistance (AMR) is a leading threat to global health** (*1*). An estimated 4.95 million deaths were associated with bacterial AMR in 2019 worldwide (*2*), mostly caused by 6 pathogens: *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*".
- "More generally, it is not yet known which type of antimicrobial drug use (e.g., **community use**, **hospital use**, or **veterinary use**) has the greatest effect on AMR emergence (*29*)

Emerging Infectious Diseases: Volume 29, Number 4—April 2023

Bacterial Pathogens and Antibiotics Common to Both Animals and Human

Common Pathogens and Specimens In Veterinary Medicine

Common Pathogens

- *Staphylococcus pseudintermedius (MRSP)*
- *Streptococcus spp. Strep agalactiae, S. equi, zooepidemicus*
- *Mycoplasma spp.*
- *E.coli*
- *Klebsiella spp.*
- *Proteus spp.*
- *Pseudomonas aeruginosa*
- *Salmonella spp.*
- *Campylobacter spp.*
- *Mycobacterium avium complex*

Common Types of Specimens

- Skin Swabs-Skin Infections: Pyoderma,
- Urine- Urinary tract infection,
- Ear Swabs-Otitis externa
- Wounds
- Nasal Swabs
- Feces/Diarrhea
- Transtracheal Washes/Pneumonia
- Joint fluids
- Uterine swabs
- Blood
- Abdominal
- Surgical Incision site

Antibiotic Use In Animals

- **Companion Animals**
  - Antibiotics used like in humans
  - Antibiotics administered by Prescription only.
  - Veterinarian/ Patient Relationship

Antibiotic Use in Food Animals Veterinary Feed Directive and GFI 263

- **Veterinary oversight for the use of medically important antibiotics in food animals.**
  - Low dose, mass medication for use as growth promoters, (colistin, fluroquinolones, macrolides economical gains, controversial, antimicrobial resistance
  - Practice has been phased out in the United States
- **Veterinary Feed Directive (2017)**
  - All medically important antibiotics to be used in feed or water for food animal species require a Veterinary Feed Directive (VFD) or a prescription.
  - Veterinarian must be involved
- **GFI 263 (June 2021)**
  - Change in over-the-counter (OTC) to prescription (Rx)

Common Antibiotics Used in Both Human and Veterinary Medicine

Ampicillin
Amoxicillin/clavulanic acid
Amikacin
Cefazolin, Cefovecin, Cephalexin, Ceftazidime
Doxycycline
Enrofloxacin, Gentamicin
Tetracycline
Trimethoprim/sulfamethoxazole
Imipenem

Antibiotic Use in Animals

Antibiotics Use In Animals

- Penicillin, amoxicillin, ampicillin, amoxicillin-clavulanic acid,
- Cephalexin, cefadroxil, cefazolin
- Doxycycline, minocycline
- Enrofloxacin, orbifloxacin, marbofloxacin

Antibiotics Reserved for Humans

- Isoniazid(TB) – Bovine not treated but destroyed
- Vancomycin-limited use in Vet med
- Colistin, Polymyxin B

Antibiotics Used in Animals after Consultation

- Imipenem-clistatin, meropenem, ciprofloxacin, tigecycline, piperacillin

Common Clinical Presentations with Treatment using an Antibiotic

Canine Respiratory Disease	• Doxycycline • Amoxicillin-clavulanate 7-10 days	*Pasteurella spp., Bordetella spp.*
Canine Superficial Pyoderma	• Cephalexin • Clindamycin 14 days	*Staph pseudintermedius*
Canine bacterial cystitis	• Amoxicillin • Trimethoprim-sulfa 3-5 days	*E. coli, Enterococcus spp.*
Feline Bacterial Upper Respiratory Infection	• Doxycycline 7-10 days • Amoxicillin	*Pasteurella spp.*

MALDI-TOF MS Biotyper® Smart Principle and Application

Matrix-assisted Laser Desorption Ionization Time-of-Flight Mass Spectrometry

Thermo Fisher Scientific
Antimicrobial Sensitivity Testing
ARIS Sensititre™

MIC Plates

9 Sensititre Veterinary Plates

AVIAN1F

BOPO6F

BOPO7F

COMPGP1F

COMPGN1F

EQUIN1F

CMV1AMAF

AMV1BURF

JOEYE2

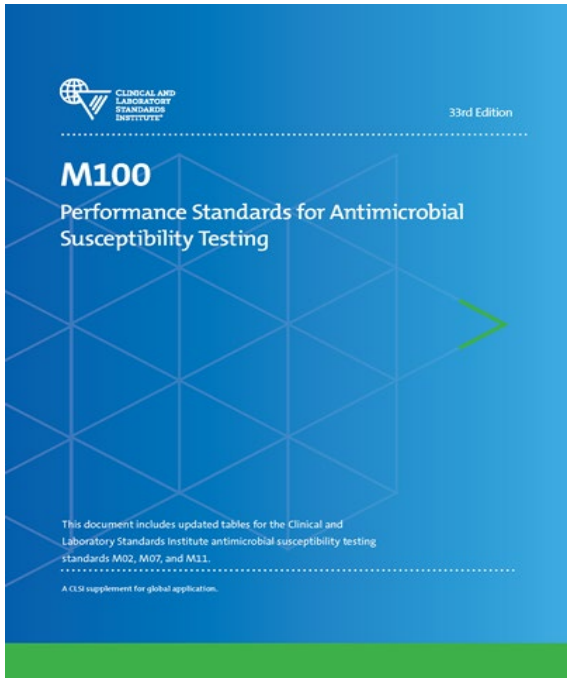
Antibiotic Sensitivity Testing

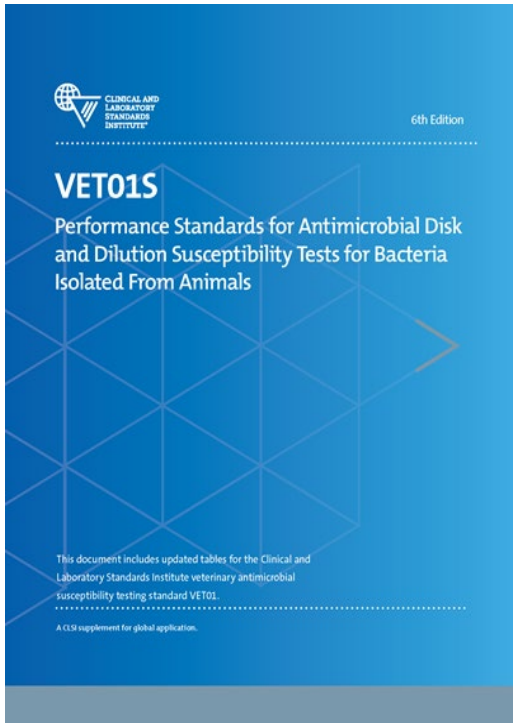
- **Two Methods Performed in Laboratory**

  - **<u>Minimal Inhibitory Concentration (MIC):</u>**
    - **In vitro test in which the organism is inoculated into a series of test wells that contain a serial dilution of antibiotic being tested. MIC is recorded as the** lowest concentration of an antimicrobial agent that prevents visible growth of a microorganism in a broth dilution susceptibility test.

  - **<u>Agar Disk Diffusion Susceptibility test</u>**:
    - **in vitro antimicrobial susceptibility test conducted using disk contains a specified single concentration of an antimicrobial agent that is applied to the surface of an agar medium that has been inoculated with a standard amount of test organism.** Then the diameter of the zone of inhibition of growth from the diffusion of the antimicrobial agent from the disk is measured with a ruler and recorded in millimeters.

