University of Minnesota
Veterinary Diagnostic Laboratory
2016 Annual Report
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The Veterinary Diagnostic Laboratory’s mission is to protect and promote animal and human health through early detection and monitoring of animal diseases. The VDL fulfills its mission by identifying emerging diseases, developing new diagnostic methods, and training diagnosticians, veterinarians and graduate students. The laboratory is the official laboratory of the Minnesota Board of Animal Health and is Minnesota’s only full service accredited animal health diagnostic facility.

2016 Highlights

New Director

The VDL welcomed Dr. Jerry Torrison as the new director of the lab in late March. Jerry is returning to the VDL, having served as an associate clinical professor and diagnostian from 2004 to 2011. From 2011 to March 2016, he was a swine veterinarian with the research and nutritional services team at Zinpro Corporation, a Minnesota-based manufacturer of organic trace minerals for beef and dairy cattle, swine, poultry, aquatic, equine, and companion animals. Prior to 2004, he was a swine consultant with Swine Vet Center, PA, in St. Peter, Minnesota, for six years and health assurance manager with PIC, a swine breeding stock company, from 1994-1998. Jerry earned his DVM and PhD degrees in veterinary medicine from the University of Minnesota.

MPTL expansion

The 2015 Minnesota Legislature provided an appropriation of $8.5 million to expand the Minnesota Poultry Testing Laboratory (MPTL), a branch lab of the VDL and partnership with the Minnesota Board of Animal Health (BAH). Enhancements included new offices, conference room and break room space along with new laboratory space specifically sample delivery room, necropsy lab, media prep lab, bacteriology and serology lab, sample process & extraction lab, PCR testing lab, master mix lab, and autoclave room. The lab spaces also have new equipment such as: chemical fume hoods, biosafety cabinets, PCR machines, centrifuges, sample vortex machines, freezers, and other diagnostic equipment. The 20-year-old space was expanded from a 3,665 square-foot building to an 11,890 square-foot facility.

The lab, located in the heart of the Minnesota’s poultry industry, will enhance the ability of the state to respond to disease outbreak situations such as the avian influenza outbreak of 2015 which affected over 110 poultry production facilities and had an economic impact in Minnesota estimated at over $650 million. MPTL also serves as the Authorized Laboratory for the National Poultry Improvement Plan (NPIP) in Minnesota and is the center for management of BAH poultry programs.

NAHLN Level 1 status

The UMN VDL achieved Level 1 status in the National Animal Health Laboratory Network (NAHLN). The NAHLN is a network of federal, state and university laboratories that provide diagnostic testing services for disease surveillance and outbreak response in agricultural animals. Level 1 laboratories must meet a defined set of criterion, including quality standards, Biosafety Level 3 space, the ability to send test results electronically and the capability of performing tests on large numbers of samples.
To support its Level 1 status the VDL has obtained federal funding for support for the quality system, electronic messaging enhancement and support, equipment that increases testing capacity, and technical support for foreign animal disease and/or emerging disease diagnostic capabilities, including emerging disease case work up.

**Legislative funding**

The Minnesota state legislature approved nearly $2.1 million to expand and enhance the Veterinary Diagnostic Laboratory’s services. The one-time funds will provide equipment for developing new diagnostic tests for emerging diseases, and increase the lab’s genomic sequencing capacity to discover emerging viruses and characterize existing viruses. The funding also will allow for three years of computer programming and software development to securely deliver higher quality diagnostic reports to veterinarians and animal owners.

