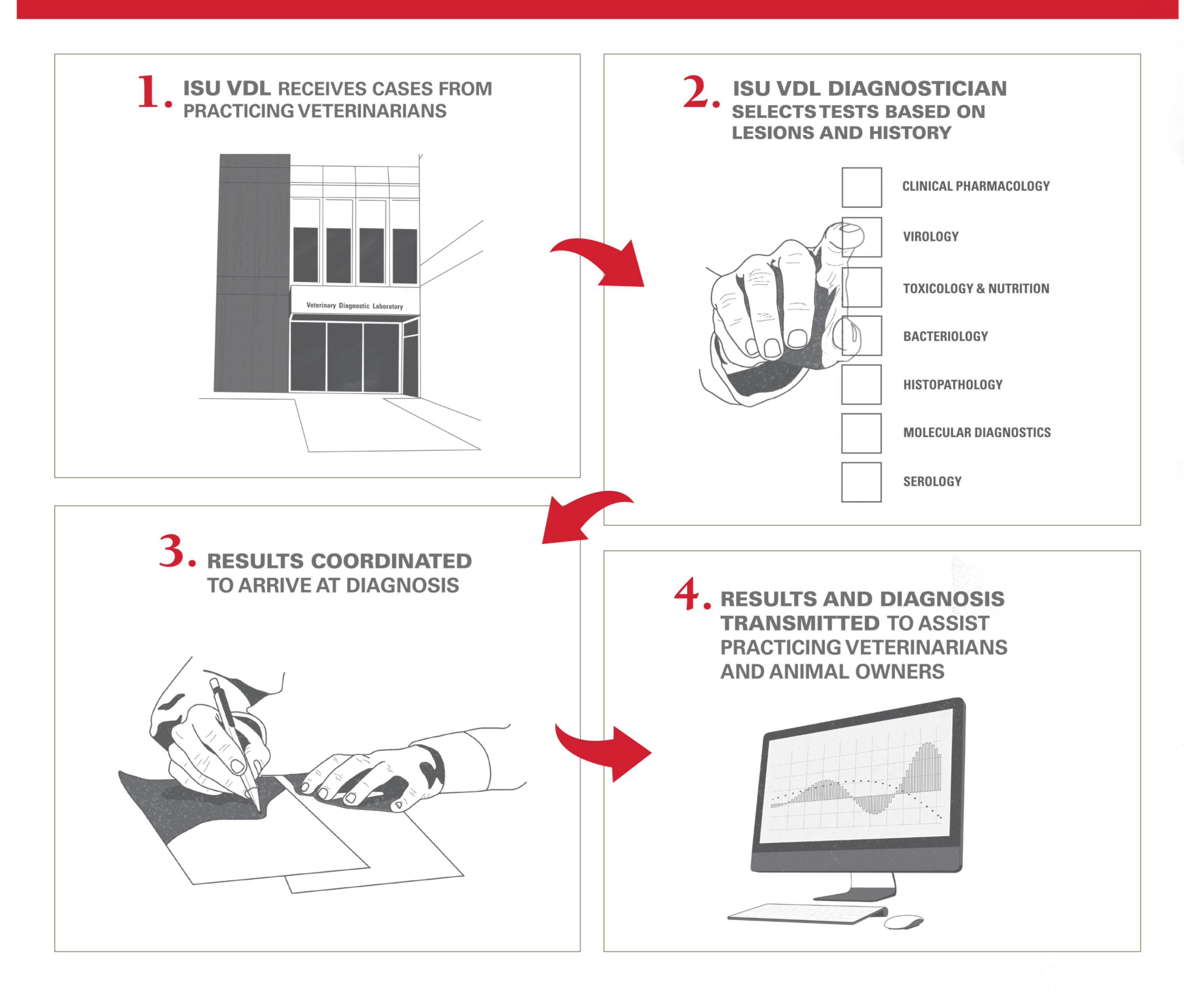
# IOWA STATE UNIVERSITY

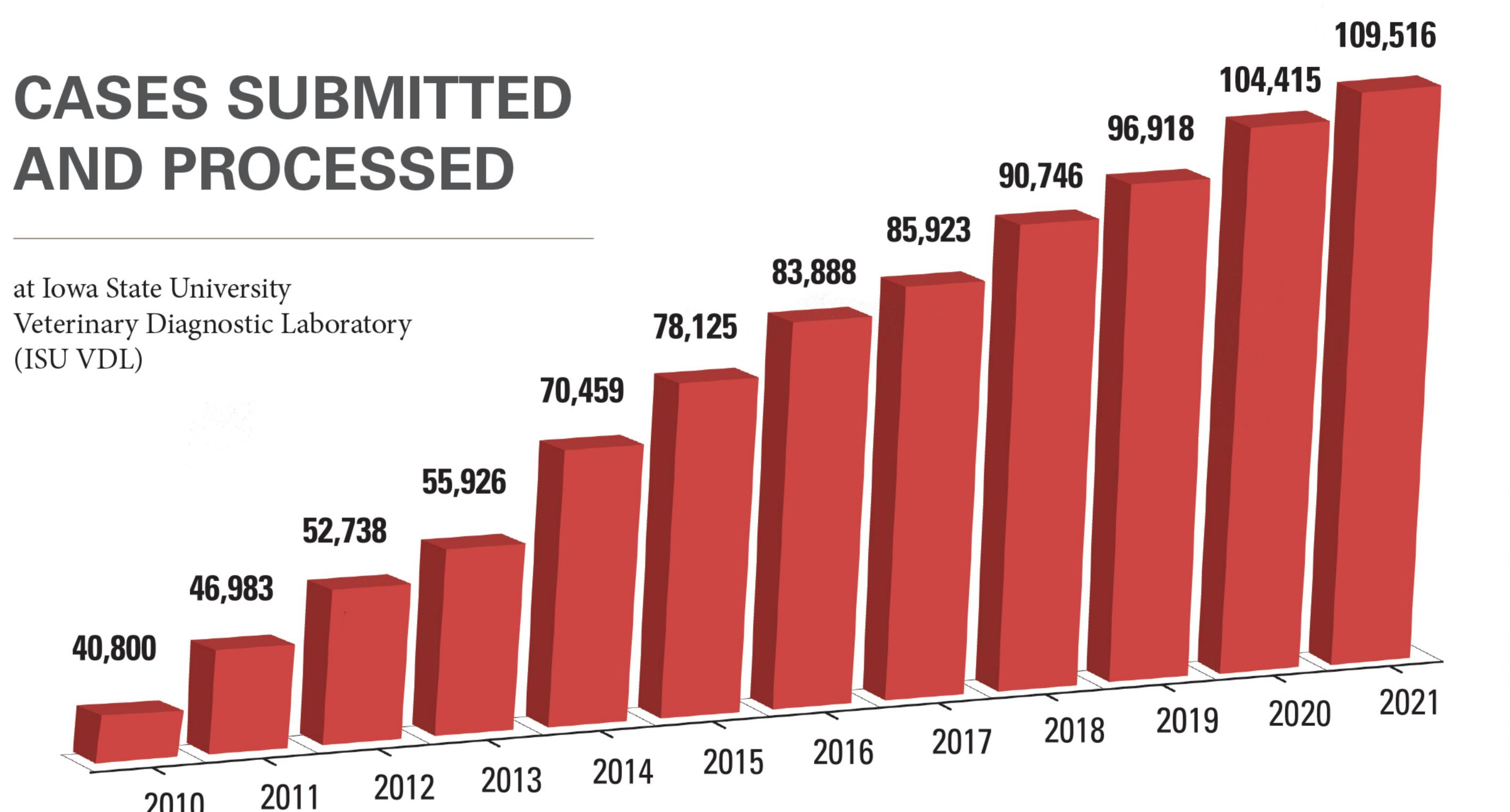
Veterinary Diagnostic Laboratory

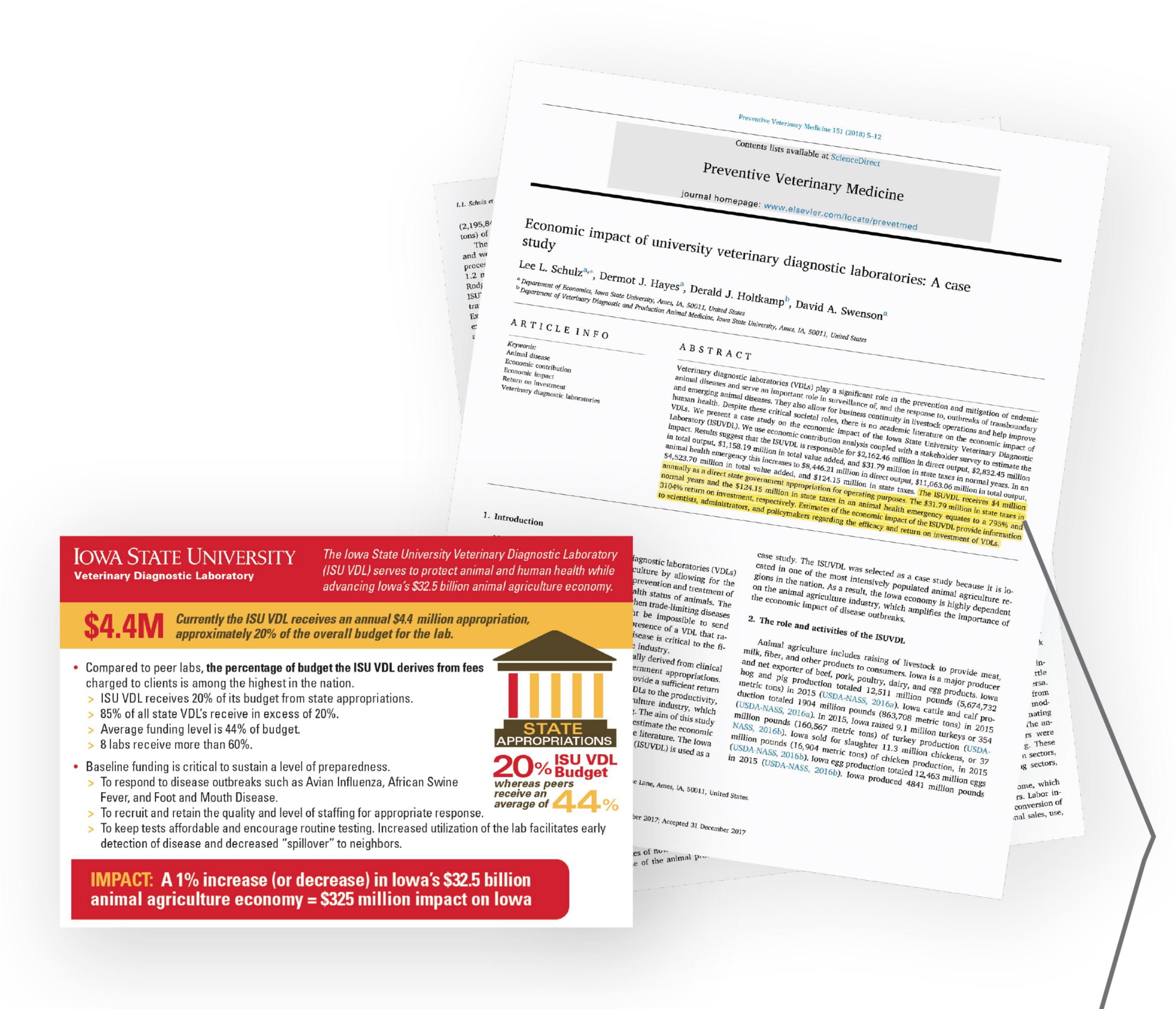


1850 Christensen Drive Ames, IA 50011-1134

Phone: 515-294-1950 Email: isuvdl@iastate.edu



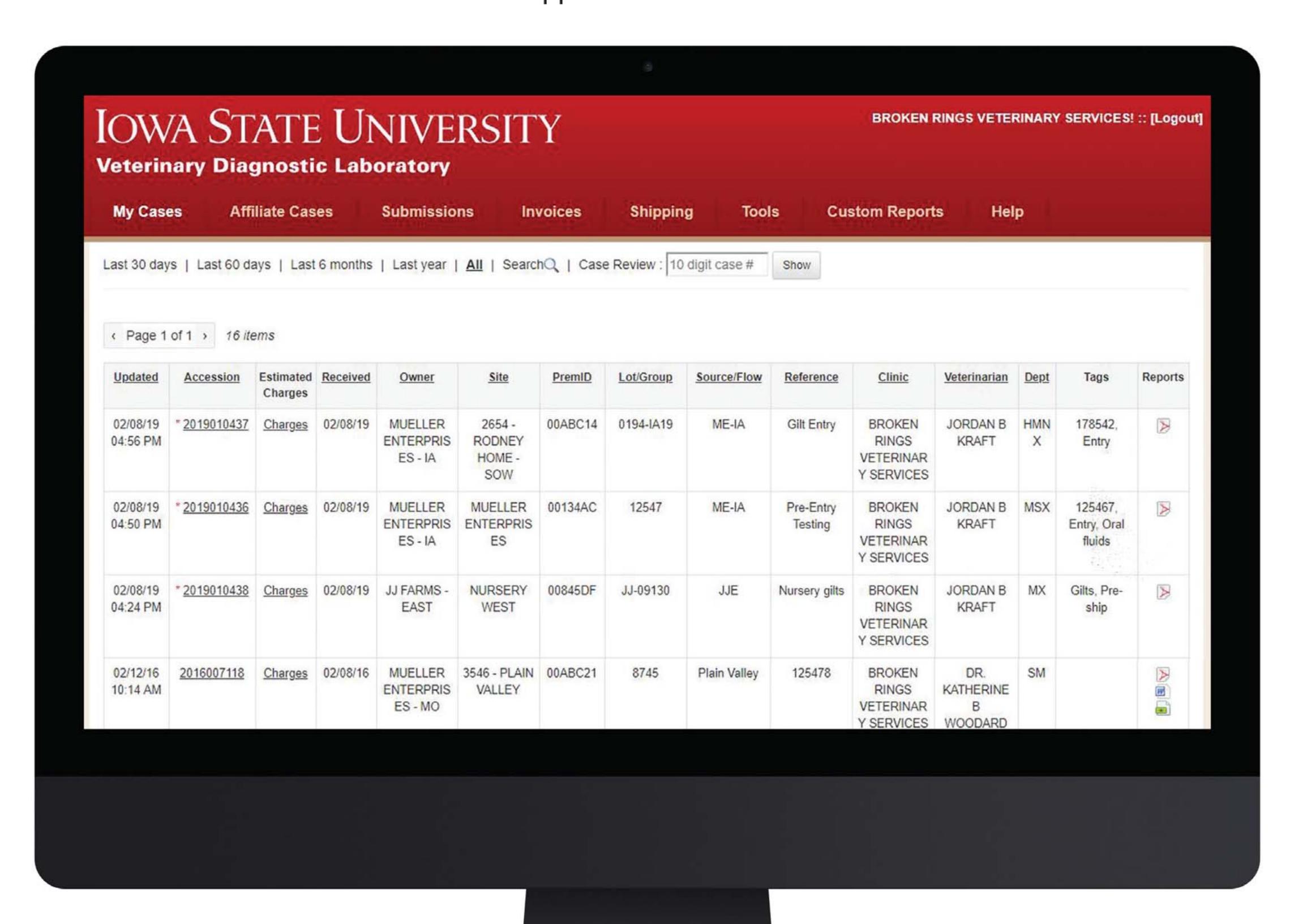


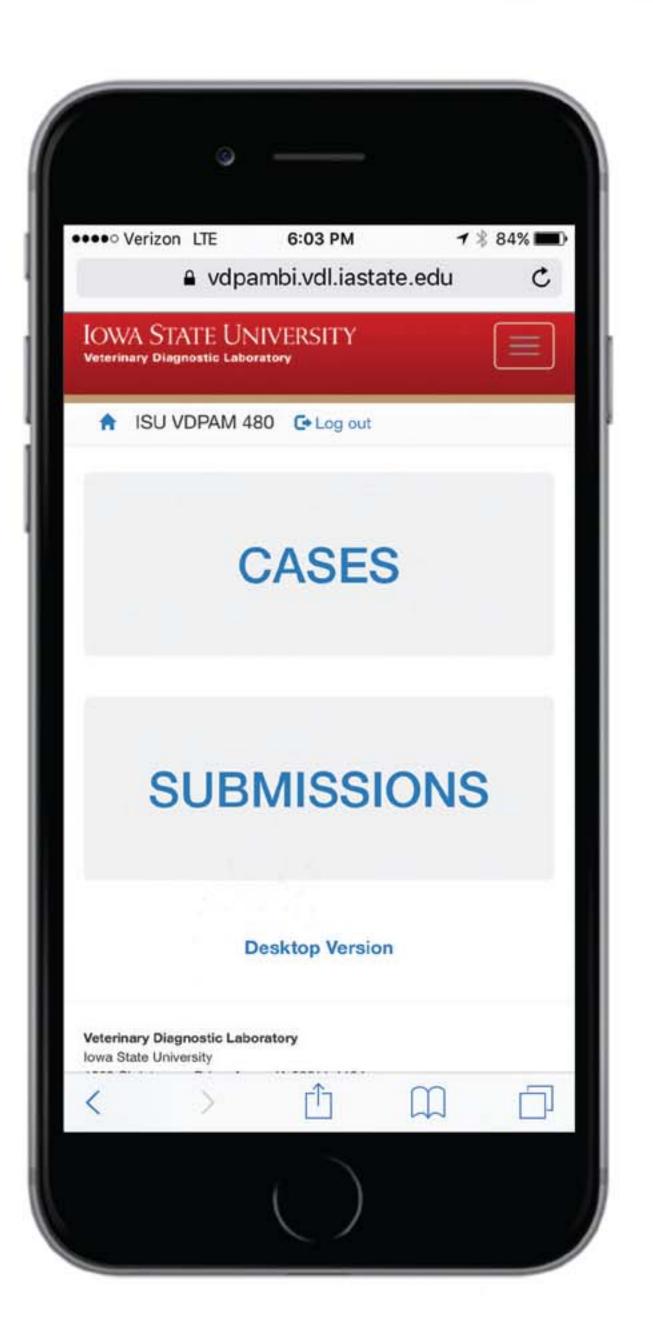


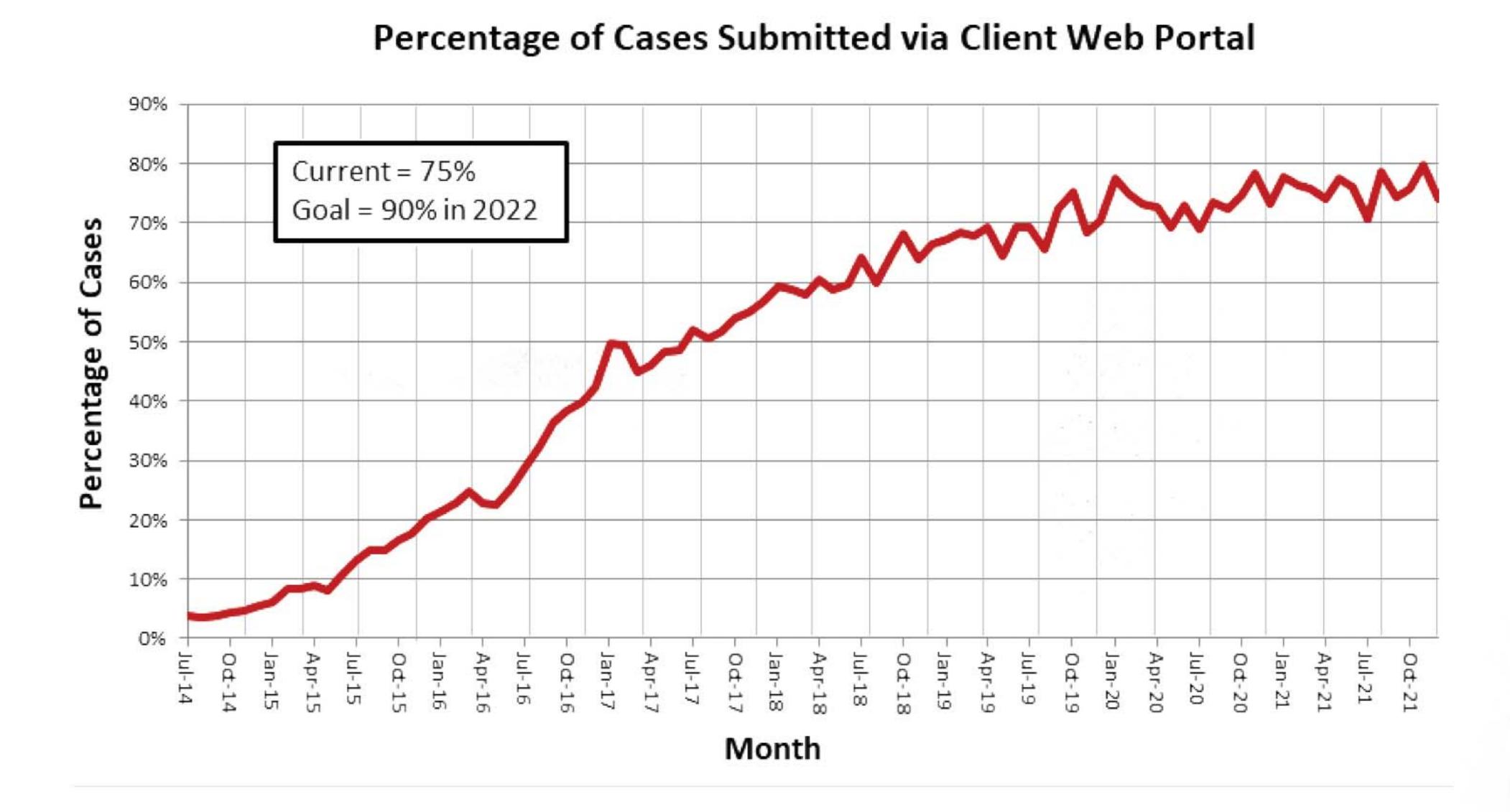
Economic Impact Study (2018): The ISUVDL receives \$4 million annually as a direct state government appropriation for operating purposes. The \$31.79 million in state taxes in normal years and the \$124.15 million in state taxes in an animal health emergency equates to a 795% and 3104% return on investment, respectively. Estimates of the economic impact of the ISUVDL provides information to scientists, administrators, and policymakers regarding the efficacy and return on investment of VDLs.

## INFORMATION TECHNOLOGIES

Suite of Web-based Applications for Submissions and Results







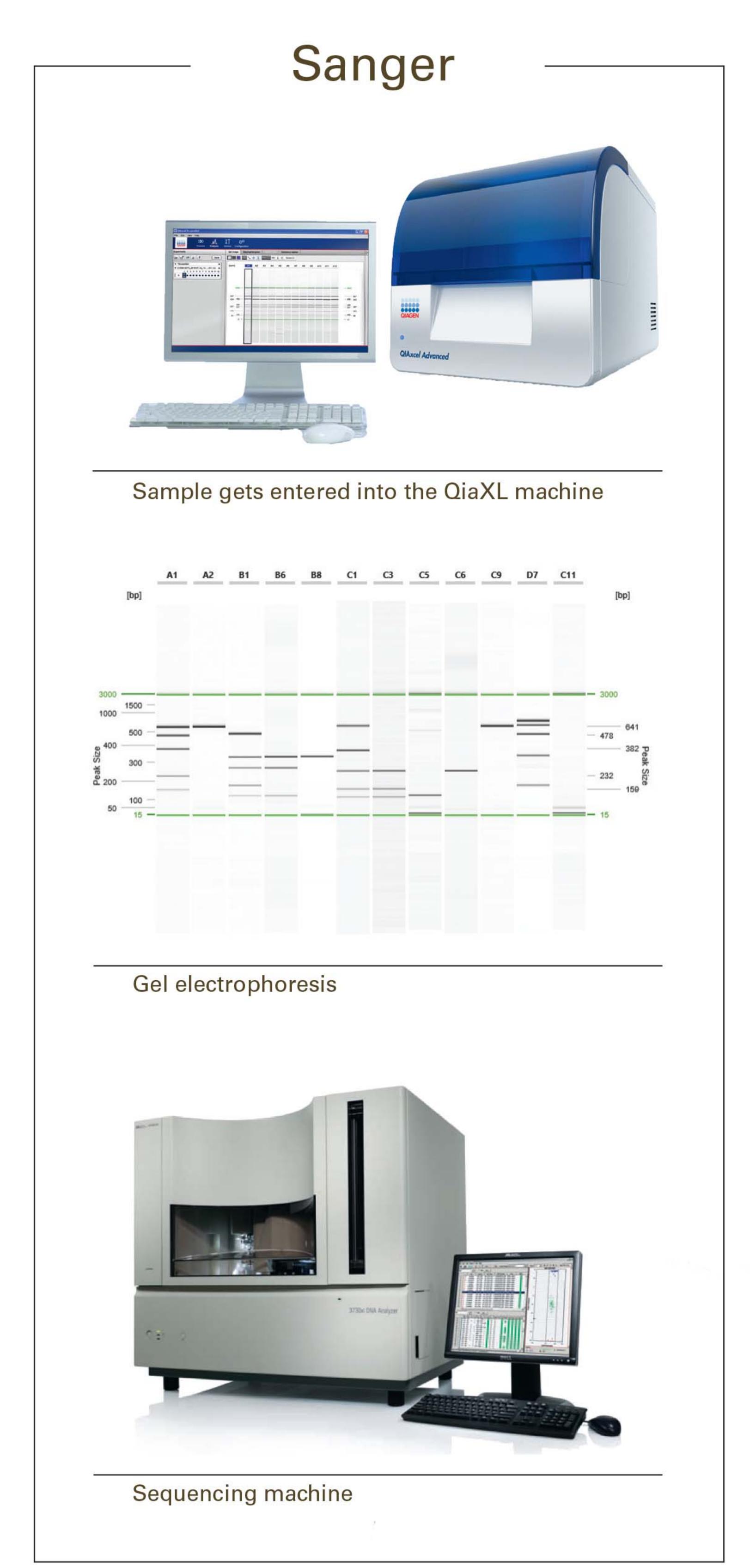