Clinical Laboratory Standards Institute (CLSI)





Committee for Veterinary Antimicrobial Susceptibility Test (VAST)

- **Develops standards for judicious use of antimicrobial agents in humans the Committee for VAST establishes the CLSI guidelines for Vet Medicine <u>VET 01-VET-09 like the "M" series for Human Medicine</u>**
- **CLSI Guidelines for Dogs, Cats, cattle, horses, pigs, poultry, fish**
- **No CLSI guidelines for birds, sheep, goats, camillids, reptiles, amphibians and wild animals. Limited clinical and pharmacologic data and therefore lack breakpoint values to determine S, I, R.**

Thermo SCIENTIFIC

SENSITITRE™ GRAM NEGATIVE COMPANION PLATE FORMAT

Plate Code: **COMPGN1F** Plate Type: **MIC**

	1	2	3	4	5	6	7	8	9	10	11	12
A	AMP 0.25	AMP 0.5	AMP 1	AMP 2	AMP 4	AMP 8	AUG2 0.25/0.12	AUG2 0.5/0.25	AUG2 1/0.5	AUG2 2/1	AUG2 4/2	AUG2 8/4
B	POD 1	POD 2	POD 4	POD 8	PRA 0.25	PRA 0.5	PRA 1	PRA 2	SXT 0.5/9.5	SXT 1/19	SXT 2/38	SXT 4/76
C	FOV 0.25	FOV 0.5	FOV 1	FOV 2	FOV 4	FOV 8	GEN 0.25	GEN 0.5	GEN 1	GEN 2	GEN 4	GEN 8
D	LEX 0.5	LEX 1	LEX 2	LEX 4	LEX 8	LEX 16	DOX 0.25	DOX 0.5	DOX 1	DOX 2	DOX 4	DOX 8
E	IMI 1	IMI 2	IMI 4	IMI 8	ORB 1	ORB 2	ORB 4	ORB 8	AMI 4	AMI 8	AMI 16	AMI 32
F	FAZ 1	FAZ 2	FAZ 4	FAZ 8	FAZ 16	FAZ 32	MAR 0.12	MAR 0.25	MAR 0.5	MAR 1	MAR 2	MAR 4
G	ENRO 0.12	ENRO 0.25	ENRO 0.5	ENRO 1	ENRO 2	ENRO 4	CHL 2	CHL 4	CHL 8	CHL 16	CHL 32	POS
H	P/T4 8/4	P/T4 16/4	P/T4 32/4	P/T4 64/4	TET 4	TET 8	TET 16	TAZ 4	TAZ 8	TAZ 16	POS	POS

ANTIMICROBICS

AMI	Amikacin
AUG2	Amoxicillin / clavulanic acid 2:1 ratio
AMP	Ampicillin
FAZ	Cefazolin
FOV	Cefovecin
POD	Cefpodoxime
TAZ	Ceftazidime
LEX	Cephalexin
CHL	Chloramphenicol
DOX	Doxycycline
ENRO	Enrofloxacin
GEN	Gentamicin
IMI	Imipenem
MAR	Marbofloxacin
ORB	Orbifloxacin
P/T4	Piperacillin / tazobactam constant 4
POS	Positive Control
PRA	Pradofloxacin
TET	Tetracycline
SXT	Trimethoprim / sulfamethoxazole

Thermo SCIENTIFIC

SENSITITRE™ GRAM POSITIVE COMPANION PLATE FORMAT

Plate Code: **COMPGP1F** Plate Type: **MIC**

	1	2	3	4	5	6	7	8	9	10	11	12
A	AMP 0.25	AMP 0.5	AMP 1	AMP 2	AMP 4	AMP 8	AUG2 0.25/0.12	AUG2 0.5/0.25	AUG2 1/0.5	AUG2 2/1	AUG2 4/2	AUG2 8/4
B	CEP 2	CEP 4	FAZ 2	FAZ 4	SXT 2/38	SXT 4/76	MIN 0.5	MIN 1	MIN 2	MAR 1	MAR 2	MAR 4
C	ERY 0.25	ERY 0.5	ERY 1	ERY 2	ERY 4	CHL 8	CHL 16	CHL 32	PRA 0.25	PRA 0.5	PRA 1	PRA 2
D	PEN 0.06	PEN 0.12	PEN 0.25	PEN 0.5	PEN 1	PEN 2	PEN 4	PEN 8	CLI 0.5	CLI 1	CLI 2	CLI 4
E	AMI 16	AMI 32	NIT 16	NIT 32	NIT 64	IMI 1	IMI 2	IMI 4	DOX 0.12	DOX 0.25	DOX 0.5	NEG
F	ENRO 0.25	ENRO 0.5	ENRO 1	ENRO 2	ENRO 4	TET 0.25	TET 0.5	TET 1	GEN 4	GEN 8	GEN 16	POS
G	POD 2	POD 4	POD 8	FOV 0.06	FOV 0.12	FOV 0.25	FOV 0.5	FOV 1	FOV 2	FOV 4	FOV 8	POS
H	VAN 1	VAN 2	VAN 4	VAN 8	VAN 16	OXA+ 0.25	OXA+ 0.5	OXA+ 1	OXA+ 2	RIF 1	RIF 2	POS

ANTIMICROBICS

AMI	Amikacin
AUG2	Amoxicillin / clavulanic acid 2:1 ratio
AMP	Ampicillin
FAZ	Cefazolin
FOV	Cefovecin
POD	Cefpodoxime
CEP	Cephalothin
CHL	Chloramphenicol
CLI	Clindamycin
DOX	Doxycycline
ENRO	Enrofloxacin
ERY	Erythromycin
GEN	Gentamicin
IMI	Imipenem
MAR	Marbofloxacin
MIN	Minocycline
NEG	Negative Control
NIT	Nitrofurantoin
OXA+	Oxacillin+2%NaCl
PEN	Penicillin
POS	Positive Control
PRA	Pradofloxacin
RIF	Rifampin
TET	Tetracycline
SXT	Trimethoprim / sulfamethoxazole
VAN	Vancomycin

Sensititre Bovine/Porcine BOPO7F Plate

SENSITITRE™ BOVINE/PORCINE PLATE FORMAT

Plate Code: **BOPO7F** Plate Type: **MIC**

	1	2	3	4	5	6	7	8	9	10	11	12
A	PEN 0.12	PEN 0.25	PEN 0.5	PEN 1	PEN 2	PEN 4	PEN 8	TET 0.5	TET 1	TET 2	TET 4	TET 8
B	AMP 0.25	AMP 0.5	AMP 1	AMP 2	AMP 4	AMP 8	AMP 16	GEN 1	GEN 2	GEN 4	GEN 8	GEN 16
C	TIA 0.5	TIA 1	TIA 2	TIA 4	TIA 8	TIA 16	TIA 32	TIP 1	TIP 2	TIP 4	TIP 8	TIP 16
D	TYLT 0.5	TYLT 1	TYLT 2	TYLT 4	TYLT 8	TYLT 16	TYLT 32	TIL 2	TIL 4	TIL 8	TIL 16	NEO 4
E	NEO 8	NEO 16	NEO 32	TUL 8	TUL 16	TUL 32	TUL 64	ENRO 0.12	ENRO 0.25	ENRO 0.5	ENRO 1	ENRO 2
F	CLI 0.25	CLI 0.5	CLI 1	CLI 2	CLI 4	CLI 8	CLI 16	DANO 0.12	DANO 0.25	DANO 0.5	DANO 1	POS
G	XNL 0.25	XNL 0.5	XNL 1	XNL 2	XNL 4	XNL 8	GAM 1	GAM 2	GAM 4	GAM 8	SDM 256	POS
H	FFN 0.25	FFN 0.5	FFN 1	FFN 2	FFN 4	FFN 8	SPE 8	SPE 16	SPE 32	SPE 64	SXT 2/38	POS

ANTIMICROBICS

AMP	Ampicillin
CLI	Clindamycin
DANO	Danofloxacin
ENRO	Enrofloxacin
FFN	Florfenicol
GAM	Gamithromycin
GEN	Gentamicin
NEO	Neomycin
PEN	Penicillin
POS	Positive Control
SDM	Sulphadimethoxine
SPE	Spectinomycin
SXT	Trimethoprim / sulfamethoxazole
TET	Tetracycline
TIA	Tiamulin
TIL	Tilmicosin
TIP	Tildipirosin
TUL	Tulathromycin
TYLT	Tylosin tartrate
XNL	Ceftiofur

Clinical History and Test Report

- Canine
  Urine/cystocentesis
- History
  - Blood in urine
  - Difficulty urinating
- Isolated
  - *Proteus mirabilis*
  - >100,000cfu/ml

