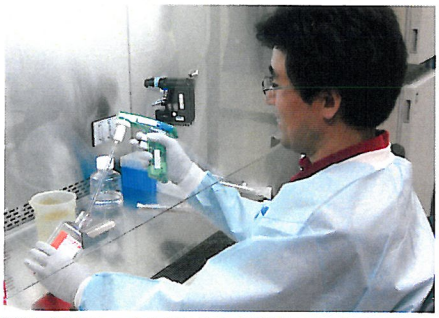
IOWA STATE UNIVERSITY

Veterinary Diagnostic Laboratory

1A

Iowa's Only Full-Service Veterinary Diagnostic Laboratory

IMPACT: A 1% increase in on-farm production = $140-million impact for Iowa



- **Partners to serve and grow Iowa's $14-billion animal agricultural economy**
- **Provides timely, comprehensive, high-quality diagnoses for diseases and toxicoses**
  - > **70,000+ cases/year**
  - > **1.5 million tests/year**
  - > **Many with same-day results**
- **Protecting safety and security of food supply**
- **Fully accredited by the American Association of Veterinary Laboratory Diagnosticians**
- **One of 12 core labs in the U.S. National Animal Health Laboratory Network**

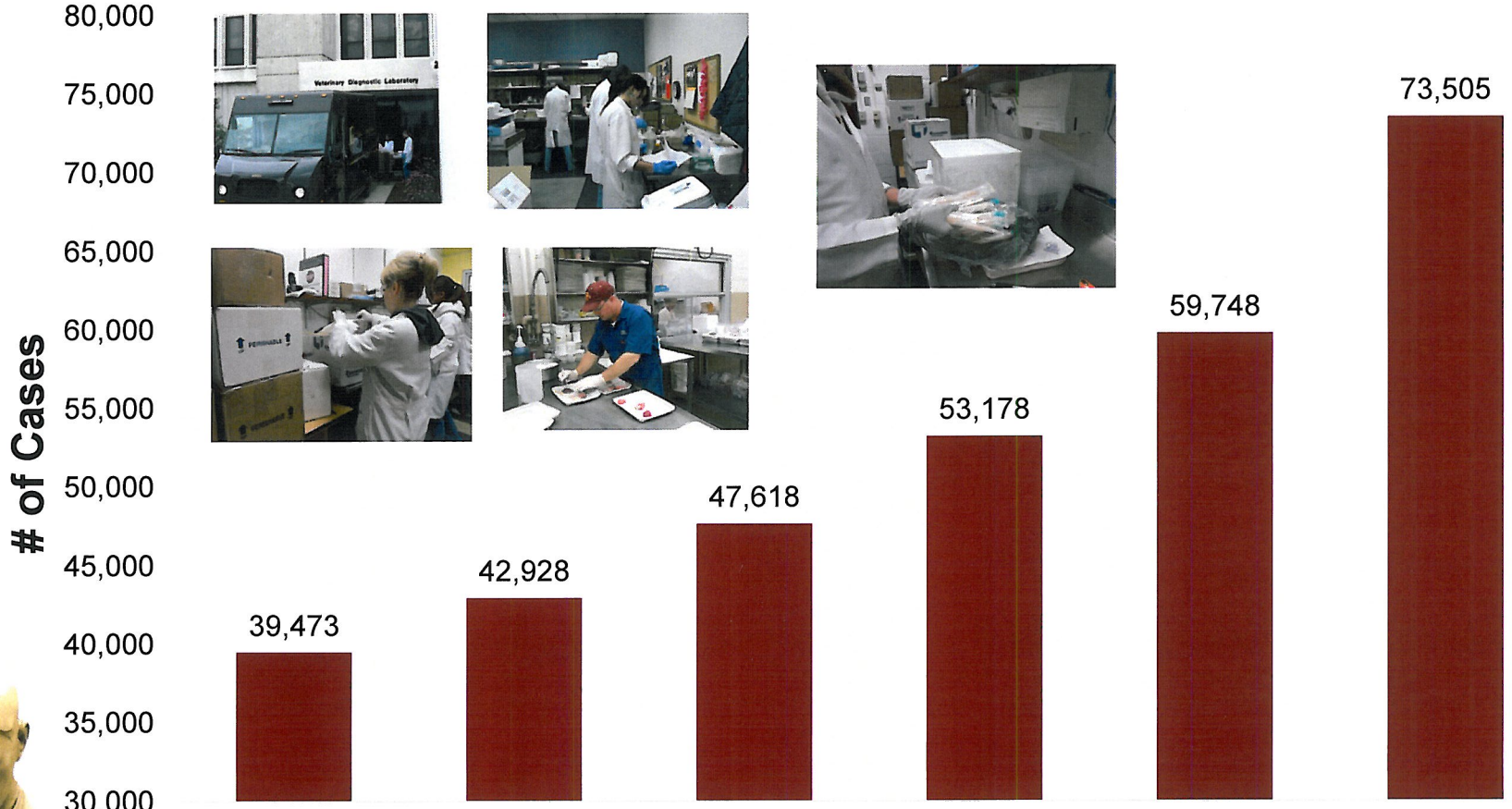
The $4 million direct appropriation through Agriculture and Natural Resources allows us to:

