

IOWA STATE
UNIVERSITY

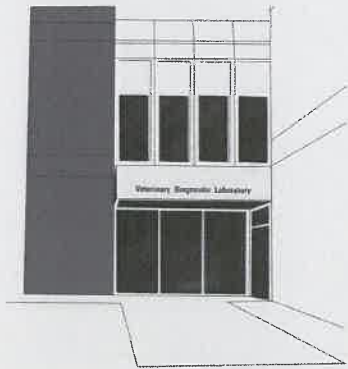


**Veterinary
Diagnostic
Laboratory**

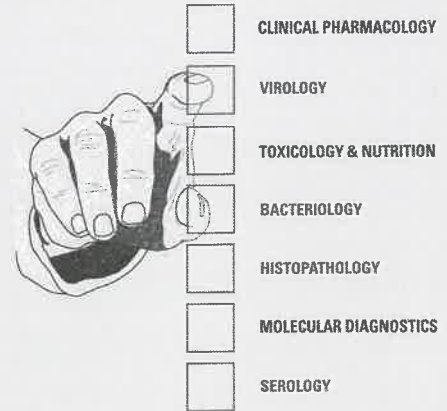
1850 Christensen Drive
Ames, IA 50011-1134

MODEL OF SERVICE, TEACHING, AND RESEARCH

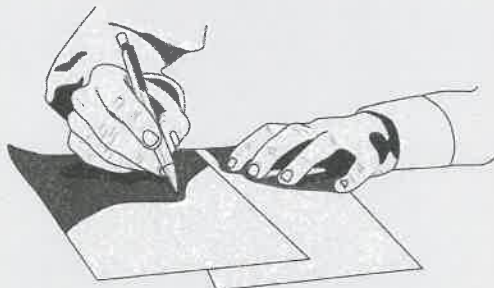
1. ISU VDL RECEIVES CASES FROM PRACTICING VETERINARIANS



2. ISU VDL DIAGNOSTICIAN SELECTS TESTS BASED ON HISTORY



3. RESULTS COORDINATED TO ARRIVE AT DIAGNOSIS

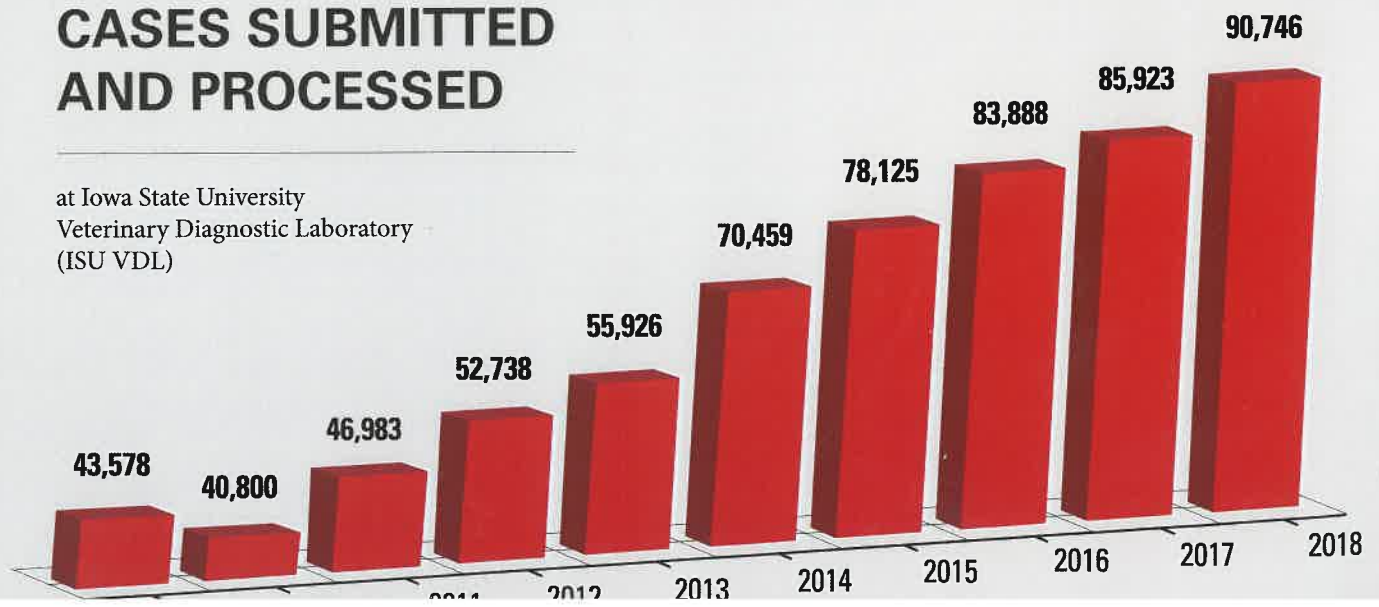


4. RESULTS AND DIAGNOSIS TRANSMITTED TO ASSIST PRACTICING VETERINARIANS AND ANIMAL OWNERS



CASES SUBMITTED AND PROCESSED

at Iowa State University
Veterinary Diagnostic Laboratory
(ISU VDL)



