National Veterinary Services Laboratories Update

Safeguarding Animal Health
NVSL Structure
NVSL Mission

• To safeguard U.S. animal health and contribute to public health by ensuring that timely and accurate laboratory support* is provided by a nationwide animal health diagnostic system.
  ➢ Reference and confirmatory laboratory for USDA


* Includes both domestic and foreign animal diseases
NVSL Activities

- Conduct diagnostic testing
- Supply reference reagents to other laboratories
  - Exchange diagnostic reagents with other laboratories to standardize and harmonize testing
- Provide training in diagnostic techniques
  - State, university, private and foreign government laboratory personnel
  - APHIS or other agency personnel
- Conduct proficiency testing of other laboratories
- Consult on agents/techniques
- Conduct developmental projects to improve diagnostic techniques for diseases of significance
- Participate in World Organization for Animal Health (OIE) Collaborating Centre for the Diagnosis of Animal Diseases and Vaccine Evaluation in the Americas – CVB, ISU
- Serve as OIE reference laboratory
  - High pathogenicity avian influenza, anthrax, pseudorabies, bluetongue, contagious equine metritis, equine encephalomyelitis, equine infectious anemia, leptospirosis, Newcastle disease, swine influenza, vesicular stomatitis and West Nile encephalitis
- Serve as FAO reference center for vesicular diseases, classical swine fever, African swine fever
Diagnostic Virology Laboratory

- **Dr. Bev Schmitt**, Director
- **Dr. Sabrina Swenson**, BPA Section Head
- **Dr. Eileen Ostlund**, EO Section Head
- **[Vacant]**, Avian Section Head

Safeguarding Animal Health
Schmallenberg Virus Update

- First identified in Europe in August, 2011
- Affects sheep, goats, cattle, possibly other ruminants.
- Impact on wild ruminants unknown at this time.
- Fever, anorexia, diarrhea, and decreased milk production seen in adult cattle
- Clinical signs non-specific; fetal malformations in sheep, goats or cattle
Schmallenberg Virus - Agent

• Closely resembles viruses in the genus Orthobunyavirus.
• Other closely related viruses are Shamonda, Aino and Akabane viruses.
• Not considered a human disease risk by CDC at this time.
• Vaccine development underway; not available at this time.
Schmallenberg Virus – Vector Range

• Most likely transmitted by biting midges, thus transmission occurs during seasons when insects are most active. Fetus affected when dam infected during early pregnancy.

• Belgian study – identified positive pools of *Culicoides obsoletus* and *C. dewulfi*

• *C. dewulfi* not recorded in North America

• *C. obsoletus* occurs in most of the U.S. and southern Canada
Schmallenberg Virus – U.S. Response

• Has not been found in the U.S. at this time
• APHIS has issued an import alert which requires specific collection conditions for semen, embryos and other genetic material from the EU.
• Trade restrictions are in addition to those already in place for the EU because of BSE.
• USDA developed general information sheets to share with stakeholders and general public.
Schmallenberg Virus – Laboratory Capacity

- NVSL has obtained the virus, protocols and reagents for PCR testing from Germany.
- Have ability to conduct diagnostic tests (PCR, VI and VN) for Schmallenberg at NVSL (Ames and Plum Island).
- NVSL-Ames can accept samples to test for Schmallenberg; work with AVIC and State Veterinarian, call NVSL for information on sampling procedures.
Schmallenberg Virus – Sampling Criteria for Submission to NVSL

• Submit cases in ruminants where more than one dam produces fetus or neonate displaying signs of arthrogryposis hydranencephaly syndrome: stillbirths, mummies, muscle atrophy, joint malformations, etc.

• Differential diagnostic testing for other causes of reproductive problems should be handled by local diagnostic laboratory.