05SEP18 IAV-2 Extraction plate barcode 05SEP18 IAV-2 ATTITUTE The Iowa State University PCR plate barcode Veterinary Diagnostic Laboratory has the 1st PCR plate fully integrated molecular diagnostic workflow in the **United States.** 

Extraction plates

3

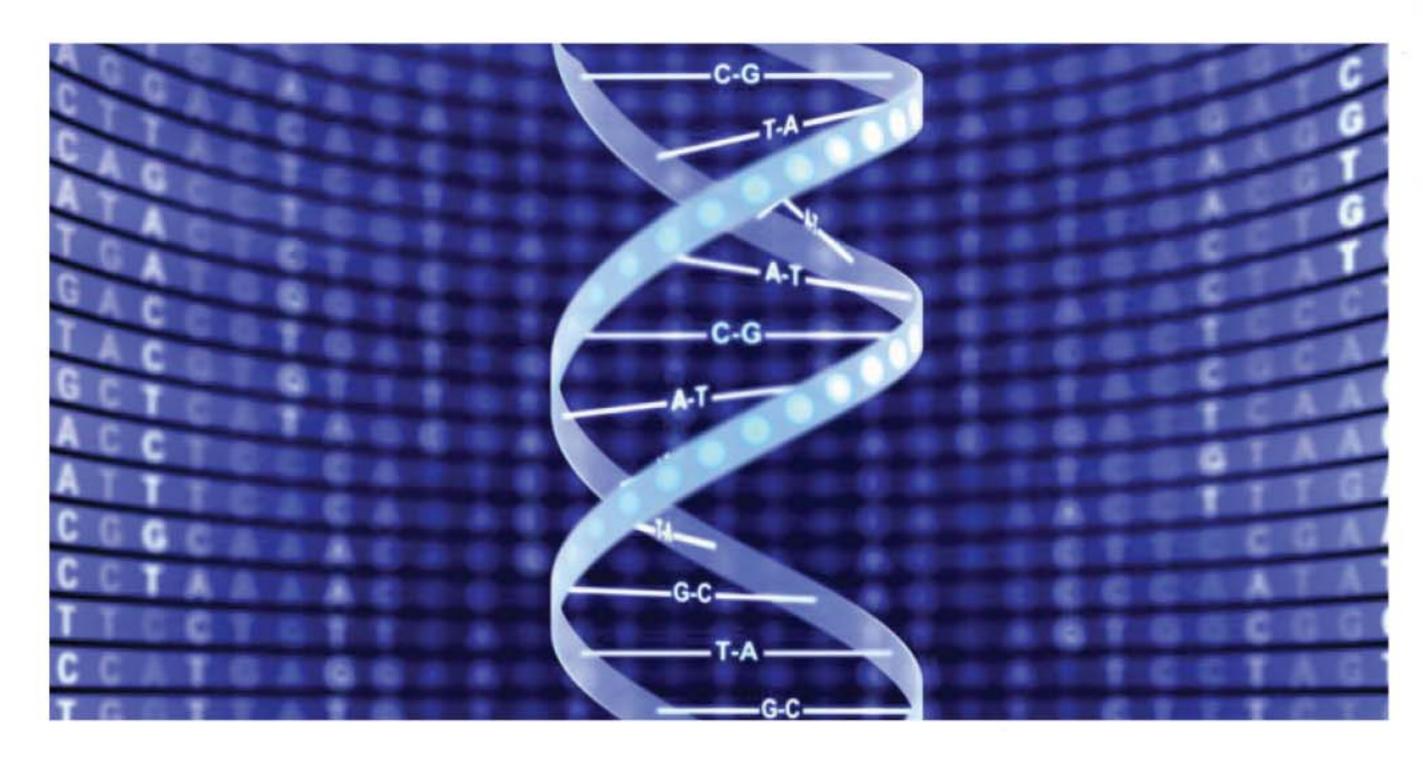
2010 2011 2012 2013 2014 2015 2016 2017

## SEQUENCING TECHNOLOGIES



### Next Generation Sequencing





### APPLICATIONS

Epidemiologic purposes

Vaccine selection

Differentiate wild type from vaccine virus

Vaccine production

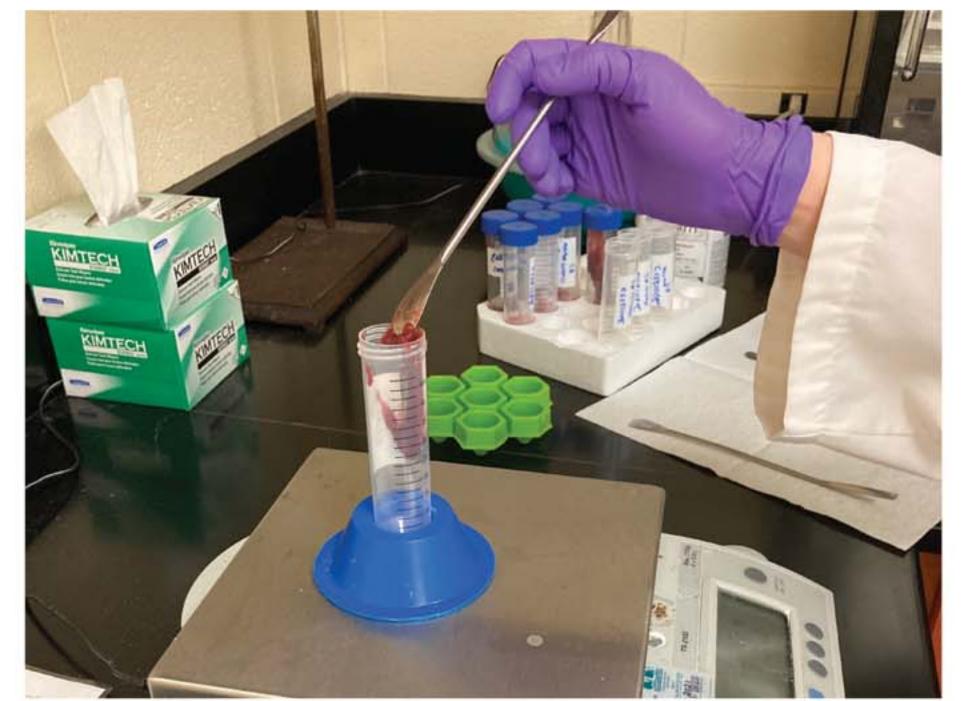
## ANALYTICAL CHEMISTRY



100 head of beef carcasses being held because 1 animal treated with oxytetracycline and shipped before withdrawal time. Value of retail around \$3000 per carcass (\$300K). Retained carcasses also had > 3000 boxes of harvest product (livers, tongues, head meat, cheek meat, tripe/ommassum/honeycomb, hearts, Intestine (small and large) oxlips, tendons, oxtail, etc.) on hold because it was unknown which boxes contain the products from the treated carcass. Drop is worth about 10% of the carcass, so add another \$300 on 3000 boxes for a total of \$450,000 to \$900,000. Total value \$750,000 to \$1.2 million on this case estimated.







