

# Determining Appropriate Treatment Regimes to Decrease Antimicrobial Resistance

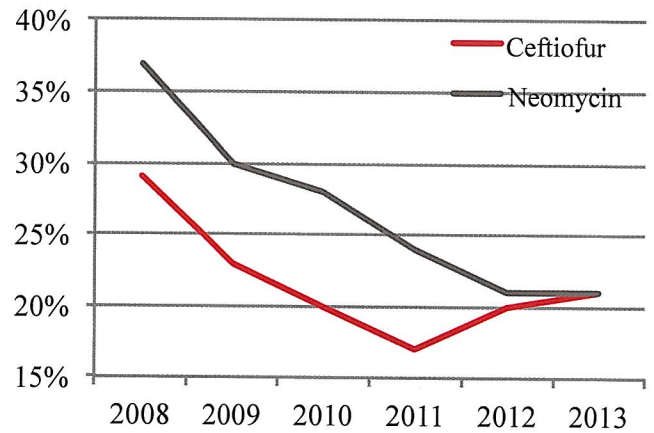
Microbroth dilution plates are used to determine if the bacteria is susceptible, intermediate, or resistant to a given antimicrobial



Concentration of antimicrobial

S = Sensitive, I = Intermediate, R = Resistant

Trends in antimicrobial resistance for commonly used drugs against *Salmonella* (Group B)



From ISU VDL testing data, *Salmonella* (Group B) resistance to:

- Neomycin dropped from 37% in 2008 to 21% in 2013
- Ceftiofur dropped from 29% in 2008 to 21% in 2013