MIC Panel - Antibiotic susceptibility (MIC susceptibility)

Specimen	Antibiotic	Interpretation	Result
Princess - Mammalia - Carnivora - Canidae - Dog (Domestic) - Dachshund - Spayed			
Proteus mirabilis - 1	Ceftazidime	Susceptible	<= 4.000 ug/ml
	Ampicillin	Susceptible	= 1.000 ug/ml
	Orbifloxacin	Susceptible	<= 1.000 ug/ml
	Piperacillin/Tazobactam	Susceptible	<= 8.000 ug/ml
	Trimethoprim/Sulfamethoxazole	Susceptible	<= 0.500 ug/ml
	Pradofloxacin	No Interpretation	<= 0.250 ug/ml
	Doxycycline	Resistant	> 8.000 ug/ml
	Amoxicillin/Clavulanic Acid	Susceptible	= 0.500 ug/ml
	Cefovecin	No Interpretation	<= 0.250 ug/ml
	Chloramphenicol	Susceptible	= 8.000 ug/ml
	Cefazolin	Intermediate	= 4.000 ug/ml
	Imipenem	Susceptible	<= 1.000 ug/ml
	Marbofloxacin	Susceptible	<= 0.125 ug/ml
	Enrofloxacin	Susceptible	<= 0.125 ug/ml
	Amikacin	Susceptible	<= 4.000 ug/ml
	Cefpodoxime	Susceptible	<= 1.000 ug/ml
	Tetracycline	Resistant	> 16.000 ug/ml
	Cefalexin	No Interpretation	= 8.000 ug/ml
	Gentamicin	Susceptible	= 0.500 ug/ml
	The MIC and interpretations on this report are based on serum levels. Antibiotics that are cleared by the kidney will reach higher levels in the urine and this may affect the susceptibility of the uropathogen being evaluated.		

MIC Panel - Antibiotic susceptibility(MIC susceptibility):

Susceptibility results are derived from both veterinary and human interpretive criteria. Susceptibility test reports contain in vitro test results only and do not constitute recommendations for treatment. "No Interpretation" indicates that the Clinical Laboratory Standards Institute (CLSI) has not established breakpoint guidelines for the combination of bacterial isolate, specimen source, and animal species. The veterinarian assumes all responsibility for determining efficacy, safety, residue avoidance and appropriate use of approved/extra label antimicrobials in the indicated species.

Clinical History Test Report

- Canine
- History
  - Superficial pyoderma
  - Skin swab
- Isolated
  - Methicillin resistant *Staphylococcus pseudintermedius* (MRSP)

MIC Panel - Antibiotic susceptibility (MIC susceptibility)

Specimen	Antibiotic	Interpretation	Result
Cali - Mammalia - Carnivora - Canidae - Dog (Domestic) - Cocker Spaniel - Spayed			
Staphylococcus pseudintermedius - 1	Rifampin	Susceptible	<= 1.000 ug/ml
	Trimethoprim/Sulfamethoxazole	Resistant	= 4.000 ug/ml
	Pradofloxacin	Resistant	= 2.000 ug/ml
	Erythromycin	Resistant	> 4.000 ug/ml
	Doxycycline	Resistant	> 0.500 ug/ml
	Clindamycin	Resistant	> 4.000 ug/ml
	Chloramphenicol	Resistant	> 32.000 ug/ml
	Nitrofurantoin	Susceptible	<= 16.000 ug/ml
	Marbofloxacin	Resistant	> 4.000 ug/ml
	Enrofloxacin	Resistant	> 4.000 ug/ml
	Amikacin	No Interpretation	<= 16.000 ug/ml
	Minocycline	Resistant	> 2.000 ug/ml
	Vancomycin	Susceptible	<= 1.000 ug/ml
	Oxacillin + 2 NaCl	Resistant	= 1.000 ug/ml
	Gentamicin	Susceptible	<= 4.000 ug/ml
	Tetracycline	Resistant	> 1.000 ug/ml

MIC Panel - Antibiotic susceptibility(MIC susceptibility):

Susceptibility results are derived from both veterinary and human interpretive criteria. Susceptibility test reports contain in vitro test results only and do not constitute recommendations for treatment. "No Interpretation" indicates that the Clinical Laboratory Standards Institute (CLSI) has not established breakpoint guidelines for the combination of bacterial isolate, specimen source, and animal species. The veterinarian assumes all responsibility for determining efficacy, safety, residue avoidance and appropriate use of approved/extra label antimicrobials in the indicated species.

Skin - Swab - 1	Staphylococcus pseudintermedius	Heavy	Methicillin-resistant Staphylococcus	Final
	Antibiotic sensitivity reporting guidelines suggest that reports for Staphylococci resistant to methicillin/oxacillin should not include any cephalosporins, amoxicillin/clavulanic acid, imipenem, ampicillin/sulbactam, or other beta-lactam antibiotic, regardless of in vitro results.			

Clinical History Test Report

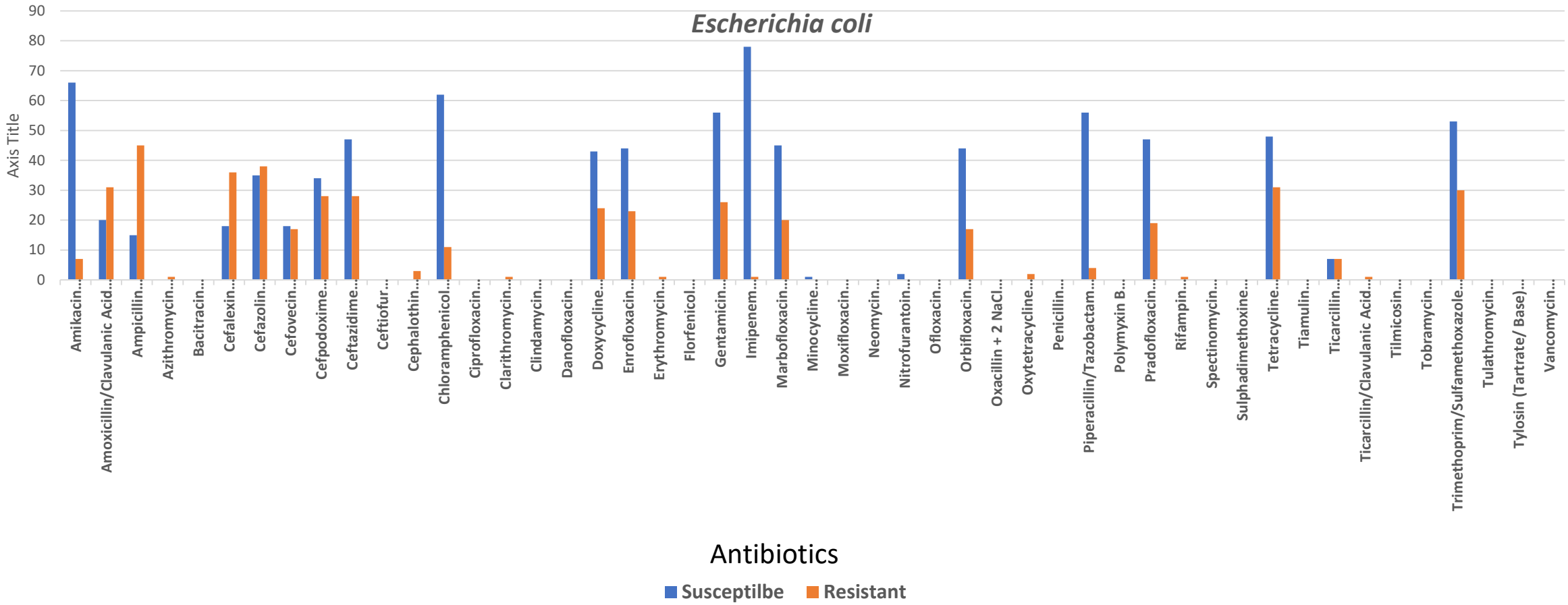
- Canine:
  - Swab of Incision
- History
  - Spayed recently caudal aspect of incision dehisced
- Isolated
  - *Pseudomonas aeruginosa*