#### MASS SPECTROMETRY

Drug residues	Toxins
Nutrients	Heavy metals

One of only a few labs in the U.S. with these capabilities.

2010 2011 2012 2013 2014

2015 2016

ZU1/

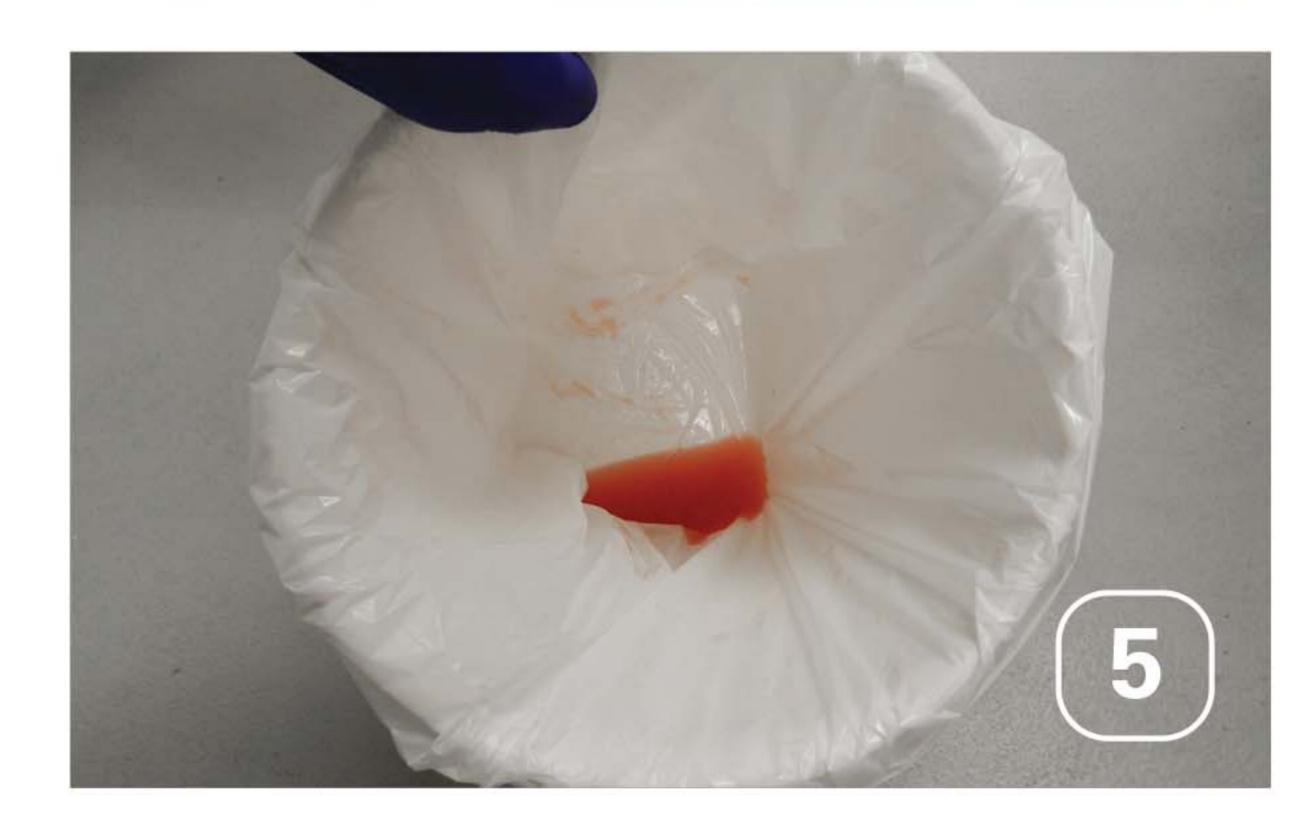
### SWINE













### PROCESSING FLUIDS

Linhares et al, ISU CVM

41,428 tests

Exudate (fluid) from testicles and tails collected from young piglets is now being used as a highly sensitive sample type for determining the health status of breeding herds.

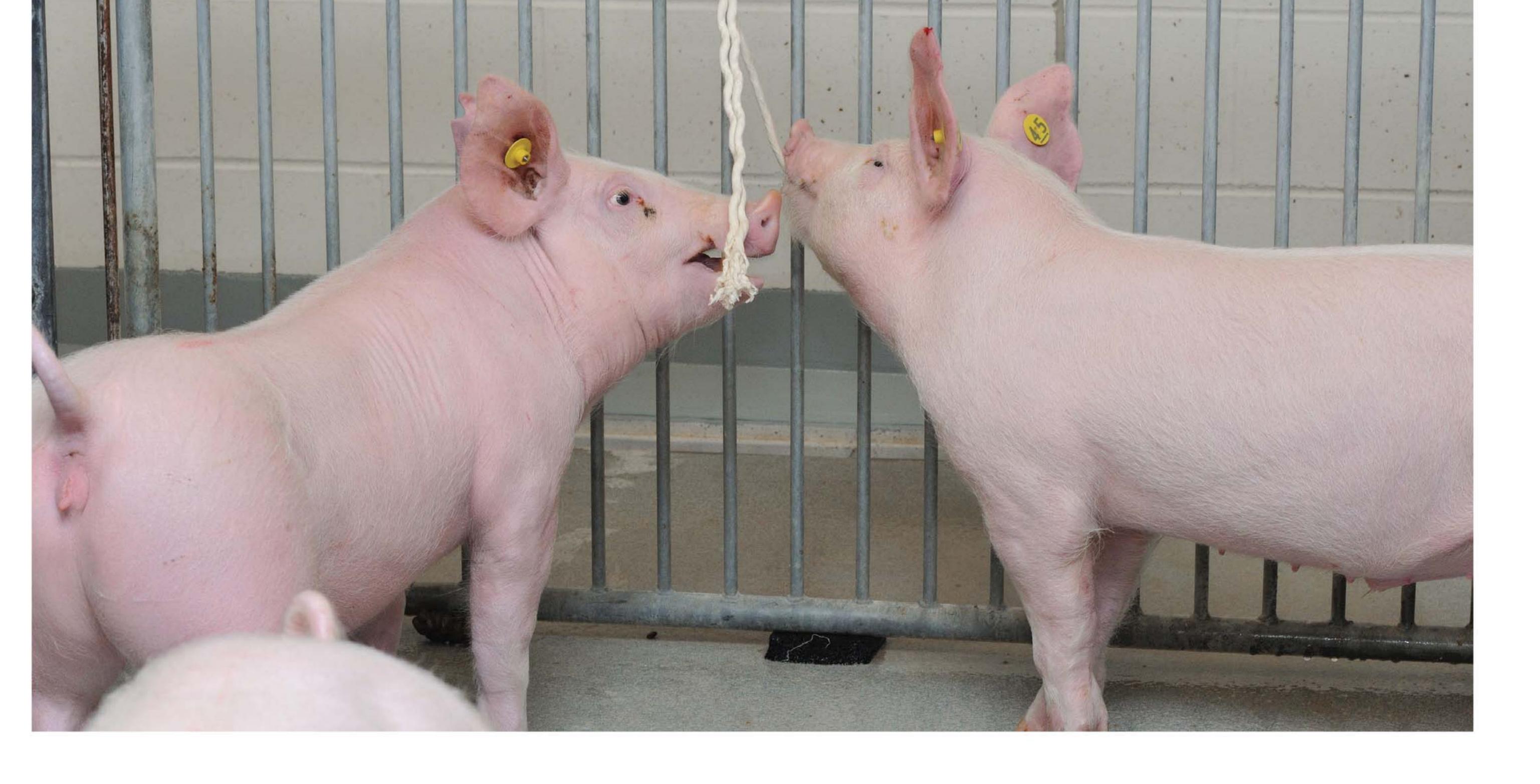
1,000 tests 19,341 tests 37,280 tests 2020 35,442 tests

2012 2013 2014 2010 2011

2015 2016

2010 ZU17

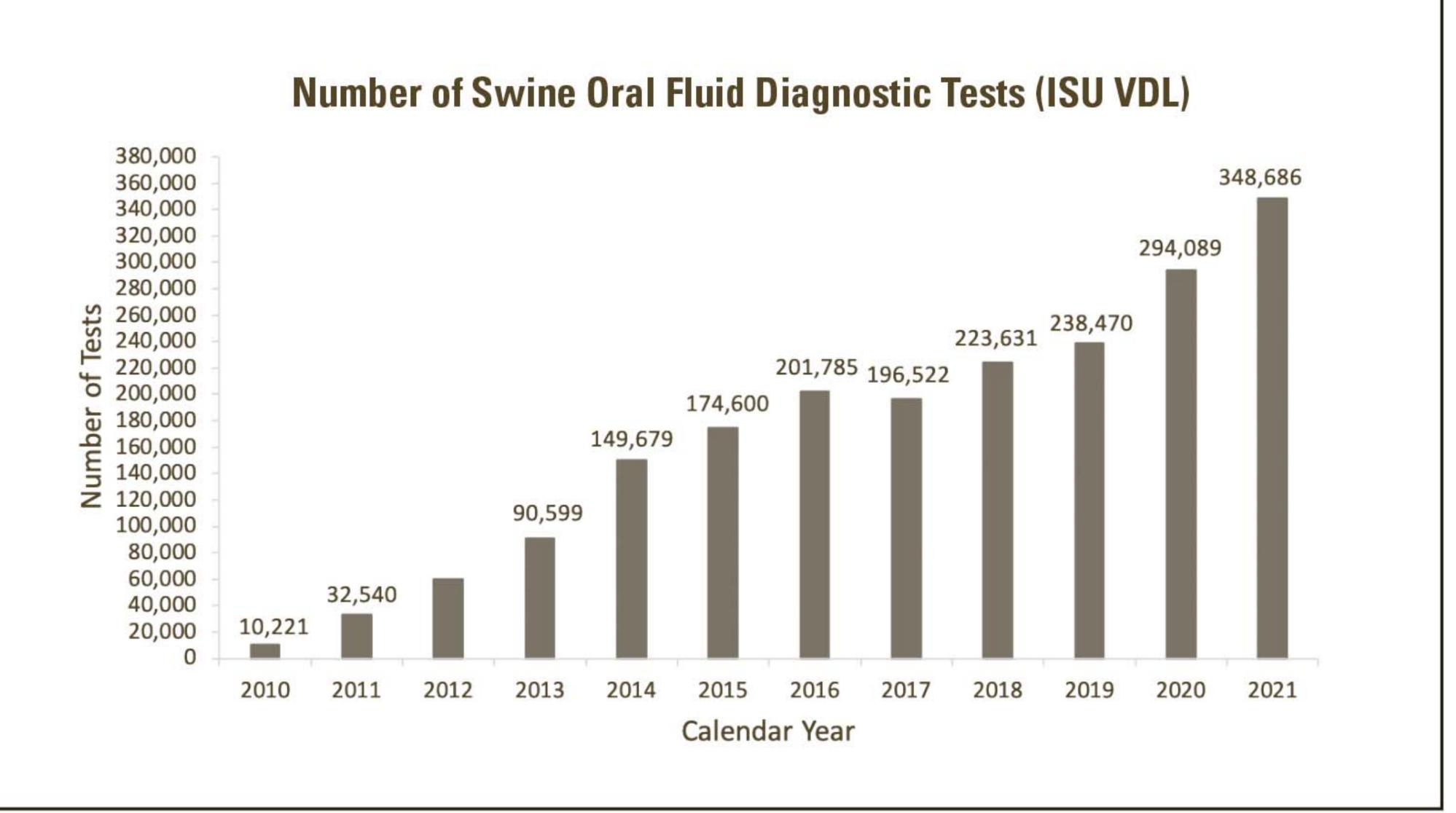
2021



#### SWINE ORAL FLUIDS

Zimmerman et al, ISU CVM

Saliva (oral fluid) collected from cotton ropes hung in swine pens has become the primary sample type used to detect the presence or absence of diseases in growing pigs.



### POULTRY



Avian influenza testing in a chicken (courtesy of IDALS)



Wild turkeys from Iowa released to Texas after clean Al testing at ISU VDL



Producer collecting blood samples for AI testing in commercial turkeys

#### AVIAN INFLUENZA

Avian Influenza (AI) testing is required for commercial poultry producers to maintain business continuity (processing) and for any bird movement across the state line.

An estimated 20,000 Avian Influenza tests are completed by the ISU VDL each year.

- Not all birds are tested, but a subset is tested from each poultry flock to ensure animal health and food safety.
- The surveillance testing provides important information on the health status of approximately 59 million laying hens, 12 million turkeys, and 30 million broilers (meat-type chickens) annually in the state of lowa.
- In January 2022 there have been 2 detections of Eurasian H5 Highly Pathogenic Avian Influenza in wild birds in North and South Carolina following 2 detections in Canada putting the entire continent on high alert.
- The ISU VDL is an integral part of preparedness to combat a potential HPAI outbreak.