- Continue to provide unbiased, critical diagnostic services to meet the needs of Iowa animal owners and consumers
- Position Iowa to continue to participate in national animal health networks and surveillance programs for domestic diseases
- Be prepared to detect and quickly respond to introduction of a transboundary (2013 PED virus) or foreign animal disease
- Provide the research infrastructure to be the nation's leader in food-animal diagnostic medicine
- Preserve and continue to grow Iowa's access to export markets: ~27% of U.S. pork and ~13% of U.S. beef is exported

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

vetmed.iastate.edu/diagnostic-lab

ISU VDL Submissions (2009-2014)



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IOWA STATE UNIVERSITY
Veterinary Diagnostic Laboratory

2A

Impacting Iowa's Animal Agriculture Industry

Investments in advanced diagnostic technologies have led to many firsts at Iowa State in the last two years:

- **1st to identify and diagnose a new and highly virulent virus Porcine Epidemic Diarrhea virus (PEDv) in the U.S. in 2013.**
- 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 isolate and 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

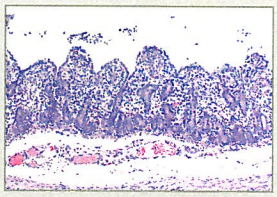
Access to innovative diagnostic and disease control technologies are essential for supporting and growing Iowa's export-centric animal agricultural industries.

EXTRAMURAL GRANT FUNDING

Iowa State University Veterinary Diagnostic Laboratory faculty currently have 18 extramural grants for $1.4 million funding on PEDv:

- Five active grants to develop effective vaccines and measure protection. *(Pork Board, Iowa Livestock Health Advisory Council)*
- Three active grants to advance understanding on transmission of PEDv. *(Protein Company, National Pork Board)*
- Three active grants on improving biosecurity to keep PEDv out of herds. *(Pork Board, Iowa Pork Producers Association)*
- Three active grants to advance understanding of how the virus causes disease and differences in virulence among strains. *(Pork Producers Association)*
- Two active grants to study approaches to disease management and elimination. *(Iowa Pork Producers, National Pork Board, and others)*
- Two active grants to advance diagnostic capabilities. *(Pork Producers Association, National Pork Board)*