Economic impact of university veterinary diagnostic laboratories: A case study

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ABSTRACT

Veterinary diagnostic laboratories (VDLs) play a significant role in the prevention and mitigation of endemic and emerging animal diseases. They also allow for business continuity in livestock operations and help improve human health. Despite these critical societal roles, there is no academic literature on the economic impact of VDLs. We present a case study on the economic impact of the Iowa State University Veterinary Diagnostic Laboratory (ISUVDL). We use economic contribution analysis coupled with a stakeholder survey to estimate the impact. Results suggest that the ISUVDL is responsible for \$2,162.46 million in direct output, \$2,832.45 million in total output, \$1,188.19 million in total value added, and \$31.79 million in state taxes in normal years. In an animal health emergency this increases to \$8,446.21 million in direct output, \$11,063.06 million in total output, \$4,823.70 million in total value added, and \$124.15 million in state taxes. 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 provide information to scientists, administrators, and policymakers regarding the efficacy and return on investment of VDLs.

1. Introduction

Much of the work done by veterinary diagnostic laboratories (VDLs) is routine and contributes to animal agriculture by allowing for the movement of animals, diagnosis of disease, prevention and treatment of disease, and ongoing monitoring of the health status of animals. The work of VDLs becomes much more crucial when trade-limiting diseases occur. Under these circumstances, it might be impossible to send samples to other states for testing, and the presence of a VDL that rapidly identifies, helps control, and treats a disease is critical to the financial performance of the animal agriculture industry.

Funding to support VDL operations is typically derived from diagnostic services fees and contracts and government appropriations. Whether these appropriations, or tax dollars, provide a sufficient return on investment depends on the contribution of VDLs to the productivity, growth, and ultimately size of the animal agriculture industry, which subsequently generates taxes that offset spending. The aim of this study is to provide a simple and transparent method to estimate the economic impact of VDLs, something currently absent in the literature. The Iowa State University Veterinary Diagnostic Laboratory (ISUVDL) is used as a

case study. The ISUVDL was selected as a case study because it is located in one of the most intensively populated animal agriculture regions in the nation. As a result, the Iowa economy is highly dependent on the animal agriculture industry, which amplifies the importance of the economic impact of disease outbreaks.

2. The role and activities of the ISUVDL

Animal agriculture includes raising of livestock to provide meat, milk, fiber, and other products to consumers. Iowa is a major producer and net exporter of beef, pork, poultry, dairy, and egg products. Iowa hog and pig production totaled 12,511 million pounds (5,674,732 metric tons) in 2015 (USDA-NASS, 2016a). Iowa cattle and calf production totaled 1904 million pounds (863,708 metric tons) in 2015 (USDA-NASS, 2016a). In 2015, Iowa raised 9.1 million turkeys or 334 million pounds (160,567 metric tons) of turkey production (USDA-NASS, 2016b). Iowa sold for slaughter 11.3 million chickens, or 57 million pounds (16,904 metric tons) of chicken production. In 2015 (USDA-NASS, 2016b), Iowa egg production totaled 13,463 million eggs in 2015 (USDA-NASS, 2016b). Iowa produced 4841 million pounds