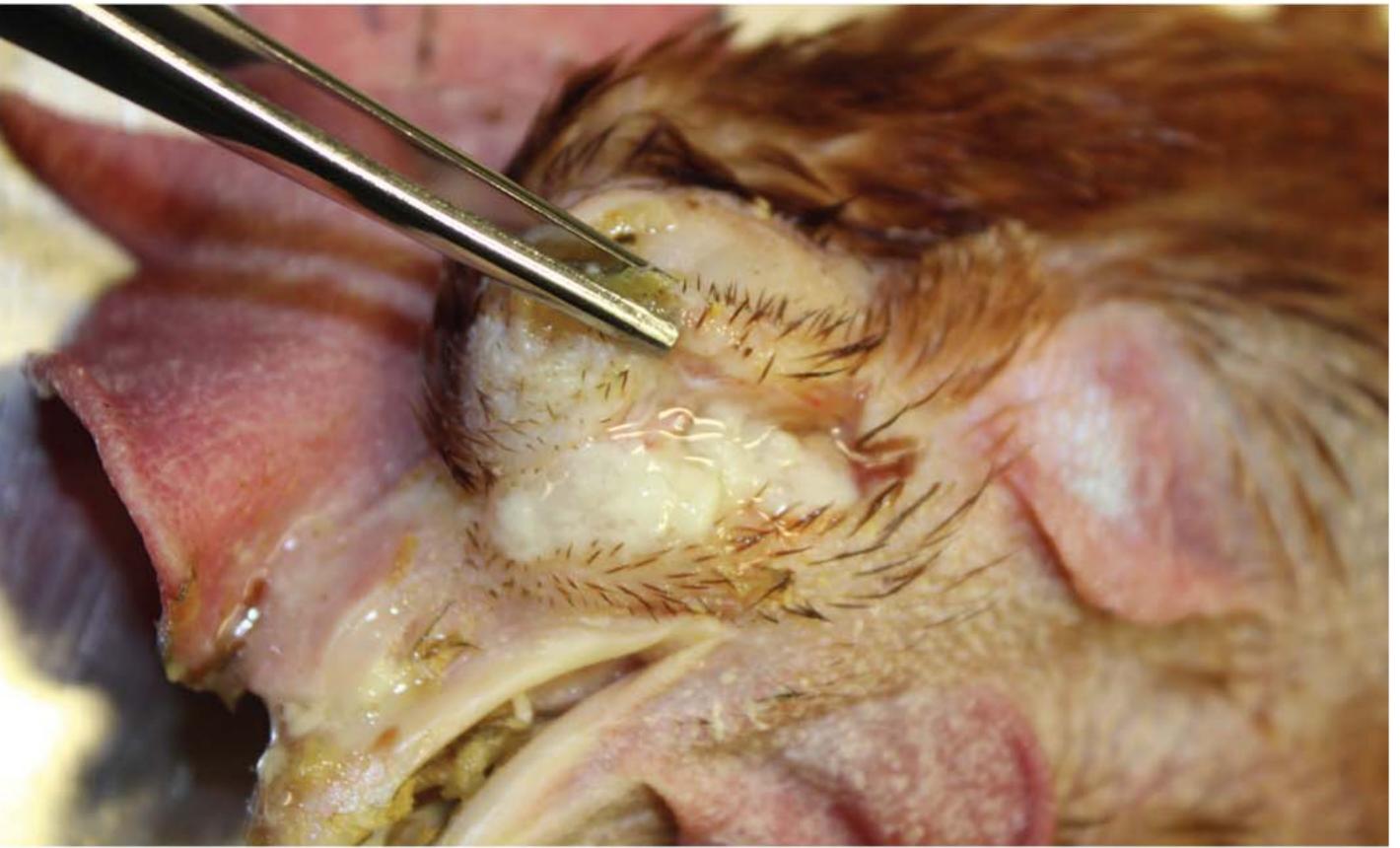
#### INFECTIOUS CORYZA

Infectious bacterial disease of chickens, causing loss in egg production and inflammation of upper respiratory tract and sinuses.

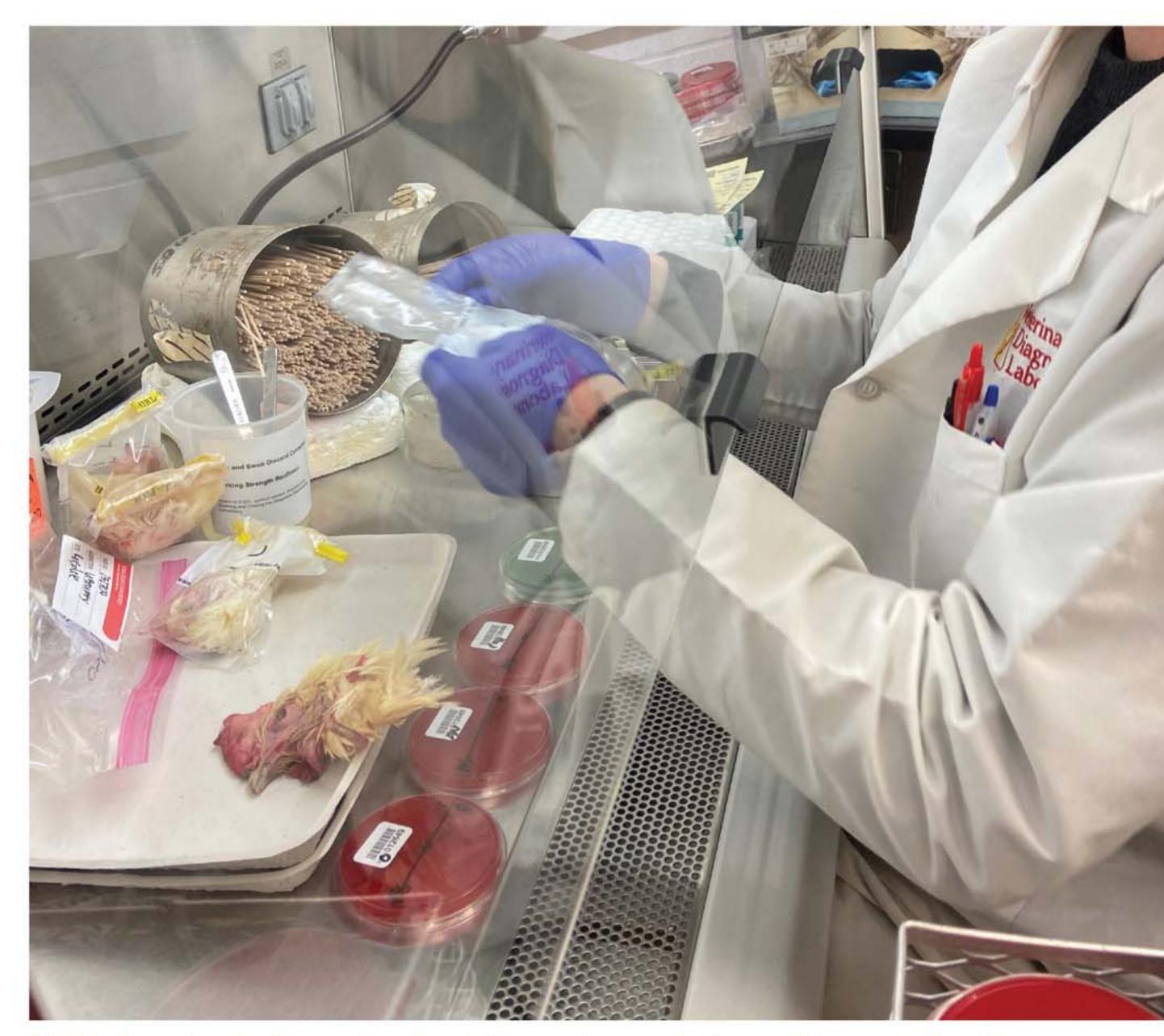
Caused by Avibacterium paragallinarum, all ages of chickens are susceptible.

- Diagnosis by bacterial culture is challenging and often requires molecular methods (e.g. PCR)
- ISU VDL has developed an infectious coryza PCR in anticipation of outbreaks in the Midwest and to facilitate diagnosis for commercial poultry producers across the country.

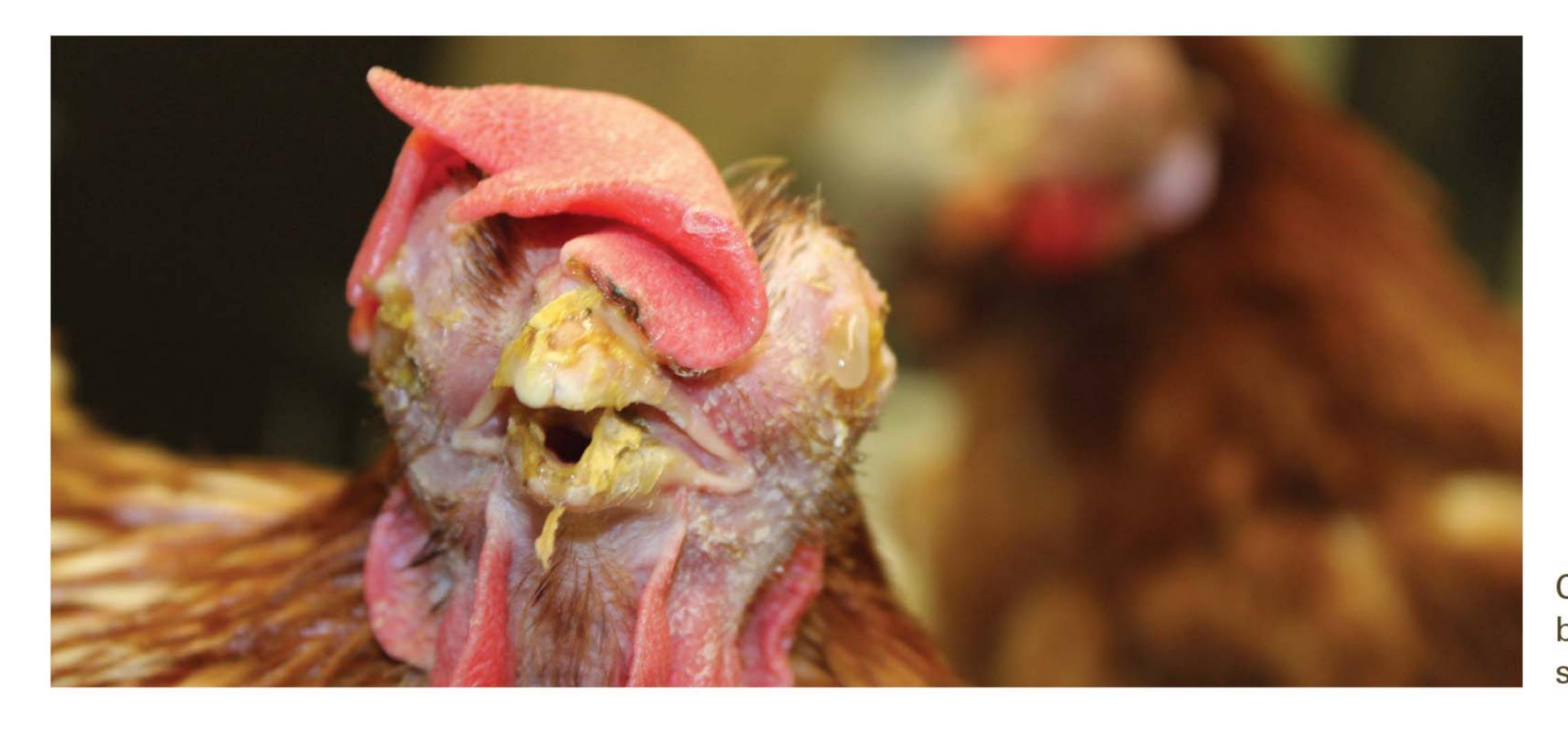
A top emerging issue in commercial layer production. Research to develop a safe and effective vaccine is in progress.



Facial swelling and conjunctivitis characteristic of coryza submitted for necropsy (courtesy of Dr. El-Gazzar)



VDL bacteriology technician at work to culture infectious coryza from a chicken

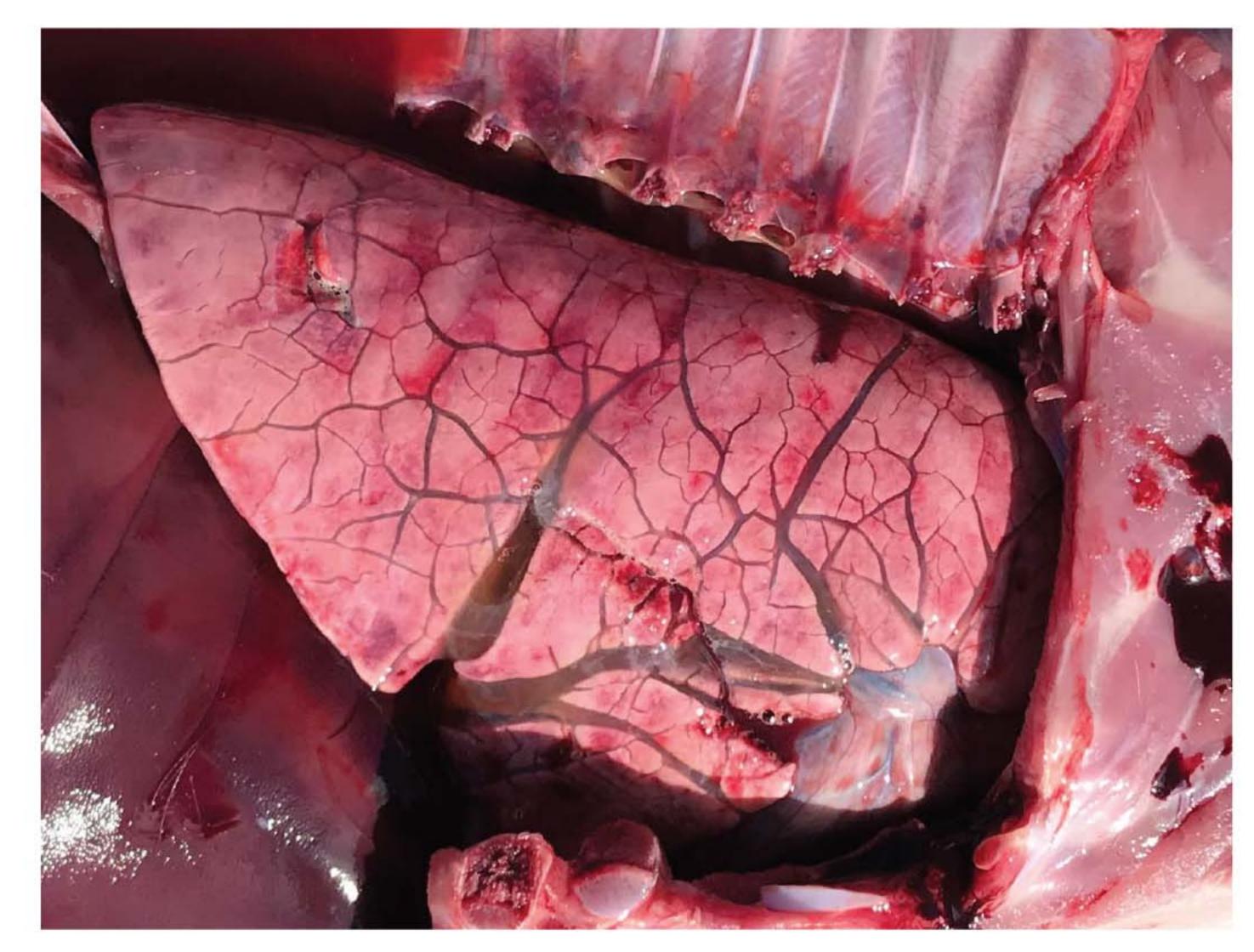


Clinical coryza characterized by severe facial swelling, sinusitis and conjunctivitis