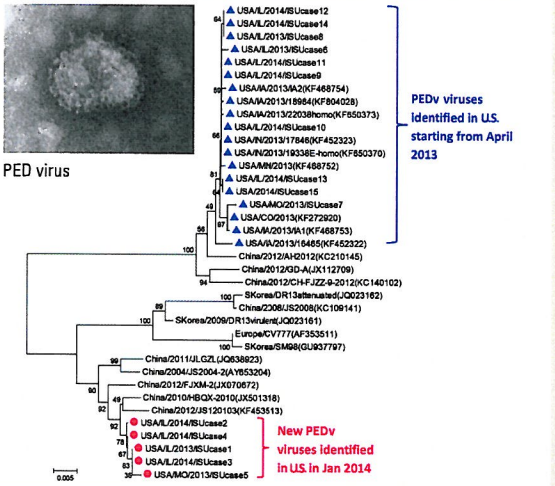
Normal intestine



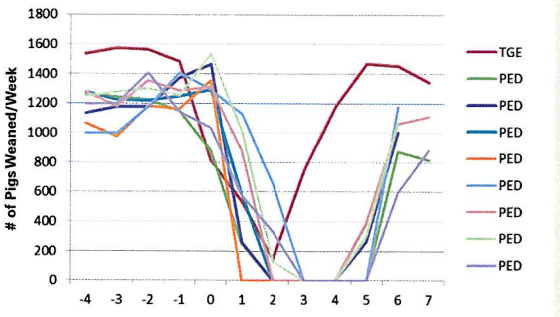
Intestine from a PEDv-infected pig

Comparing the Genetic Similarities of PEDv

PED virus

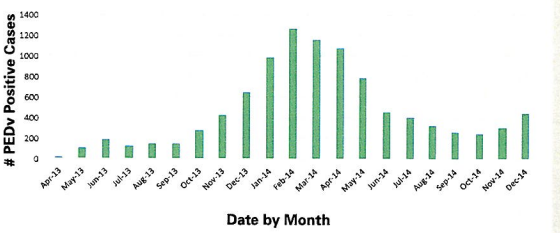


PEDv – Immediate Costs of Disease on Naïve Breeding Herds



≈ 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+ pigs/sow/year… ≈ $150+/Sow
≈ $375,000 in 2,500 sow herd

PEDv Continues to Impact Agriculture Positive PEDv Cases per Month in the U.S.

