USDA Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

National Animal Health Laboratory Network

NAHLN

Introduction

The National Animal Health Laboratory Network (NAHLN) was established in 2002. In the first 10 years, NAHLN was built to a level of National recognition through participation and partnerships that span all sectors. Our second 10 years have been built successfully on that strong foundation. What has proven most important to the achievements attributed to NAHLN are the collaborative partnerships that have continued over the years as well as the addition of many new partnerships developed in support of various levels of expansion and new initiatives. In our new structure, NAHLN has been able to quickly adapt to the changing needs presented through global pressures and new opportunities.

A timeline of our first 10 years is captured here "Celebrating 10 Years, NAHLN".

Continue reading for more information on activities from our second decade! Highlights from the last 10 years include:

- NAHLN laboratories were integral in the response of the 2015 highly pathogenic avian influenza outbreak- the largest animal disease outbreak the United States has ever seen.
- NAHLN was restructured in 2016.
- NAHLN expanded into Antimicrobial Resistance surveillance in 2018.
- NAHLN received funding to support animal disease prevention and management as part of the 2018 Farm Bill.
- As of 2021, all Level 1, 2, and 3 NAHLN laboratories are expected to electronically message test results in real-time.
- NAHLN laboratories tested millions of human samples for COVID-19 in support of Public Health in 2020 and 2021.

Image AdobeStock

NAHLN Mission and Vision Statements

Vision

The National Animal Health Laboratory Network (NAHLN): a network of animal disease diagnostic laboratories that works effectively as a team, provides ongoing disease surveillance, responds quickly to disease events, communicates diagnostic outcomes to decision makers in a timely manner, and has the capability and capacity to meet diagnostic needs during animal disease outbreaks.

****The NAHLN mission statement was updated in 2022 to address the need for early detection of any threat to our animal agriculture whether it is present locally or globally and whether directly associated with animals of agriculture or indirectly through other non-agriculture animal species.**

Image AdobeStock

Mission

The NAHLN is a nationally coordinated network and partnership of Federal, State, and university-associated animal health laboratories. NAHLN laboratories provide animal health diagnostic testing, methods research and development, and expertise for education and extension to detect any local, regional, national, and global biological threats to the nation's animal agriculture (poultry, livestock, and other animal species that may interact with animals of agriculture) thus protecting animal health, public health, and the nation's food supply.

NAHLN Founding Principles

NAHLN laboratories support our founding principles to ensure that regulatory officials, consumers, and trade partners can have confidence in test results for surveillance, foreign animal disease investigations, surge capacity and outbreak recovery testing.

- Operate within a quality management system,
- Establish and maintain competency of laboratory personnel,
- Use standardized protocols, reference materials, and equipment,
- Maintain biosafety/biosecurity levels requisite for testing performed,
- Provide secure communications and real time electronic reporting, and
- Evaluate preparedness through scenario testing.

Acronyms

AMR - Antimicrobial resistance
ASF - African swine fever
BSE - Bovine spongiform encephalopathy
CSF - Classical swine fever
CWD - Chronic wasting disease
FAD - Foreign animal disease
FMD - Foot and mouth disease
HPAI - Highly pathogenic avian influenza
IAV-A - Influenza A virus of avian
IAV-S - Influenza A virus of swine
ISA - Infectious salmon anemia
NDV - Newcastle disease
PRV - Pseudorabies disease
SECD - Swine enteric coronavirus disease
VHS - Viral hemorrhagic septicemia
VSV - Vesicular stomatitis virus

2013

NAHLN Stats:
57 NAHLN labs
18 Core (includes branch labs)
29 Member
7 Contract
3 Adjunct

NAHLN Program Update:
Leadership Transition- Ensured smooth succession for the second NAHLN Coordinator

IT:
Laboratory Messaging Service (LMS) Implemented

Outbreak:
2013 – 2015 - SECD

Ongoing Success:

- QMS training:
  - 68 NAHLN + International participants
  - 54 National Plant Diagnostic Network
- 132,899 surveillance tests conducted for BSE, CWD, CSF, ISA, PRV, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

Newsletters:
Vol 5, No. 1 (October 2013)

"It is amazing what you can accomplish if you do not care who gets the credit."

– Harry Truman

2014

NAHLN Stats:
59 NAHLN labs
18 Core (includes branch labs)
30 Member
9 Contract
2 Adjunct

Ongoing Success:

- QMS Training -
  - 67 NAHLN Lab and International Participants
  - 27 National Plant Diagnostic Network Participants
- 128,819 surveillance tests conducted for BSE, CWD, CSF, ISA, PRV, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

Outbreak:
2013 – 2015 – SECD
2014 – 2015 - HPAI

IT:
LMS Used in Production for SECD
Spreadsheet Uploader Created for non-messaging labs

New Initiative:
Developing the NAHLN Strategic Plan

"If you want to go fast, go alone. If you want to go far, go together."

African Proverb

2015

NAHLN Stats:
61 NAHLN labs
18 Core (includes branch labs)
32 Member
9Contract
2 Adjunct

Outbreak:

- 2014 – 2015: HPAI Largest animal disease outbreak to date in the U.S.
- 2013 – 2015: SECD
- 2015: VSV

IT:
LMS used in HPAI 2015, Technical Gaps identified

New Initiative:
NAHLN Restructure Plan Approved

Ongoing Success:

- QMS Training-
  - NAHLN Lab and International Participants
- 136,240 surveillance tests conducted for BSE, CWD, CSF, ISA, PRV, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

New Initiative:
Aquatic pathogen assays added to NAHLN Scope

Newsletters:
Vol 6, No. 2 (November 2015)
Vol 6, No. 1 (January 2015)

Preparedness:
NAHLN 1st Annual Exercise- FMD Hands-on Exercise
NAHLN Accessioning Drill

"Success is best when shared."

Howard Schultz

2016

Outbreaks:
3 LPAI IN, MO, NY/NJ/PA

New Initiative:
NAHLN Restructure Implemented

New Initiatives:
Indefinite Delivery/Indefinite Quantity contracts implemented for testing reimbursement

NAHLN Program Update:
MTWG restructure to increase expertise and encourage general membership participation

Publications:
AMR Survey published

Newsletter:
Vol 7, No. 1 (June 2016)

NAHLN Stats:
60 NAHLN labs
17 Level 1 (includes branch labs)
29 Level 2 (includes branch labs)
13 Level 3
1 Affiliate
0 Specialty

IT:
Database replaced with SQL Server Database that Fully Abstracted HL7

Preparedness:
NAHLN Exercise: Electronic Messaging

Ongoing Success:

- QMS Training-
  - 55 NAHLN Lab Participants
  - 35 attended the 1st Regional QMS Training (FL)
- 115,848 surveillance tests conducted for BSE, CWD, CSF, ISA, PRV, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

"Individually, we are one drop.
Together, we are an ocean."