2010 2011 2012 2013 2014

2015 2016

### HORSES AND CATTLE







above: Fumonisin - induced pulmonary edema and necrosis of the brain in a horse

#### MYCOTOXINTESTING

**Analytical Capabilities** 

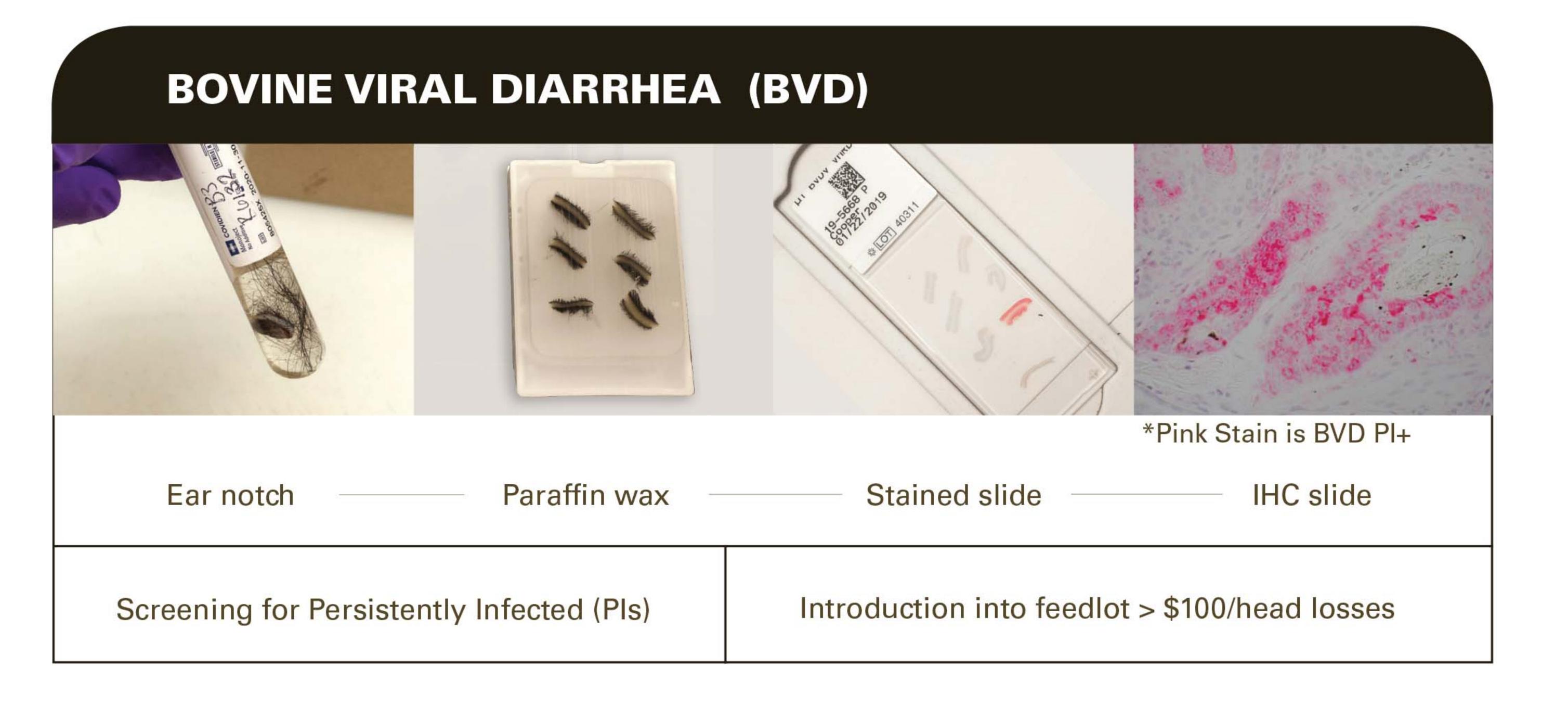
- Sensitive & comprehensive testing
- Fast screening

Recent pet food recall – over 80 deaths

#### High Economic Impact

- Curb mycotoxin losses (~\$1.5 billion) US annual estimate
- Food safety
- Post derecho concerns
- Ensure animal health
- Minimize losses for producers & pet owners

TRACE MINERALS Important for Health & Immune System Deficient Determines status Liver biopsy Adequate **Toxicities** 



2015 2016 2017 2010 2011 2012 2013 2014

### CERVIDS





#### CHRONIC WASTING DISEASE

Fatal neurodegenerative disease

Retropharyngeal lymph node submitted +/- obex (elk or captive/preserve deer)

Screen with ELISA, confirm with IHC

#### Impact:

- Surveillance
- Inform management actions
- Prevent prions from entering human food chain

#### Significance:

- First detected in wild white-tailed deer in lowa in 2013
- Outbreaks intensify locally and expand geographically
- Infected deer shed prion during long asymptomatic phase
- Lower annual survival
- Environmental persistence

Peaks late summer into early fall

EPIZOOTIC HEMORRHAGIC DISEASE

PCR on spleen or whole blood; serology

#### Impact:

Transmitted by

Culicoides midges

- Local mass mortality
- Transmissible to cattle (trade implications)

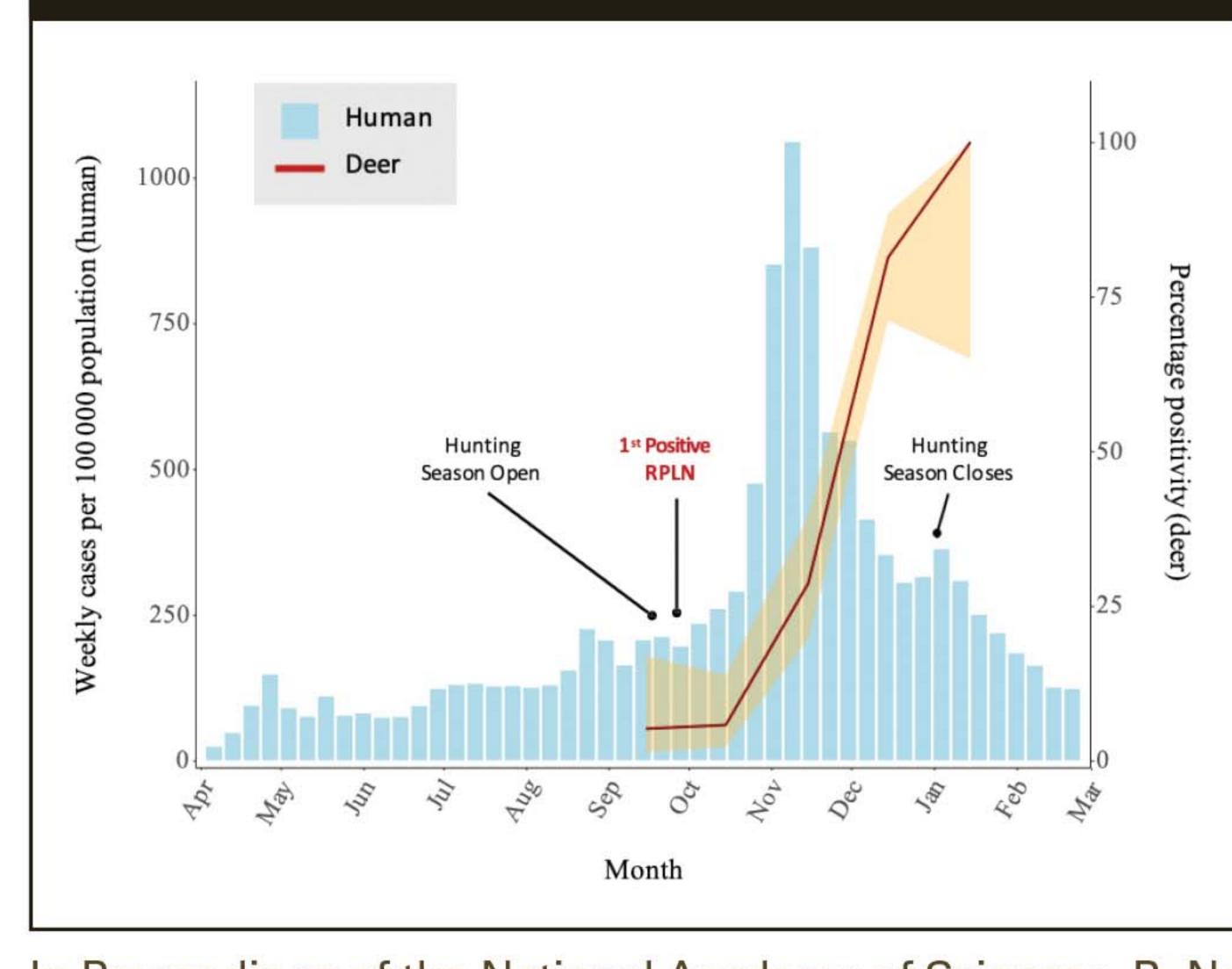
#### Other Pertinent Details:

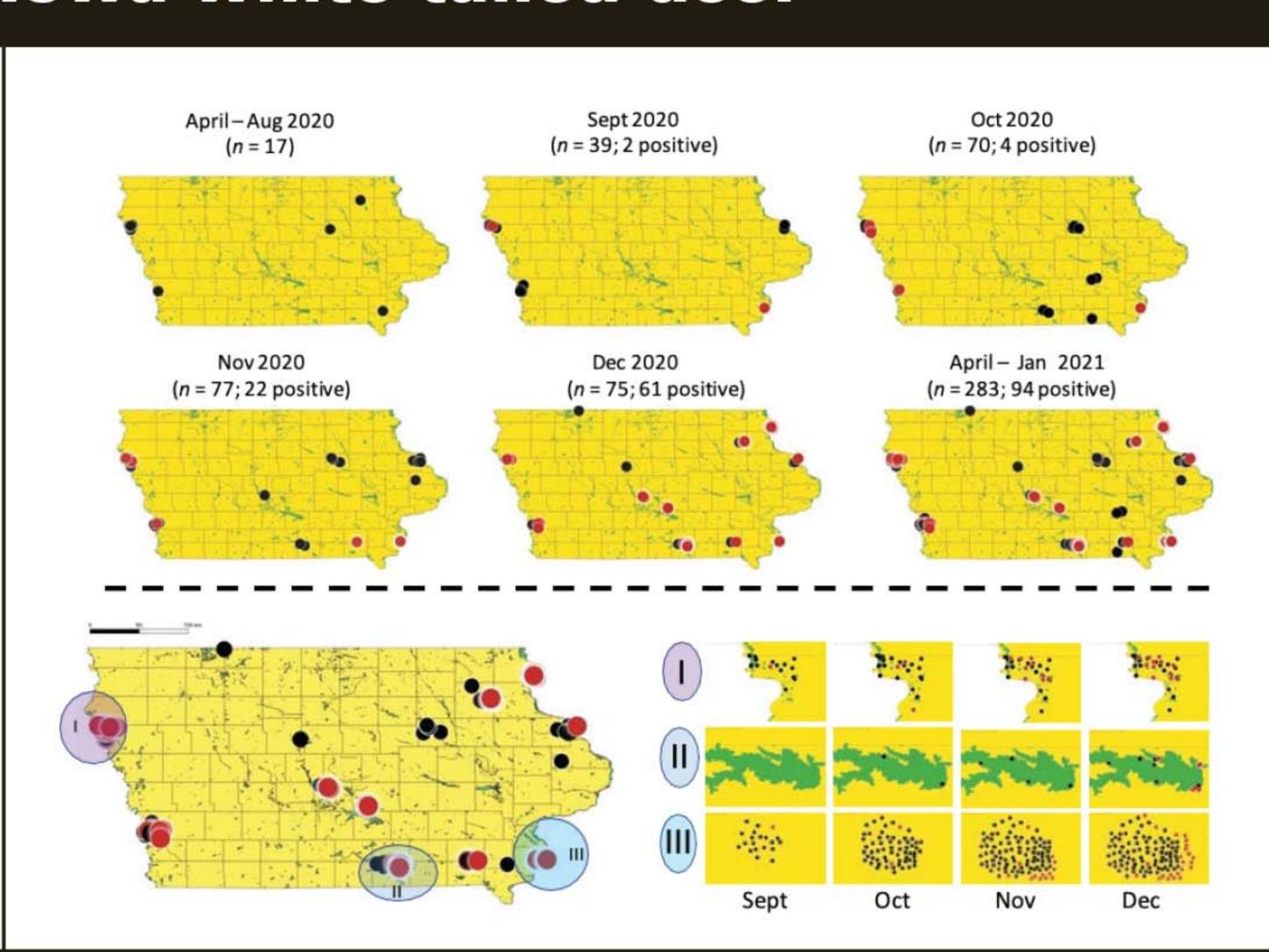
- EHDV-2 and -6 have caused outbreaks in wild deer in lowa
- Not a human health concern
- 7-10 day incubation period followed by rapid decline
- Closely related to Bluetongue—causes of "Hemorrhagic Disease"





### Multiple spillovers from humans and onward transmission of SARS-CoV-2 in Iowa white-tailed deer





In Proceedings of the National Academy of Sciences. R. Nelli, R. Rudin et al. 2022

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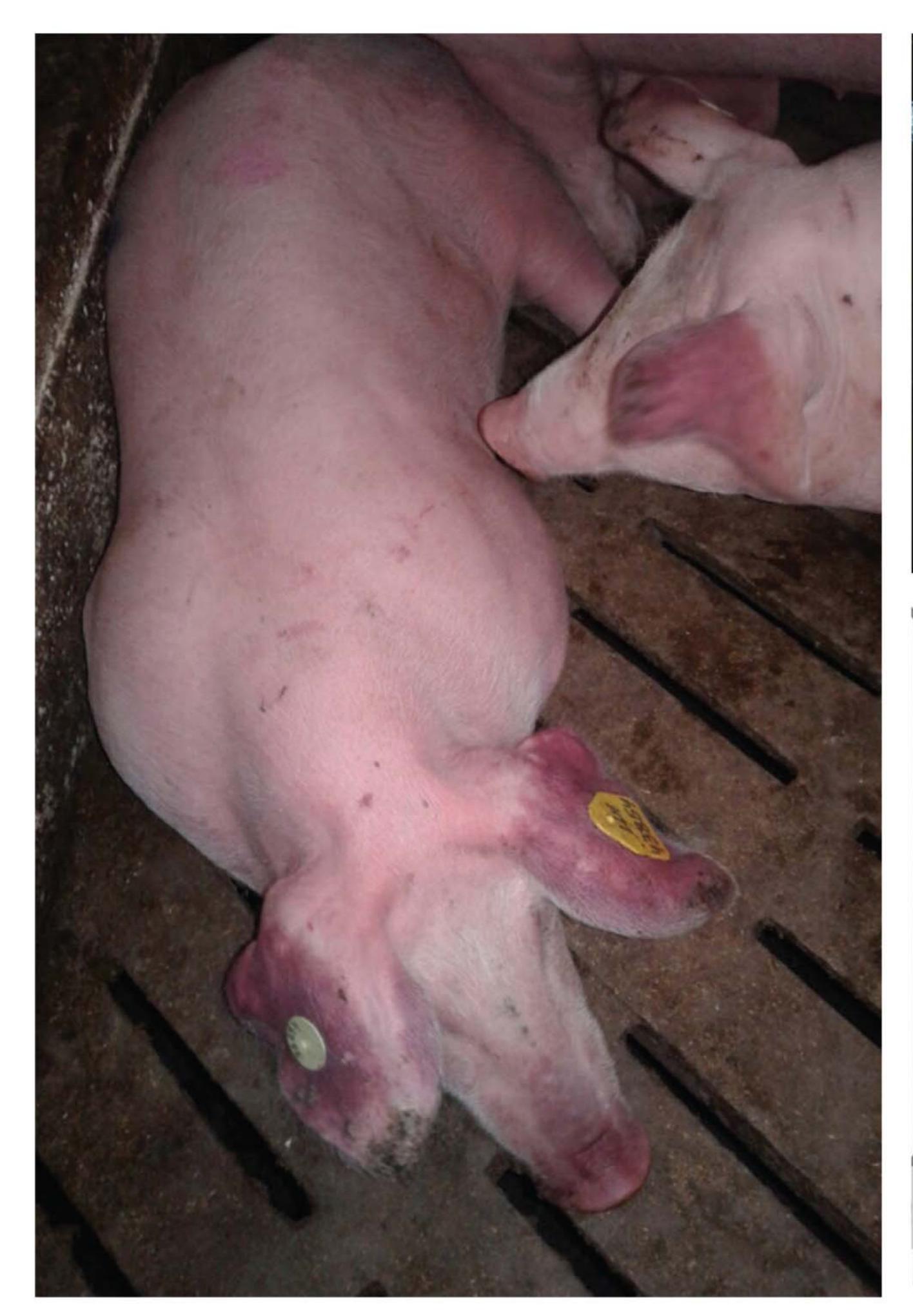
2010 2011

