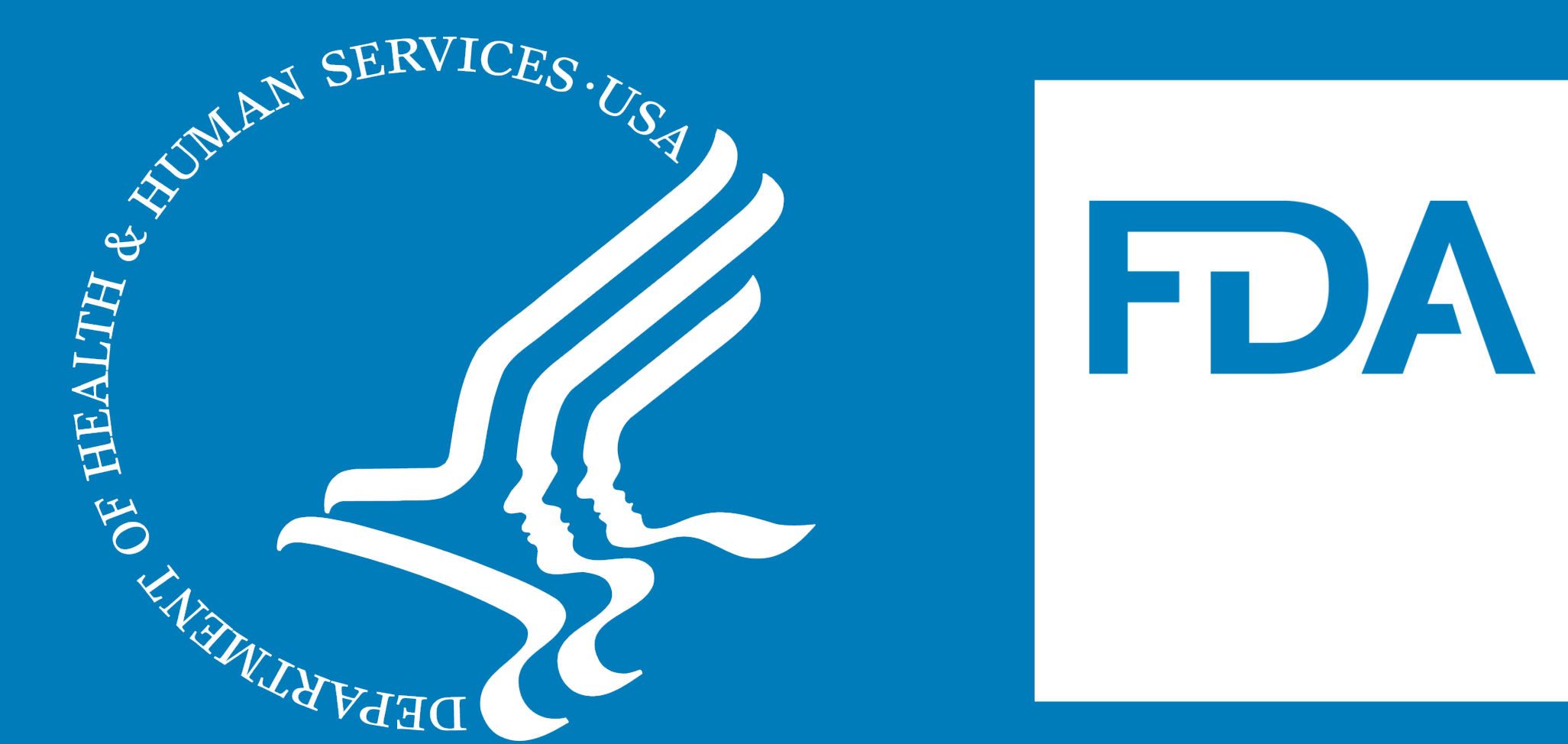


# The role of FDA's Veterinary Laboratory Investigation and Response Network in monitoring antimicrobial resistance of animal pathogens

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## Background

### Vet-LIRN Mission

The Veterinary Laboratory Investigation and Response Network (Vet-LIRN) is an FDA/CVM program created in 2010. Vet-LIRN's mission advances the CVM mission of protecting human and animal health by coordinating a network of veterinary diagnostic laboratories.