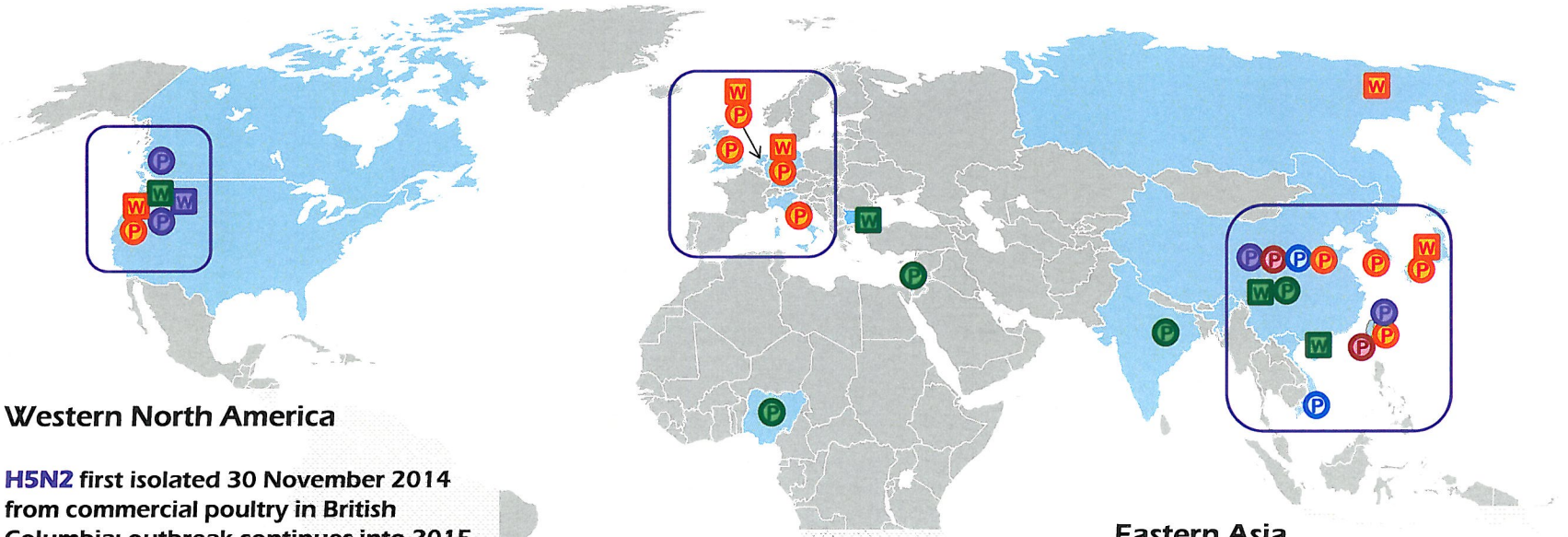


H5 HPAI reports from North America

November 2014 through January 2015 (OIE)

the Center for Food Security & Public Health
IOWA STATE UNIVERSITY

USDA



Western North America

H5N2 first isolated 30 November 2014 from commercial poultry in British Columbia; outbreak continues into 2015.

H5N8 first isolated 10 December 2014 from captive wild birds in Washington; later isolated from backyard poultry in Oregon. Similarly, **H5N2** identified in US wild birds and backyard poultry.

H5N1 first isolated 29 December 2014 from wild duck in Washington.

H5N8 isolated 19 January 2015 from commercial turkey farm in California.

Western Europe

H5N8 first isolated 4 November 2014 from commercial poultry in Germany; also isolated in November from a wild duck.

By mid-December, **H5N8** was isolated from commercial poultry in The Netherlands, United Kingdom, and Italy.

