Overview--

The University of Kentucky Veterinary Diagnostic Laboratory (UKVDL) strives to be one of the premier veterinary diagnostic laboratories in the United States, providing timely and accurate services in support of the practicing veterinary profession, Kentucky animal agriculture, the signature equine industries, companion animals, and public health. As the state’s flagship veterinary diagnostic laboratory, the University of Kentucky Veterinary Diagnostic Laboratory’s primary goal is to develop, apply, and utilize state-of-the-art veterinary diagnostic testing methods and scientific knowledge to improve animal health and marketability, preserve the human-animal bond, and help protect and improve public health through the early and accurate identification of zoonotic diseases. The UKVDL laboratory is fully accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), and is a member of the USDA National Animal Health Laboratory Network (NAHLN) and the FDA Veterinary Laboratory Investigation Response Network (Vet-LIRN).

In addition to its clinical diagnostic role, the UKVDL provides surveillance and regulatory testing for emerging and endemic diseases such as equine infectious anemia (EIA), equine viral arteritis, equine piroplasmosis, West Nile virus, chronic wasting disease of deer, contagious equine metritis, bovine spongiform encephalitis (Mad Cow Disease), Johne’s disease, bovine leukosis, avian influenza, rabies and many other diseases of agricultural, public health and companion animal importance. Furthermore, the laboratory continually monitors for the emergence of foreign animal diseases (FADs) such as foot and mouth disease, and classical swine fever. As part of the NAHLN, the UKVDL conducts ongoing Proficiency Testing (PT) to be prepared for any outbreak of a FAD in Kentucky and to assist other states as needed. Finally, UKVDL hosts a rich continuing education and outreach program for our clients and the public every year. The laboratory is composed of fifteen distinct sections as depicted in this organizational chart:
Farmers and animal owners use the UKVDL’s services primarily through their practicing veterinarians. These professionals have expertise in selecting, preparing, shipping, and submitting the proper specimens for testing when needed to assist in making a clinical diagnosis. Laboratory findings are reported back to the submitting veterinarian who then consults with his or her clients to implement a treatment protocol or a prevention/management solution to disease problems on the farm. A state-of-the-art Laboratory Information Management System (LIMS) is utilized at the UKVDL which enables UKVDL to provide the most professional, accurate and timely accessioning, order entry, results capture and clinical case reporting for our clients.

UKVDL faculty, scientists, and technical staff are specialists in several diagnostic medical disciplines directly related to animal health to include bacteriology, clinical pathology, epidemiology, extension, molecular biology, pathology, serology, toxicology, virology and informatics. Funding to add metagenomics testing is being pursued to improve diagnostics in the future. The laboratory is also exploring the potential of supporting the Kentucky aquaculture industries, food safety, stem cell therapy and other emerging animal health technologies. As part of the cooperative agreement with the Lincoln Memorial University College of Veterinary Medicine, the Center for Animal Health in Appalachia (CAHA) was launched in 2015. Director, Dr. Craig Carter, is serving on the advisory board.
Disease diagnostic efforts are coordinated and handled by specialists in the appropriate disciplines. Complex clinical cases involving multiple sections are monitored by trained case coordinators. During surge testing periods and disease outbreaks, cross-trained technicians are redistributed across sections to assure that the surge in workload can be managed in a timely and accurate fashion.

The UKVDL received 13,493 clinical diagnostic cases (+4%) and 31,534 regulatory cases (+12%) in calendar year 2015. Regulatory cases are down about 10% from 2013. The increasing trend in regulatory cases is due primarily to gaining three large poultry clients. The clinical diagnostic and necropsy caseloads have increased by ~4% each in cy2015. The diagnostic and necropsy accession loads fluctuate based on seasonal and natural epidemiologic conditions and events. Total tests run in each laboratory section are listed in the individual section reports.

Locations of clients submitting accessions to UKVDL, 2010-2015
The Veterinary Diagnostic Laboratory strives to be one of the premier veterinary diagnostic laboratories in the United States, providing the very best and timely services in support of the practicing veterinary profession, Kentucky animal agriculture, the signature equine industries, companion animals and public health.

The Veterinary Diagnostic Laboratory (UKVDL) is a full-service laboratory and an administrative unit in the College of Agriculture, Food and the Environment (CAFE) at the University of Kentucky. The UKVDL was established in 1970 by the State Legislature of Kentucky and charged with the responsibility of provision of diagnostic assistance to veterinary practitioners, owners of animals in Kentucky, wildlife conservationists, scientists utilizing animals in their research throughout the university, and state-federal regulatory officials. The laboratory assists with safeguarding the health of animal agriculture in Kentucky via diagnostic testing and disease identification.