**2016 Numbers**

**Cases:** 52,129  
**Procedures:** 1,283,364

**Procedures by Species:**

- Avian 332,359  
- Bovine 184,826  
- Canine/Feline 9,935
- Equine 6,283  
- Other Ruminant/Cervidae 19,319  
- Fish 7,292
- Porcine 658,589  
- Other Miscellaneous 64,761
- TOTAL  1,283,364
**2016 Selected Animal Health and Disease Trends**

**PRRS** In 2016, the VDL ran 244,189 PRRS PCR tests.

**SECD** In 2016, the VDL ran 40,131 PEDv and PDCoV Multiplex Real Time PCR tests and 5,238 Triplex (PEDv/TGE/PDCoV) RT-PCR tests. The VDL began running the Triplex PCR in November 2016.
SVV The UMN VDL ran 3,205 Senecavirus A EZ Real time RT-PCR tests in 2016.

![SVA positive cases by Month (MN)](image)

**Lab for Udder Health Testing**

**Mastitis Cow/Quarter Culture – Top 10 positive Organisms of 18,036 samples**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillus sp.</td>
<td>3,580</td>
</tr>
<tr>
<td>Staphylococcus chromogenes</td>
<td>2,031</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>1,464</td>
</tr>
<tr>
<td>Staphylococcus sp.</td>
<td>1,264</td>
</tr>
<tr>
<td>Aerococcus sp.</td>
<td>1,228</td>
</tr>
<tr>
<td>Streptococcus dysgalactiae</td>
<td>1,169</td>
</tr>
<tr>
<td>Streptococcus uberis</td>
<td>867</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>832</td>
</tr>
<tr>
<td>Lactococcus garvieae</td>
<td>820</td>
</tr>
<tr>
<td>Streptococcus sp.</td>
<td>658</td>
</tr>
</tbody>
</table>

**Screening Tests – Positive Results**

<table>
<thead>
<tr>
<th>Test</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mycoplasma Culture Total</td>
<td>48,101</td>
</tr>
<tr>
<td>Mycoplasma positive</td>
<td>1,486</td>
</tr>
<tr>
<td>Prototheca Culture Total</td>
<td>6,566</td>
</tr>
<tr>
<td>Prototheca positive</td>
<td>242</td>
</tr>
<tr>
<td>Staph &amp; Strep Culture Only Total</td>
<td>12,089</td>
</tr>
<tr>
<td>Non-ag Strep. sp.</td>
<td>6,052</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>266</td>
</tr>
<tr>
<td>Staphylococcus sp.</td>
<td>3,660</td>
</tr>
<tr>
<td>Streptococcus agalactiae</td>
<td>11</td>
</tr>
<tr>
<td>Staphylococcus Culture Only Total</td>
<td>23,722</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>1,473</td>
</tr>
<tr>
<td>Staphylococcus sp.</td>
<td>13,033</td>
</tr>
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</table>
Tularemia