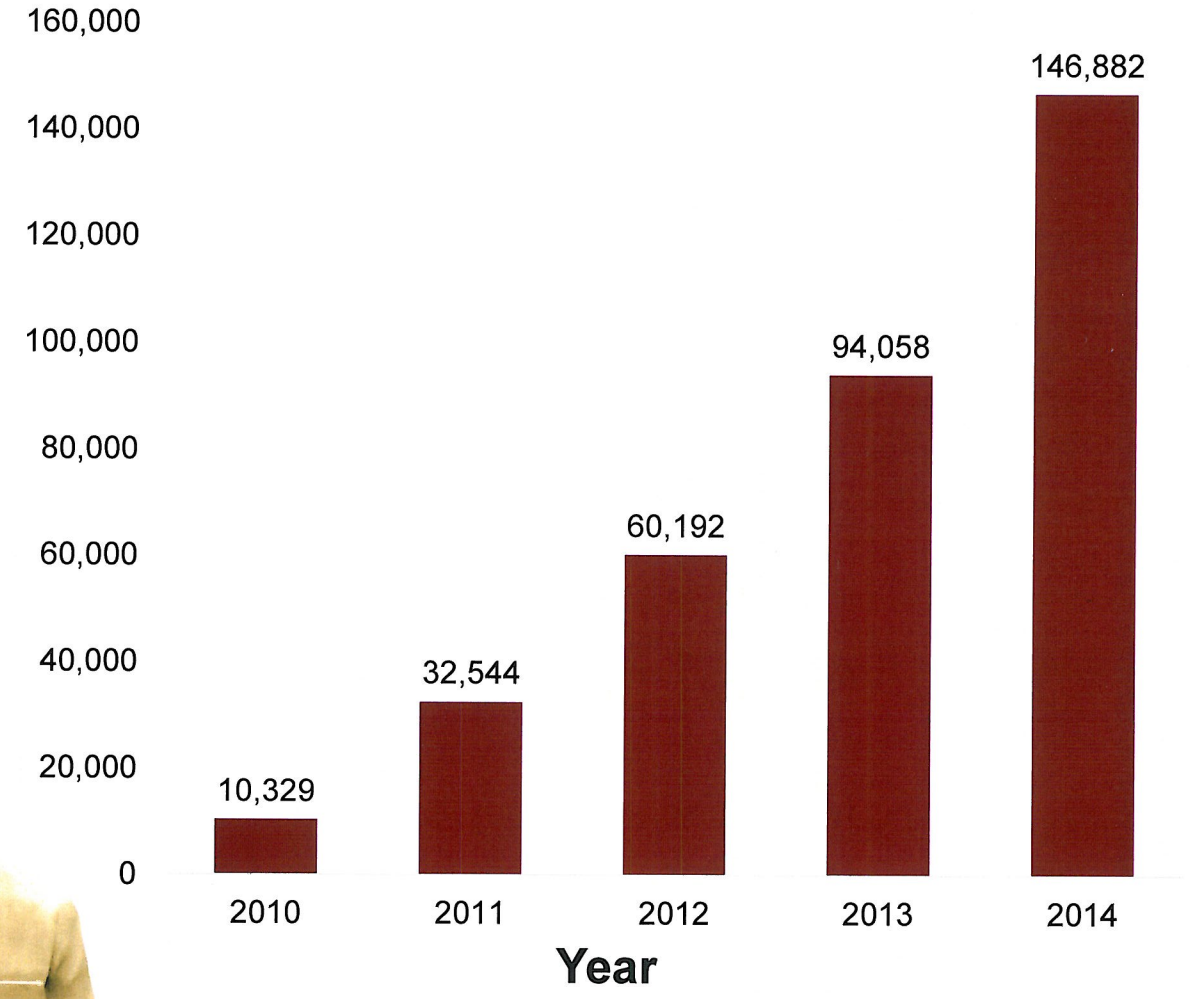
Eastern Asia

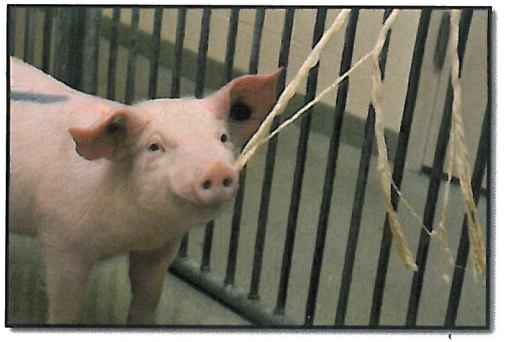
Reports of H5 HPAI subsided in the region during summer 2014. Then in September, outbreaks of **H5N1**, **H5N2**, **H5N6**, **H5N8** HPAI occurred in China.

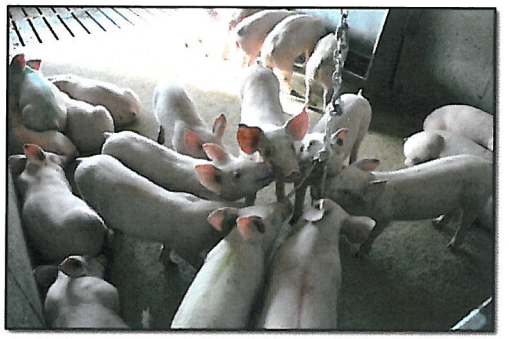
Original **H5N8** outbreak occurred January-April, 2014, most intensely in S. Korea and Japan. After 5 months with no reported cases, H5N8 was detected again, 24 September, in S. Korean commercial poultry. It was detected again in Japan in November.