Pseudomonas aeruginosa - 1	Ceftazidime	Intermediate	= 16.000 ug/ml
	Ampicillin	Resistant	> 8.000 ug/ml
	Orbifloxacin	No Interpretation	= 4.000 ug/ml
	Piperacillin/Tazobactam	Resistant	= 64.000 ug/ml
	Trimethoprim/Sulfamethoxazole	Resistant	> 4.000 ug/ml
	Pradofloxacin	No Interpretation	= 1.000 ug/ml
	Doxycycline	Resistant	> 8.000 ug/ml
	Amoxicillin/Clavulanic Acid	Resistant	> 8.000 ug/ml
	Cefovecin	No Interpretation	> 8.000 ug/ml
	Chloramphenicol	Resistant	> 32.000 ug/ml
	Cefazolin	Resistant	> 32.000 ug/ml
	Imipenem	Susceptible	<= 1.000 ug/ml
	Marbofloxacin	No Interpretation	= 0.500 ug/ml
	Enrofloxacin	No Interpretation	= 1.000 ug/ml
	Amikacin	Intermediate	= 8.000 ug/ml
	Cefpodoxime	No Interpretation	> 8.000 ug/ml
	Tetracycline	Resistant	= 16.000 ug/ml
	Cefalexin	No Interpretation	> 16.000 ug/ml
	Gentamicin	Resistant	= 8.000 ug/ml

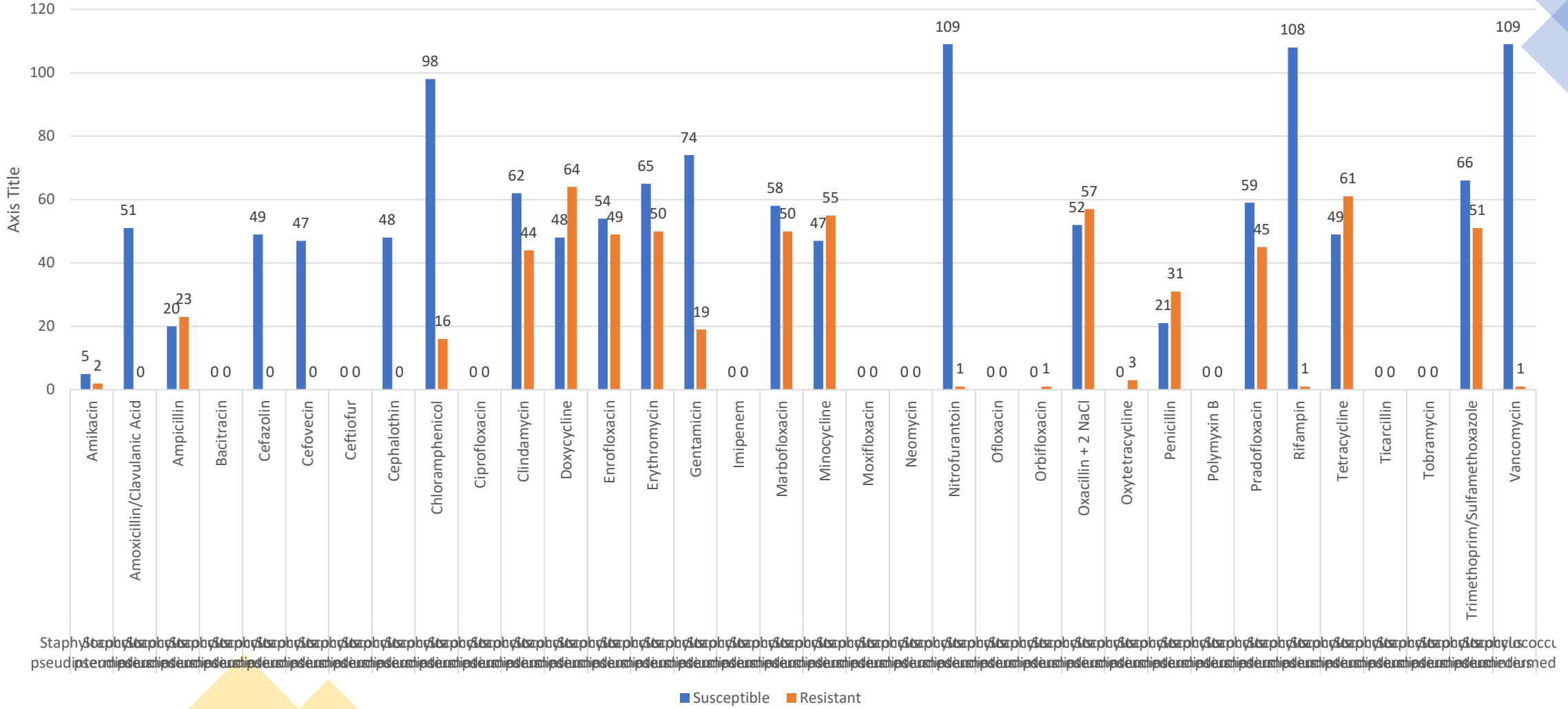
MIC Panel - Antibiotic susceptibility(MIC susceptibility):

Susceptibility results are derived from both veterinary and human interpretive criteria. Susceptibility test reports contain in vitro test results only and do not constitute recommendations for treatment. "No Interpretation" indicates that the Clinical Laboratory Standards Institute (CLSI) has not established breakpoint guidelines for the combination of bacterial isolate, specimen source, and animal species. The veterinarian assumes all responsibility for determining efficacy, safety, residue avoidance and appropriate use of approved/extra label antimicrobials in the indicated species.

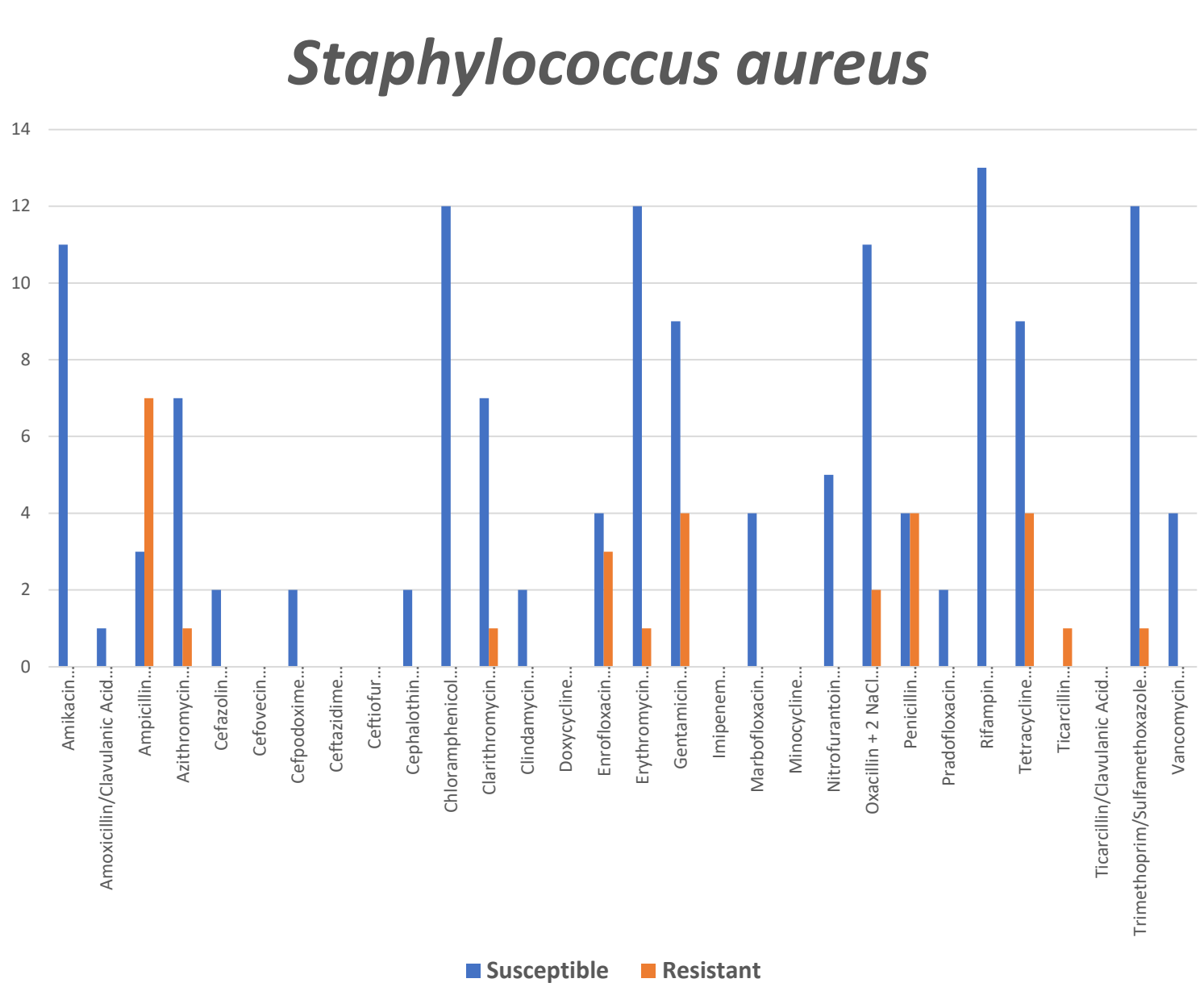
Antimicrobial Sensitivity Tests Results *E. Coli* 2022