Ryunosuke Satoro

2017

Outbreak:
HPAI – Regional AL, GA, KY, TN

Disease Response
atypical L-type BSE in AL

NAHLN Program Update:

- Establishment of the Portal Working Group
- Restructure of MTWG into General and Core Membership
- New Management and Program Analyst position added to NAHLN Team
- Establishment of Quarterly calls with NAHLN lab Directors

Newsletters:
Vol 8, No. 3 (December 2017)
Vol 8, No. 2 (September 2017)
Vol 8, No. 1 (June 2017)

Preparedness:
NAHLN Barcode/messaging exercise

NAHLN Stats:
59 NAHLN labs
20 Level 1 (includes branch labs)
30 Level 2 (includes branch labs)
8 Level 3
1 Affiliate
0 Specialty

NAHLN Program Update:
Leadership Transition- Ensured smooth succession for the third NAHLN Coordinator

IT:
NAHLN Portal changed name to APHIS Laboratory Portal (ALP)

ALP includes management of all APHIS PTs

Ongoing Success:

- QMS Training-
  - 63 NAHLN Lab Participants
  - 56 Aquaculture Participants
- 164,365 surveillance tests conducted for BSE, CWD, CSF, ISA, PRV, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

2018

Outbreaks:

- LPAI: MO, TX, MN, CA
- NDV: CA, AZ

Disease response:
atypical H-type BSE in FL

New Initiative:
AMR Pilot begins with 19 labs enrolled

New Initiative:
Laboratory Accountability Process

Newsletters:
Vol 9, No. 4 (December 2018)
Vol 9, No. 3 (October 2018)
Vol 9, No. 2 (June 2018)
Vol 9, No. 1 (March 2018)

NAHLN Stats:
58 NAHLN labs
20 Level 1 (includes branch labs)
29 Level 2 (includes branch labs)
8 Level 3 (includes branch labs)
1 Affiliate
0 Specialty

IT:

- LMS Test Data integrated into Palantir Gotham and a pipeline created
- Messaging Competencies development to test proficiency

Ongoing Success:

QMS Training-

- 76 NAHLN Lab Participants
- 19 attended 2nd Regional QMS

- 159,435 surveillance tests conducted for BSE, CWD, CSF, ISA, PRV, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

Preparedness:

- National Exercise (ARMAR)- Function FMD Exercise
- NAHLN Exercise- NDV Tabletop

2019

Outbreaks:

- LPAI: CA
- NDV: CA, AZ
- VSV: CO, NE, NM, WY

NAHLN Program Updates:
ORISE Fellow to support AMR

New Initiative:
Active surveillance for ASF added to CSF plan

New Initiative:
Farm Bill funding competitive process

New Initiative:
Planning an Advanced QMS Training Course

Preparedness:

- National Exercise– Swine Fever Exercise for Agriculture Response
- Developed Emergency validation Process
- NAHLN Exercise– ASF (AI/ND for non–swine labs) simulated FADIs with testing of mock samples

NAHLN Stats:
59 NAHLN labs
22 Level 1 (includes branch labs)
29 Level 2 (includes branch labs)
7 Level 3
1 Affiliate
0 Specialty

IT:

- Enterprise Messaging Service Live, HL7 Supported
- LMS Test and Production Pipelines Fully Operational
- Level 2 labs required to message test results

Ongoing Success:

- 126,928 surveillance tests conducted for ASF/CSF BSE, CWD, ISA, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

Newsletter:
Vol 10, No. 1 (June 2019)

2020

Outbreaks:

- NDV: CA
- VSV: NE, NM, TX
- LPAI/HPAI: NC, SC

Outbreaks:

SARS-CoV-2

AL, CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MI, MN, MO, MS, NE, NY, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, WA, WI, WY

Ongoing Success:

- Year 2 of the NAHLN Farm Bill funding competitive process
- 150,762 surveillance tests conducted for ASF/CSF BSE, CWD, ISA, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

NAHLN Stats:

59 NAHLN labs

25 Level 1 (includes branch labs)

27 Level 2 (includes branch labs)

6 Level 3

1 Affiliate

0 Specialty

IT:

Level 2 labs required to message test results

New Initiative:

NAHLN labs test human samples for COVID-19

Preparedness:

NAHLN Exercises: Emergency Validation/Evaluation Process

NAHLN Program Updates:

NAHLN Team positions become 100% remote

Newsletters:

Vol 11, No. 2 (December 2020)

Vol 11, No. 1 (June 2020)

"In the midst of chaos, there is also opportunity."

Sun Tzu

2021

Outbreaks:

SARS-CoV-2
AL, CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MI, MN, MO, MS, NE, NY, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, WA, WI, WY

New Initiative:
NAHLN Data Management Summit

Preparedness:

- National Exercise– Foreign Animal Disease-Southern Agriculture Functional Exercise (FAD–SAFE)
- NAHLN Exercise: FAD investigation initiated in the laboratory (NDV, IAV-A)

Newsletter:
Vol 12, No. 1 (July 2021)

NAHLN Program Updates

- NAHLN Laboratory System Definition implemented across the network
- ORISE Fellow supporting Diagnostic Laboratory administration

NAHLN Stats:
59 NAHLN labs
32 Level 1 (includes branch labs)
22 Level 2 (includes branch labs)
4 Level 3
1 Affiliate
0 Specialty

IT:

- Level 3 labs required to message test results
- Acknowledgment report implemented for EMS
- Transition to EMS Initiated

Ongoing Success:

- Year 3 Farm Bill funding competitive and non-competitive process
- NAHLN AMR public dashboard released
- 150,669 surveillance tests conducted for ASF/CSF BSE, CWD, ISA, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

"Coming together is a beginning, staying together is progress, and working together is success."

Henry Ford

2022

Outbreak:
HPAI: Geographically the largest outbreak in the history of the U.S.

New Initiative:
AMR to transition 5-year pilot to permanent surveillance program

NAHLN Program Update:

- Under Secretary Jenny Moffitt traveled to Ames, IA to learn more about NAHLN
- New Bio-informaticist position added to the NAHLN Team
- Three new Management and Program Analysts
- ORISE Fellow supporting Diagnostic Laboratory administration

NAHLN Stats:
59 NAHLN labs
32 Level 1 (includes branch labs)
22 Level 2 (includes branch labs)
4 Level 3
1 Affiliate
0 Specialty

IT:
NAHLN labs actively messaging completed transition to EMS

Preparedness:
NAHLN Exercise: FAD investigation initiated in the laboratory (ASF, IAV-A)

Ongoing Success:

- QMS Training - 80 NAHLN Lab Participants
  - 50 attended the Basic Course
  - 30 attended the new Advanced QMS Training Course
- Surveillance continues for ASF/CSF BSE, CWD, ISA, Scrapie, SVC, IAV-S, VHS
- FAD investigations available for ASF, IAV-A, FMD, NDV

Newsletter:
Vol 13, No. 1 (March 2022)
Vol 13, No. 2 (July 2022)

Outbreak Response

2002-2003: Exotic Newcastle

The 2002-2003 Exotic Newcastle disease outbreak in Southern California, Arizona, Nevada, and Texas lead to multiple emergency declarations and over 7,000 individuals responded to the incident from the USDA and the California Department of Food and Agriculture Task Force. After 11 months, the depopulation of 3.16 million birds and a total cost of $161 million, the disease was eradicated and the outbreak ended.

2003, 2005, 2006, 2012, 2017, 2018: BSE

Six cases of Bovine Spongiform Encephalopathy (BSE) have been diagnosed in the United States. The first was in Washington state in 2003 and was diagnosed as classical BSE in a dairy cow who had been imported from Canada. The other five cases were atypical BSE and were found in Texas (2005), Alabama (2006, 2017), California (2012), and Florida (2018). Ongoing surveillance continues today in four NAHLN laboratories, strategically placed across the United States.

2004-2006: VSV

Sporadic cases of Vesicular Stomatitis Virus were diagnosed across Colorado, New Mexico, Texas, Arizona, Idaho, Montana, Nebraska, Utah, and Wyoming affecting nearly 750 premises during 2004-2006. Infections included both the New Jersey and Indiana serotypes.

2013-2015: SECD

In 2013, Porcine Epidemic Diarrhea Virus was first diagnosed in the United States and was quickly followed by the detection of Porcine Delta Coronavirus the following year. Together these two pathogens are known as Swine Enteric Coronavirus Disease (SECD). These viruses had previously been detected in Asia, but widespread testing was not yet available within the United States In response to this outbreak and its devastating effects on the U.S. swine industry, numerous NAHLN laboratories developed and deployed their own PCR assays to assist in detection of disease within their state. This test remains a useful tool in the diagnosis of swine diarrhea and aids producers in accurate diagnosis.