- H5N1 in wild birds
- H5N1 in poultry
- H5N2 in wild birds
- H5N2 in poultry
- H5N3 in wild birds
- H5N3 in poultry
- H5N6 in wild birds
- H5N6 in poultry
- H5N8 in wild birds
- H5N8 in poultry

ISU VDL Oral Fluid Tests (2010-2014)







Changing Practice of Medicine through Innovation

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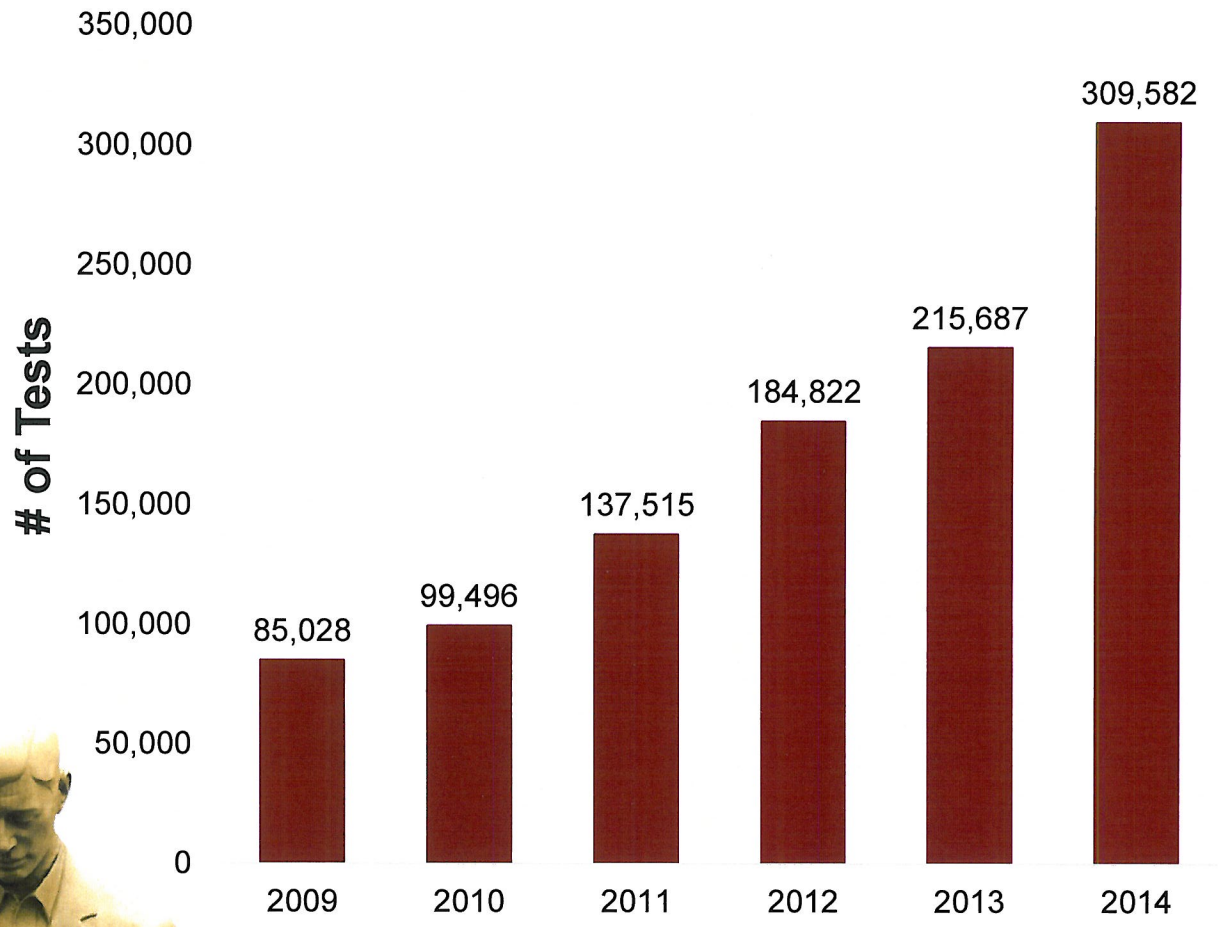
ISU VDL Molecular Tests (2009-2014)