The UKVDL confirms infectious and parasitic diseases, chemical and other toxic contaminants that may harm animals or humans, nutritional diseases, regulatory diseases, provides the means to meet export sales and movement requirements, and provides an early warning system for impending epidemics. Emphasis is placed on quality assurance and control for all diagnostic and regulatory testing including new testing methods. Each employee of the UKVDL

<table>
<thead>
<tr>
<th></th>
<th>Diagnostic</th>
<th>%Change</th>
<th>Regulatory</th>
<th>%Change</th>
<th>Necropsies</th>
<th>%Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>13487</td>
<td></td>
<td>39705</td>
<td></td>
<td>3172</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>13491</td>
<td>0.03%</td>
<td>41538</td>
<td>4.62%</td>
<td>3645</td>
<td>14.91%</td>
</tr>
<tr>
<td>2012</td>
<td>14227</td>
<td>5.46%</td>
<td>35093</td>
<td>-15.52%</td>
<td>3398</td>
<td>-6.78%</td>
</tr>
<tr>
<td>2013</td>
<td>13655</td>
<td>-4.02%</td>
<td>31251</td>
<td>-10.95%</td>
<td>3100</td>
<td>-8.77%</td>
</tr>
<tr>
<td>2014</td>
<td>12976</td>
<td>-4.97%</td>
<td>28142</td>
<td>-9.95%</td>
<td>3227</td>
<td>4.10%</td>
</tr>
<tr>
<td>2015</td>
<td>13493</td>
<td>3.98%</td>
<td>31534</td>
<td>12.05%</td>
<td>3343</td>
<td>3.59%</td>
</tr>
</tbody>
</table>
focuses on performance of all tasks according to protocol with total commitment to quality.

Mission—

The UK Veterinary Diagnostic Laboratory’s primary goal is to develop, apply and utilize state-of-the-art technology and scientific knowledge to improve animal health and marketability, preserve the human-animal bond, and to help protect the public health.

Quality Philosophy and Objectives--

Every employee of the UKVDL is committed to quality, integrity and excellence in all work completed. In order to meet our mission and achieve our vision, we must:

- Ensure client satisfaction by consistently meeting or exceeding customer requirements.
- Demonstrate competence in accordance with AAVLD Essential Requirements through the performance of high quality diagnostic testing in accordance with ISO 17025 standards and guidelines.
- Continuously improve diagnostic information and dissemination processes.
- Integrate contemporary laboratory practices throughout the laboratories.
- Ensure employee health and safety.
- Provide employees with training and tools to facilitate our quality effort.

The Laboratory’s success is measured by customer satisfaction, meeting professional standards, meeting the essential American Association of Veterinary Laboratory Diagnosticians (AAVLD) Accreditation requirements and our response to service demands. These quality objectives are reviewed for continuing compliance on a recurring basis.

Outreach--

The UKVDL continues to build and enhance outreach programs around Kentucky. The Kentucky VetLabNet listserv continues to distribute animal health bulletins and has grown to a list to over 2000 UKVDL clients, scientists, farmers and stakeholders. The UKVDL Director and other faculty continue to contribute articles quarterly to the KVMA journal and the Kentucky Cattleman Association Cow Country News. The UKVDL Director, faculty and staff continue to deliver lectures at scientific and lay meetings and participate in the monthly Equine Diagnostic-Research Seminar Series at the UKVDL since 2006. These seminars are filmed by The Horse magazine, edited and made available as Webinars. These seminars have been viewed in over sixty countries:
University of Kentucky Diagnostic Research Lecture Series

The University of Kentucky Lecture Series offers up-to-date horse health research and information from leading academic experts. Most presentations are 45 minutes to an hour long.

- Sport Horse Reproduction: Challenges and Solutions
- Emergent and Re-Emergent Equine Disease
- Equine Enteric Coronavirus
- Equine Gastric Ulcers
- Objective Determination of Limb The Horse
- Advances in Joint Disease Treatment
- Pain Management in Horses
- Performance Horse Nutrition: What Role Do Supplements Play?
- The Ergot Alkaloid Enigma
- Developing Practical Pasture and Forage Diagnostic Tools
- Parasite and Growth Rates in Foals, and More
- Surgical Intervention to Improve Mare Fertility
Other outreach events (select)--