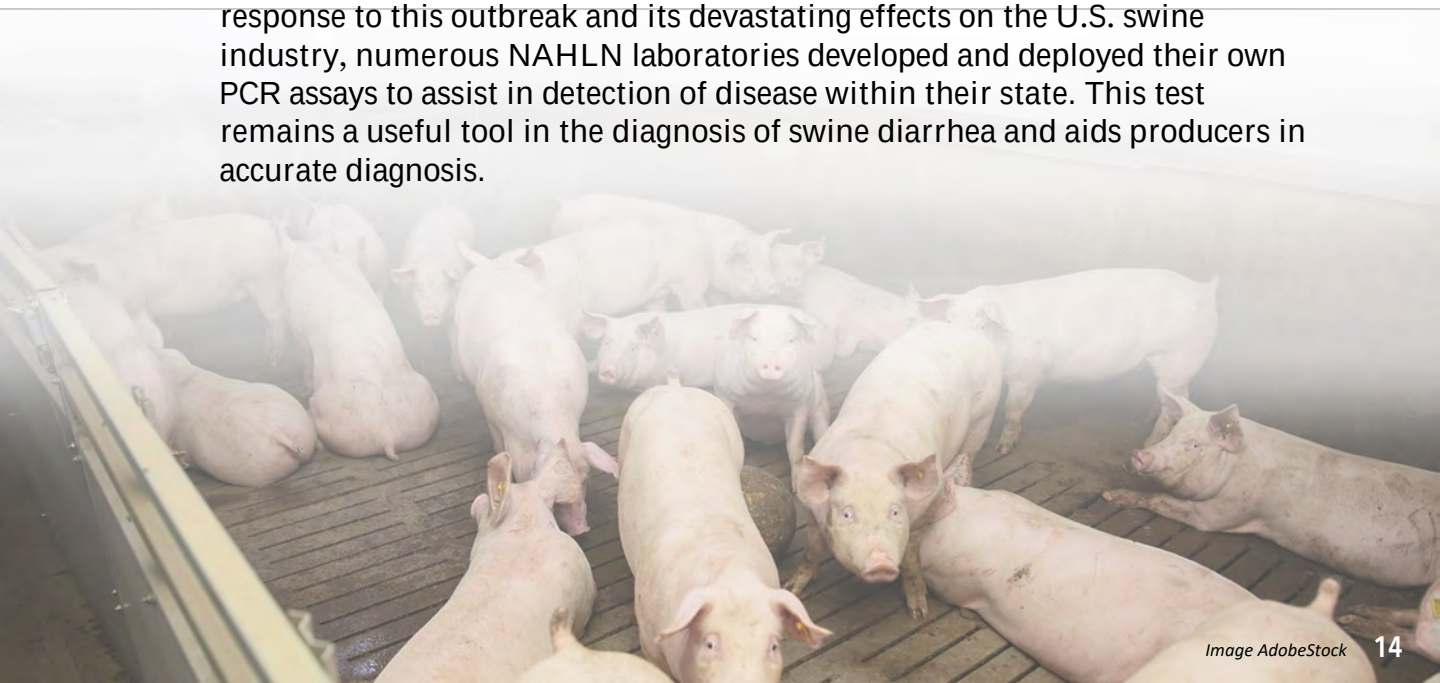


Image AdobeStock

2014-2015: HPAI- largest outbreak in U.S. history

January 2015 kicked off the largest outbreak in U.S. history, when HPAI was diagnosed in a commercial poultry flock in California. Over the next six months, infected premises were identified in fourteen additional states with Iowa and Minnestota hit the hardest. In total, 232 commercial and backyard premises were infected, and approximately 50 million birds were lost to the outbreak. Numerous infections in wild birds were also detected during this time period. The cost of the outbreak was $850 million and NAHLN laboratories completed approximately 80,000 PCR tests for HPAI. This outbreak was devastating for U.S. poultry producers with the loss of their birds and long-lasting trade implications. Many lessons learned were applied to the next large outbreak of HPAI in 2022.

2016: Three Low Pathogenicity Avian Influenza (LPAI) outbreaks IN, MO, NY/NJ/PA

A combined outbreak of highly pathogenic and low pathogenic avian influenza occurred in Indiana during January 2016. Luckily the numbers of premises remained very low with only one HPAI infected premises and eight LPAI infected premises. Later that same year LPAI infections were confirmed on farms in Missouri, New York, New Jersey, and Pennsylvania.

2015: VSV- regional AZ, CO, NE, NM, SD, TX, UT, WY

VSV hit the United States again in 2015 affecting 823 premises and lingered until March of 2016. The New Jersey serotype of VSV infected both bovines and equids and covered 91 counties in the states of Arizona, Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, and Wyoming.

2017: HPAI- regional AL, GA, KY, TN

In March 2017, a mixed HPAI/LPAI outbreak began in Tennessee and eventually spread to Alabama, Georgia, and Kentucky. Both the HPAI and LPAI in this outbreak were found to be H7N9 of North American wild bird lineage. No new cases were identified after March 25, 2017, and the outbreak ended quickly with a total of 14 premises being infected.

Image AdobeStock

2018: LPAI- MO, TX

Three separate premises in Missouri (2) and Texas (1) were confirmed to be infected with the same strain of LPAI H7N1. No link between these farms was found, and all three were determined to be separate introductions within the Mississippi and Central Flyways.

2018: LPAI- MN

From October-November 2018, eight commercial turkey farms located in two neighboring Minnesota counties were infected with H5N2 LPAI. Rapid outbreak response, enhanced biosecurity, and increased surveillance testing helped keep this outbreak from further spread.

2018-2019: LPAI- CA

An H7N3 LPAI was detected in a turkey flock in California in the fall of 2018. Sporadic cases of LPAI continued to occur within the state through June of 2019. While not all were caused by H7N3, they were all consistent with spread from wild birds to domestic poultry.

2018-2020: NDV – CA, AZ

From May 2018 to May 2021, the USDA confirmed 476 positive premises in California infected with virulent Newcastle disease (NDV). Two additional premises in Arizona and Utah were infected after birds were moved from CA. The California Animal Health & Food Safety Laboratory, a Tier 1 NAHLN laboratory, played a significant role in this outbreak by performing sustained outbreak testing throughout this period of time. Since this outbreak, the CA laboratory has grown its NDV testing capacity by nearly doubling the number of proficiency tested analysts, serving as a shining example of their dedication to NAHLN and the poultry industry.

2020: LPAI/HPAI - NC, SC

Another mixed outbreak of LPAI and HPAI was reported in the Carolinas in the spring of 2020. This incident began as LPAI and escalated to HPAI through mutation of the avian influenza virus. The first HPAI infected flock was located in South Carolina and the preliminary diagnosis was made by the NAHLN laboratory located at Clemson University.

2020: VSV – NE, NM, TX

From April-October of 2020, an outbreak of Vesicular Stomatitis Virus affected the states of Arizona, Arkansas, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Texas. Both horses and cattle were involved in the outbreak and around 325 premises were affected. As new states were confirmed infected, their NAHLN laboratories worked diligently to add this test to their list of available NAHLN assays.