2016 Tularemia Positives: Date, Animal and Location information
UMN VDL Regulatory Testing Numbers 2016

<table>
<thead>
<tr>
<th>FOREIGN ANIMAL DISEASES AND PROGRAM DISEASES</th>
<th># PROCEDURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOOT AND MOUTH DISEASE</td>
<td>298</td>
</tr>
<tr>
<td>CLASSICAL SWINE FEVER – USDA SURVEILLANCE</td>
<td>725</td>
</tr>
<tr>
<td>PSEUDORABIES – USDA SURVEILLANCE</td>
<td>3318</td>
</tr>
<tr>
<td>AVIAN INFLUENZA</td>
<td>70,515</td>
</tr>
<tr>
<td>EXOTIC NEWCASTLE DISEASE</td>
<td>9532</td>
</tr>
<tr>
<td>VESICULAR STOMATITIS VIRUS</td>
<td>1548</td>
</tr>
<tr>
<td>SWINE INFLUENZA VIRUS- USDA SURVEILLANCE</td>
<td>3372 (FY2016)</td>
</tr>
<tr>
<td>RABIES</td>
<td>2248</td>
</tr>
<tr>
<td>SCRAPIE</td>
<td>161</td>
</tr>
<tr>
<td>CWD</td>
<td>2578</td>
</tr>
<tr>
<td>KOI HERPES VIRUS</td>
<td>8</td>
</tr>
<tr>
<td>VIRAL HEMORRHAGIC SEPTICEMIA</td>
<td>564</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER DISEASES - REPORTABLE TO THE MINNESOTA BAH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRUCELLOSIS (B CANIS AND SP.)</td>
</tr>
<tr>
<td>EQUINE INFECTIOUS ANEMIA</td>
</tr>
<tr>
<td>JOHNE’S DISEASE</td>
</tr>
<tr>
<td>Q. FEVER</td>
</tr>
<tr>
<td>TULAREMIA</td>
</tr>
<tr>
<td>EQUINE HERPES MYELOENCEPHALOPATHY</td>
</tr>
<tr>
<td>AVIAN ENCEPHALOMYELITIS</td>
</tr>
<tr>
<td>AVIAN METAPNEUMOVIRUS</td>
</tr>
<tr>
<td>MYCOPLASMA GALLISEPTICUM</td>
</tr>
<tr>
<td>MYCOPLASMA MELEAGRIDIS</td>
</tr>
<tr>
<td>MYCOPLASMA SYNOVIAE</td>
</tr>
<tr>
<td>PULLORUM TYPHOID</td>
</tr>
<tr>
<td>SALMONELLALLA ENTERITIDIS</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>OTHER ZOONOTIC AND EMERGING DISEASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENECAVIRUS A</td>
</tr>
<tr>
<td>OPP</td>
</tr>
<tr>
<td>TOXOPLASMOsis</td>
</tr>
<tr>
<td>CANINE INFLUENZA</td>
</tr>
<tr>
<td>BORRELIA BURGDORFERI</td>
</tr>
</tbody>
</table>
Section Updates

Administration

• The new laboratory director, Dr. Jerry Torrison began work April 1, 2016. Interim director, Dr. Stephanie Rossow resumed her role as a veterinary diagnostic pathologist specializing in swine.

• Dr. Jim Collins completed his sabbatical where he spent a year exploring the use of telepathology and other technology in veterinary diagnostic medicine. He is back working as a food animal pathologist.

Bacteriology

• Bacteriology is participating in a project with Vet-LIRN, (an FDA laboratory network of veterinary diagnostic laboratories that can coordinate to respond to chemical and microbial food or drug contamination events) that is determining the antibiograms of selected veterinary clinical pathogens using Sensititer data.

Comparative Immunology and Endocrinology

• Testing services in the Comparative Immunology & Endocrinology (CIE) lab section were discontinued, effective September 2016. Routine testing will be outsourced and research testing will be done in a CVM research laboratory.

Electron Microscopy

• A new JEOL 1400 Plus transmission electron microscopy (TEM) microscope was purchased. The new TEM will replace the current TEM unit, which is 26 years old. The scope is equipped with newly developed digital imaging, to allow high-definition images. Features include automated focusing, stigmation and alignment. The optics system will provide high-contrast, rotation-free imaging, and stability that minimizes astigmatism. The JEOL 1400 Plus has a newly designed graphical user interface, and tomography capabilities, which will allow 3-dimensional imaging of viral particles and tissue components.

Histology

• The Histology lab acquired two important pieces of equipment – an additional/backup tissue processor and tissue embedder. These pieces of equipment were necessary to provide continuous service to the VDL.

Immunohistochemistry

• The IHC Lab continues to perform lymphoma typing for a Hong Kong diagnostic center, as well as tumor and infectious agent identification for various VDLs from around the US and South America.

• The IHC Lab has acquired a digital oven to precisely control the heat steps present in the IHC and in situ hybridization procedures, as well as a new pressure cooker (for unmasking antigens) and a micro-centrifuge.