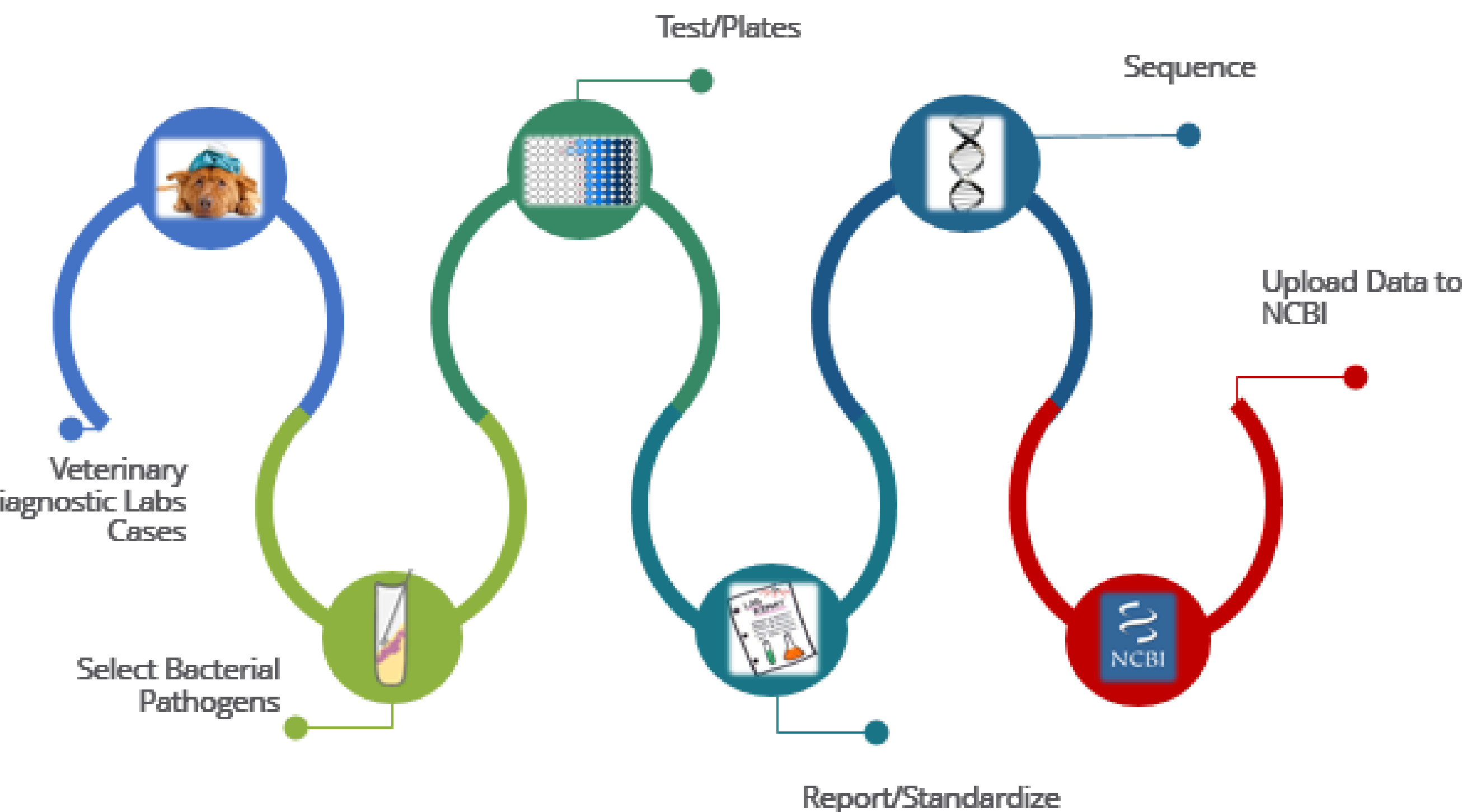


### Vet-LIRN and CARB

In 2017, Vet-LIRN initiated an Antimicrobial Resistance (AMR) Monitoring Program focused on monitoring AMR profiles in veterinary and zoonotic pathogens isolated at veterinary clinics and diagnostic laboratories in the U.S. and Canada. Vet-LIRN's AMR program supports the national initiative to Combat Antibiotic Resistant Bacteria (CARB) and FDA's Center for Veterinary Medicine's multi-pronged, multi-year strategy designed to slow the emergence of resistance arising from the use of antibiotics in animals.