- Food Animal Practitioner Conference, February 26, 2015, ~50 veterinarians and other guests in attendance.
- Food Animal Practitioner Conference, August 13, 2015, ~50 veterinarians and other guests in attendance.
- The Director and six UKVDL employees attended the AAVLD meeting in Providence, RI, for continuing education and delivering scientific presentations.
- Dr. Craig Carter, Executive Director of the World Association of Veterinary Laboratory Diagnosticians, oversaw planning for the biennial meeting in Saskatoon, Saskatchewan, Canada.
- Public Health Contributions of Veterinary Diagnostic Laboratories, 1st annual meeting of the Center for Animal Health in Appalachia, Lincoln Memorial University College of Veterinary Medicine, Ewing, VA, Oct 2015.
- Overview of the DVM Training Programs by the University of Kentucky in support of the Lincoln Memorial University (LMU) College of Veterinary Medicine. Presented to the LMU Dean, faculty and staff, Jul 28, 2015
- See the Ruminant Extension Veterinarian and Epidemiologist’s reports below for additional outreach activities.

Disease Diagnoses & Outbreak Responses (select few cases to highlight the UKVDL clinical diagnostic mission)--

- UKVDL placed on standby by the National Animal Health Laboratory Network to assist in control of the 2015 High Path Avian Influenza outbreak, H5N2.
- Severe necrotizing bronchopneumonia and pleuritis, *M. haemolytica*, *Mycoplasma* sp., and *P. multocida*, BRSV
- EHV-1, leptospiral, and other etiologies in equine abortion cases.
- Confirmation of selenium/copper deficiencies in cattle.
- Confirmed diagnoses of botulism in cattle.
- Centrilobular hepatocyte necrosis in a bovine.
- Bovine Viral Diarrhea and deaths in multiple outbreaks.
- Confirmed diagnosis of blackleg (*Clostridium chauvoei*) in cattle.
- Confirmed canine herpesvirus infection in a litter of Labrador puppies.
- Vegetative endocarditis in cattle.
- Diffuse interstitial pneumonia in cattle.
- Coccidiosis and epicarditis in chickens.
- Mild segmental enterocolitis in cattle.
- Multifocal nonsuppurative interstitial nephritis in cattle.
- Myocardial degeneration and necrosis in cattle.
- Anaplasmosis in cattle.
- Histomoniasis, mycotic myocarditis, pneumonia and sacculitis in chickens.
- Ulcerative stomatitis in Alpacas.
- Necrotizing enteritis, coronavirus and rotavirus infection in cattle.
- Intestinal cryptosporidiosis in cattle.
- Abomasal obstruction in cattle.
- *Mycoplasma bovis* pneumonia and pulmonary abscesses in cattle.
- Parasitic meningoencephalomyelitis, verminous pneumonia in goats.
- Leptospiral infection in cattle.
- Lymphoproliferative disease in chickens.
- Necrotizing enterocolitis in sheep.
- Chronic fibrosing and eosinophilic portal hepatitis in pigs.
- Capillariasis (severe ingluvitis and mucosal nematodes) in quail.
- Aspiration pneumonia in an alpaca.
- Poison hemlock toxicosis in cattle.
- Botulism in horses.
- Carbofuran poisoning in a dog.
- Lead poisoning in calves.
- Taxus poisoning in cattle.
- Anticoagulant rodenticide poisoning in a dog.
- Sodium intoxication & water deprivation in cattle.
- Ivermectin toxicosis in dogs.
- Nitrate poisoning in cattle.
- Ethylene glycol toxicosis in a dog.

**Notable achievements or advancements—**

- Maintained American Association of Veterinary Laboratory Diagnosticians (AAVLD) national accreditation, accredited by the USDA National Animal Health Laboratory Network (NAHLN), FDA Veterinary Laboratory Investigation & Response Network (VetLIRN) certified member, National Poultry Improvement Program (NPIP) laboratory certification through the oversight of proficiency testing and quality control programs, faculty & staff continuing medical education initiatives, and participation in outbreak response and emergency exercises.
- Provided leadership and guidance for faculty and staff to enhance the UKVDL outreach programs through one day symposia and seminars such as food animal (Dr. Michelle Arnold), equine (all faculty), poultry (Meg Steinman & Dr. Lynne Cassone), toxicology (Dr. Cindy Gaskill). The Equine Diagnostic Research Seminars reach a global audience through our partnership with *The Horse* magazine.
- Supported and guided Mr. Ryan Redimarker and helped to provide a clear vision and oversight for a UKVDL strategic and marketing plan to improve
client services, enhance testing and collection of fees and to purchase high value instrumentation to modernize our laboratory sections.