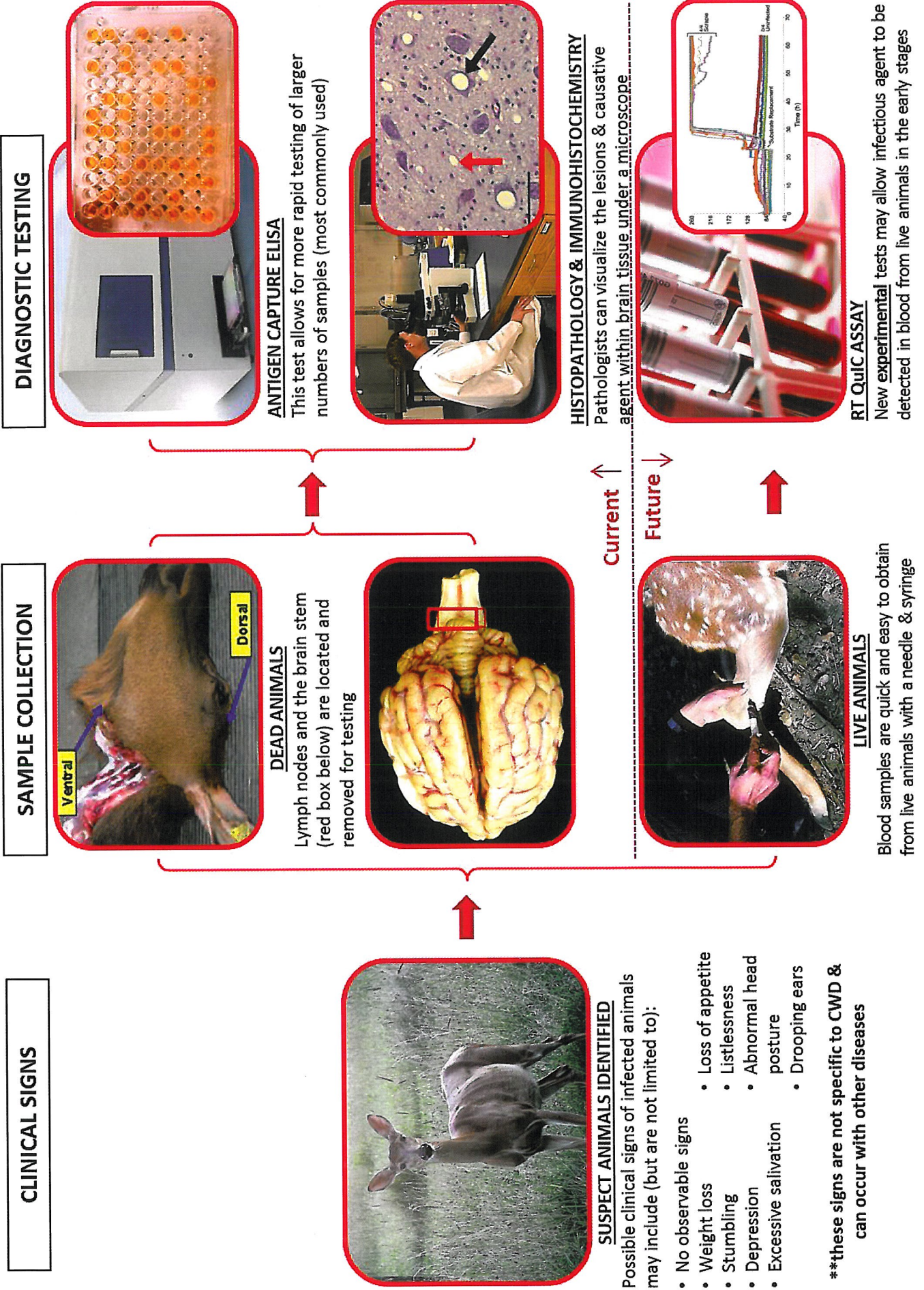
## LCMS Instrumentation

Using State of the Art Instruments to Verify Appropriate Antimicrobial Use and Avoid Residues





# Chronic Wasting Disease



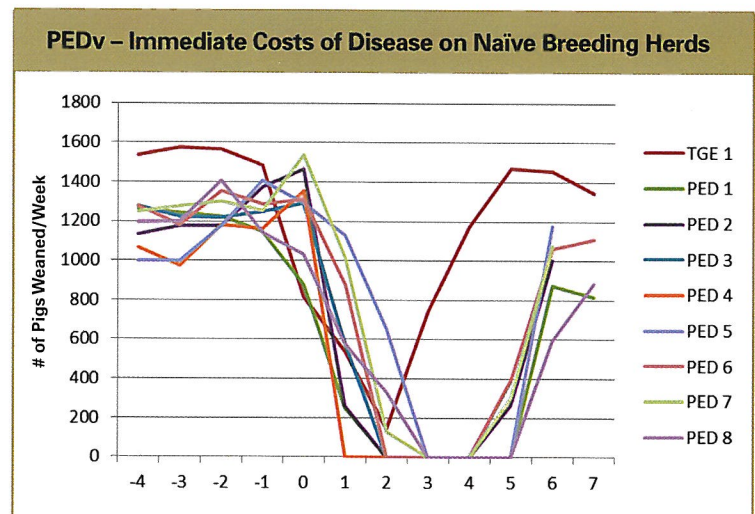
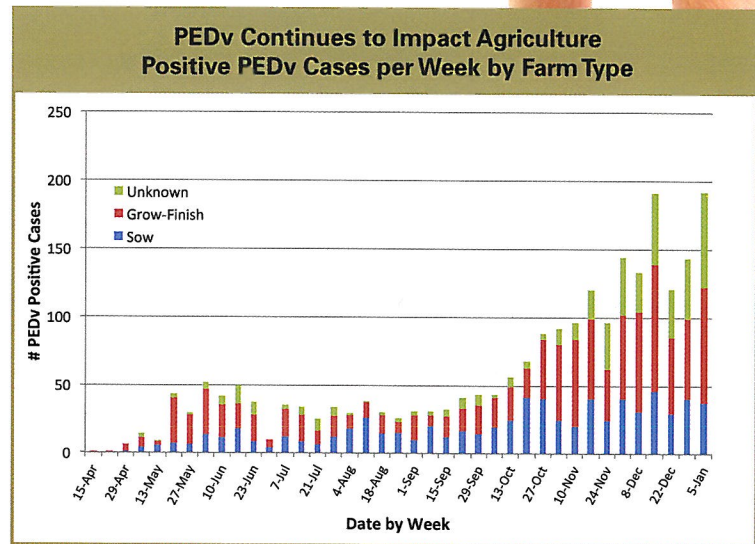