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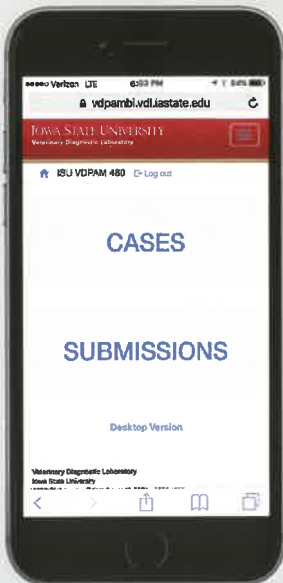
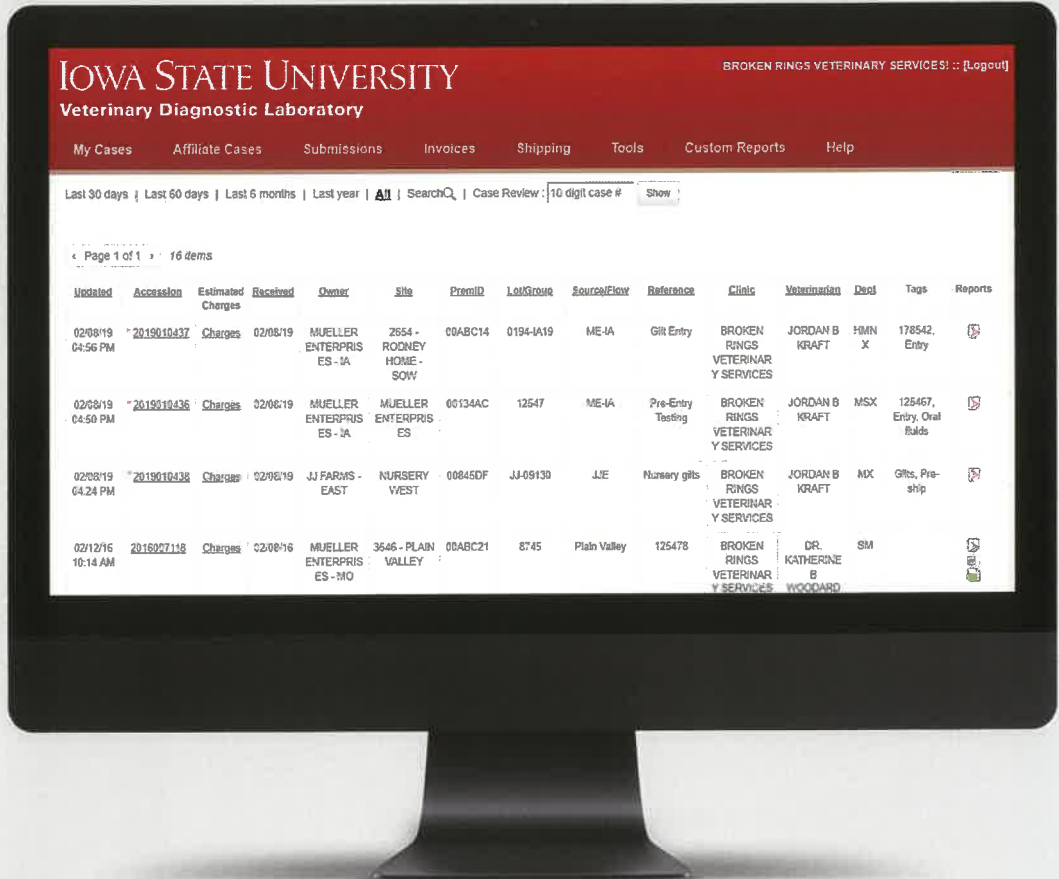
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by the
collections are
second step, these come
stakeholder survey estimates of D
the overall economic value of the animal p

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.