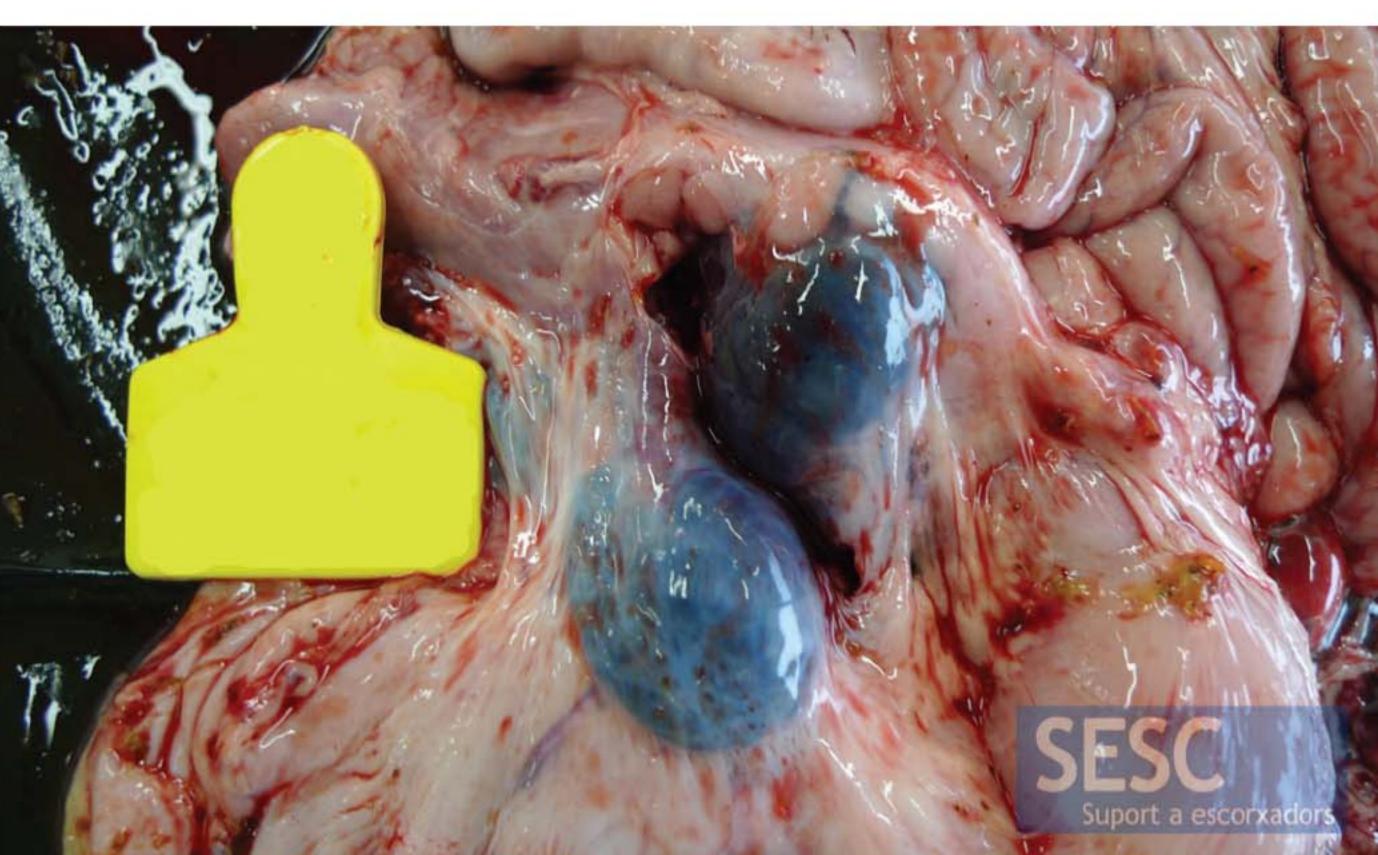
2012 2013 2014

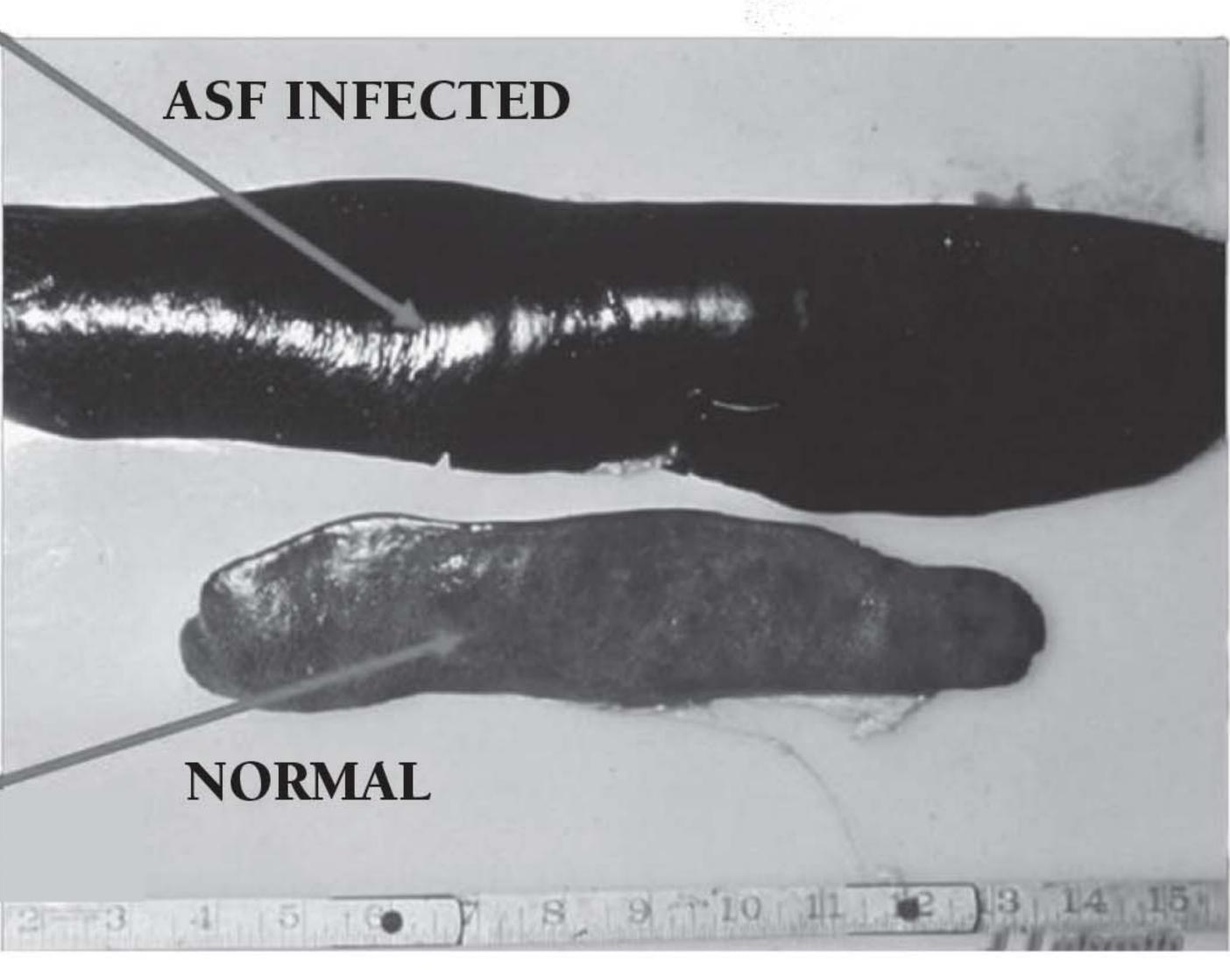
2016 2015

2017

### AFRICAN SWINE FEVER

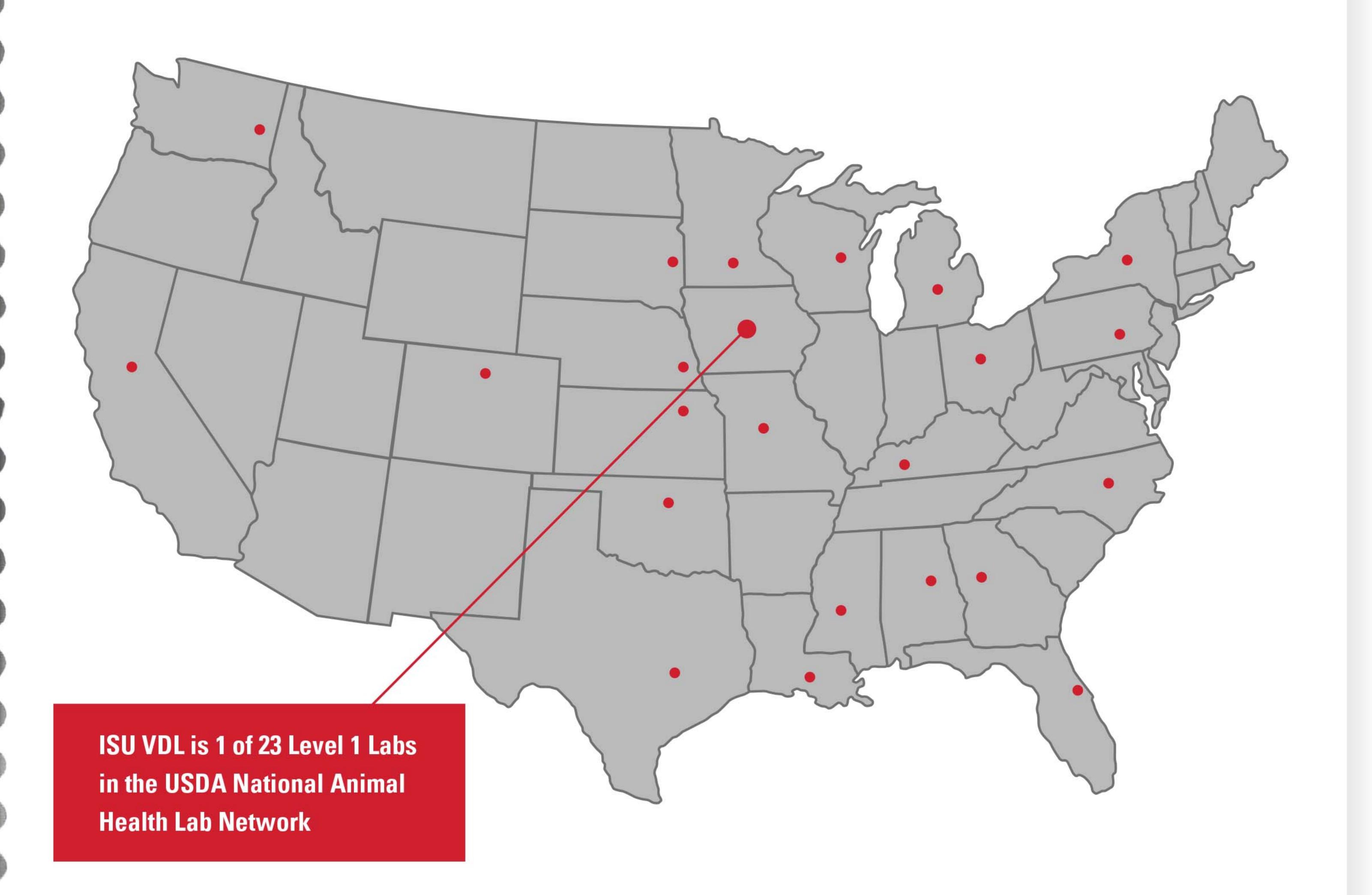






### AFRICAN SWINE FEVER (Animal Health Crisis in Asia and parts of eastern Europe) High morbidity High mortality Highly resistant virus Depopulation of affected sites TRADE IMPACTING DISEASE Not a human health concern ~ 30% of U.S. pork is exported

## NAHLN LEVEL 1 LABS



FRONTLINES OF FOREIGN ANIMAL DISEASE Surveillance and Response	
	African Swine Fever (ASF)
	Classical Swine Fever (CSF)
	High-Path Avian Influenza Virus (HP-AIV)
	Foot and Mouth Disease (FMD)
	Exotic Newcastle Disease (END)

2010 2011 2012 2013 2014 2015 2016

15

### U.S. SHIP

"Piloting a proven platform for safeguarding, certifying, and bettering animal health"





#### U.S. SWINE HEALTH IMPROVEMENT PLAN

USDA Funded (2-Year) Pilot Project

Modelled after National Poultry Improvement Plan

ASF-CSF Monitored Certification of US Pork Production Operations

Farm Sites

17

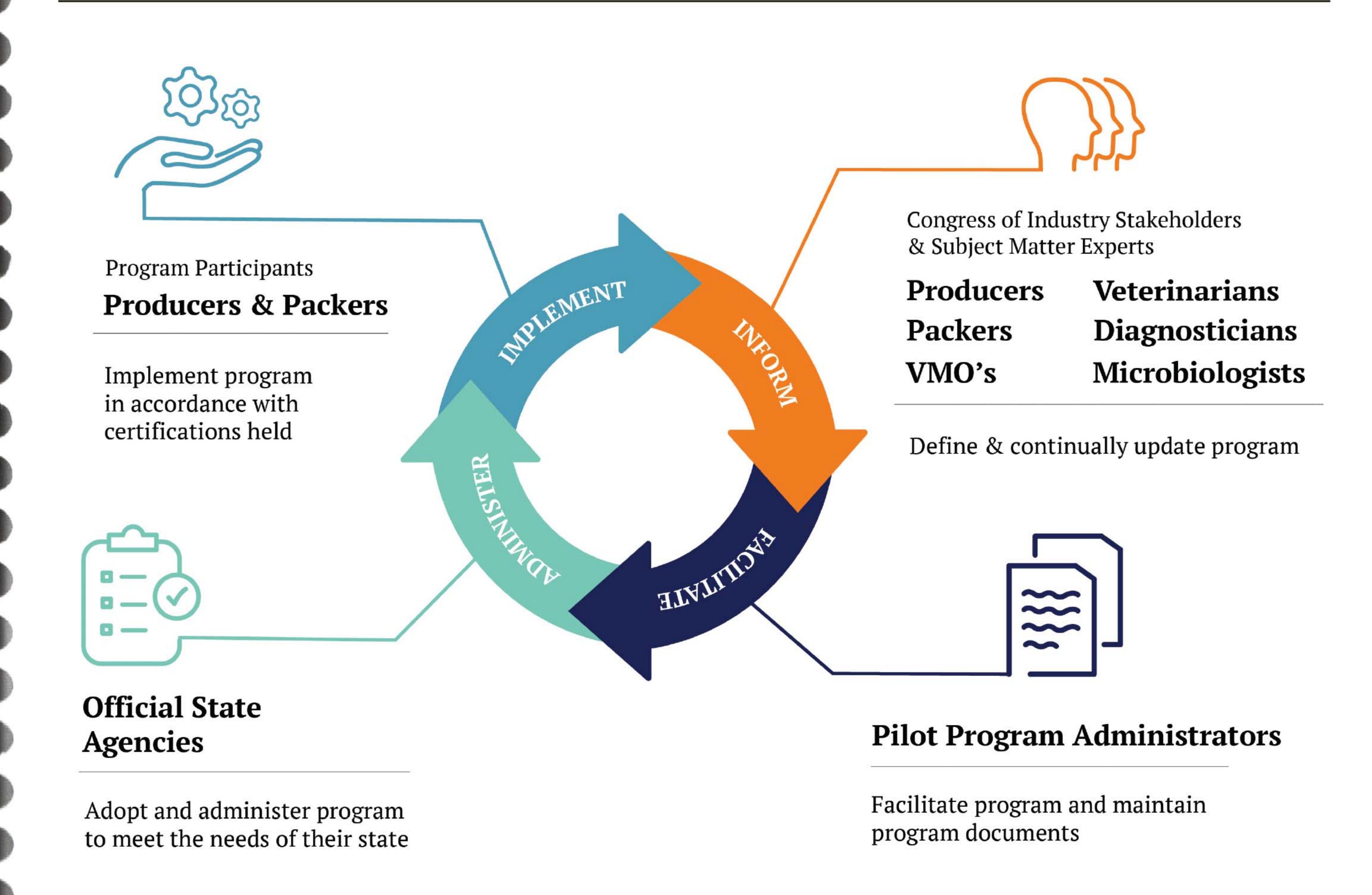
Slaughter Facilities

Biosecurity, Traceability, & Disease Surveillance

Increases Preparedness, Sustainability, & Competitiveness of IA and US Animal Agriculture

2015 2016 2017 2012 2013 2014

### Partnering to Safeguard and Improve Animal Health



### Industry, State, and Federal Partnership

Enhance all three aspects (prevention, response, & recovery) of trade impacting disease (TID) preparedness amongst participating producers, slaughter facilities, and states through proactively establishing an industryinformed and working system of operations and certification built upon well-defined program requirements for biosecurity, traceability, and disease surveillance.