Staphylococcus pseudintermedius



Antimicrobial Susceptibility Testing Results 2022



ONE HEALTH

American Medical Association

American Veterinary Medical Association

American Veterinary Medical Association (AVMA)

- **Promote protect and advance the veterinary profession**
  - **Committee on antimicrobials**
  - **In collaboration with similar stakeholders and CDC promotes a One Health approach to the issue of antimicrobial use and antimicrobial resistance.**
  - **Promotes antimicrobial stewardship – involves actions taken to preserve the effectiveness and availability of antimicrobial drugs through responsible decision-making and oversight while safeguarding animal, public, and environmental health.**
  - **Veterinary Checklist for Antimicrobial Stewardship available.**

Core Principles of Antimicrobial Stewardship in Veterinary Medicine

- **Commit to stewardship**
  - **Involve all stakeholders (members of practice and clients)**
  - **Identify high priority conditions that are commonly treated with antimicrobials on**
- **Advocate for a system of care to prevent common diseases**
  - **Work with clients to adopt preventive and management strategies to minimize the need for antimicrobial drugs.**
- **Select and Use antimicrobial drugs judiciously**
  - **Make informed selection of antimicrobial based on guidelines for judicious use**
  - **Access outcomes of antimicrobial use**
- **Evaluate Antimicrobial drug use practices**
  - **Educate clients on use of drugs**
- **Educate and build Expertise**

  Make resources available for antimicrobial stewardship.

  Educate those practicing veterinary medicine and clients
- **AVMA veterinary checklist for antimicrobial stewardship avma.org/microbials**

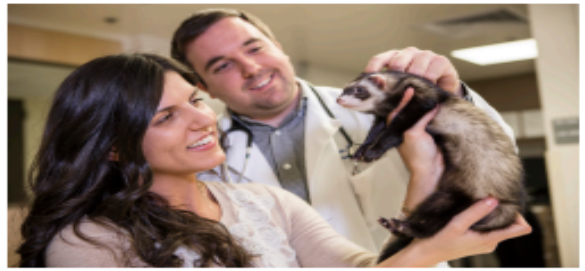
Judicious Use Principles

- **Veterinarian-client-patient relationship**
- **Antimicrobial used only after:**
  - **Diagnosis made which indicates that antimicrobial therapy is appropriate.**
  - **Culture and antimicrobial susceptibility testing performed, when possible, to guide the selection of antimicrobial.**
  - **Treatment should be established using scientific and clinical principles i.e., microbiological and pharmacological tenets.**
  - **Antimicrobial therapy in uncomplicated viral infections and non-septic inflammatory conditions should be avoided.**
  - **Duration of therapy base on scientific and clinical evidence to minimize resistance**
  - **Antimicrobial therapy targeted to ill or at-risk animals**
  - **Accurate records of therapy and outcome should be maintained**
  - **Educate clients on proper use of antibiotics in animals.**

- AVMA veterinary checklist for antimicrobial stewardship avma.org/microbials

THE VETERINARIAN-CLIENT-PATIENT RELATIONSHIP (VCPR)

is the basis for veterinary care — and is critical to the health of your animal



Establishing this important relationship requires all of the following:

1. The licensed veterinarian has assumed the responsibility for making medical judgments regarding the health of the patient(s) and the need for medical therapy, and has instructed the client on a course of appropriate therapy.
2. The veterinarian has sufficient knowledge of the patient(s) to initiate at least a general or preliminary diagnosis of their medical condition.
3. The client has agreed to follow the veterinarian's recommendations.
4. The veterinarian is readily available for follow-up evaluation, or has arranged for emergency or urgent care coverage, or has designated continuing care and treatment to another licensed veterinarian who has access to the patient's medical records and/or can provide reasonable and appropriate medical care.
5. The veterinarian provides oversight of treatment.
6. The veterinarian has performed a timely physical examination of the patient(s) and/or is personally acquainted with their keeping and care by virtue of medically appropriate and timely visits to the operation where they are kept.
7. Patient records are maintained.

AVMA®
American Veterinary Medical Association

Tenets of Antimicrobial Prescribing Handbook of Antimicrobial Stewardship in Companion Animals

University of Minnesota College of Vet Med

- Make a Diagnosis
- Follow antimicrobial guidelines
- Consider host, likely disease agent and drug when selecting antimicrobial
- Use the correct dose and duration
- Teach clients to administer antimicrobials
- Do not prescribe antimicrobials “just in case”
- Use a tiered approach, choosing antimicrobials with lower importance to human medicine first.

One Health Approach to Infectious Diseases in Animals and Humans

- Infectious Disease Society of America
- IDSA
- Provides guidance to physicians on management of various infectious diseases

- International Society for Companion Animal Infectious Diseases ISCAID

ISCAID

International Society for Companion Animal Infectious Diseases

ISCAID

International Society for Companion Animal Infectious Diseases

Urinary Tract Infection in Dogs
Recommendations for use of Amoxicillin

- Drug table summarizing recommendations for the management of bacterial urinary tract infection in dogs and cats.
- Amoxicillin (CIA) 11–15 mg/kg PO every 8–12 h Good first-line option for sporadic bacterial cystitis. Excreted in urine predominantly in active form if normal kidney function is present. Klebsiella spp. are resistant. Ampicillin is used in susceptibility tests to predict activity of amoxicillin. Breakpoint for susceptibility testing is 0.25mg/mL for systemic infections but a breakpoint of 8mg/mL can be used for lower urinary tract infections owing to high urine concentrations. Not recommended for pyelonephritis or prostatitis.