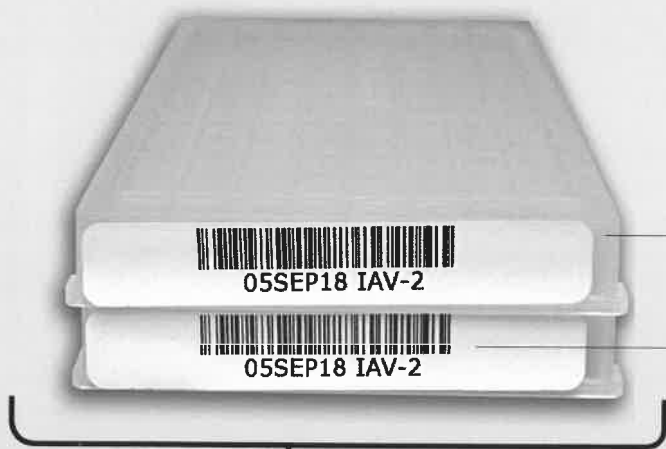
INFORMATION TECHNOLOGIES

Suite of Web-based Applications for Submissions and Results



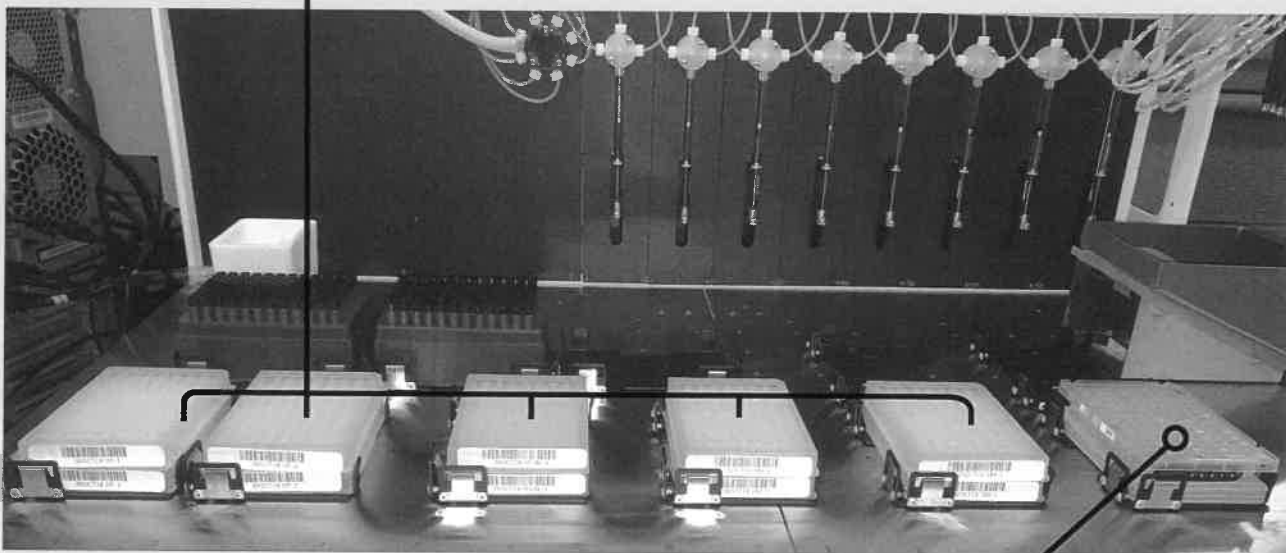
Percentage of Cases Submitted Electronically





Extraction plates

Extraction plate barcode



PCR plate barcode

PCR plate

The Iowa State University Veterinary Diagnostic Laboratory has the **1st fully integrated molecular diagnostic workflow in the United States.**

SWINE



PROCESSING FLUIDS

Linhares et al, ISU CVM

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.

2017 — 1,000 tests

2018 — 19,341 tests

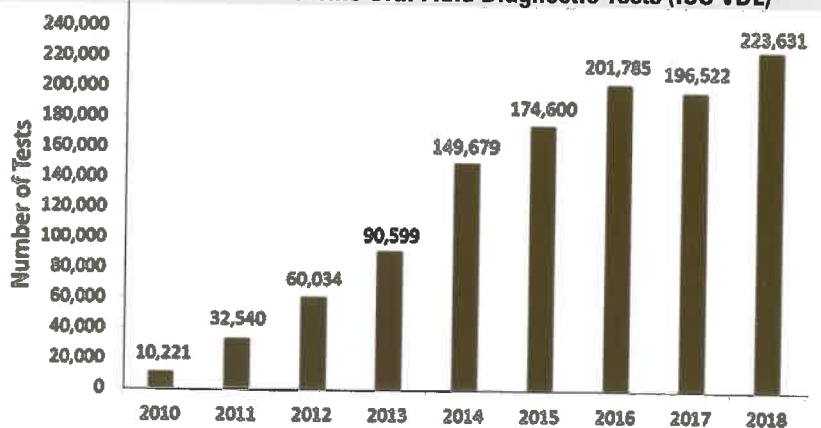


SWINE ORAL FLUIDS

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.

Number of Swine Oral Fluid Diagnostic Tests (ISU VDL)



POULTRY



Liver lesions present



Campylobacter colonies grown on Blood agar



Campylobacter organism



SPOTTY LIVER DISEASE

(*Campylobacter hepaticus*)

First diagnosed in the United States in 2011

Liver lesions present

Increases mortality

Decreases egg production

More frequently diagnosed in floor raised

Iowa State University researchers are investigating ways to develop rapid diagnostic tools and effective vaccines against Spotty Liver Disease (SLD)