- Served as key liaison with Lincoln Memorial University leaders to enter a cooperative agreement to provide training for veterinary medical students in exchange for significant funds that can be used to improve UKVDL services and research capability in support of Kentucky animal agriculture.
- Continue to oversee the operation of a real-time animal disease cluster detection system for Kentucky.
- Continue to provide support for faculty and staff to host professional exhibits for display at local, state and national meetings
- Supported and guided Dr. Jackie Smith in fostering the growth of KY-VetLabNet listserv from 600 to 1949 subscribed clients to maintain a high level of situational awareness for veterinarians and farmers through alerts and bulletins.
- Continue to oversee epidemiological field investigations/research studies for clients as requested/needed.

- Regular articles in the Kentucky Veterinary Medical Association (since 2005) and the Kentucky Cattleman Association (since 2009) magazines.
- Implemented a visiting foreign scientist program at the UKVDL—One scientist from Turkey recruited in 2015 to arrive in 2016.
- Supported and guided Dr. Laura Kennedy as PI in the furtherance of the Kentucky Horse Racing Necropsy Program funded by the Kentucky Horse Racing Commission and the Equine Drug Research Council.
- Supported and guided Dr. Erdal Erol in the development of several problem-based diagnostic testing panels that assist veterinarians in obtaining the earliest definitive diagnosis on clinical cases.
- Supported and guided Dr. Erdal Erol in the implementation of Matrix Assisted Laser Desorption-Ionization Time Of Flight (MALDI-TOF) mass spectrometric identification of pathogenic bacteria and fungi. This new technology has accelerated the time from receipt of samples to pathogen identification by up to 24 hours.
- Supported and guided Dr. Erdal Erol in his role as a member of the Joint National VS-AAVLD Antimicrobial Resistance Working Group.
- Supported and guided Dr. Michelle Arnold in her role as a Co-PI on the Southeast Quality Milk Initiative to improve milk quality in the southeast.
- Supported and guided Dr. Jennifer Janes in her role as PI on an internally funded project to identify genetic determinants in Wobbler Syndrome in horses.
- Supported and guided Drs. Cindy Gaskill and Lori Smith in the modernization of instrumentation and staffing in the toxicology laboratory to include the purchase of new ICP-MS and HPLC instrumentation to improve the development of toxicological methods and enhance throughput of cobalt, mycotoxin and ergovaline testing.
- Supported and guided Dr. Alan Loynachan as a Co-PI on the development of a genetically defined live attenuated equine herpesvirus-1 vaccine for the horse.
• Supported and guided Dr. Jackie Smith in the production and dissemination of the weekly Reportable Disease alerts distributed to the Office of the KY State Veterinarian’s office.
• Supported and guided James Mason and Derrick Miles in the total overhaul and upgrade of the UKVDL file servers and networking software to greatly improve the performance and efficiency of our centralized Laboratory Information System internally and for UKVDL clients.

Initiatives and programs—

• Equine leptospirosis awareness and vaccine initiative: Served on the Zoetis Equine Leptospirosis Advisory Committee. PI on the national sero-epidemiological survey that helped convince Zoetis to pursue a research and development project to create a vaccine for the horse. In October, 2015, the LeptoEQ Innovator equine leptospirosis vaccine was announced by Zoetis as the first ever licensed vaccine for the horse to protect against abortion and recurrent uveitis.
• Metagenomics diagnostic laboratory section for UKVDL— Met with the University of Tennessee, University of Illinois, Columbia University, Texas A&M University and Neogen Corporation to discuss the formation of a consortium of university and industry partners to explore metagenomics as an initiative for furthering veterinary diagnostic medicine. Helped convince the Gluck Equine Research Center to hire a bioinformatics faculty member to assist in the formation of a metagenomics research effort within the Department of Veterinary Science.
• Pursuit of laboratory testing data integration with veterinary practice management software— Hosted several meetings and demonstrations with AAVLD laboratory directors and representatives of VetData corporation toward LIMS data integration with practice management software at clients hospitals/clinics.
• Established an agreement with VetAura, a commercial veterinary laboratory in Lexington, to refer selected case material to UKVDL for testing.
Section Reports--

Bacteriology/Mycology
Dr. Erdal Erol, Section Head; Mr. Steve Locke, Section Supervisor

The Bacteriology/Mycology Section of the UKVDL receives specimens to culture for the isolation and identification of potentially pathogenic bacteria and fungi from livestock, companion and other animals. The section performs susceptibility testing on isolates for the treatment of specific pathogens to safeguard the health of animals in Kentucky and beyond. This section performs cultures for *Taylorella equigenitalis* and *T. asinigenitalis* for the federal/state CEM regulatory program in equines. Other specialized cultures and testing techniques include: anaerobic culture, mycoplasma culture, mastitis culture and fluorescent antibody testing for leptospires and clostridia (blackleg). This section also performs cultures for the National Poultry Improvement Plan (NPIP) In addition, Bacteriology/Mycology section participates in annual proficiency testing for AAVLD, NPIP salmonella, FDA Vet-LIRN salmonella and Listeria.