## Materials and Methods

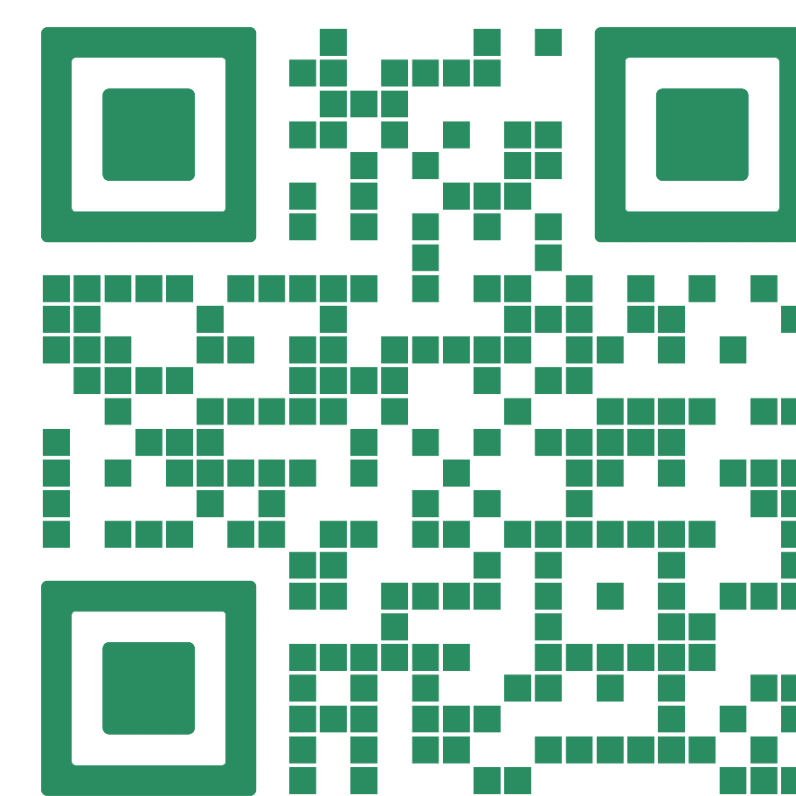
- Vet-LIRN laboratories use a commercially available testing platform to provide antimicrobial susceptibility testing (AST) data from clinically relevant bacterial isolates from animals such as: *Salmonella enterica* from any animal host and *Escherichia coli* and *Staphylococcus pseudintermedius* isolates from dogs. Laboratories sequence a subset of isolates and submit the whole genome sequencing data (WGS) to the National Center for Biotechnology Information (NCBI) submission portal.
- All sequencing data are publicly available. Laboratories follow Clinical and Laboratory Standards Institute (CLSI) AST testing methods. Vet-LIRN has partnered with the FDA's National Antimicrobial Resistance Monitoring System (NARMS), to include animal pathogen AMR data into the NARMS integrated report and create publicly available data dashboards.