Restricted antibiotic use exacerbates impact



Causes necrotic enteritis and diarrhea

COCCIDIOSIS

Protozoal disease

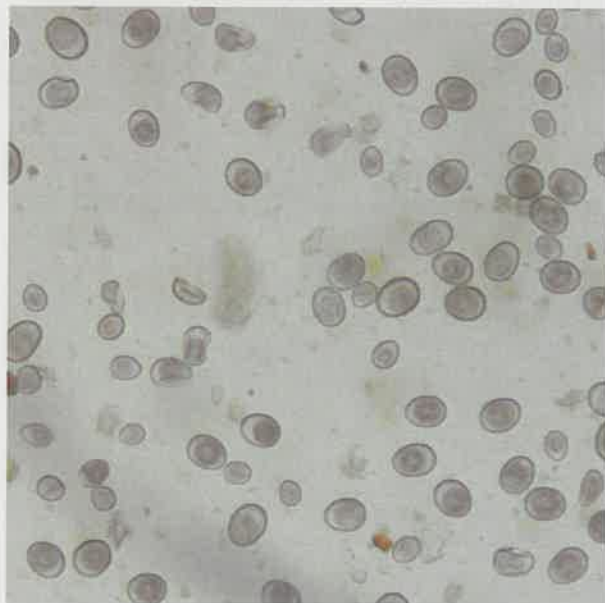
Diarrhea

High morbidity

Low growth
Low feed efficiency

Fecal – Oral

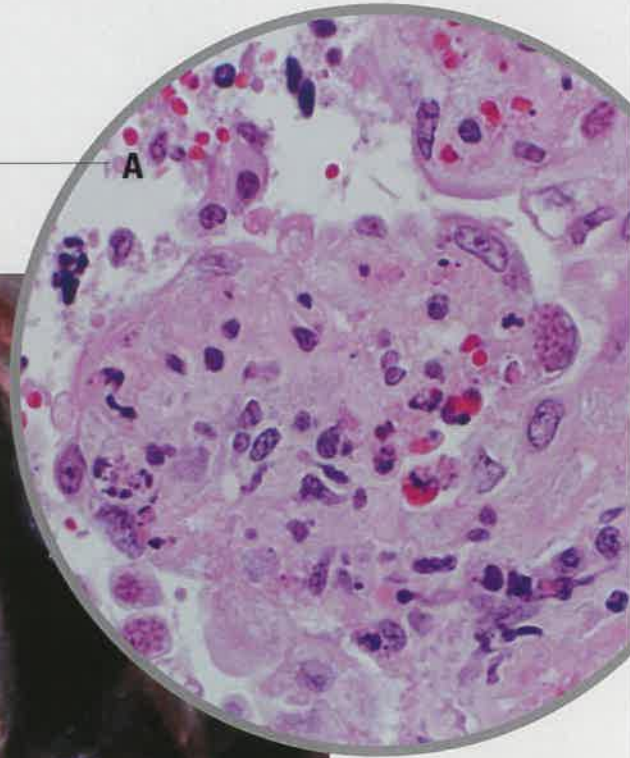
#1 disease impacting growing birds



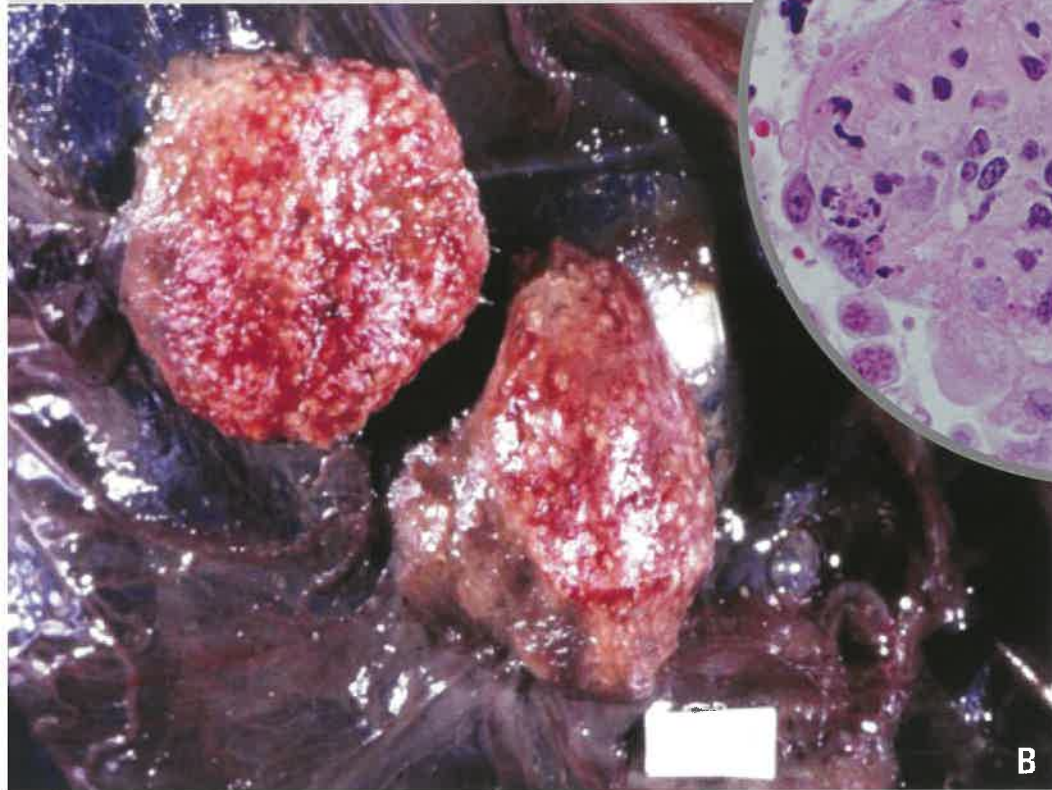
Microscopic image of cocci

RUMINANT

A – Ewe placenta
microscopic lesion



B – Placenta
gross lesion



TOXOPLASMA

Abortion in Sheep

3 fetuses & 1 placenta submitted