## ISU PHTS

### ISU PUBLIC HEALTH TESTING SERVICES

Assisted State Hygienic Lab in onboarding new PCR technology and building high throughput capacity

Stood up a new COVID lab at ISU VDL in early 2020 complete with new standalone IT system, COVID-19 PCR testing, and serology (antibody-based) testing

Continuing to serve central lowa

Antibody tests were used to screen blood donors and identify possible plasma donations for COVID-19 treatments

24-hour turnaround time







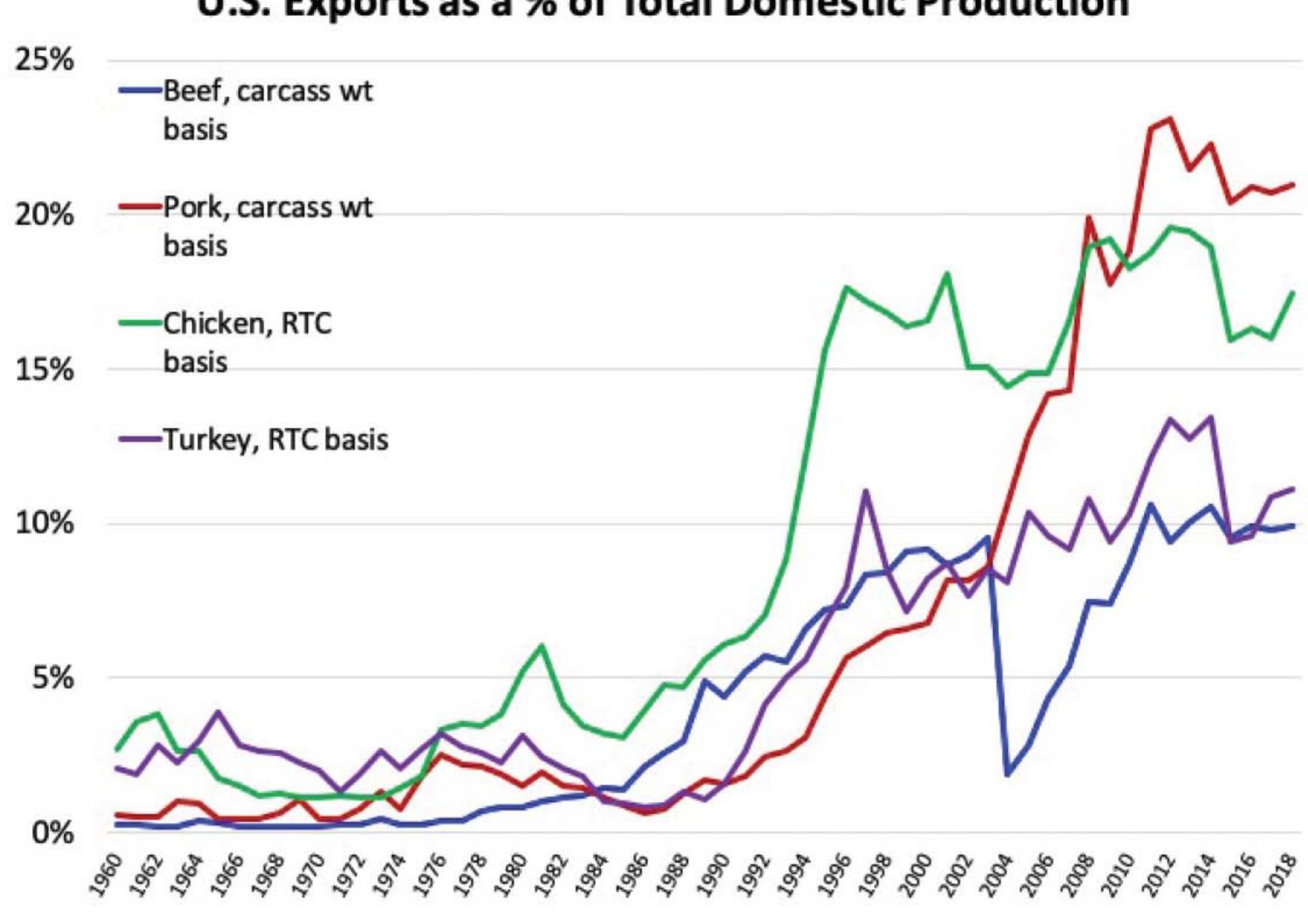


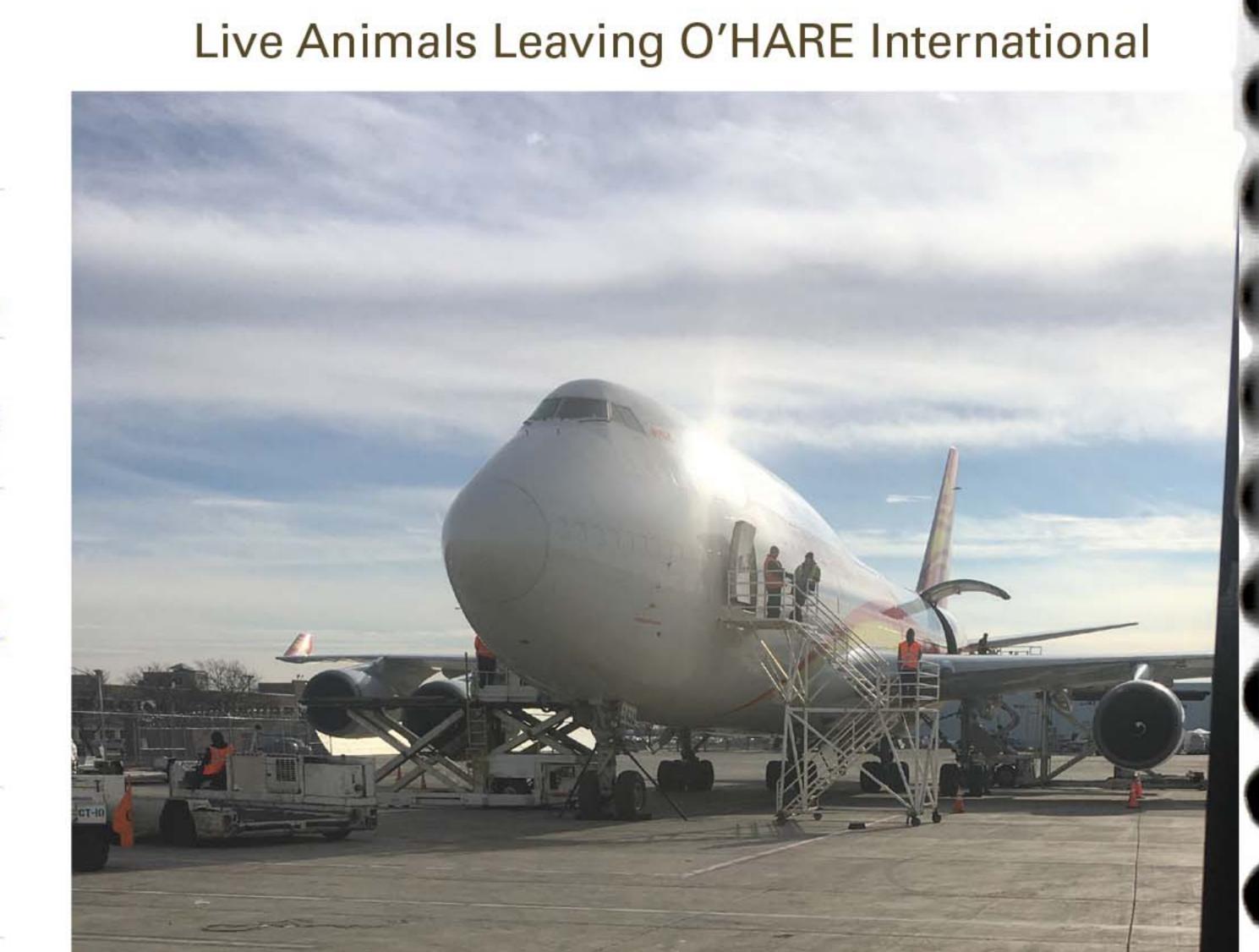


Stepping up to meet new challenges

## EXPORTS

U.S. Exports as a % of Total Domestic Production

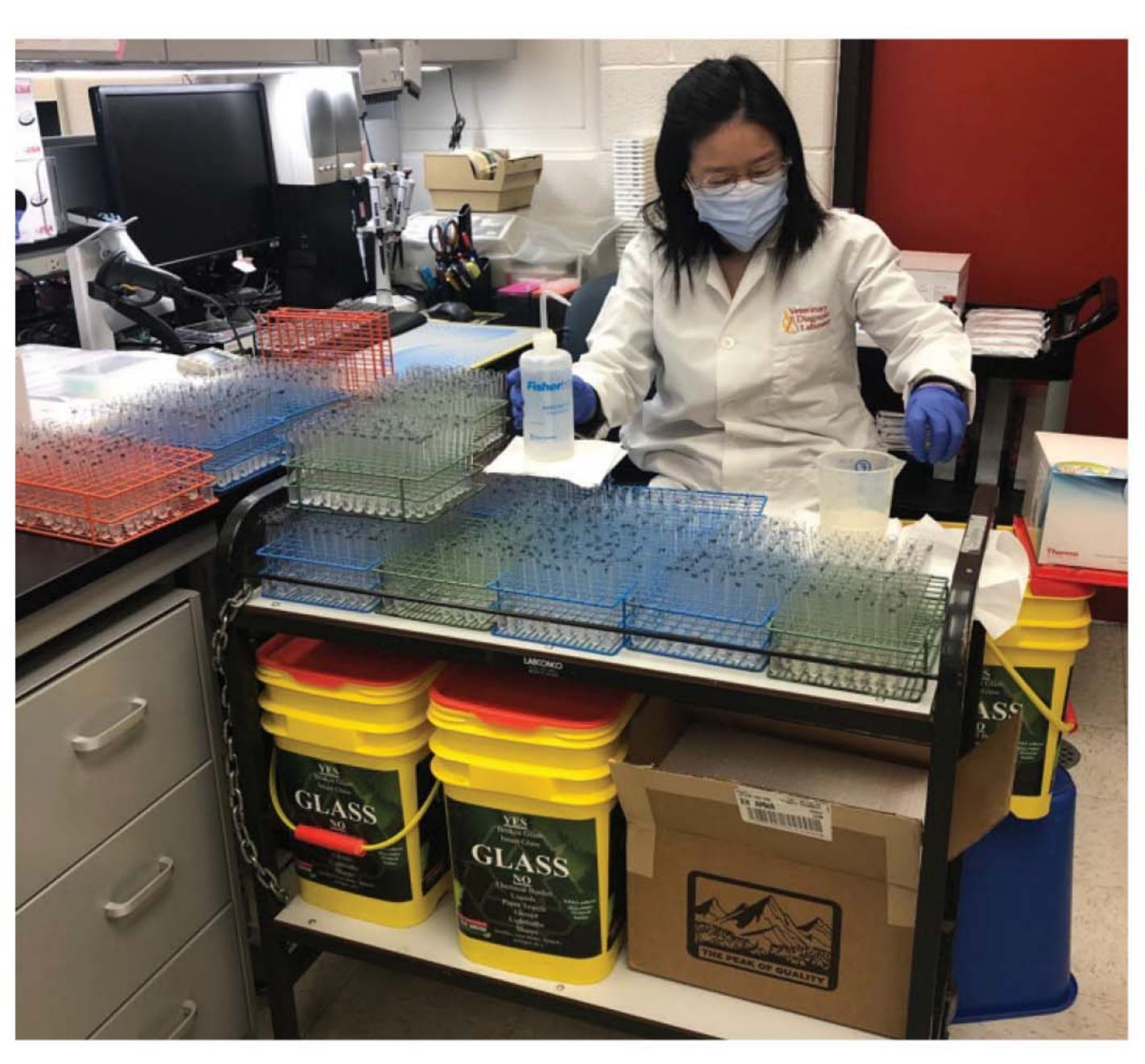


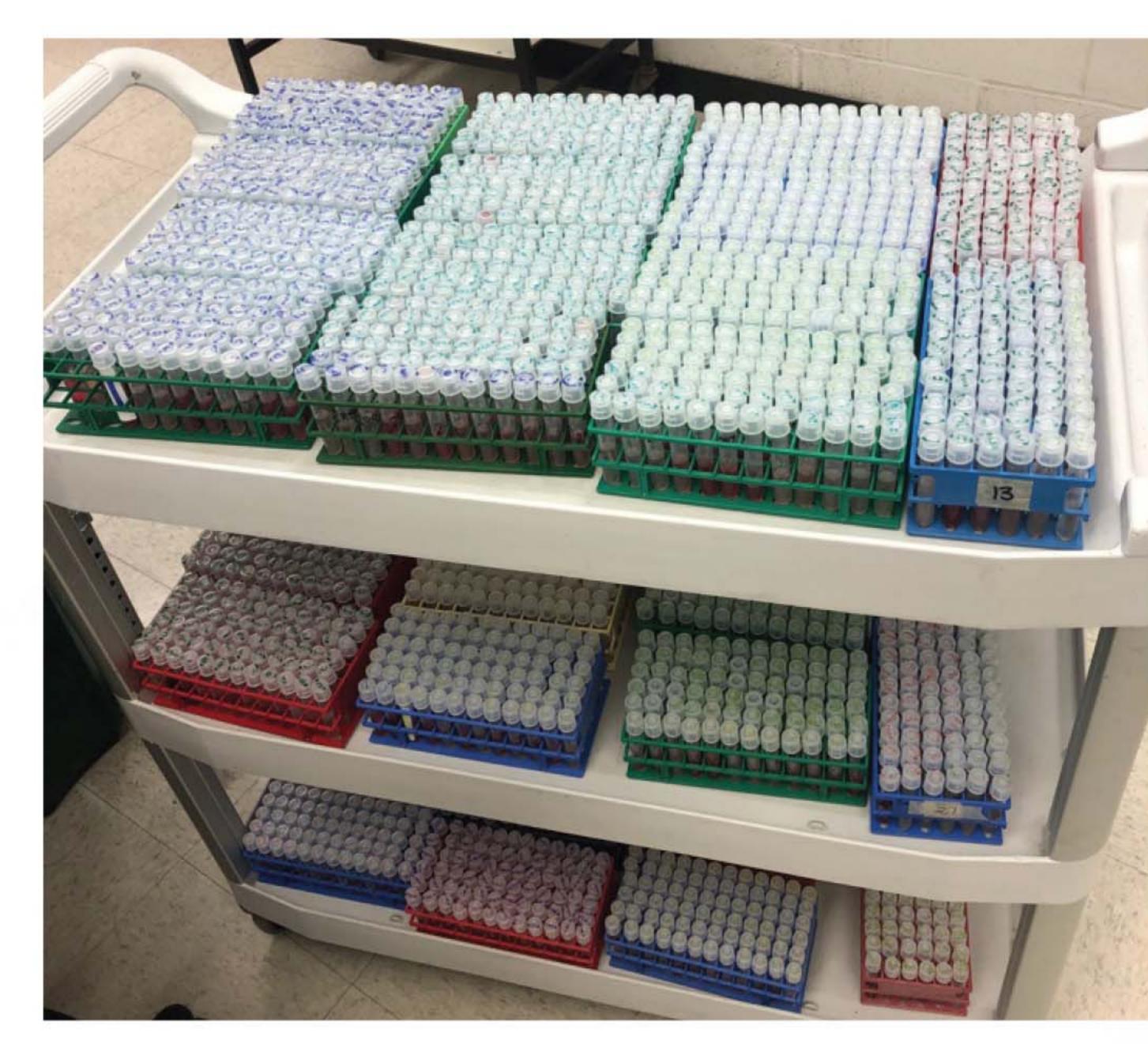


### **EXPORTS**

(Food Products & Live Animals)