National Programs involved in Antimicrobial Resistance Monitoring

National Action Plan for Combating Antibiotic-Resistant Bacteria (CARB)

National Antimicrobial Resistance Monitoring system (NARMS)

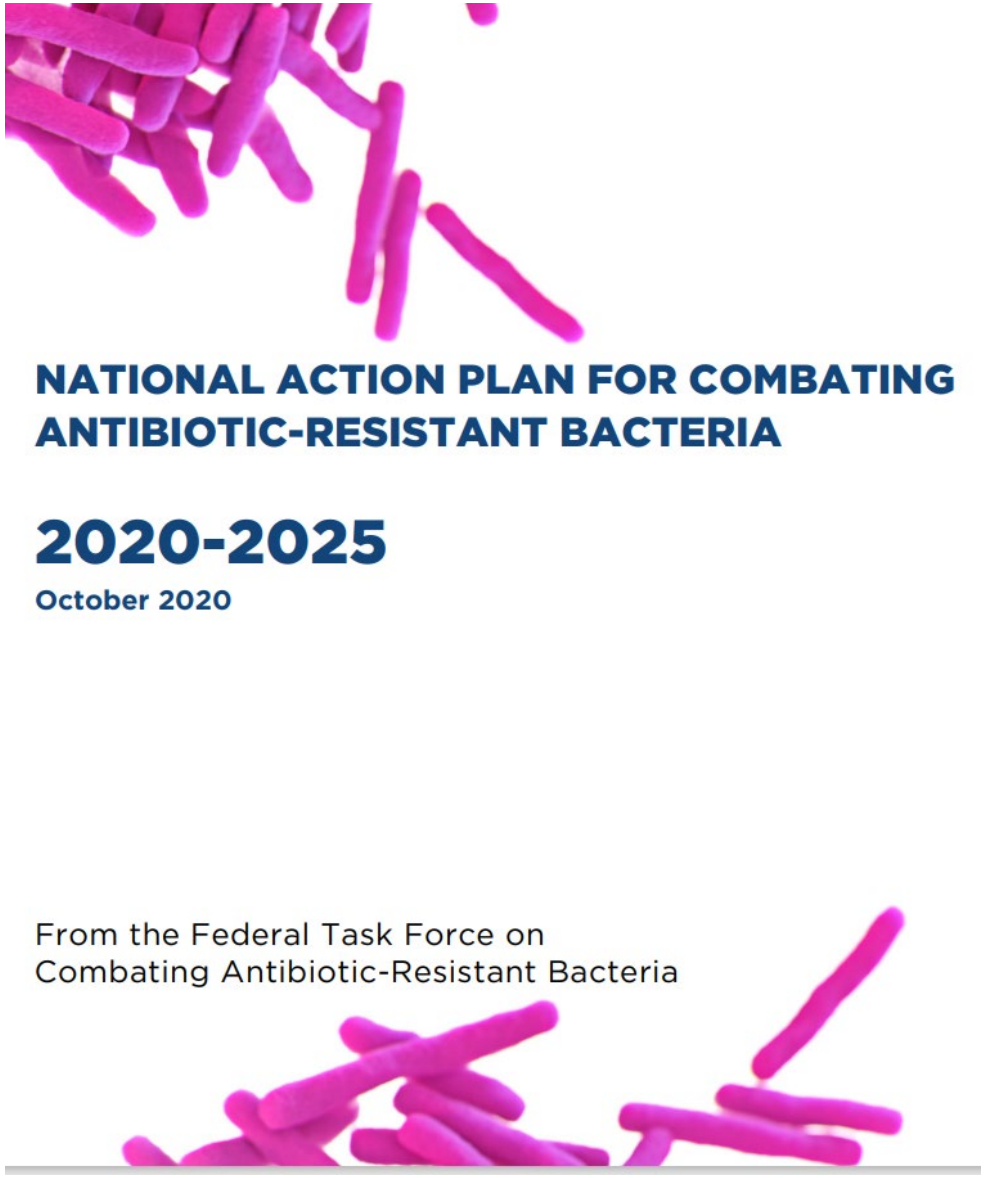
Veterinary Laboratory Investigation Response Network (VetLIRN)

National Animal Health Laboratory Network (NAHLN) Antimicrobial Resistance Monitoring Project

- **Monitors data from cattle, swine, poultry and horses, dog and cats.**
  - ***E.coli*** **(all species)**
  - ***Salmonella enterica*** **(all species)**
  - ***Mannheimia haemolytica*** **(cattle)**
  - ***Streptococcus suis*** **(swine)**
  - ***Pasteurella multocida*** **(poultry)**
  - ***Streptococcus zooepidemicus*** **(horses, swine)**
  - ***Streptococcus equi*** **(horses)**
  - ***Staphylococcus intermedius*** **group (dogs and cats)**

National Action Plan for Combating Antibiotic-Resistant Bacteria (CARB)

- Office of the U.S President 2015
- Purpose: Monitor the Activities and Actions of Government, Public Health, Healthcare and veterinary partners to address AMR threat.



The Federal CARB Task Force

National Goals of CARB

- **Goal 1: Slow the Emergence of Resistant** Bacteria and Prevent the Spread of Resistant Infections
- **Goal 2: Strengthen National One Health Surveillance Efforts t**o Combat Resistance
- **Goal 3**: **Advance Development and Use of Rapid and Innovative Diagnostic Tests for Identification** and Characterization of Resistant Bacteria
- **Goal 4**: Accelerate Basic and Applied Research and **Development** for **New Antibiotics**, Other Therapeutics, and Vaccines
- **Goal 5**: **Improve International Collaboration** and Capacities for Antibiotic-Resistance Prevention, Surveillance, Control and Antibiotic Research and Development.

Strengthen National One Health Surveillance Efforts to Combat Resistance Goal 2

- Objective 1.1 Expand surveillance through existing systems to monitor antibiotic resistance from multiple sources across One Health.
  - CDC, FDA, APHIS, FSIS Increase the amount of laboratory testing for antibiotic resistance, the number of isolates accompanied by test results and available data, and the number of different specimen sources and specimen types collected
- Objective 1.2 Increase **whole-genome sequencing** and antibiotic resistance phenotypic and genotypic testing in laboratory networks for antibiotic-resistant pathogens listed in CDC's 2019 AR Threats Report and upload sequenced data to the National Institutes of Health (NIH) National Center for Biotechnology Information at the National Library of Medicine or to other approved, secure, and widely accessible databases.
- CABA-National-Action-Plan 2020-2025, HHS,USDA, DoD, Dol, VA,EPA

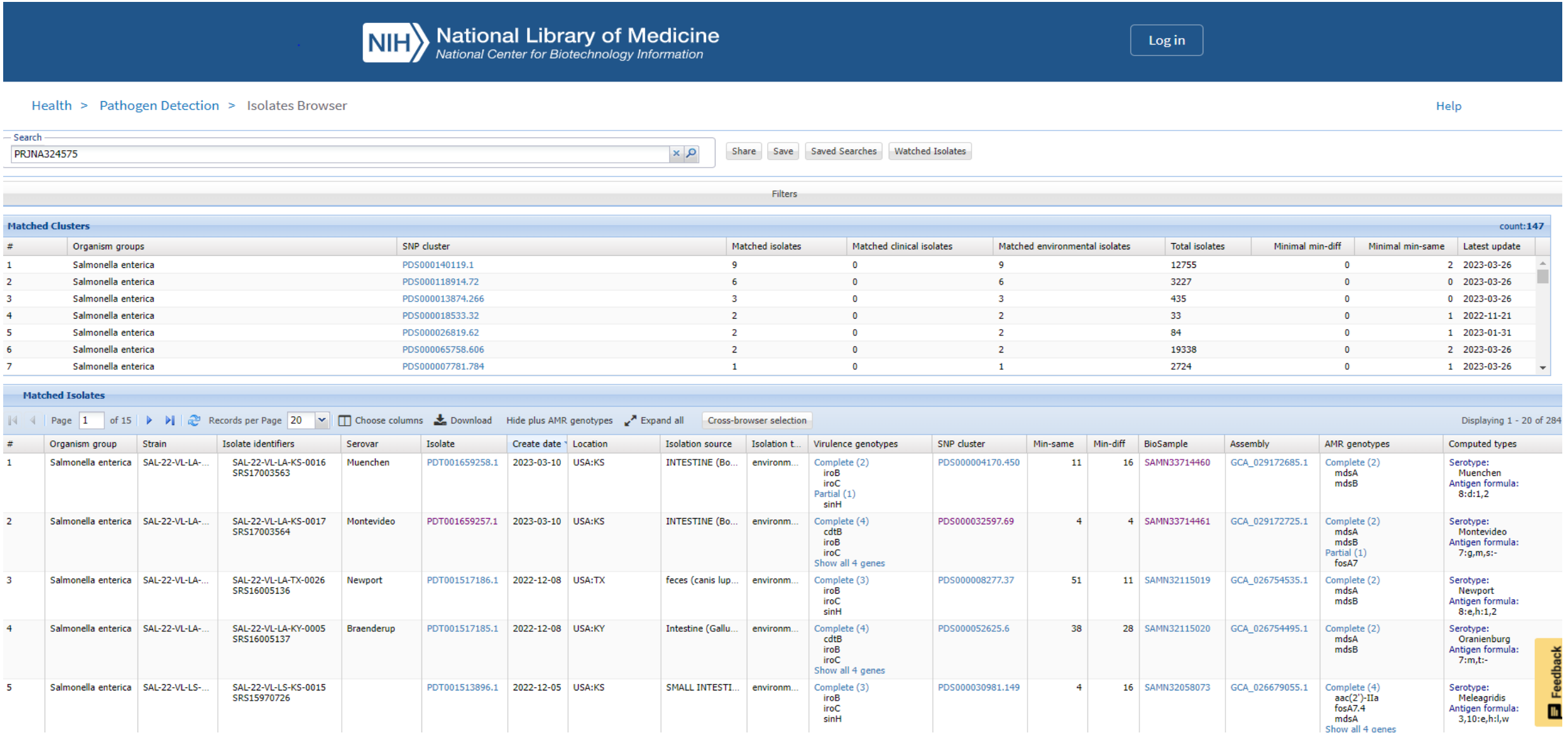
Antimicrobial Resistance Monitoring

USDA/National Animal Health Laboratory Network (NAHLN)