Toxoplasma PCR+

Impact

Prevention (Cats)

Human Health (Zoonotic)

Initiate Treatment

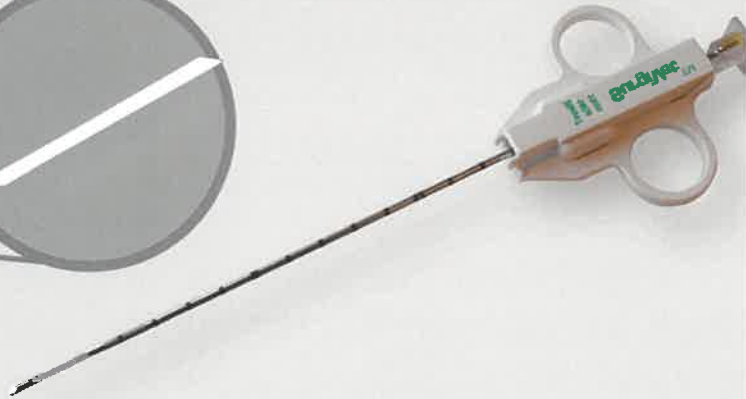
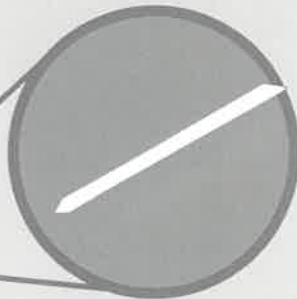
TRACE MINERALS

Important for Health & Immune System

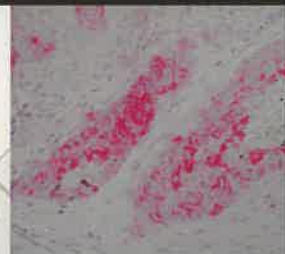
Liver biopsy

Determines status

Deficient
Adequate
Toxicities



BOVINE VIRAL DIARRHEA (BVD)



*Pink Stain is BUO+

Ear notch

Paraffin wax

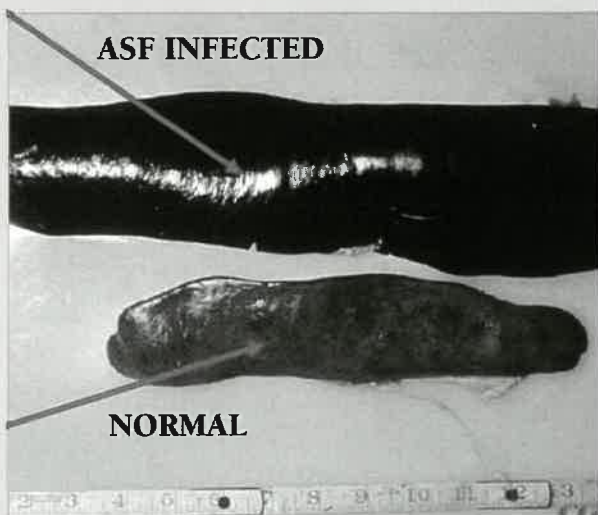
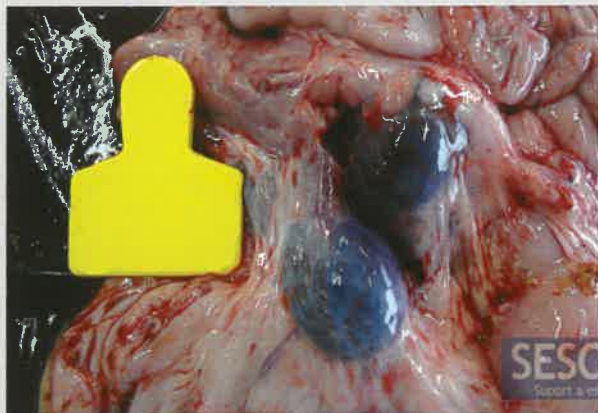
Stained slide