VDL testing supports exportation of US food products and live animals





February 2021 - Sample of Export Case (US Seed Stock Suppliers) of pigs to China

**21**2010 2011 2012 2013 2014 2015 2016 2017

## NEW VDL BUILDING PROJECT



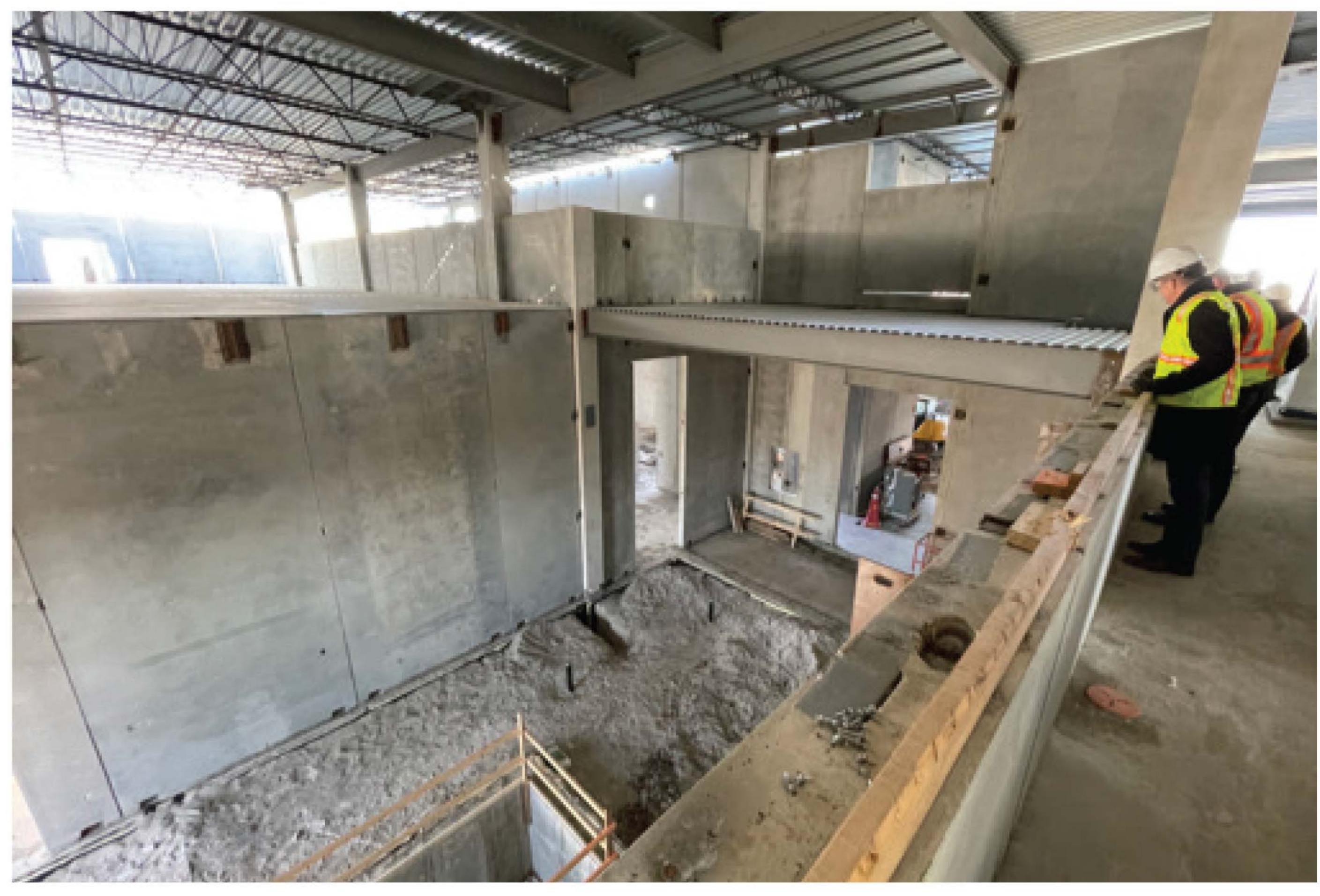
## VETERINARY DIAGNOSTIC LABORATORY NEW BUILDING

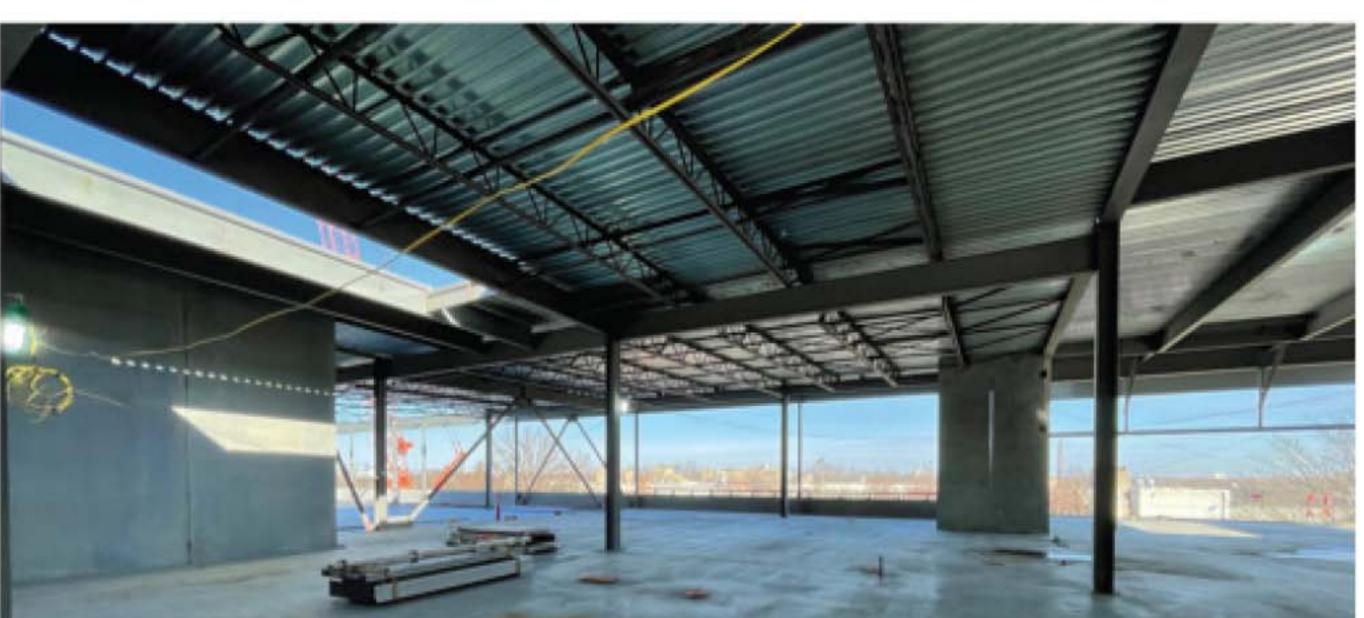
Ground breaking ceremony held on October 30th, 2020

Construction began March 2021

Phase 1 completion on schedule for late spring 2023

## NEW VDL BUILDING PROJECT

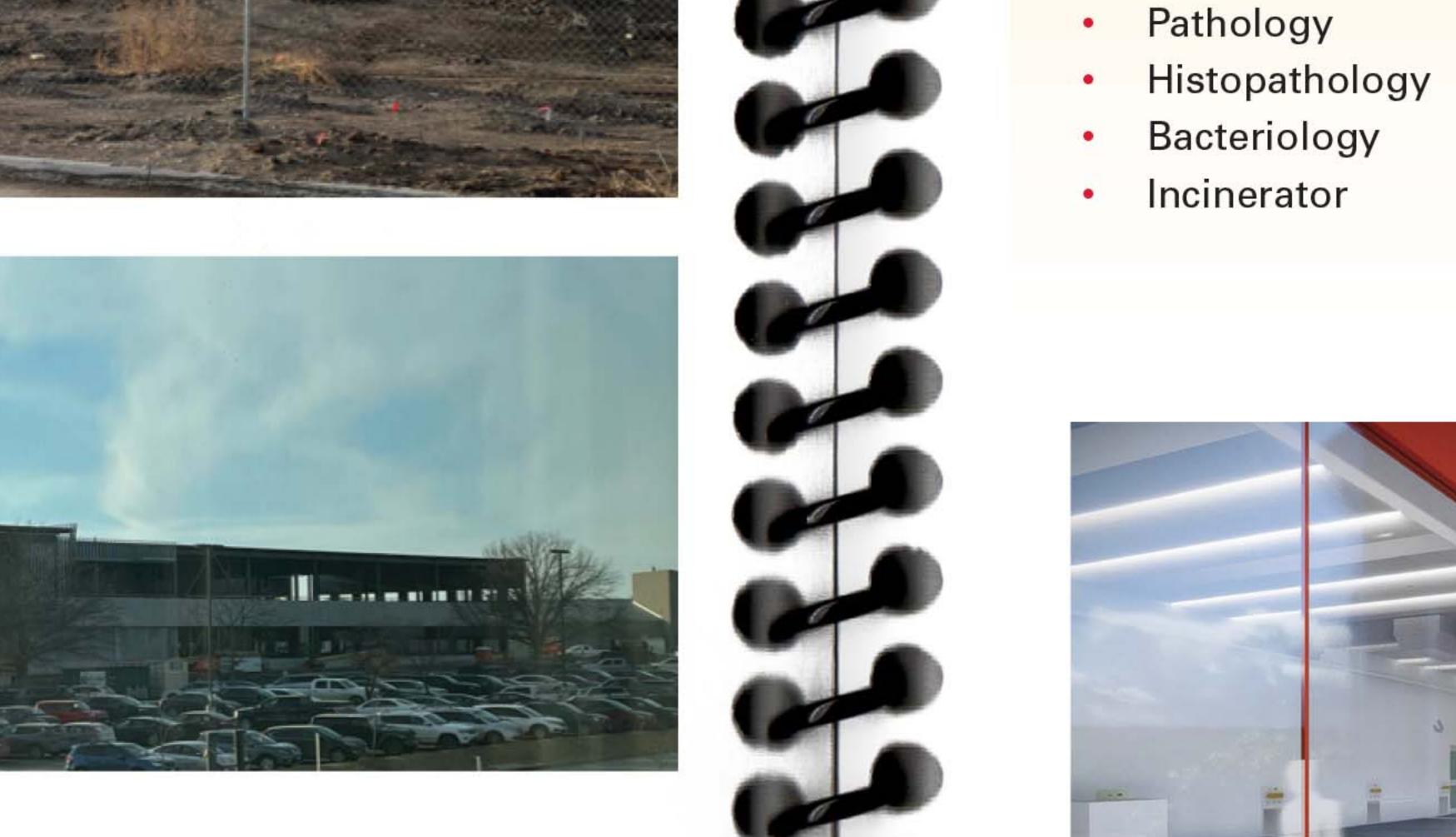
















#### Construction underway March 2021 **Completion Spring 2023**

\$75 million project (\$63.5 Legislature + \$11.5 ISU and Donors) includes critical infrastructure and 90K gsf of essential program space + 11K gsf basement:

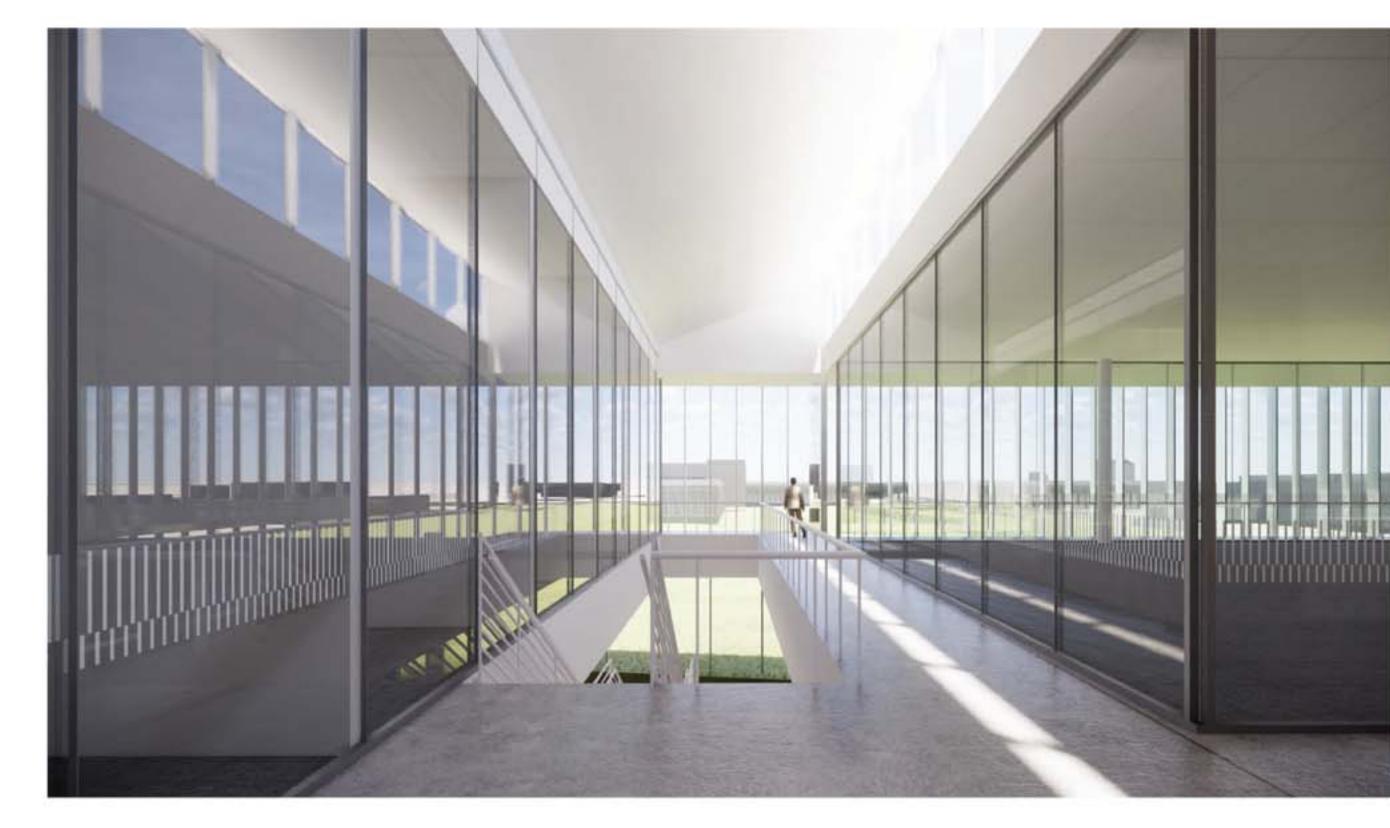
- Client services
- Receiving/Accessioning
- Sample processing
- Necropsy (Autopsy)



Critical unmet needs (80% of testing) which will need to be addressed in the near future. 69.6K gsf, \$64.3 million (\$60.8M Legislature request + \$3.5 million ISU and Donors):

- Molecular diagnostics
- Genetic sequencing
- Virology
- Serology
- Analytical Chemistry/Toxicology
- BSL-3 High biosecurity diagnostics
- Diagnostic Research and Development
- Information Technology and Quality Assurance
- VDL Administration









## IOWA STATE UNIVERSITY

Veterinary Diagnostic Laboratory

**Dr. Dan Grooms**, *Dean* | 515-294-1242

Dr. Pat Halbur, VDPAM Chair and VDL Executive Director | 515-294-6970

Dr. Rodger Main, VDL Director | 515-294-6945