FDA/CVM Veterinary Laboratory Investigation Network (VetLIRN)

- **Surveillance Program to monitor antimicrobial resistance (AMR)**
- **Utilized as a part of a unified Federal response as a One Health partner agency –FDA, CDC , USDA**
- **Whole Genome Sequencing**
  - **Genome Trakr Network, PulseNet, Foodborne pathogens**
  - **NCBI- National Center for Biotechnology Information Gene database**
- **Collect AMR data and establish dashboards to display results**
- **Clinicians use the AMR data in making best treatment decisions**

Next Generation Sequencing



NIH National Library of Medicine
National Center for Biotechnology Information

Log in

Health > Pathogen Detection > Isolates Browser

Help

Search

PRJNA324575

Share | Save | Saved Searches | Watched Isolates

Filters

Matched Clusters count:147

#	Organism groups	SNP cluster	Matched isolates	Matched clinical isolates	Matched environmental isolates	Total isolates	Minimal min-diff	Minimal min-same	Latest update
1	Salmonella enterica	PDS000140119.1	9	0	9	12755	0	2	2023-03-26
2	Salmonella enterica	PDS000118914.72	6	0	6	3227	0	0	2023-03-26
3	Salmonella enterica	PDS000013874.266	3	0	3	435	0	0	2023-03-26
4	Salmonella enterica	PDS000018533.32	2	0	2	33	0	1	2022-11-21
5	Salmonella enterica	PDS000026819.62	2	0	2	84	0	1	2023-01-31
6	Salmonella enterica	PDS000065758.606	2	0	2	19338	0	2	2023-03-26
7	Salmonella enterica	PDS000007781.784	1	0	1	2724	0	1	2023-03-26

Matched Isolates

Page 1 of 15 | Records per Page 20 | Choose columns | Download | Hide plus AMR genotypes | Expand all | Cross-browser selection | Displaying 1 - 20 of 284

#	Organism group	Strain	Isolate identifiers	Serovar	Isolate	Create date	Location	Isolation source	Isolation t...	Virulence genotypes	SNP cluster	Min-same	Min-diff	BioSample	Assembly	AMR genotypes	Computed types
1	Salmonella enterica	SAL-22-VL-LA-...	SAL-22-VL-LA-KS-0016 SRS17003563	Muenchen	PDT001659258.1	2023-03-10	USA:KS	INTESTINE (Bo...	environm...	Complete (2) iroB iroC Partial (1) sinH	PDS000004170.450	11	16	SAMN33714460	GCA_029172685.1	Complete (2) mdsA mdsB	Serotype: Muenchen Antigen formula: 8:d:1,2
2	Salmonella enterica	SAL-22-VL-LA-...	SAL-22-VL-LA-KS-0017 SRS17003564	Montevideo	PDT001659257.1	2023-03-10	USA:KS	INTESTINE (Bo...	environm...	Complete (4) cdtB iroB iroC Show all 4 genes	PDS000032597.69	4	4	SAMN33714461	GCA_029172725.1	Complete (2) mdsA mdsB Partial (1) fosA7	Serotype: Montevideo Antigen formula: 7:g,m,s:-
3	Salmonella enterica	SAL-22-VL-LA-...	SAL-22-VL-LA-TX-0026 SRS16005136	Newport	PDT001517186.1	2022-12-08	USA:TX	feces (canis lup...	environm...	Complete (3) iroB iroC sinH	PDS000008277.37	51	11	SAMN32115019	GCA_026754535.1	Complete (2) mdsA mdsB	Serotype: Newport Antigen formula: 8:e,h:1,2
4	Salmonella enterica	SAL-22-VL-LA-...	SAL-22-VL-LA-KY-0005 SRS16005137	Braenderup	PDT001517185.1	2022-12-08	USA:KY	Intestine (Gallu...	environm...	Complete (4) cdtB iroB iroC Show all 4 genes	PDS000052625.6	38	28	SAMN32115020	GCA_026754495.1	Complete (2) mdsA mdsB	Serotype: Oranienburg Antigen formula: 7:m,t:-
5	Salmonella enterica	SAL-22-VL-LS-...	SAL-22-VL-LS-KS-0015 SRS15970726		PDT001513896.1	2022-12-05	USA:KS	SMALL INTESTI...	environm...	Complete (3) iroB iroC sinH	PDS000030981.149	4	16	SAMN32058073	GCA_026679055.1	Complete (4) aac(2')-IIa fosA7.4 mdsA Show all 4 genes	Serotype: Meleagridis Antigen formula: 3,10:e,h:l,w

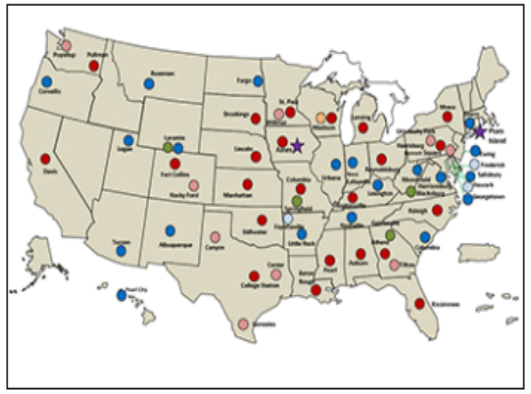
Feedback

National Antimicrobial Resistance Monitoring system for Enteric Bacteria (NARMS)

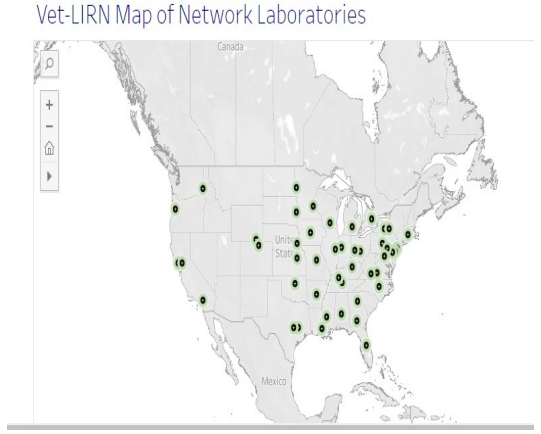
- Tracking Trends in Resistance
- Interagency partnership CDC, FDA and USDA
- ARM in enteric bacteria from human's, retail meats, food animals.
- *Salmonella, Campylobacter, Shigella, E. Coli* 0157*, Vibrio*