In April 2015, the bacteriology section put a MALDI-TOF biotyper into service a cutting edge instrument used for the quick identification of microorganisms. This equipment has already significantly decreased our turn-around time on the identification of many bacteria. We are confident that this new technology will increase client satisfaction with our microbiology service offerings.

Highlights 2015:

- 8862 Aerobic Cultures were performed on samples submitted to the UKVDL; significant bacterial pathogens were found in these samples, such as: Nocardioform bacteria, coliforms, Beta-hemolytic streptococci, *Salmonella, Pasteurella, Mannheimia, Arcanabacterium, Mycoplasma* and *Staphylococci*.
- 6869 CEM cultures were performed for the CEM regulatory screening program.
- 3022 antimicrobial susceptibilities were performed to determine the antimicrobials that could be used for their treatment in exposed animals (MIC broth microdilution method).
- 1385 specimens were tested for leptospires by fluorescent antibody testing.
- 687 specimens were cultured for NPIP Salmonella testing. Our participation in NPIP helps poultry industry improve infectious disease control and eradication programs.
- 373 anaerobic cultures were performed. *Clostridium perfringens & C. difficile* screening was the predominant focus.
- 204 ruminant mastitis cultures were performed. Often collaborate with extension veterinarian, Dr. M. Arnold for communication of treatment options to client.
• 155 specimens were tested for fungal pathogens.
• 132 *Clostridium chauvoei* (blackleg) and *Clostridium septicum* fluorescent antibody tests were performed.

**Virology**  
*Dr. Erdal Erol, Section Head; Ms. Sharon K. Ray, Section Supervisor*

The Virology section aids veterinarians and animal owners to diagnose viral infections, treat and protect their animals. Our section also works closely with UKVDL Pathology section to test for evidence of viral infections in necropsy specimens. In addition, Virology performs a high volume of regulatory tests for national sales, and for both the national and international movement of animals. The Virology section provides information to the field veterinarians and animal owners regarding sample selection, preservation, shipping procedures and interpretation of results.

**Highlights:**

During 2015, Virology conducted numerous virus neutralizations, virus isolations, ELISAs and fluorescent antibody tests (FA) in support of animal agriculture not only in Kentucky but across the country. The table below provides an overview of the variety and number of tests done this year.

<table>
<thead>
<tr>
<th>Virus/Agent</th>
<th>Method</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovine Corona Virus</td>
<td>FA</td>
<td>47</td>
</tr>
<tr>
<td>Bovine Respiratory Syncytial Virus</td>
<td>FA</td>
<td>97</td>
</tr>
<tr>
<td>Bovine Respiratory Syncytial Virus</td>
<td>VN</td>
<td>31</td>
</tr>
<tr>
<td>Bovine Rotavirus</td>
<td>FA</td>
<td>32</td>
</tr>
<tr>
<td>Bovine Viral Diarrhea</td>
<td>ELISA</td>
<td>5712</td>
</tr>
<tr>
<td>Bovine Viral Diarrhea 1</td>
<td>VA</td>
<td>60</td>
</tr>
<tr>
<td>Bovine Viral Diarrhea 2</td>
<td>VA</td>
<td>60</td>
</tr>
<tr>
<td>Canine Adenovirus</td>
<td>FA</td>
<td>21</td>
</tr>
<tr>
<td>Canine Corona Virus</td>
<td>FA</td>
<td>20</td>
</tr>
<tr>
<td>Canine Distemper Virus</td>
<td>FA</td>
<td>75</td>
</tr>
<tr>
<td>Canine Herpesvirus</td>
<td>FA</td>
<td>43</td>
</tr>
<tr>
<td>Canine Parainfluenza 2</td>
<td>FA</td>
<td>27</td>
</tr>
<tr>
<td>Canine Parvovirus</td>
<td>FA</td>
<td>93</td>
</tr>
<tr>
<td>Equine Herpesvirus 1</td>
<td>FA</td>
<td>779</td>
</tr>
<tr>
<td>Equine Herpesvirus 1</td>
<td>VN</td>
<td>235</td>
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<tr>
<td>Equine Influenza A1</td>
<td>HI</td>
<td>142</td>
</tr>
<tr>
<td>Equine Influenza A2</td>
<td>HI</td>
<td>142</td>
</tr>
<tr>
<td>Equine Viral Arteritis</td>
<td>VN</td>
<td>12999</td>
</tr>
</tbody>
</table>
Feline Herpesvirus FA 31
Feline Infectious Peritonitis FA 49
Feline Panleukopenia FA 49
Infectious Bovine Rhinotracheitis FA 266
Infectious Bovine Rhinotracheitis VN 82
Parainfluenza-3 Virus FA 71
Potomac Horse Fever IFA 392
Vesicular Stomatitis IN VN 1722
Vesicular Stomatitis NJ VN 1722
Virus Isolation VI 544
West Nile IgM Capture ELISA 113