IHC slide

Screening for Persistently Infected (PIs)


Introduction into feedlot > \$100/head

AFRICAN SWINE FEVER



AFRICAN SWINE FEVER

(Emerging Animal Health Crisis in Europe & Asia)

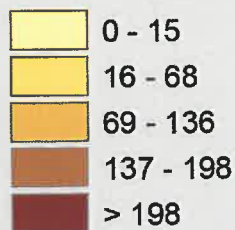
Highly resistant virus	High morbidity	High mortality
Depopulation of affected sites	 TRADE IMPACTING DISEASE	
Not a human health concern		



OIE Confirmed ASF Detections in China *1

- Confirmed ASF Detections in Domestic Pigs (n=106)
- ▲ Confirmed ASF Detection in Wild Boar (n=2)

() Number of All Confirmed ASF Detections Swine / sq km *3

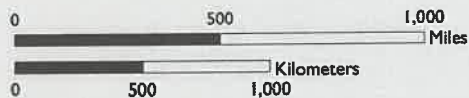


Data Source:

*1 World Organisation for Animal Health (OIE)

*3 Statistics on China's live pig stocks:

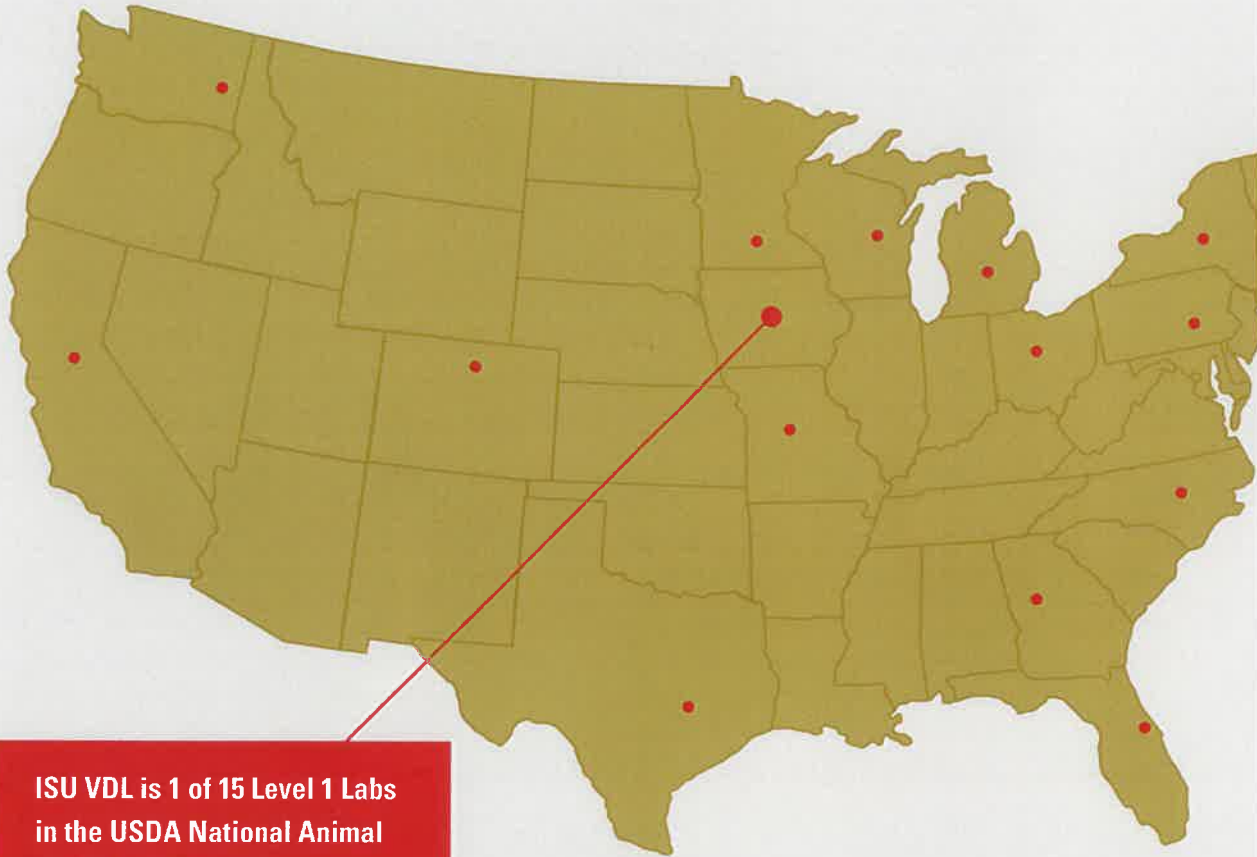
2016, Zhiyan Consulting



USDA, APHIS
Center for
2150 Cent
Fort Collins

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NAHLN LEVEL 1 LABS



ISU VDL is 1 of 15 Level 1 Labs in the USDA National Animal Health Lab Network

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)

\$4.1M Currently the ISU VDL receives an annual \$4.1 million appropriation, approximately 17% of the overall budget for the lab.