Delivering Technology to Meet the Emerging Needs

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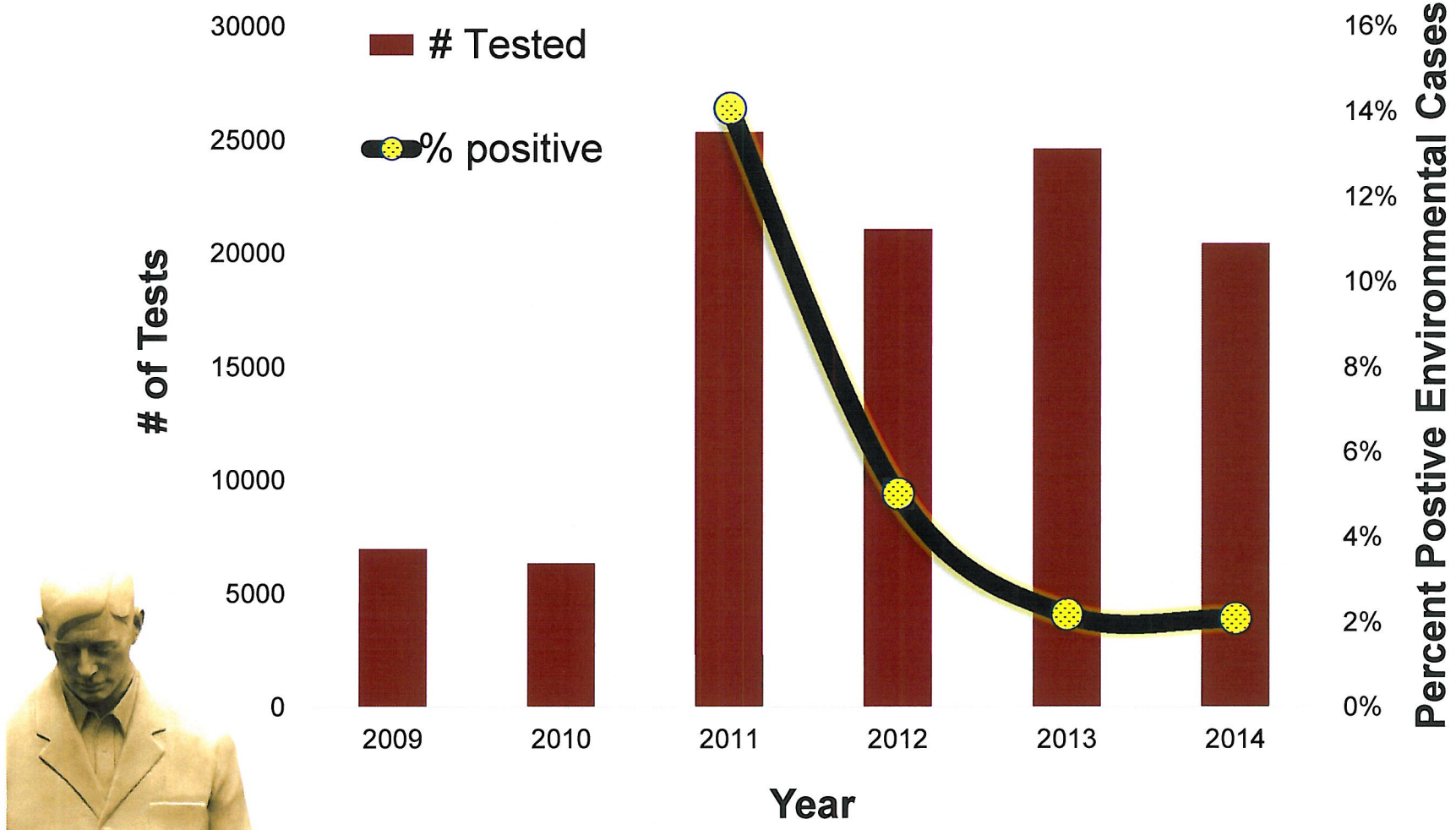
Poultry Salmonella Tests & Percent Positive (2009-2014)