Molecular Diagnostics
Dr. Erdal Erol, Section Head

The primary mission of the Molecular Diagnostic Section at the UKVDL is to provide molecular testing on the clinical specimens submitted by animal owners, veterinarians and pathologists. A number of molecular assays, in the formats of gel-based PCR, real-time PCR, multiplex gel-based PCR or multiplex real-time PCR, are being utilized because of their speed, specificity and sensitivity. This section also analyzes specimens received from the Virology and Bacteriology sections to obtain a confirmatory diagnosis. In addition, Dr. Erol provides consultations to Kentucky veterinarians and animal owners on the areas of appropriate sample collection and submission, therapeutic advice, interpretation of test results, determination of appropriate tests and differential diagnosis. The molecular biology section personnel consist of Dr. Erdal Erol, two full-time technicians and one half-time technician.

Highlights:

- The molecular diagnostics section successfully demonstrated its ability to provide accurate, rapid, high-volume testing. This section also became an accredited member of the USDA’s National Animal Laboratory Health Network and passed several federal proficiency tests such as Foot and Mouth disease, Classical Swine Fever, Avian influenza and Exotic New Castle Disease. The membership enables this unit to participate in national veterinary disease surveillance and provide rapid coordinated diagnostic response in the event of future outbreaks within the veterinary industry.
- Dr. Erol performed independent and collaborative research with other scientists. The results were presented at World Veterinary Medical Association Congress.
- The number of major molecular tests performed by Molecular section in 2015 is provided in the below table.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avian Influenza</td>
<td>250</td>
</tr>
<tr>
<td>Calf Diarrhea Panel (corona virus, rotavirus, E. coli, Salmonella and Cryptosporidium)</td>
<td>212</td>
</tr>
<tr>
<td>Bovine Respiratory disease-Viral panel (viral diarrhea virus, corona virus, Respiratory syncytial virus and herpes virus)</td>
<td>143</td>
</tr>
<tr>
<td>Bovine Respiratory disease-Bacterial panel (Mannheimia haemolytica, Pasteurella multocida, Histophilus somni and Mycoplasma bovis)</td>
<td>70</td>
</tr>
<tr>
<td>Clostridium perfringens Toxin Typing</td>
<td>80</td>
</tr>
<tr>
<td>Nocardofoform actinomycetes (Amycolatopsis spp and Crossiella equi)</td>
<td>62</td>
</tr>
<tr>
<td>Equine Arteritis Virus</td>
<td>42</td>
</tr>
<tr>
<td>Equine Herpesvirus 1</td>
<td>291</td>
</tr>
<tr>
<td>Equine Herpesvirus 2</td>
<td>99</td>
</tr>
<tr>
<td>Equine Herpesvirus 3</td>
<td>17</td>
</tr>
<tr>
<td>Equine Herpesvirus 4</td>
<td>121</td>
</tr>
<tr>
<td>Equine Herpesvirus 5</td>
<td>64</td>
</tr>
<tr>
<td>Equine Influenza</td>
<td>221</td>
</tr>
<tr>
<td>Equine Protozoal Myeloencephalitis</td>
<td>14</td>
</tr>
<tr>
<td>Lawsonia intracellularis</td>
<td>158</td>
</tr>
<tr>
<td>Leptospira</td>
<td>62</td>
</tr>
<tr>
<td>Mycobacterium paratuberculosis</td>
<td>87</td>
</tr>
<tr>
<td>Mycoplasma gallisepticum</td>
<td>99</td>
</tr>
<tr>
<td>Potomac Horse Fever</td>
<td>449</td>
</tr>
<tr>
<td>Salmonella</td>
<td>872</td>
</tr>
<tr>
<td>Streptococcus equi</td>
<td>669</td>
</tr>
<tr>
<td>Tritrichomonas foetus</td>
<td>145</td>
</tr>
</tbody>
</table>
Pathology
Dr. David Bolin, Section Head