• The IHC lab participated in the 2016 AAVLD/NVSL Program for Inter-laboratory Comparison, and scored 100% in its detection of Porcine Circovirus type 2 in the test samples provided by NVSL.
Information Technology

- The state funding for the VDL will provide for computer programming and software development to securely deliver higher quality diagnostic reports to veterinarians and animal owners over the next three years. The upgrades will allow the addition of historical trends to a herd’s health status, the ability to trace disease pathogens through a business’s supply chain, and ensure compatibility with regional and federal disease reporting standards. The new reporting tools also will be built for delivery via mobile technology—giving veterinarians and farmers more convenient access to their data.

- Work on the project began in 2016 and an RFP was developed and sent out to solicit bids for the project.

Lab Receiving

- New laboratory refrigerator and freezer were purchased to increase sample storage space and security.

- Lab staff have taken on various roles in sample processing for molecular diagnostics and bacteriology, with plans to grow this into a larger team of staff dedicated solely to sample processing for the entire VDL.

- A significant upgrade to the shipping and receiving logistics is in progress, which will improve inbound tracking capabilities and return shipping label systems for VDL clients across the state. The goal is to implement the new program within the next couple of months.

Molecular Development

- State funds will provide equipment to create a dedicated section for developing new diagnostic tests for emerging diseases, and increase the lab’s genomic sequencing capacity to discover emerging viruses and characterize existing viruses. The extra equipment means the development of new tests won’t disrupt routine lab testing. It also provides reserve testing capacity during large-scale disease outbreaks.

- Work has begun on the process to renovate VDL room 341 in preparation for the transition of that space to accommodate the Molecular Development group.

- A new wet-bench expert and a new section head were added to the Molecular Development Section in 2016. A new -80 freezer was also added to the lab.

Molecular Diagnostics

- The Molecular section underwent reorganization and as of October 31st, 2016 no longer consists of two separate labs (formerly Molecular Diagnostics and Molecular Bacteriology) and instead is designated as one section- Molecular Diagnostics.

- Seneca Valley Virus was validated by the Molecular Development Lab and is part of routine testing in Molecular Diagnostics twice a week.

- A new multiplex Polymerase Chain Reaction (PCR) test that combines Porcine Epidemic Diarrhea Virus (PEDv), Porcine Deltacoronavirus (PDCoV) and Transmissible Gastroenteritis Virus (TGEV) into one assay was implemented into the Molecular Diagnostic clinical testing schedule effective October 31st, 2016. The new assay provides clients with timely, quality results for all three viruses at the same time.
• The Molecular Diagnostics lab has hired 7 new employees in the last year and plans to add 3 more in the coming months.

• The Molecular Diagnostics lab has improved the average PRRS sequencing turn-around time from 4 business days to 2 business days.

Necropsy
• Three new large pieces of equipment have been installed in the Necropsy section.
  o A digital Faxitron machine has replaced decades old film version to increase efficiency and productivity for cases requiring x-rays.
  o A Biosafety Cabinet has been installed in the BSL-2 area for the containment of high risk specimens such as tularemia and Brucella suspects.
  o A downdraft table was donated to the VDL by Laboratory Builders of Burr Ridge, IL. This provides much needed ventilated space for trimming of formalin fixed tissues.

Parasitology
• The parasitology section purchased an Olympus SZX16 transillumination and reflective stereoscope with a double objective (0.5x and 1.0x objective) that allows for magnification from 5x to 115x magnification with a 5MP Color Camera Head Compatible with CellSense 1.14 imaging software. The lab is now able to take videos and high resolution photos of gross specimens for teaching, collaboration, and telepathMDology.

Pathology
• Two residents began the residency training program in 2016. The VDL currently has 4 anatomic pathology residents.

Poultry Testing Lab
• The Grand Re-Opening of the MPTL occurred September 22, 2016. The renovated and expanded space and new equipment will greatly improve service for poultry clients.

• PCR testing officially began at MPTL on Monday September 26th; the lab is currently able to run Al, aMPV, END, and NDV PCRs in the new molecular lab. Mycoplasma and salmonella serotyping PCR will be added in the near future.