# Impacting Iowa's Animal Agriculture Industry



## Investments in next generation molecular diagnostic technologies have led to many firsts at Iowa State University Veterinary Diagnostic Lab in 2013:

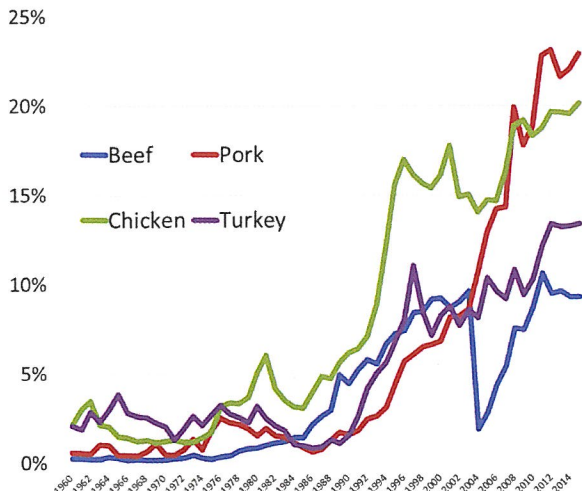
- 1st to identify and diagnose a new and highly virulent Porcine Epidemic Diarrhea Virus (PEDv) in the U.S.
- 1st to sequence and fully characterize PEDv in the U.S.
- 1st to identify "where in the world" this new virus came from
- 1st to develop and make a same-day PEDv-PCR diagnostic assay available to producers
- 1st to grow PEDv in cell-culture in the U.S.
- 1st to develop and make a same-day PEDv antibody test available
- 1st to have a modified-live vaccine candidate in development in U.S.
- 1st in PEDv diagnostic support to the U.S. swine industry
- 1st in PEDv associated extramural funding



≈ 4 weeks of weaned pigs losses + 1 more week of losses 18-20 weeks later  
 ≈ 10% of affected sow units annual output... 2.2 to 2.5+ PSY... ≈ \$150+/Sow  
 ≈ \$375,000 in 2,500 sow herd



## Preserving Animal Health and Access to Export Markets



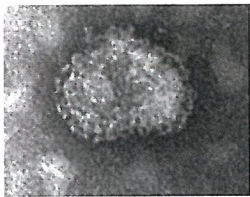
Domestic Production Being Exported (Carcass Weight Basis)

- ↑ Demand globally for high quality protein based diets
- ↑ Dependence of U.S. animal ag on foreign trade
- ↑ Opportunity/demand for diagnostic medicine at Iowa State

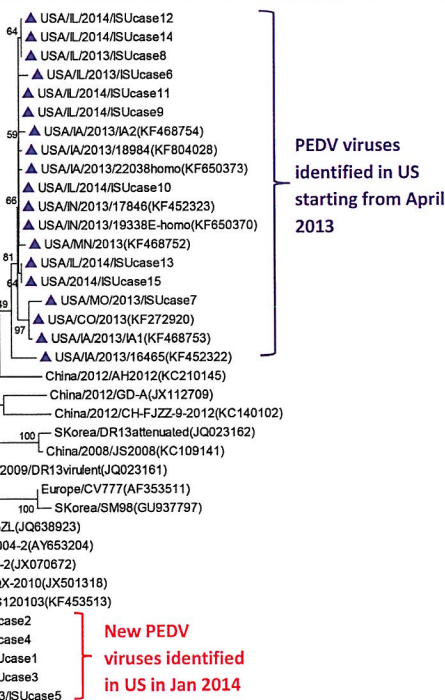


Access to these types of innovative diagnostic and disease control technologies are essential for supporting and growing Iowa's export-centric animal agricultural industries.