➢ Ames will only test for Schmallenberg virus and Cache Valley Fever virus
Schmallenberg Virus – Submitting Samples

• Initially requesting samples associated with reproductive signs
  ➢ Fetal tissues: brain, heart blood, serum
  ➢ Dam: serum ONLY
• Submit to NVSL-Ames on our 10-4 submission form; indicate “Schmallenberg virus” as exam requested
• Contact the VS AVIC and State Animal Health Official when submitting
• If case is a FAD suspect, handle as FAD investigation as per VS Memo 580.4
2011 Q Fever: Washington & Montana

4/2011  99 goats tested  QF CFT  73/99-74% positive
       99 goats tested QF ELISA  77/99-78% positive
       Tested at NVSL submitted by owner
       Noted by owner 14 does aborted from Dec 2010

6/2011  Epi-Aid request to CDC for assistance
       Request from a state begin process
       Rapid and focused action on trace outs
       567 goats tested QF ELISA  62/567-11% positive
       Tested at NVSL submitted by CDC
       Farms in WA/MT/OR purchased goats from index
Swine Influenza Update

• Investigation of suspected pig lineage influenza in humans; H3N2v
• Collaboration with NAHLN labs to identify and obtain isolates H3N2 isolates as part of SIV surveillance program
• Full genome sequencing from repository of SIV isolates using new Ion Torrent method
Avian Influenza Update

**Wild Birds:** 420 specimens received for confirmation and identification from individual state wildlife service surveillance programs, research, etc.

- **No HPAI H5N1 detected**
- LPAI H5N1 (North American lineage) detected in 4 states (ID, OH, MN and WA)
- LPAI H5N2 – Predominate subtype (52 isolations)
- LPAI H7N3 – Predominate subtype (27 isolations)
- Other subtypes detected
  - H1 (4), H2 (3), H3 (36), H4 (38), H5 (62), H6 (29), H7 (49), H8 (1), H9 (1), H10 (5), H11 (35), H12 (4), H13 (1), H14 (3)
  - The H14 isolation represents the first isolation of H14 in North America. Previous to this H14 avian influenza was isolated one time and that is from the Caspian Sea in 1982.

**Commercial Poultry:** Two cases reported to OIE in FY 2011

Safeguarding Animal Health
## Live-bird Market Surveillance – FY11

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<tr>
<th>State</th>
<th>Submissions</th>
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<tr>
<td>NE</td>
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Total - 12  
761 (8.8% pos)  
4,397 (2.6% pos)
Diagnostic Bacteriology Laboratory

- **Dr. Matt Erdman**, DBL Director
- **Dr. Suelee Robbe-Austerman**, MB Section Head
- **Dr. Dave Kinker**, Serology Section Head
- **[Vacant]**: BI Section Head
Diagnostic Bacteriology Laboratory

• Implemented ovine tissue matching and sex determination microsatellite assays.
• Harmonized NVSL TB genotyping (VNTR) to match CDC genotyping protocols for human isolates.
• Initiated a whole genome sequencing project on *Mycobacterium bovis* and *Brucella* spp to improve epidemiological traces.
• Provided Proficiency tests for CEM
• Proficiency tests for Group D *Salmonella* in poultry, *Salmonella* serotyping, and general bacteriology will be distributed in April and May 2012
• *Leptospira* MAT proficiency test and training course planned for summer 2012
• Implemented new testing scheme and PCR for *Campylobacter* spp identification
• Implemented luminex xMAP *Salmonella* Assay for molecular serotyping of *Salmonella* isolates
• Collaborated with Ohio State University to screen *Salmonella* isolates for antimicrobial resistance

• Successfully completed initial large scale production of TB tuberculin bulks.

• Continuing Caudal Fold Tuberculin distribution in multiple fill volumes to accommodate multiple herd size testing (10 ml, 5 ml, and 1 ml)

• Brucellosis Reagents - Large volume production of Card, RAP, and BAPA antigen. Smaller volume production of Tube, Plate, and Rivanol antigens.

• Successful production of Dourine CF antigen, Glander’s CF antigen, Anaplasma CF antigen, and various control serum.
• TB Cervid Stat-Pak Project: 1654 serum samples from Elk, White-Tailed Deer, and Reindeer were tested on the Cervid Stat-Pak. The goal of this project is to develop sensitivity and specificity values so that this test could potentially be used as a screening test or official test instead of the skin test for bovine TB. This project is ongoing and will continue in FY2012.