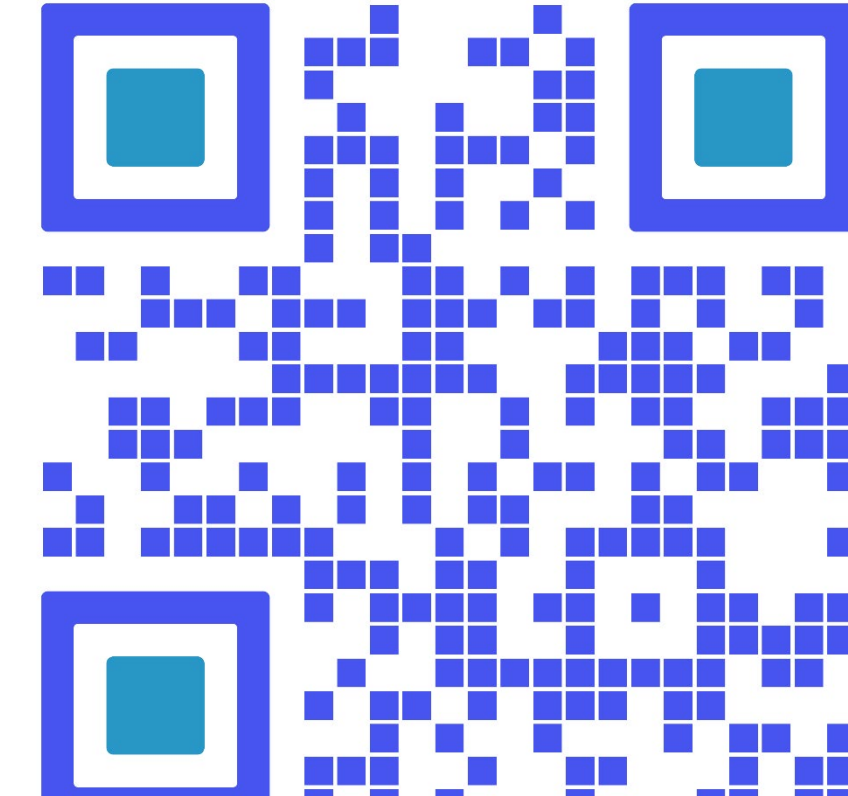
## Results and Discussion

Since 2017, the Vet-LIRN AMR program has provided a wealth of information to detect emerging antimicrobial resistance, understand the effectiveness of FDA-regulated products over time, and foster antimicrobial stewardship in veterinary settings. For example, in 2019 we identified the carbapenem resistance gene, bla<sub>NDM-5</sub>, for the first time in the U.S., in a 2018 isolate of *E. coli* from a dog in Philadelphia.

Learn about the E.coli bla<sub>NDM-5</sub> outbreak!



Learn about the complete E.coli bla<sub>NDM-5</sub> genome sequence!



Over 15,000 isolates have undergone antimicrobial susceptibility testing, and more than 4,000 isolates have been sequenced with data publicly available under NCBI BioProject [PRJNA314609](https://www.ncbi.nlm.nih.gov/bioproject/PRJNA314609).

Bacterial pathogen	AST	WGS
SAL	3,635	1,657
SPSE	4,751	1,355
ECOL	4,750	1,378
<i>K. pneumoniae</i>	355	200
<i>P. aeruginosa</i>	780	/
<i>E. faecalis/faecium</i>	822	/
<i>Campylobacter</i>	10	10
<i>E. cloacae complex</i>	201	201
All fish pathogens	~200	60
Total	>15,000	>4,000

### WGS Program Highlights—in progress

- Characterization of the *E. coli* and *S. pseudintermedius* pan-genome in dogs in comparison with humans and analysis of genetic components of isolates from dogs, correlated with AMR.
- Continue to monitor carbapenem-resistant *E. coli* (bla<sub>NDM-5</sub>) in companion animals after 2019 outbreak.
- Collaboration with various groups (FDA, CDC, USDA) on multiple clusters related to *Salmonella* isolates.