The UKVDL pathology section is composed of seven faculty pathologists, a staff laboratory animal pathologist, one post-doctoral scholar (pathology residents), four histology technicians, four full-time necropsy technicians, and three part-time necropsy student workers. The pathologists perform complete necropsy examinations on animals, histopathology on necropsy cases, surgical biopsies, and cytological examinations, all submitted by veterinarians, producers, and pet owners. The pathologists are fully supported by the other laboratory sections in the necropsy investigations.

As part of the comprehensive necropsy examination, additional laboratory tests are ordered by the pathologist to aid in confirming a diagnosis. The abnormal findings on necropsy are correlated with other laboratory tests, including microscopic examination of the tissues, and a comprehensive report is prepared for every pathology case. Utilizing the abundant cases submitted to the VDL and the faculty expertise, the post-doctoral scholar (DVM) is trained in veterinary anatomic pathology in a three-year program. However, with the upcoming cooperative agreement to train Lincoln Memorial University DVM students, the post-doctoral residency program is being discontinued. Visiting senior veterinary students have extern rotations, and surgical residents visit to fulfill the pathology requirement for the American College of Veterinary Surgeons.

Highlights:

Necropsy Examinations--

Postmortem examinations (necropsies) are conducted on animals submitted to the VDL to identify any pathologic changes in the tissues that would indicate disease, injury, toxicosis, or any other abnormal process resulting in illness.

<table>
<thead>
<tr>
<th>Species</th>
<th># Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avian</td>
<td>115</td>
</tr>
<tr>
<td>Bovine</td>
<td>1,111</td>
</tr>
<tr>
<td>Caprine</td>
<td>80</td>
</tr>
<tr>
<td>Equine</td>
<td>1,480</td>
</tr>
<tr>
<td>Ovine</td>
<td>68</td>
</tr>
<tr>
<td>Porcine</td>
<td>30</td>
</tr>
<tr>
<td>Small animal</td>
<td>429</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>40</td>
</tr>
<tr>
<td>Laboratory animal</td>
<td>60</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,413</td>
</tr>
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</table>
Necropsy Examinations (Cont.)—

<table>
<thead>
<tr>
<th>Species</th>
<th>Necropsy Type</th>
<th># of Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Grey Parrot</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>1</td>
</tr>
<tr>
<td>Alpaca</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>13</td>
</tr>
<tr>
<td>Antilopine Kangaroo</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>2</td>
</tr>
<tr>
<td>Bovine</td>
<td>Gross Necropsy - Food Animal Adult</td>
<td>319</td>
</tr>
<tr>
<td>Bovine</td>
<td>Gross Necropsy - Food Animal Fetus/Neonate</td>
<td>710</td>
</tr>
<tr>
<td>Canine</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>242</td>
</tr>
<tr>
<td>Caprine</td>
<td>Gross Necropsy - Food Animal Adult</td>
<td>38</td>
</tr>
<tr>
<td>Caprine</td>
<td>Gross Necropsy - Food Animal Fetus/Neonate</td>
<td>45</td>
</tr>
<tr>
<td>Chicken</td>
<td>Gross Necropsy - Poultry (up to 3 birds)</td>
<td>128</td>
</tr>
<tr>
<td>Chinchilla</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>3</td>
</tr>
<tr>
<td>Deer</td>
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<td>6</td>
</tr>
<tr>
<td>Donkey</td>
<td>Gross Necropsy - Equine Adult</td>
<td>4</td>
</tr>
<tr>
<td>Donkey</td>
<td>Gross Necropsy - Equine Fetus/Foal</td>
<td>2</td>
</tr>
<tr>
<td>Elk</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>3</td>
</tr>
<tr>
<td>Emu</td>
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</tr>
<tr>
<td>Equine</td>
<td>Gross Necropsy - Equine Adult</td>
<td>538</td>
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<td>Equine</td>
<td>Gross Necropsy - Equine Fetus/Foal</td>
<td>750</td>
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<td>Gross Necropsy - Equine Placenta</td>
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<td>Gross Necropsy - Food Animal Adult</td>
<td>1</td>
</tr>
<tr>
<td>Equine</td>
<td>Gross Necropsy - Food Animal Fetus/Neonate</td>
<td>3</td>
</tr>
<tr>
<td>Felis</td>
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<td>87</td>
</tr>
<tr>
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<td>3</td>
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<tr>
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<tr>
<td>Hedgehog</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>1</td>
</tr>
<tr>
<td>Lion</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
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<tr>
<td>Llama</td>
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<td>6</td>
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<tr>
<td>Mouse</td>
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<tr>
<td>Ovine</td>
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<td>29</td>
</tr>
<tr>
<td>Ovine</td>
<td>Gross Necropsy - Food Animal Fetus/Neonate</td>
<td>37</td>
</tr>
<tr>
<td>Pigeon</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>2</td>
</tr>
<tr>
<td>Porcine</td>
<td>Gross Necropsy - Food Animal Fetus/Neonate</td>
<td>33</td>
</tr>
<tr>
<td>Quail</td>
<td>Gross Necropsy - Poultry (up to 3 birds)</td>
<td>24</td>
</tr>
<tr>
<td>Quail</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>2</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Gross Necropsy - Food Animal Fetus/Neonate</td>
<td>1</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>4</td>
</tr>
<tr>
<td>Raccoon</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>1</td>
</tr>
<tr>
<td>Rat</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>18</td>
</tr>
<tr>
<td>Ringnecked Parakeet</td>
<td>Gross Necropsy - Small Animal/Exotic Animal</td>
<td>1</td>
</tr>
</tbody>
</table>