## Comparing the Genetic Similarities of PEDV



PED virus



## EXTRAMURAL GRANT FUNDING

Iowa State Veterinary Diagnostic Laboratory faculty currently have 8 extramural grants funded on PEDV:

- "Development and evaluation of a live attenuated porcine epidemic diarrhea virus vaccine" (award from Zoetis)
- "Characterization of the pathogenesis of porcine epidemic diarrhea virus (PEDv) in neonates and weaned pigs and generation of reference diagnostic specimens" (award from the Iowa Pork Producers Association)
- "Linking veterinary diagnostic laboratory submissions and corresponding PEDv test results to spatiotemporal mapping tools: the future of disease management, control and elimination" (grant from the National Pork Board and Iowa Pork Producers Association)
- "Oral fluid testing for cost-effective surveillance and control of porcine epidemic diarrhea virus in swine populations" (grant from the National Pork Board)
- "Porcine Epidemic Diarrhea Virus: Development of tests and reagents for diagnosis and disease management" (grant from the Iowa Pork Producers Association)
- "Evaluation of time and temperature sufficient to kill PEDv in swine feces on metal surfaces" (grant from the National Pork Board)
- "Feed transmission of PEDv to neonatal pigs" (grant from the National Pork Board)
- "Defining PEDv Maternal Humoral Immunity and Correlates of Neonatal Protection" (grant from the National Pork Board)

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# Serving Food Animal Agriculture

COMPREHENSIVE DIAGNOSTIC SERVICE, TEACHING, AND DISCOVERY



Location	Case #	Species	Sex	Age	Owner
220081232828	220081232828	Swine	Male	1000	Swine
220081232829	220081232829	Swine	Female	1000	Swine
220081232830	220081232830	Swine	Male	1000	Swine
220081232831	220081232831	Swine	Female	1000	Swine
220081232832	220081232832	Swine	Male	1000	Swine
220081232833	220081232833	Swine	Female	1000	Swine
220081232834	220081232834	Swine	Male	1000	Swine
220081232835	220081232835	Swine	Female	1000	Swine
220081232836	220081232836	Swine	Male	1000	Swine
220081232837	220081232837	Swine	Female	1000	Swine
220081232838	220081232838	Swine	Male	1000	Swine
220081232839	220081232839	Swine	Female	1000	Swine
220081232840	220081232840	Swine	Male	1000	Swine
220081232841	220081232841	Swine	Female	1000	Swine
220081232842	220081232842	Swine	Male	1000	Swine
220081232843	220081232843	Swine	Female	1000	Swine
220081232844	220081232844	Swine	Male	1000	Swine
220081232845	220081232845	Swine	Female	1000	Swine
220081232846	220081232846	Swine	Male	1000	Swine
220081232847	220081232847	Swine	Female	1000	Swine
220081232848	220081232848	Swine	Male	1000	Swine
220081232849	220081232849	Swine	Female	1000	Swine
220081232850	220081232850	Swine	Male	1000	Swine



Iowa's only Full-Service & Fully Accredited Veterinary Diagnostic Laboratory

- Processing 55,000 cases/year from livestock producers
- Applying world-class technology to solve real-world problems