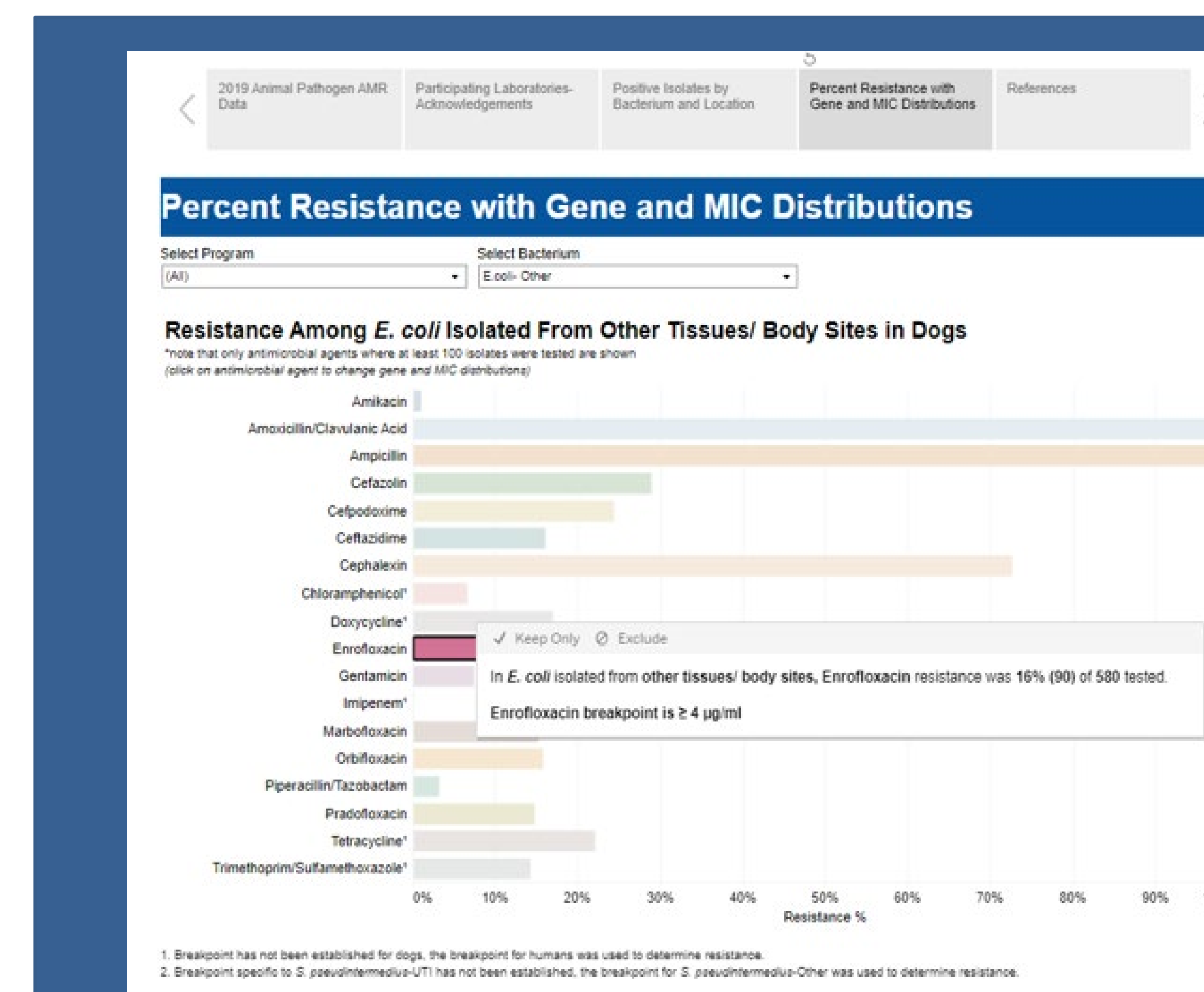
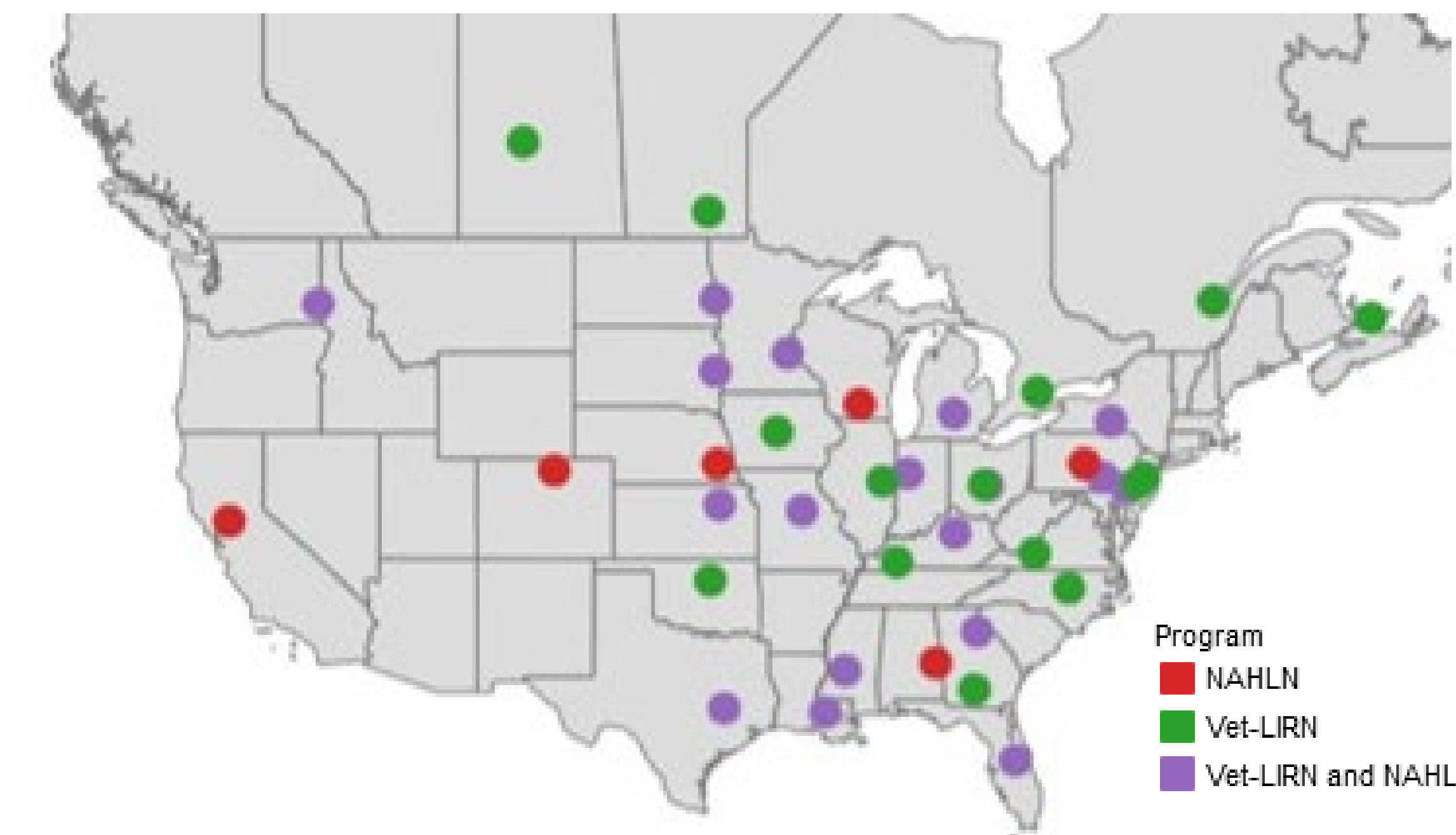
### Vet-LIRN/NAHLN Integrated Animal Pathogen AMR Data