2020-2021: SARS-CoV-2 – AL, CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MI, MN, MO, MS, NE, NY, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, WA, WI, WY

In response to the global pandemic of SARS-CoV-2, or COVID-19, the NAHLN network entered unchartered territory by heeding a call for help from human diagnostic laboratories to increase human testing capacity within the United States. Many NAHLN labs utilize high throughput PCR testing for various animal pathogens, which is not a common practice among their human counterparts. To make this happen, each laboratory independently obtained Clinical Laboratory Improvement Amendments approval and many took on all human testing for their states. Some also performed next-generation sequencing, aiding in identification and tracking of viral mutation including detection of the Delta variant as it spread across the country. By October of 2021, 33 NAHLN laboratories were conducing SARS-CoV-2 testing; 22 of those for human samples, and 26 testing for the virus in animals. The National Veterinary Services Laboratories in Ames, IA, also served as the reference laboratory for animal testing. Over 5.6 million human samples were tested in veterinary diagnostic labs across the NAHLN.

2022: HPAI

In the geographically largest outbreak in the history of the U.S., 37 states have been infected with the Eurasian lineage goose/Guangdong H5 clade 2.3.4.4b virus. The outbreak began in February 2022 in Indiana, and as of July 1, there have been over 1,800 wild bird detections and over 380 domestic flocks affected. Forty-four NAHLN laboratories have been activated within 31 states and performed over 100,000 PCR tests for HPAI.

Outbreak Timeline:

2002-2003: NDV

2003, 2005, 2006, 2012, 2017, 2018: BSE

2004-2006: VSV

2013-2015: SECD

2014-2015: HPAI - largest outbreak in U.S. history

2015: VSV - regional AZ, CO, NE, NM, SD, TX, UT, WY

2016: Three LPAI outbreaks IN, MO, NY/NJ/PA

2017: HPAI - regional AL, GA, KY, TN

2018: LPAI - MO, TX

2018: LPAI - MN

2018-2019: LPAI - CA

2018-2020: NDV – CA, AZ

2020: LPAI/HPAI - NC, SC

2020: VSV – NE, NM, TX

2020-2021: SARS-CoV-2 – AL, CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MI, MN, MO, MS, NE, NY, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, WA, WI, WY

2022: HPAI: AK, CA, CO, CT, DE, FL, GA, ID, IL, IN, IA, KS, KY, ME, MD, MA, MI, MN, MO, MT, ND, NE, NV, NH, NJ, NY, NC, OH, OK, OR, PA, SD, TX, UT, VA, VT, WA, WI, WY

Image AdobeStock

IT

In 2001, a Memorandum of Understanding (MOU) was established between the National Veterinary Services Laboratories (NVSL) and the American Association of Veterinary Laboratory Diagnosticians (AAVLD). This MOU clearly defined the roles of the NVSL and the AAVLD laboratories and expressed the mutual desire to develop a more integrated veterinary diagnostic laboratory network for the United States This network has strengthened the biosecurity of animal agriculture systems by ensuring laboratory IT systems can send diagnostic test results to a central data base via electronic transmission. To support this effort an IT committee was established to develop systems for electronic reporting of test data in a standardized and secure manner.

The first-generation approach to electronic messaging adopted HL7 standards for transmitting diagnostic data to a contractor-built NAHLN IT system. This solution worked, but it took a significant amount of time to bring on new diseases.

In 2012 NAHLN provided a new vision for messaging and requested development of a new central database. The vision focused on essential data elements laboratories could provide and aimed to make results sent to the central database as transparent as possible to address data issues at the source. Much of the previous gatekeeping was removed to expedite adding new diseases. The central database was meant to function as a service so laboratory results could be linked to field-side systems containing epidemiological information.

In 2014 the new system was first used in support of SECD. A spreadsheet uploader was created to assist labs that could not yet message. The following year the same uploader was used for the HPAI 2015 outbreak. Lessons identified in these outbreaks led to several technical changes to better support the new vision, including:

- Moved to the SQL Server database, which allows the entire HL7 message schema, or messaging structure, to be accepted into VS database
- Integration with the Palantir Gotham software, which facilitated consistent downstream reporting on NAHLN laboratory results
- Moved to Enterprise Messaging Service, which allows greater transparency to the data flow from NAHLN laboratories to the central VS database
- Implementation of Order Messaging between VS' Emergency Management Response System (EMRS) and Puerto Rico to facilitate ASF surveillance and reduce manual accessioning

Images AdobeStock

Timeline:

2012 - New Vision for Technical Approach to Messaging, Laboratory Messaging Service (LMS)

2013 - Oracle XML Database Implemented to Serve as Messaging Repository (LMS)

2014 - LMS Used in Production for SECD; Spreadsheet Uploader Created for non-messaging labs

2015 - LMS used in HPAI 2015, Technical Gaps identified

2016 - Oracle Database replaced with SQL Server Database that Fully Abstracted HL7

2018 - LMS Test Data Ingested into Palantir Gotham and Pipeline Created

2019 - Level 1 lab messaging requirement

2019 - LMS Test and Production Pipelines Fully Operational

2019 - Enterprise Messaging Service Live, HL7 Supported

2020 - Level 2 lab messaging requirement

2020 - Proposal to move to EMS

2021 - ACK implemented for EMS, Transition to EMS Initiated

2021 - Level 3 lab messaging requirement

2022 - 55/56 actively messaging labs fully completed transition to EMS

Image AdobeStock

Preparedness

The NAHLN Program Office develops and implements table-top and functional exercises to help identify gaps when addressing major animal disease outbreaks. These exercises are designed to practice policy implementation, decision-making, and communications with laboratory, VS, and State field personnel. Participants gain enhanced awareness of laboratory issues encountered during an outbreak and assess the completeness of their response plans. Additional exercises are held at the NVSL to increase internal preparedness with focus on decision-making, primary and support role activities, interaction, and support of NAHLN laboratories, collaborations, and communications.

In preparation for potentially disastrous occurrences such as severe weather or man-made emergencies, the NAHLN program office also conducts immediate response drills to help labs understand what they may see in response to an actual event. Emails are sent to all NAHLN laboratories that have personnel trained and proficiency tested to conduct a particular disease assay such as Foot and Mouth Disease PCR. The e-mail notifies the laboratories of the possible closure of the reference laboratories and requests that each lab provide specific information as soon as possible (within 24 hours of receiving the email) regarding their immediate capacity based on the availability of reagents, personnel, equipment, and other parameters. NAHLN laboratories have proven that the network is very responsive with up to 98% of labs responding to these drills within 24 hours.

Timeline:

NAHLN Exercises

2013 – Laboratory Capacity Estimation Module web based exercise

2015 – Hands-on FMD Accessioning Drill

- 3-day exercise: accession and process as they would during the first 3 days of an FMD outbreak
- 14 labs participated

2017 – Barcoding/messaging exercises

- Functional exercise spanning three different months focused on high throughput accessioning utilizing barcoding, reporting of results via messaging or spreadsheets, and development of electronic messaging competencies
- 39 labs participated

Image AdobeStock

2018 – virulent Newcastle disease tabletop exercise

- Tabletop exercise spanning three days and focusing on laboratory biosafety enhancement, communication, and testing capacity in the face of a virulent Newcastle disease outbreak;
- 39 labs participated

2019 – ASF (AI/ND for non-swine labs)

- Held in conjunction with SFEAR (2nd & 3rd days);
- Exercise action items: updates to resulting spreadsheet, initiation of FADI SOP for NAHLN labs, guidance on pooling of samples, beginning of Emergency Validation pathway, lack of live animal test for CSF at NAHLN labs, so initiated approval of tonsil scrapings;
- 35 labs participated: accessioning, sample prioritization, testing, resulting, communication, FADI policy review

2020 – Emergency Validation/Evaluation

- Three exercises evaluating procedure and communication steps for the process

2021 – FADI in the Laboratory

- Submission of paper "bird" to laboratories with history of possible NDV;
- FAD investigation initiated, and sampling of the paper bird carried out by laboratory with actual shipment of package to NVSL containing "samples";
- NCAH portal-generated packing slip;
- Diagnostic Virology Laboratory assessed packaging, samples, submission forms, and provided feedback to participating laboratories

USDA Exercises

2018 – ARMAR

- Six states completed functional FMD exercise;
- Seven states completed adjacent table-top exercise;
- NAHLN labs participated and responded to independent injects written by the NAHLN EDWG

2019 – SFEAR

- 14 participating states: simulated FADIs with testing of mock samples for ASF/CSF

2021 – FAD SAFE

- 11 states and Puerto Rico, functional 4-day exercise;
- NAHLN labs participated and responded independent injects written by NAHLN EDWG

Surveillance

NAHLN laboratories play a critical role in USDA-Veterinary Services' (VS) preparedness activities by providing rapid standardized testing and results reporting for foreign animal disease investigations, in concordance with several VS regulatory documents (VS' Guidance Document 12001, entitled "Policy for the Investigation of Potential Foreign Animal Disease/Emerging Disease Incidents (FAD/EDI); VS' Foreign Animal Disease Preparedness Response Materials and References document; NAHLN Sample Chart for Regulatory Submitters).