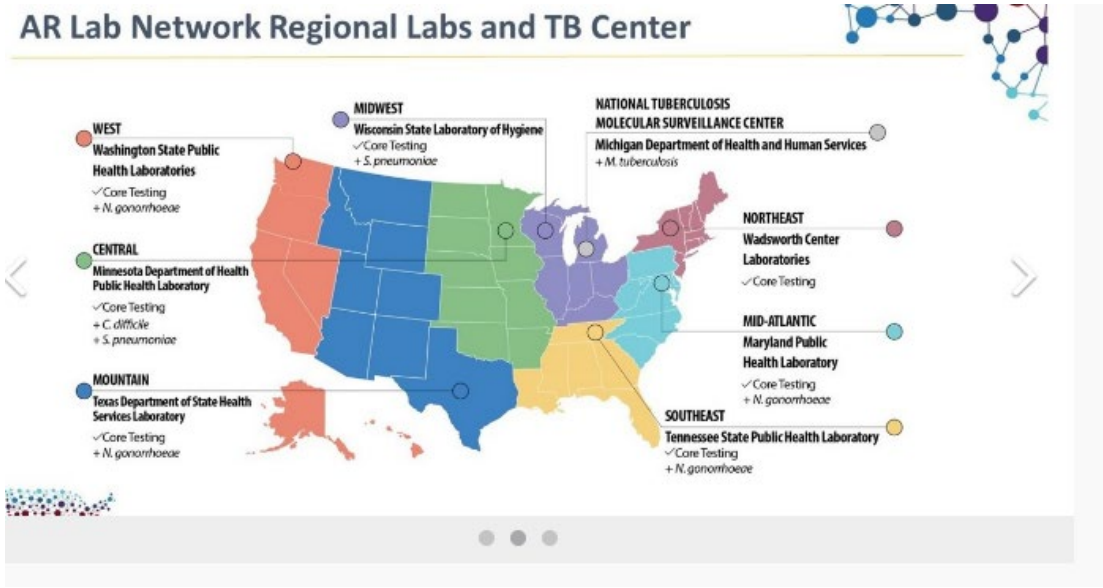
Human and Veterinary Medicine Laboratories involved in Antimicrobial Resistance Detection

- **Human Medicine**
  - 8 Regional Laboratories
  - **Antibiotic Resistance Laboratory Network** (ARLN): **Southeast Tennessee State Public Health Laboratory**
  - **PulseNet**
- **Vet Medicine**
- **National Animal Health Laboratory Network (NAHLN):** Antibiotic Sensitivity and WGS
- GenomeTraker , NCBI
  - **Louisiana Animal Disease Diagnostic Laboratory**
- **Veterinary Laboratory Investigation Response Network (VetLIRN**) WGS GenomeTraker, NCBI
  - **Louisiana Animal Disease Diagnostic Laboratory**



NAHLN Laboratories | SOPs





PennVet CREATE University of Pennsylvania

- **CREATE: Carbapenem-Resistant Enterobacterales Animal Testing and Epidemiology**
- **System to Flag Carbapenem Resistant Enterobacterales (CRE)**
- **Recognized that animals colonized or infected with organism resistant to Carbapenems with an MIC of 2mcg/ml or greater for imipenem or meropenem**
    - ***Klebsiella pneumoniae* carbapenemase (KPC)**
    - **New Delhi Metallo-beta-lactamase, (NDM)**
    - **Imipenemase (IMP)**
    - **Verona integronencoded metallo-beta-lactamase (VIM)**
- **Concerns that CRE is Transmissible between animal and human and vice versa.**
- **Veterinarians' opinions on the use of Carbapenem antibiotics**
    - **limit to life threatening cases**
    - **others believe drugs should never be used to treat animal patients.**

Complete Genome Sequence of a Carbapenem-Resistant *Escherichia coli* Isolate with *blaNDM-5* from a Dog in the US in 2018 (endotracheal wash specimen resistant to imipenem)

Gregory H. Tyson Cong Li, Olgica Ceric, Renate Reimschuessel, Stephen Cole, **Laura Peak** Shelley C. Rankinb

Emerging Infectious Diseases Vol. 29, No. 6, June 2023

One Health Approach for Reporting Veterinary Carbapenem-Resistant Enterobacterales and Other Bacteria of Public Health Concern

Kate KuKanich, Amy Burklund,1 Rob McGaughey, Nancy Muturi, Sasha Thomason,2 M.M. Chengappa, Ingrid Garrison,3 Bryna Stacey, Shuping Zhang, Tamara Gull (Kansas State University, University of Missouri)

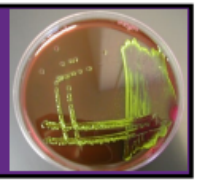
CRE Outbreak in a Veterinary Teaching Hospital Increased the urgency for Improved communication among diagnostic labs, public health officials, veterinarians, and pet owners

CRE <u>are</u> reportable to State Health Departments

CRE <u>are not</u> reportable to State Veterinary Official/Department.

Carbapenem-resistant *Enterobacterales* Information for Veterinarians

My small animal patient has been diagnosed with a CRE, now what?



What is carbapenem-resistant *Enterobacterales* (CRE)?

- CRE is a type of bacteria (e.g., *E. coli, Klebsiella)* that are resistant to drugs such as imipenem and meropenem as well as many other antimicrobials.
- Isolating CRE has public health implications because CRE can cause severe infections that are difficult to treat in both pets and people.

Where did my patient get this bacteria?

- *Enterobacterales* and CRE can colonize the GI and urogenital tracts of healthy people and pets.
- In pets, infections typically occur when CRE spreads to the lungs, urinary tract or wounds.
- CRE can be spread by contaminated hands or through bodily fluids, feces, contaminated surfaces, or equipment.

Is there risk to my staff and other patients?

- It is possible to share CRE between pets and people, but the risk is believed to be low.
- Immunosuppressed veterinary staff and patients should avoid contact with CRE patients when possible.
- Everyone can reduce spread by washing hands.
- Anyone concerned about CRE exposure or illness should consult their healthcare provider.

How can we treat my patient?

- Do **NOT** screen healthy pets for CRE. Do **NOT** treat colonized pets with no clinical signs; you cannot decolonize a pet.
- CRE infections can be challenging to treat; consult with a pharmacologist, microbiologist, or infectious disease specialist as needed.
- Remove any implants, and drain and clean wounds.
- Consider topical antiseptics/antimicrobials for skin or wound infections.

General precautions

- Isolate hospitalized CRE patients, minimize staff caring for them, and wash hands after contact
- Have CRE patients urinate/defecate in a separate area, and disinfect area frequently.
- Wear gloves, gowns, and masks when handling a CRE patient, cleaning wounds, changing bandages, or handling bodily fluids
- Be careful to not cross-contaminate hospital surfaces and equipment with CRE.
- Follow manufacturer guidelines closely for all disinfectants (e.g., dilution, storage, contact time).

Where can I find more information?

- Kansas State Veterinary Diagnostic Laboratory
  (785) 532-5650 http://www.ksvdl.org/
- MU Veterinary Medical Diagnostic Laboratory
  (573) 882-8367 https://vmdl.missouri.edu/
- CDC FAQs about CRE for Veterinarians
  https://www.cdc.gov/hai/organisms/cre/FAQ-Vets.html

Antimicrobial resistance and Stewardship Initiative

- **Inaugural Veterinary School Small Animal Antimicrobial Stewardship Workshop August 24-25, 2023**
- **University of Minnesota, Ohio State University, and Tufts University**
- **Meeting of academic small animal stewards In U.S.**
- **Purpose/ Focus :**
  - **Develop Hospital antimicrobial stewardship programs**
  - **Research Opportunities and Needs**
  - **Antimicrobial Stewardship Curriculum**

Close Companions

- ONE HEALTH
  - Veterinary Medicine and Human Medicine
  - As of 2023, 66% of U.S. households (86.9 million homes) own a pet
  - Dogs are the most popular pet in the U.S. (65.1 million U.S. households own a dog), followed by cats (46.5 million households) and freshwater fish (11.1 million households).[1]
    - Pet Ownership Forbes Advisor

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Evaluation Reminder

Evaluation reminder for the 2023 Louisiana Office of Public Health Antimicrobial Stewardship Summit

Please use this QR code or log-on/type in the following URL: https://bit.ly/AMR2023

To use QR code:

- Open your phone Camera app from the Home screen, Control Center, or Lock screen.
- Select the rear-facing camera. Hold your device so that the QR code appears in the viewfinder in the Camera app.
- Tap the notification to open the link associated with the QR code.

Healthcare-associated Infections HAI Elimination Louisiana

LOUISIANA DEPARTMENT OF HEALTH