- A cross-agency collaborating group was formed to develop a centralized data collection and reporting process across participating laboratories from both networks. The group consists of members from FDA's Vet-LIRN and NARMS, and USDA's NAHLN.
- More than 40 laboratories from Vet-LIRN and NAHLN provided antimicrobial susceptibility test (AST) data on *Escherichia coli*, *Salmonella* spp., and *Staphylococcus intermedius* group species in dogs. Dashboards include resistance mechanisms from genomics data, along with the percent resistance and MIC distributions for each of the antibiotics included in the panels.

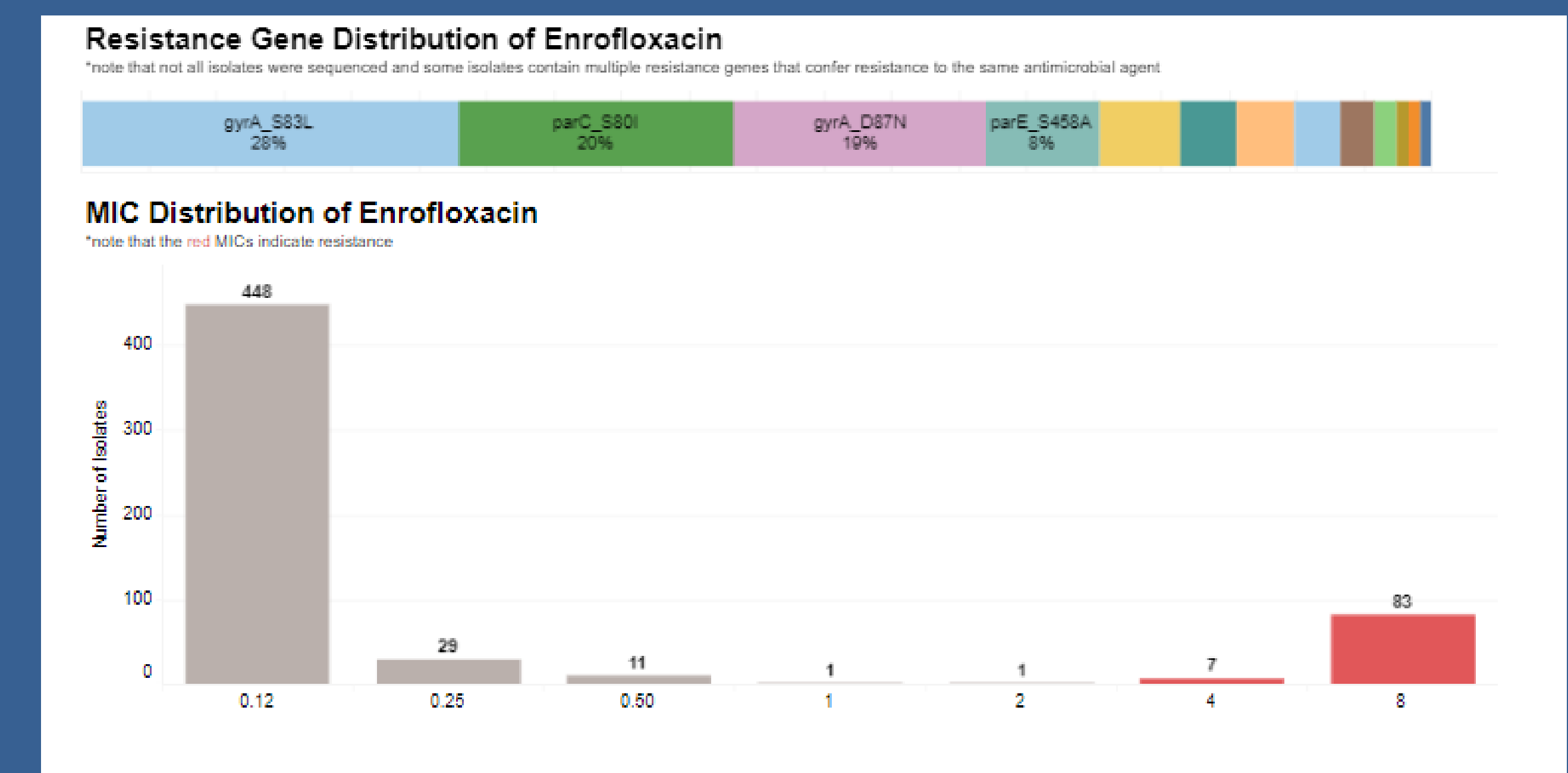


## Integrated AMR Data (Vet-LIRN/USDA NAHLN)

NAHLN-National Animal Health Laboratory Network



## Example of the Dashboard views



## Public Health Relevance

The Vet-LIRN AMR monitoring program highlights the importance of antimicrobial stewardship across humans and animals and facilitates One Health research and surveillance