NAHLN has collaborated with the NVSL Reference Laboratories, the Center for Epidemiology and Animal Health (CEAH), the Animal Commodity Health Centers, National Preparedness & Incident Coordination Center, and Wildlife Services to implement surveillance programs and preparedness measures. NAHLN laboratories routinely participate in surveillance programs for bovine spongiform encephalopathy, African swine fever and classical swine fever, chronic wasting disease, scrapie, and influenza A virus of avian and swine. Additionally, NAHLN laboratories stand ready to respond to disease outbreaks with staff who are proficiency tested and approved to conduct testing for avian influenza, exotic Newcastle disease, foot and mouth disease, and vesicular stomatitis virus when needed.

Timeline:

- 2005 - NAHLN began surveillance testing for CSF and BSE
- 2006-2012 and 2019-present: collaboration with VS Wildlife Services for monitoring avian influenza in wild birds
- 2006 - NAHLN began participating in surveillance testing for CWD and scrapie
- 2009-2020 - pseudorabies surveillance conducted through NAHLN laboratories
- 2012 - aquaculture testing for SVC, ISA, and VHS was added to NAHLN's scope
- 2015 - Vesicular stomatitis PCR test deployed to NAHLN labs for use with outbreak surveillance testing
- 2019 - active surveillance for ASF initiated

Images AdobeStock

Quality Management System (QMS) Training Course

NAHLN laboratories must be prepared to be involved in surveillance for early detection of foreign animal disease, surge testing during an outbreak, and testing samples during an outbreak recovery phase. Because of this, there must be a high degree of confidence in the quality of the testing laboratories and associated test results. All NAHLN laboratories must be fully accredited by AAVLD or by an accrediting body according to the International Organization for Standardization (ISO) 17025 standard. If a NAHLN laboratory is not accredited, it must have implemented a quality management system consistent with the ISO 17025 standard and be willing to participate in scheduled NAHLN audits. To assist NAHLN laboratories in meeting these requirements, and to continuously improve quality management systems throughout the network, the NAHLN Program Office collaborated with members of the AAVLD Accreditation Committee and the NVSL Quality Assurance group to develop and deliver a Quality Management System, or QMS, Training Course.

The first course was held in 2010 at the National Centers for Animal Health (NCAH) in Ames, Iowa. The three-day course provided an interactive class environment that included training on quality management topics as quality management system requirements, document control, internal auditing, corrective actions, and root cause analysis. Hands-on workshops were incorporated to engage the participants in learning, including a mock audit workshop that provided the opportunity for participants to apply what was learned and recognize areas of non-conformance. This course was a great success, and it became clear that training on the important concepts and strategies of quality management system implementation was appreciated and well-utilized by NAHLN laboratories.

From 2011-2015, the NAHLN partnered with USDA International Services (IS) to provide training to international participants as part of an agreement with the Defense Threat Reduction Agency. Individuals representing 30 different countries participated in QMS training during those years: Barbados, Brazil, Cameroon, Canada, Georgia, Jordan, Kazakhstan, Kenya, India, Iraq, Jamaica, Laos, Mexico, Morocco, Nigeria, Pakistan, Philippines, Russia, South Africa, South Korea, Taiwan, Tajikistan, Tanzania, Thailand, Trinidad & Tobago, Tunisia, Uganda, Ukraine, Vietnam, and Yemen.

In 2011, 2014 and 2015, the NAHLN partnered with representatives from the National Plant Diagnostic Network (NPDN) to provide QMS training to representatives from their network laboratories. Through this collaboration, NPDN member laboratories gained a greater understanding of the requirements to effectively implement a QMS, which assisted them in attaining the levels of quality assurance necessary for accreditation.

QMS Advanced Training Course

In August 2022, the NAHLN QMS training program was expanded to include an Advanced QMS Training course. This course provided a discussion-based interactive class environment that focused on quality system requirements including client-centric activities, risk, information technology, training/competency, complaints, and internal auditing. In addition, interactive workshops were utilized to reinforce concepts. Those attending were required to have previously completed one of the Basic QMS courses.

Following the quality tradition of continuous improvement, participants in each QMS training class were provided the opportunity to complete evaluation forms to assess the training content and effectiveness. The feedback obtained from these evaluations has been used to drive improvements and enhancements for future classes. This training program would not be what it is today without the hard work and dedication of the trainers, and the enthusiasm and participation of those that attend.

QMS On-Line Course

The QMS Online training course was launched in October 2012 with the goal of assisting laboratories in training staff at every level on quality management system principles. This online training tool is a valuable resource as it helps to ensure continuous improvement of laboratory procedures that produce critical test results and diagnoses, and provides and option when budget issues put increasing constraints on travel and training expenses.

The course is divided into several topics specific to the AAVLD standards: Introduction to QMS; Control of Documents; Clients, Services and Supplies; Records Management; Process Improvement; Personnel; The Lab and Its Equipment; Specimen Management; and Measurement Traceability and Test Method and Reporting. Each topic may contain more than one sub-topic. For example, the Clients, Services and Supplies topic contains the following sub-topics: Client Complaints, Review of Work Requests and Contracts, Subcontracting of Test Services, and Purchasing of Services and Supplies. Each sub-topic contains a recorded presentation that discusses the basic intent and principles for each quality topic. At the end of the presentation, there is an opportunity to take a self-guided quiz that will provide the user with feedback on their answers. In addition, there is a final test for each sub-topic that will provide a completion certificate if the user scores 80% or better.

As laboratories in the United States and around the world work to implement and improve their quality programs, expectations for ongoing improvement continuously "raise the bar." The online QMS training course has also undergone continuous improvement to meet the expectations. The number of modules and activities has grown significantly since its launch, and it is currently being expanded to include ISO 17025 references while denoting the differences between the ISO 17025 and AAVLD standards. In addition, students that complete the online training course can now earn 1.0 continuing education units (CEUs).