• A Luminex machine was also purchased as part of the project to run salmonella serotyping.

• The Sensititre System was also purchased with building project funds for the bacteriology lab. This has been installed and training is complete.

• The serology section purchased a second automated ELISA plate washer and stacker which will make it much easier for the technicians to coordinate testing runs, which provides more testing capabilities and decreases turnaround time.
Quality Assurance

• The VDL had 3 external audits last year:
  o Medtronic 2/3/2016 - no findings
  o USDA BSL-2 Inspection 4/21/2016 - 1 observation
  o NAHLN Desktop Audit 11/16/2016 - 4 non-conformances

• There were two major upgrades to QPulse (the quality management software system).

• The VDL is currently accredited by AAVLD (American Association of Veterinary Laboratory Diagnosticians).

• Dr. Becky Davies of Quality Central and some research GRP clients was published as a news feature in Nature. (http://www.nature.com/news/how-quality-control-could-save-your-science-1.19223)

Serology

• The Serology lab conducted intensive testing in collaboration with Zoetis for validation of porcine epidemic diarrhea (PED) antibody test kit which they are planning to release on the market soon. Also, the lab collaborated with a company “Indevr” to test samples for validation of an automated HI reader. The lab successfully completed required proficiency testing performed through the National Veterinary Services Laboratory. The lab also started offering the Parachek 2 ELISA test for detection of antibodies to Johne’s disease in small ruminants.

• The Serology lab started offering ELISA test for antibodies to Seneca Valley Virus in pigs.

Udder Health

• The Laboratory for Udder Health developed a new agar media that will be launched in the near future as part of the MN Easy Culture™ System. This new media has undergone internal testing and was part of a validation study and pilot study on selective dry cow therapy.

• The LUH is currently exploring adding options for dairy bedding testing, making use of the UMN Soils Lab to offer dry matter and organic matter testing.

• The MN Easy Culture System was featured in the UK Farmer’s Guardian online and in print (2/5/2016).

Virology

• The Virology lab validated and started offering Seneca Valley Virus (SVV) isolation and indirect immunofluorescence assay (IFA) for detection of antibodies to SVV.

• The Virology lab also worked with the Molecular Diagnostic Lab to validate a tissue processing method using an instrument called “Genogrinder”. Validation for isolation of swine influenza virus on samples processed using genogrinder was completed.
VDL Faculty and Staff

The VDL currently employs 16 faculty members and 78 staff

Outreach

• The VDL conducted 19 formal tours in 2016 with a total of 190 people visiting the lab.

• In addition to the CVM senior veterinary students and veterinary technician students from nearby technical colleges, the VDL also trained several outside individuals or groups including the Joint Pathology Center residents, a swine certificate student from China and others.

• The Laboratory for Udder Health conducted 4 trainings for 69 people on their Easy culture system and also had two trainees for an extended training in the lab.

• The Molecular Diagnostics lab trained National Guard members from the Mobile Lab Unit on avian influenza testing.

• Other outreach activities included:
  o VDL/OFC booths at the MN Dairy Health Conference and the AABP Conference

Awards

• Jan Shivers, Anibal Armien, CVM researchers: Davis-Thompson Foundation (former CL Davis Foundation) Journal award for best article in the journal Veterinary Pathology for the year 2016

• Ileana Miranda- J1 scholar under Dr. Armien: ACVP Young Investigators Award Poster Competition in the category of Diagnostic Pathology.

• Matt Sturos: Charles Louis Davis DVM Foundation for the Advancement of Veterinary and Comparative Pathology 2016 Student Scholarship award

• Dr. Talita Resende, a PhD student advised by Dr. Fabio Vannucci; Best poster at the 24th International Pig Veterinary Society (IVPS) congress

• Dale Lauer: Exemplary Leadership Award

• Dr. Jim Collins: 2016 Minnesota Pork Board Distinguished Service Award

Publications