- Compared to peer labs, the percentage of budget the ISU VDL derives from fees charged to clients is among the highest in the nation.
 - ISU VDL receives 17% of its budget from state appropriations.
 - 85% of all state VDLs receive in excess of 20%.
 - Average funding level is 44% of budget.
 - 8 labs receive more than 60%.
- Baseline funding is critical to sustain a level of preparedness.
 - To respond to disease outbreaks such as Avian Influenza, African Swine Fever, and Foot and Mouth Disease.
 - To recruit and retain the quality and level of staffing for appropriate response.
 - To keep tests affordable and encourage routine testing detection of disease and decreased "spillover" to neighboring areas.
- A recently published study estimated that \$31.79 million in years and \$124.15 million in state taxes are generated in return to a 8:1 return on investment during normal years and a 3:1 health emergency. [vetmed.iastate.edu/article/economic-](http://vetmed.iastate.edu/article/economic-impact)



REQUEST: Increase of \$410,000 (10%) in funding for VDL Operations.

The \$4.1 million direct appropriation through Agriculture and Natural Resources allows the VDL 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.
- Serve as 1 of 14 Tier 1 labs in the U.S. National Animal Health Laboratory Network.
- Detect and capably respond to the introduction of transboundary (porcine epidemic diarrhea virus 2013-14), foreign animal diseases (highly pathogenic avian influenza virus 2015), and emerging diseases of animals (Senecavirus A 2015-16) and humans.
- 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: ~23% of U.S. pork, ~11% of U.S. beef, ~19% of U.S. chicken is exported.



IMPACT: A 1% increase (or decrease) in Iowa's \$32.5 billion animal agriculture economy = \$325 million impact on Iowa

vetmed.iastate.edu/vdl 2

1/20/19

World-Class Veterinary Diagnostic Lab Needs a Suitable Facility

The Veterinary Diagnostic Laboratory (VDL) at ISU protects animal and human health and advances Iowa's \$32.5 billion dollar animal agriculture economy.

- Processes 90,000+ diagnostic cases/year, doubled in 6 years
- Teaching the next generation of animal health professionals
- Conducts applied research of high relevance (animal health, food safety, zoonotic diseases)



SERIOUS INFRASTRUCTURE CHALLENGES

- 43 year-old facility, outdated HVAC, plumbing, electrical
- 1976: 10 faculty, 20 staff, 16,000 cases/year
- 2018: 25 faculty, 130 staff, 90,000+ cases/year, largest food animal caseload in U.S.
- Compromised biosafety & biocontainment
- Severe overcrowding

Excerpts of External Review Panel Reports:

"...the space and structural limitations of this aging facility combined with the rapid growth of the laboratory will, in the opinion of the team, limit the laboratory's ability to adequately respond to a large foreign animal disease outbreak." – 2017 AAACVLD Accreditation Site Visit Report



SOLUTION: Build New Veterinary Diagnostic Laboratory

- **Thank you** for your support. We sincerely appreciate recognition of the impact and need with the \$63.5 million over 6 years from Rebuild Iowa Infrastructure Fund.
- ISU worked with architects and engineers to bring 2014 program plans up-to-date.
 - ✓ Program space needs validated
 - ✓ Decrease from 151K gsf to 139K gsf
 - ✓ Construction cost of \$655/gsf. Comparable to other new VDLs
 - ✓ Space utilization efficiency increased from 55% to 63%
 - ✓ Total cost to meet expanding diagnostic program needs = \$126 million

- \$75 million (\$63.5 Legislature + \$11.5 ISU and Donors) builds phase 1 which includes essential infrastructure and 48% (73K gsf) of the needed program space including:

- ✓ Receiving
- ✓ Pathology
- ✓ Bacteriology
- ✓ Necropsy
- ✓ Histopathology
- ✓ Incinerator

- Critical unmet needs which will need to be addressed in phase 2 include:

- ✓ Analytical Chemistry
- ✓ Molecular Diagnostics
- ✓ VDL Research
- ✓ Serology
- ✓ Virology
- ✓ BSL-3 Necropsy

- The VDL provides outstanding return on investment by supporting the critical diagnostic needs necessary to support Iowa's animal agriculture industry.



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