Images AdobeStock

Publications

NAHLN Update Newsletter timeline:

Vol 13, No.2 (July 2022)
Vol 13, No. 1 (March 2022)
Vol 12, No. 1 (July 2021)
Vol 11, No. 2 (December 2020)
Vol 11, No. 1 (June 2020)
Vol 10, No. 1 (June 2019)
Vol 9, No. 4 (December 2018)
Vol 9, No. 3 (October 2018)
Vol 9, No. 2 (June 2018)
Vol 9, No. 1 (March 2018)
Vol 8, No. 3 (December 2017)
Vol 8, No. 2 (September 2017)
Vol 8, No. 1 (June 2017)
Vol 7, No. 1 (June 2016)
Vol 6, No. 2 (November 2015)
Vol 6, No. 1 (January 2015)
Vol 5, No. 1 (October 2013)
Vol 4, No. 2 (December 2012)
Vol 4, No. 1 (July 2012)
Vol 3, No. 3 (December 2011)
Vol 3, No. 2 (July 2011)
Vol 3, No. 1 (May 2011)
Vol 2, No. 4 (January 2011)
Vol 2, No. 3 (November 2010)
Vol 2, No. 2 (August 2010)
Vol 2, No. 1 (April 2010)
Vol 1, No. 4 (December 2009)
Vol 1, No. 3 (October 2009)
Vol 1, No. 2 (June 2009)
Vol 1, No. 1 (February 2009)

Publications:

Lucas Harrison, Gregory H. Tyson, Errol Strain, Rebecca Lindsey, Nancy Strockbine, Olgica Ceric, Gamola Fortenberry, Beth Harris, Sheryl Shaw, Glenn Tillman, Shaohua Zhao, Uday Dessai. 2022. ***Use of large-scale genomics to identify the role of animals and foods as potential sources of Extraintestinal Pathogenic Escherichia coli that cause human illnesses.*** Foods. 2022 Jul 3;11(13):1975. doi: 10.3390/foods11131975.

Harris, B., J. Hicks, M. Prarat, S. Sanchez, B. Crossley. 2020. Next-generation sequencing capacity and capabilities within the National Animal Health Laboratory Network. J Vet Diag Invest. Jul 1;1040638720937015. doi: 10.1177/1040638720937015. Online ahead of print.

Dargatz, D.A., Matthew M. Erdman, B. Harris. 2017. A survey of methods used for antimicrobial susceptibility testing in veterinary diagnostic laboratories in the U.S. J Vet Diag Invest. Sep;29(5):669-675. doi: 10.1177/1040638717714505. Epub 2017 Jun 9.

Images AdobeStock

New Initiatives

NALHN Restructure

Originally NAHLN was composed of 12 Core laboratories. These Core laboratories were regionally distributed and capable of testing large numbers of animal samples. By 2015 NAHLN had grown to include 28 Member and 9 Contract laboratories in addition to the 12 Core labs. Member laboratories were more widely disseminated facilitating greater geographic coverage. Contract laboratories provided targeted surveillance testing for specific disease agents. Also part of NAHLN were a small number of adjunct Federal laboratories outside of the USDA that could provide increased diagnostic capacity.

NAHLN was restructured in 2016. Veterinary Services supported the restructure of NAHLN to expand the capability and capacity for detecting emerging and zoonotic disease while still maintaining the original surveillance and response goals of protecting animal health, public health, and the nation's food supply.

Instead of Core, Member and Contract laboratories, NAHLN labs are now designated as Levels 1, 2, 3, Affiliate, or Specialty laboratories. Level 1, 2, and 3 laboratories are publicly funded state and university-associated animal health diagnostic laboratories. Affiliate laboratories are Federal laboratories outside of USDA that are approved to provide increased capacity testing for NAHLN-scope diseases. Specialty laboratories are private or commercial enterprises that provide niche or expanded diagnostic capabilities that enhance NAHLN capacity.

NAHLN currently includes 32 Level 1 laboratories, 22 Level 2 laboratories, 4 Level 3 laboratories and 1 Affiliate Laboratory.

The NAHLN has gained flexibility through clearer designation of network members' roles and responsibilities, and through the ability to more easily expand or contract NAHLN testing capabilities and capacities.

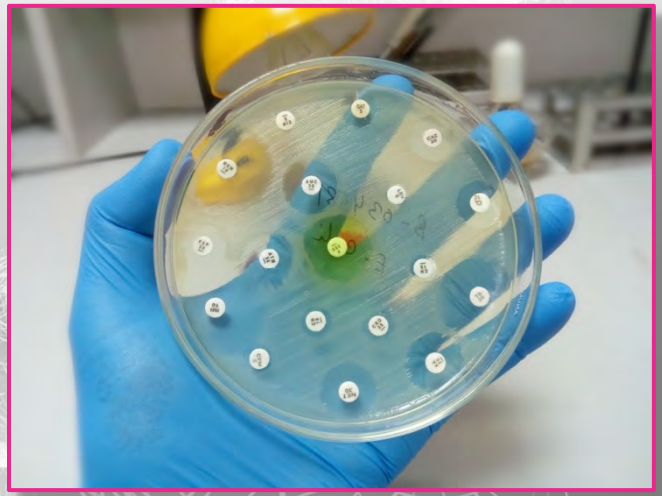
Images AdobeStock

AMR Pilot

Antimicrobial resistance (AMR) of bacterial pathogens is an emerging public health threat to people and animals because it compromises the ability to treat infections. Traditionally, antimicrobial resistance surveillance programs in the United States, such as the National Antimicrobial Resistance Monitoring System (NARMS), have focused on collecting data from healthy food animals, retail foods, and people. In March of 2015, the Executive Office of the President released The National Action Plan for Combating Antibiotic-Resistant Bacteria (CARB), with the primary purpose to guide activities and actions by the government, public heath, healthcare, and veterinary partners to address the AMR threat. The National Action Plan laid out five main goals and charged all federal agencies to work together to identify emerging resistance with the goal of increasing antimicrobial stewardship.

The primary goal of this project is to monitor AMR profiles in pathogens routinely isolated from sick animals by veterinary clinics and diagnostic laboratories across the United States. By developing a centralized data collection and reporting process across all these laboratories, data can be monitored for trends in antimicrobial resistance phenotypes and genotypes to identify new or emerging resistance profiles, to help monitor the continued usefulness of antibiotics over time, and to provide information back to our stakeholders regarding these trends.

NAHLN initiated the NAHLN AMR pilot project in January of 2018. This project monitors data from four livestock species (cattle, swine, poultry, and horses), and two companion animal species (dogs and cats). Bacterial isolates surveyed include *E. coli* (all animal species), *Salmonella enterica* (cattle), *Mannheimia haemolytica* (cattle), *Pasteurella multocida* (poultry), *Streptococcus zooepidemicus* (horses, swine) *Streptococcus equi* (horses) and *Staphylococcus intermedius* group (dogs and cats).



Images AdobeStock

Objectives:

- Develop national-level monitoring system to track AMR data from multiple veterinary diagnostic laboratories using standardized methodology, interpretation, and reporting mechanisms.
- Assess results to inform, support and guide further development to a full national monitoring system for reviewing AST data from both food and companion animals.
- Help inform users of antibiotics about trends in AMR patterns in animals to facilitate antimicrobial stewardship.

Measures of Success:

1. Laboratories able meet 50% or more of project's target numbers
2. VS can develop parameters for electronically messaging AST data
3. VS can develop reporting mechanism/s to share results from this pilot with laboratories, State and federal regulatory authorities, and other interested stakeholders

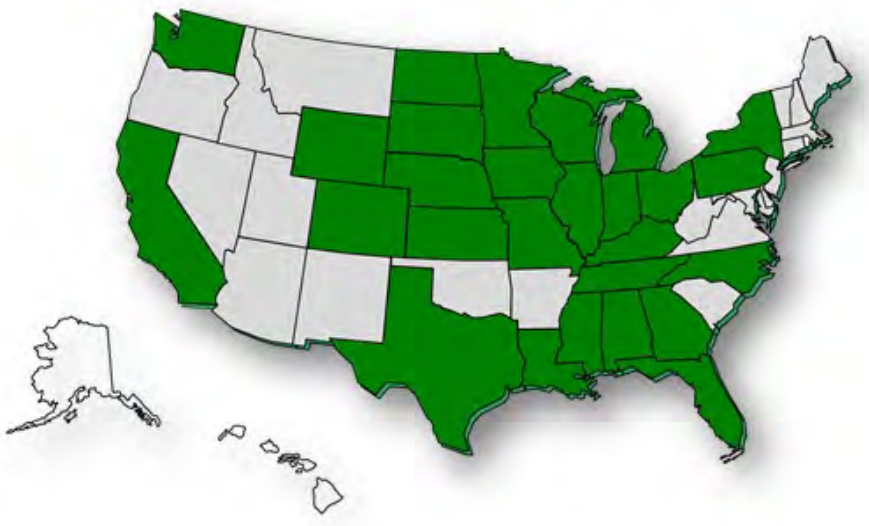
Years 1-5 - by the numbers:

Year	# labs	# isolates submitted	# isolates sequenced
2018	19	3535	388
2019	24	5380	811
2020	27	5414	1167
2021	30	5361	1218
2022	31	2995*	40*
TOTALS		22,685	3,624

*As of August 2022

In 2022 there are 31 Participating Laboratories in 27 States

List of states: AL, CA, CO, FL, GA, IA, IL, IN, KS, KY, LA, MI, MN, MS, MO, NE, NY, NC, ND, OH, PA, SD, TN, TX, WA, WI, WY



The NAHLN AMR Pilot Project is on track to be converted to a permanent program at the end of 2023. As mentioned above, antimicrobial resistance poses a threat to disease control throughout the world and is a primary concern for human and animal health.

By establishing a surveillance program within the NAHLN to monitor AMR profiles in animal pathogens, this will enhance our Nation's early detection of, response to, and recovery from animal health emergencies. It will also help identify new or emerging AMR profiles and help monitor continued usefulness of antimicrobials over time.

The permanent program will continue collecting and providing AMR data via public-facing reports and dashboards, which supports USDA's goal of ensuring America's agricultural system is equitable, resilient, and prosperous by addressing threats to animal health posed by AMR. Data collected through this program will also be utilized as a part of a unified Federal response if AMR profiles of concern are detected by a One Health partner agency (USDA, Food and Drug Administration (FDA), or Centers for Disease Control and Prevention (CDC)). Finally, data will be made available for veterinarians and other animal health professionals to use in making appropriate and efficacious treatment decisions for ill animals.

Image AdobeStock

NAHLN Farm Bill

In the 2018 Farm Bill, Congress provided funding for a 3-tier program to support animal disease prevention and preparedness, including the National Animal Disease Preparedness and Response Program (NADPRP), the National Animal Vaccine and Veterinary Countermeasures Bank (NAVVCB), and additional funding for the NAHLN. This is part of an overall strategy to help prevent animal pests and diseases from entering the United States and reduce the spread and impact of potential disease incursions through advance planning and preparedness. Congress directed $120M to APHIS VS to support the programs from FY 2019 through FY 2022. Congress directed $30M per year to APHIS to support the programs in FY 2023 and each year thereafter.

Should foreign animal disease strike, the NAHLN laboratories are the first line of defense in swiftly diagnosing and detecting the extent of the outbreak to limit the impact on producers. Farm Bill funding has been provided to NAHLN laboratories through a competitive process to fund projects supporting specific priorities determined with input from many stakeholders and recommended by the NAHLN Coordinating Council. These have included diagnostic test development and validation, IT standardization, data management, increasing biosafety and biosecurity, increasing capability and capacity, enhancing emergency preparedness, developing training and exercises. A total of $19 million has been provided through the competitive process in the first three years of Farm Bill funding supporting over 80 projects. An additional $2.5 million has been distributed to NAHLN laboratories in a non-competitive manner to support laboratory operations directly associated with NAHLN-related activities.

Images AdobeStock

NAHLN supports Animal and Public Health by testing over 6 million human samples for COVID-19

Through its One Health partnership with the CDC and with state animal and human health partners, APHIS, including NAHLN, played a critical role in the coordinated federal response to COVID-19. APHIS must report confirmed U.S. animal infections to the World Organization of Animal Health (WOAH) which considers SARS-CoV-2 to be an emerging disease. Since the beginning of the pandemic, APHIS has participated in the One Health Federal Interagency COVID-19 Coordination Group (OHFCCG). Within this group, APHIS officials lead three subgroups focused on livestock, animal testing and diagnostics, and animal welfare.

NAHLN laboratories have provided testing for SARS-CoV-2 in many species including companion animals, wildlife, and livestock. Confirmed cases in companion animals, wildlife, and zoo animals have been identified across the United States. The majority of confirmed cases in animals under human care have been in companion animals but the proportion of cases in zoo and aquarium species is rising. The only farmed animal found to be significantly susceptible to date is mink.

The World Health Organization (WHO) named variants have been detected in animals dating back as far as January 2021. The variants found in animals reflect what was circulating in the human population, supporting the theory that humans are the main reservoir of SARS-CoV-2 and the major source of exposure for animals. Between August 2021 and early January 2022, all confirmed cases in which a named variant was identified were infected with the Delta variant. In late January 2022, the Omicron variant was found for the first time in animals in the United States. APHIS has been very engaged with our public health partners in supporting the SARS-CoV-2 response activities. NVSL and NAHLN laboratories collaborated closely on animal and human testing, genetic sequencing and sharing information, and activities at the human/animal interface.

Like the approach with other zoonotic diseases such as highly pathogenic avian influenza, USDA relies on the expertise of our veterinary diagnostic laboratories to perform testing, report results, and collaborate to leverage our collective resources most efficiently quickly and confidently. NAHLN laboratories provided this expertise and the significant experience and infrastructure to increase the ability of the Public Health community to meet the vast need to treat people for COVID-19. As many as 25 of the NAHLN animal health diagnostic laboratories gained the needed approvals and certifications to test human cases. NAHLN labs have tested more than six million human samples in this unprecedented effort!

Image AdobeStock

Testimonials

Having a voice and place in national preparedness and response for high consequence animal disease outbreaks. - *Animal Health Diagnostic Center, Cornell University, Ithaca, NY*

Our lab is well integrated into the network and benefits from collective power and support of diagnostic labs managed and coordinated through the NAHLN network. The success of NAHLN was well evident in U.S. handling AI outbreaks in 2015 and 2022 and keeps preparedness at the forefront of the animal health mission. - *Pennsylvania Veterinary Laboratory, Pennsylvania Department of Agriculture, Harrisburg, PA*

The training, exercises and resources provided through NAHLN ensured that our labs were prepared for and easily adjust to the recent HPAI outbreak. - *Salisbury Animal Health Laboratory, Salisbury, MD*

Participation in the NAHLN continues to provide invaluable access to graded staff proficiency testing, standardized methods for regulatory tests, essential funds to support laboratory staff and operational costs, and a galvanized national network of esteemed colleagues working diligently to safeguard animal health and bolster disease surveillance. - *University of Pennsylvania, School of Veterinary Medicine, New Bolton Center, Kennett Square, PA*

NAHLN has standardized veterinary diagnostics and established confidence in results from its member laboratories. - *West Virginia Moorefield Animal Health Diagnostic Laboratory, Moorefield, WV*

NAHLN's financial support is a tremendous resource that allows veterinary diagnostic laboratories to remain current in a field that is rapidly changing. Veterinary diagnostic laboratories have technical capabilities that are essentially equivalent to human infectious disease testing laboratories, and we saw the ability of many of the NAHLN laboratories throughout the U.S. provide high throughput testing for human COVID-19 samples. The infrastructure of NAHLN laboratories was already in place well before COVID-19 arrived in the U.S., and this readiness by the NAHLN labs was not only at the instrument level, but also at a high level of technical proficiency that was already a standard for all laboratory staff. - *Thompson-Bishop-Sparks State Diagnostic Laboratory, Auburn, AL*