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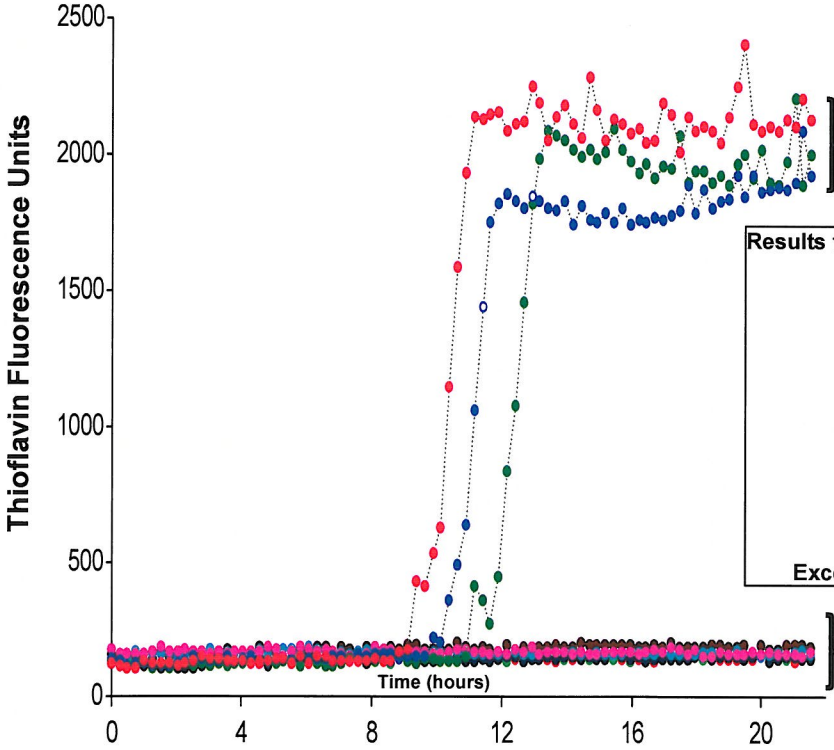
CHRONIC WASTING DISEASE (CWD) - TESTING FOR PRION DISEASE IN DEER AT IOWA STATE UNIVERSITY

NORMAL DEER

PRION DIAGNOSTIC TEST
DEER RECTAL BIOPSY SAMPLES

CWD PRION-INFECTED DEER

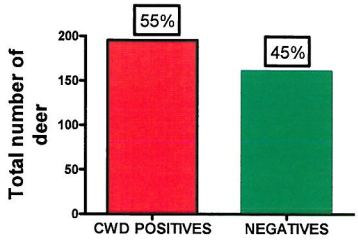
Efficient detection using Real-Time Quaking-Induced Conversion (RT-QuIC) assay



Infected deer samples
Test result = POSITIVE

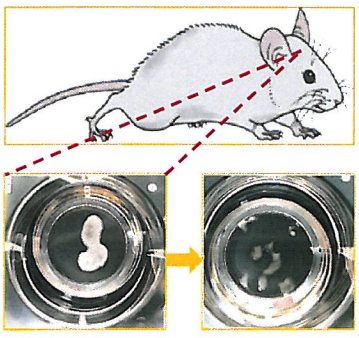
Uninfected deer samples
Test result = NEGATIVE

Results from 356 deer from Iowa herd with RT-QuIC assay



Excellent correlation with Histopathology results

Transgenic mouse - deer model of CWD



***Ex-vivo* CWD brain slice culture model from CWD transgenic deer-mouse**

Infected in few weeks

Infect with deer prions for studies

Infected in few days

Applications:

Used as a model to study:

- **Infection rate**
- **Potential drug targets for CWD**
- **Mechanisms of disease transmission**

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