ISU VDL Diagnostician receives the case from the local veterinarian

55,000/year

Select diagnostic tests based on history and gross lesions

Serology

Molecular Diagnostics

Histopathology

Bacteriology

Toxicology & Nutrition

Virology

Clinical Pharmacology

Results coordinated to arrive at a diagnosis

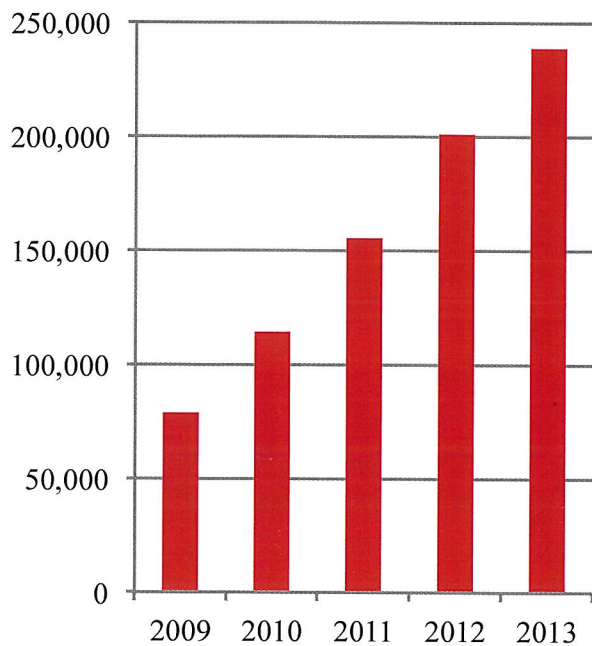
Transmit diagnosis to and assist local veterinarian with intervention strategies and establishment of best practices

Informs teaching and research programs

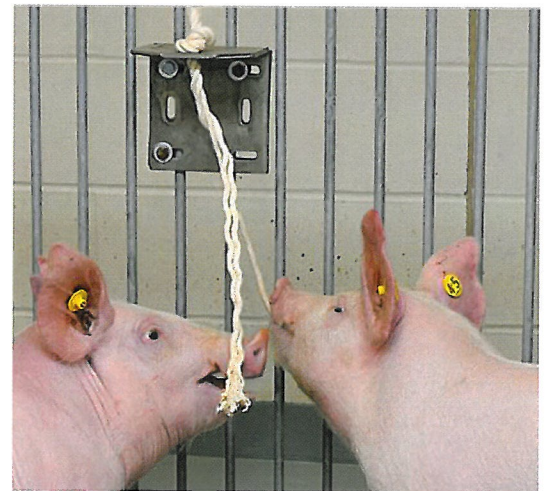
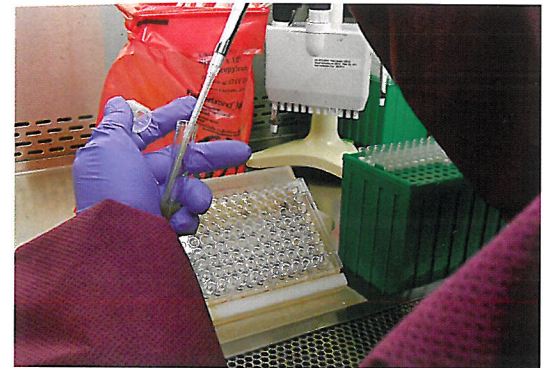


## Growth in Services

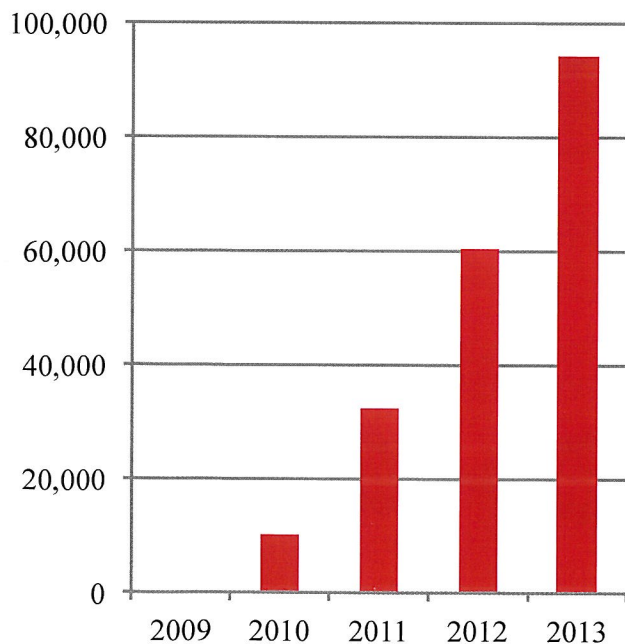
Number of Molecular Diagnostic Assays



The caseload at the diagnostic laboratory has increased **95% over the past 4 years**



Number of Diagnostic Assays Using Oral Fluid



# Sequencing the Genomes of Pathogens to Improve Animal Health