The NAHLN has allowed each lab to make choices, within parameters set out by the mission of NAHLN, about how the funds are expended in their labs. These choices have made huge changes in the culture of diagnostics all directed towards protecting livestock and the American consumer from foreign animal disease. Efforts are at a local level, so to speak, which allows lab personnel to take ownership of programs and make purchases that are most relevant to their area. - *Breathitt Veterinary Center, Murray State University, Hopkinsville, KY*

The NAHLN has proven to be a partnership that has tremendously enhanced the national capability and capacity for early detection and rapid response to high consequence diseases in the U.S. Financial support from the NAHLN has allowed us to purchase and maintain state of the art equipment needed to help maintain the testing capacity needed to serve our animal agriculture industries. - *Mississippi Veterinary Research & Diagnostic Laboratory, West Pearl, MS*

Helping network laboratories to enhance their capabilities to handle any potential biological threats. Well-coordinated national network of veterinary diagnostic laboratories that shares/disseminates information to alert about any potential outbreak or biological threats to nation's animal industries and help with state of readiness to safeguard nation's animal health, public health and food supply. - *Rollins Diagnostic Laboratory, Raleigh, NC*

Participation in NAHLN has brought many opportunities to our laboratory. Our annual infrastructure agreements have allowed us to procure additional equipment for molecular diagnostics. Perhaps more importantly, however, we have made strong contacts with other laboratories through NAHLN. Our closest partner, Breathitt Veterinary Center, has graciously allowed us to visit their laboratory to learn and bring additional testing of our own online. - *Kord Animal Disease Diagnostic Laboratory, Nashville, TN*

The NAHLN's centralization and standardization of reporting is critical for early detection of disease outbreaks, essential for protection of both animal and human health. The resource stockpiles are also greatly appreciated, especially during the pandemic with the supply chain issues we have experienced. - *University of Illinois Veterinary Diagnostic Laboratory, Urbana, IL*

Being a member of the NAHLN has been helpful in many different ways. This was especially brought to light during the early phases of the SARS-CoV-2 pandemic when veterinary diagnostic laboratories were being called upon to stand up testing of human COVID-19 samples. The NAHLN provided a forum for laboratories to compare notes on technical and equipment related topics in addition to administrative and supply chain challenges. The NAHLN facilitated equitable distribution of testing resources from vendors and, most importantly, provided a space for laboratories to share their successes and frustrations for the benefit of all. - *University of Minnesota Veterinary Diagnostic Laboratory, St. Paul, MN*

Because of our preparedness in cooperation with the NAHLN, the NVDC has been a key player in controlling HPAI during the 2022 outbreak in Nebraska. During the COVID-19 Pandemic, our laboratory provided testing capabilities for the University in order to maintain in-person teaching. We have performed over 302,000 tests since beginning in January 2021. - *University of Nebraska Veterinary Diagnostic Center, Lincoln, NE*

NAHLN has changed veterinary diagnostics across the country by connecting laboratory experts to one another to tackle challenges of veterinary and public health importance. This network is poised to respond immediately to emerging or re-emerging diseases with standardized, quality-driven methodologies. - *Veterinary Diagnostic Laboratory, North Dakota State University, Fargo, ND*

NAHLN has provided an excellent coordinated communication system for discussing and implementing strategies, procedures and information with veterinary diagnostic laboratories throughout the United States. This communication is on going, relevant, and inclusive. - *Animal Disease Research & Diagnostic Laboratory, South Dakota State University, Brookings, SD*

NAHLN has provided standard procedures for early detection of foreign animal diseases, disease surveillance, financial resources to purchase equipment, and proficiency training and testing to detect those agents. - *Wisconsin Veterinary Diagnostic Laboratory, Madison, WI*

NAHLN is a primary source of operational funding of the Arkansas VDL. In addition to funds, recognition by NAHLN has enabled the VDL to stand up a nationally recognized program in aquaculture and in testing for Chronic Wasting Disease for the Arkansas Game and Fish Commission. - *Arkansas Department of Agriculture Veterinary Diagnostic Laboratory, Little Rock, AR*

The Oklahoma Animal Disease Diagnostic Laboratory was the first veterinary lab in the nation to implement human COVID-19 testing on April 1, 2020 – just two weeks after COVID-19 was confirmed in the state of Oklahoma. Our involvement with NAHLN prepared us for this effort. - *Oklahoma Animal Disease Diagnostic Laboratory, Stillwater, OK*

Besides the infrastructure funding which is greatly appreciated, belonging to the NAHLN has allowed TVMDL to have a better understanding of the issues that all of us that work in VDLs across the nation face, and to know that we're not alone in overcoming challenges with regards to things like IT issues, staffing, equipment, and reagent shortages, etc. - *Texas A&M Veterinary Medical Diagnostic Laboratory, College Station, TX*

One of the most vital functions NAHLN provides is increasing the flow of communication during outbreak response which helps facilitate broader collaboration and problem solving among the individual member labs. - *Montana Veterinary Diagnostic Laboratory, Bozeman, MT*

The collegiality and collaboration between NAHLN member laboratories is incredible. We are proud to be part of this group and grateful for the support provided by NAHLN. - *Oregon State University Veterinary Diagnostic Laboratory, Corvallis, OR*

We appreciate the continued support NAHLN has given to our laboratory. We are not the typical laboratory among the NAHLN community and rely on NAHLN accreditation to continue wildlife health surveillance within Wyoming. - *Wyoming Game and Fish Wildlife Health Laboratory, Laramie, WY*

As a smaller lab in a state rich in wildlife and agriculture largely based on livestock rangeland feeding. Thus, we have a lot of responsibilities without the support of the diagnostic stream provided by more intensive animal agriculture. NAHLN provides us with both financial support and an organization that shows how our lab fits into a bigger picture. - *Wyoming State Veterinary Laboratory, Laramie, WY*

The NAHLN has benefited from the AzVDL's critical position an hour away from the Arizona/Mexico border. Arizona shares 372 miles of border with Mexico, a large portion of this being part of indigenous people's land that is partially in the United States and partially Sonora, Mexico. The NAHLN has changed veterinary diagnostics across the country by creating an expectation of solid scientific data coming from any laboratory in the network. The expectation is not a stand-alone column; there is training, financial support, legislative support and the sharing of ideas that back up the expectation. Sharing what worked and sometimes more importantly, what did not. Sharing what is possible for the future. - *Arizona Veterinary Diagnostic Laboratory, Tucson, AZ*

NAHLN has changed veterinary diagnostics in numerous ways, some examples are:

- Harmonization of processes and procedures
- Networking with other AAVLD labs and state and federal agencies
- Providing training opportunities for technicians in other NAHLN laboratories
- Development and ongoing enhancement of the NAHLN portal for one-stop-shopping (ordering and handling of PT, QC tracking, protocols, meeting updates, scheduling, committee work, etc)
- Supporting the quality framework of AAVLD (including QMS training in Ames, IA, the online training) and integration into AAVLD accreditation process through accreditation committee membership and AAVLD assessments
- Providing funding and support for laboratories allowing the smaller labs to participate in the high level NAHLN testing
- Providing financial help for equipment purchases and remodel of BSL3 areas
- Ability to provide technical help during outbreak situations
- Enhances reputation of laboratories

- *California Animal Health & Food Safety Laboratory, Davis, CA*

Although more modest than some of the activities mentioned above, I especially appreciate the quality training provided through NAHLN. This gives an outside, national perspective to quality systems that is so valuable to midsize and smaller laboratories. - *Utah Veterinary Diagnostic Laboratory, Logan, UT*

National Animal Health Laboratory Network

NAHLN

"As I look to the future, I have no doubt at all that the one certainty is change... But I do not think that we should be over-anxious. We can make sense of the future, if we understand the lessons of the past."

-Queen Elizabeth II (1926 - 2022)