• Samples provided by NVSL Serum Bank:
  ➢ ~ 425 Cervid samples
  ➢ ~ 250 Bovine samples
  ➢ 3734 Cervid samples and 2891 Cattle samples in bank
Pathobiology Laboratory

- Dr. Art Davis, Director
- Dr. Walter Hyde, CAS Section Head
- Dr. Mark Hall, PPE Section Head
Pathobiology Laboratory

- The Pathobiology group receives approximately 10,000 samples annually for histopathological examination in support of the USDA Bovine Tuberculosis eradication program. Of these samples approximately 85-90% are from slaughter surveillance stream.
- Also a participant in the evaluation of Permethrin for use in dip vat solutions against cattle fever ticks.
- Conducting ongoing evaluation of three IHC TSE testing platforms (Ventana, BioCare, Leica) for use in VS Programs.
CWD Rectal Biopsy Study

- Test sensitivity for the rectal biopsy samples was approximately 70% compared to the gold standard of CWD testing on brain and/or lymph nodes samples.
- Test sensitivity was influenced by animal genotype and stage of disease:
  - RB test sensitivity is highest in prion protein codon 96 GG deer, with lower RB test sensitivity in 96GS and 96SS deer.
  - Deer later in the course of the disease (as defined by increasing amounts of prion protein in the brain) have the greatest likelihood of a positive RB test.
  - Conversely, deer early in the course of the disease that lack prion in the brain or have low amounts of prion, more frequently have false negative RB results.
Foreign Animal Disease Diagnostic Laboratory

- [Vacant], Director
- Dr. Fernando Torres-Velez, DSS Section Head
- Dr. Mike McIntosh, PVS Section Head
- Dr. Wei Jia, RVS Section Head
FADDL - International Collaborations

**Dx Assistance & Capacity Building**

- **Ecuador**
  - Characterization of O/ECU FMD strain
- **Dominican Republic**
  - Low pathogenic CSF
  - PTV-1
- **Haiti**
  - PTV-1
- **Mexico**
  - Reference lab Capacity building (CSF)
- **Mongolia**
  - OIE twinning program (FMD)

- **Harmonization**
  - US/Mexico CSF Dx harmonization
  - Proficiency panels (Canada)

**International Transboundary Animal Disease Course**

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<tr>
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Safeguarding Animal Health
FADDL: Emerging Disease Investigations

- October 2011
  - Vesicular-like to ulcerative disease among Ringed seals in the northwest Alaska Arctic region
  - Animals from Canada and Russia also reported with same symptoms
  - FADDL provided support through conventional and state of the art diagnostic techniques to rule out vesicular diseases
  - The etiologic agent still unknown as of January 2012
FADDL: CSF Surveillance in the Americas

• 2011 – CSF outbreak in Guatemala near MX border
  ➢ FADDL monitoring the “re-emergence” of Classical Swine Fever in Guatemala for possible low virulence strain variations
  ➢ We provided molecular characterization and phylogeny analysis to complement the field clinical observations.
Diagnostic Development Projects

Assay Development
• FMD 3ABC ELISA
• FMD 3D ELISA (DIVA)
• FMD LPBE
• CSF Competitive ELISA
• Isothermal LAMP assay*
  ➢ Pan-mycoplasma
  ➢ Capripox
  ➢ Lumpy skin disease
• Panviral microarrays
• Multiplex platforms

Assay Validation
• FMD Penside test (SVANODIP® FMDV-Ag)
• Detection of FMDV in bulk tank milk
• Sample preservation & transport in FTA paper (CSF & FMD)
• Ropes for collection of oral fluid (Dx CSF & FMD)

Reagent Development & Production
• Vesicular Ag ELISA reagent production
• Monoclonal production
  ➢ ASF
• FMD antisera bank

*Safeguarding Animal Health

*not DHS funded
Assay Validation:

- Evaluation of FMD Penside Dx Assays-Lateral Flow Device
  Investigate performance characteristics of a penside FMD assay pending licensing in the USA

- Bulk Tank Milk PCR for Foot-and-Mouth Disease
  - FMD PCR in Milk: Inter-laboratory Comparison study (currently underway)
  - FMD PCR in Milk: Negative Cohort study (to begin in Summer 2012)
NAHLN - A State and Federal Partnership to Safeguard Animal Health

National Animal Health Laboratory Network (NAHLN)

Approved Laboratories

- Newcastle Disease (ND)/Avian Influenza (AI)
- Bovine Spongiform Encephalopathy (BSE)
- Scrapie/Chronic Wasting Disease (CWD)
- Classical Swine Fever (CSF)/Foot and Mouth Disease (FMD)
- Pseudorabies Virus (PRV)
- Swine Influenza (SIV)
- Vesicular Stomatitis (VS)
- National Veterinary Services Laboratories

*For specified agents, not all laboratories are currently participating in surveillance testing.

September 2011
NAHLN Strategic Planning

February 2011 - NAHLN structure options were discussed during Coordinating Council Meeting

August 2011 – Edits discussed by Coordinating Council and proposed model document finalized.
- 4 models based on: state, region, function, or geographic area

September 2011 – Coordinating Council developed concept paper shared at USAHA/AAVLD
- “A Vision for National Animal Health Laboratory Network: Current Thinking”

May 2012 – Concept paper to be finalized and laboratory related policies reviewed for finalization
- This is an important step to codification of NAHLN in the 9CFR

July 2011 – Structure options provided to USAHA/AAVLD Joint NAHLN Committee for input

August 2011 – AAVLD Executive Committee solicited input from stakeholder groups including laboratory personnel, industry, SAHOs, and VS.
- 138 individuals responded

February 2012 – All comments on concept paper received and shared with NAHLN Coordinating Council

Safeguarding Animal Health
NAHLN Surveillance Update—Highlights

SIV Report

*testing numbers October 2010 January 2012*

- 6855 Total samples submitted under program
- 2733 accessions (approximate number of herds)
- 1058 Matrix positive accessions
- 171 accessions positive for pN1 gene
- Total of 629 isolates sequenced
  - Sequences deposited in Gen Bank for reference for vaccine development researchers
  - Currently in process of changing the testing algorithm to a broader focus of swine influenzas and emerging virus strains by removing N1 PCR and adding standardized subtyping PCRs.
    - Expected to implement in the next few weeks
- Since 2008, VS has been collaborating with CDC on SIV by regularly sharing isolates mainly for human vaccine development purposes, and also sharing SOPs methods and molecular expertise.
Upcoming NAHLN Training

- **May 2012** – Planned QMS training in collaboration with AAVLD and International Services
- **August 2011** – NAHLN IT messaging training with 20 participants from NAHLN labs and VS OCIO
- **February and March 2012** – Funding mechanism webinar series for NAHLN labs
- **May 2012** – VS Memo 580.4 implementation training for laboratory and field staff
NVSL Proficiency Tests 2011

- African Swine Fever
- Anaplasmosis
- Avian Influenza (rRT-PCR and AGID)
- Bacteriology
- Bluetongue
- Bovine Leukosis
- Bovine Spongiform Encephalopathy
- Brucellosis
- Classical Swine Fever
- Contagious Equine Metritis
- Equine Infectious Anemia
- Equine Viral Arteritis
- Foot and Mouth Disease
- Johne’s Disease (organism, serum, milk)
- Leptospira
- Newcastle Disease
- Pseudorabies (serology, latex agglutination, gI ELISA, gB ELISA)
- Rinderpest
- *Salmonella* Type D
- Scrapie/Chronic Wasting Disease
- Vesicular Stomatitis
NVSL Scientific Publications


Websites

• National Veterinary Services Laboratories
  www.aphis.usda.gov/animal_health/lab_info_services

• National Animal Health Laboratory Network
  www.aphis.usda.gov/animal_health/nahln