Biopsies--

Tissue lesions are often removed surgically or portions biopsied from live animals and sent to the laboratory for determination of the type of process, recommended treatment, and potential prognosis. These tissue specimens are processed and microscopic slides prepared for the pathologists to examine by microscopy. Tissue specimens representing 3,149 cases were processed and examined. A report with diagnosis was produced for each case. Typical turn-around on these cases is 24 to 48 hours.
Cytologies--

Preparations of cells harvested and/or aspirated from abnormal lesions or abnormal fluids are placed on microscopic slides and stained for examination under the microscope by the pathologists. Cytopathological examinations were performed, diagnoses made, and reports generated for 483 cases.

Pathology, research animal (DLAR)--
Kathryn (Casey) Coyle

The research animal pathology service sees mostly small rodents and a variety of other species (see below) non-human primates, and pigs. There were 101 submissions from research animals during 2014 including clinical pathology samples, biopsies and necropsies. In addition to research animal work, Dr. Coyle is handling the diagnostic pathology case load for the agricultural research animals housed at the various UK farms.

<table>
<thead>
<tr>
<th>DLAR CASES</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cynomolgus monkey</td>
<td>1</td>
</tr>
<tr>
<td>Equine</td>
<td>1</td>
</tr>
<tr>
<td>Hamster</td>
<td>2</td>
</tr>
<tr>
<td>Mouse</td>
<td>46</td>
</tr>
<tr>
<td>Pigeon</td>
<td>1</td>
</tr>
<tr>
<td>Porcine</td>
<td>1</td>
</tr>
<tr>
<td>Quail</td>
<td>7</td>
</tr>
<tr>
<td>Rat</td>
<td>24</td>
</tr>
<tr>
<td>Salamander</td>
<td>2</td>
</tr>
<tr>
<td>Water</td>
<td>16</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>101</strong></td>
</tr>
</tbody>
</table>

Clinical Pathology Section
Bonnie L. Decker

The primary mission of the Clinical Pathology is to provide chemistry, hematology, endocrine, urinalysis, fluid analysis, fecal parasite exams, and other testing to animal owners, veterinarians and the agriculture community. The section also provides support and testing to UKVDL’s pathologists and testing related to necropsy as well as University of Kentucky equine and animal science researchers who can submit specimens to Clinical Pathology for monitoring various chemistry, hematology and endocrine levels in their research animals. Clinical Pathology hosts 2-3 Morehead State University veterinary technician students every year to help them complete their practicum.
The Clinical Pathology section completes its testing same day as receipt with a few exceptions to get information to the submitting veterinarian as soon as possible to aid in the treatment of their client’s animals. The department personnel consist of 1.50 FTE. A section chief with a BS MT (ASCP) and 40 years’ experience in veterinary and human diagnostic laboratory testing works full time. A part time veterinary technician with 21 years’ experience occupies the half-time position in the section. Other qualified UKVDL personnel are available for backup and consultation as needed.

Clinical pathology is dedicated to meeting the current and future needs of the agriculture community, companion animal community and veterinarians.

**Testing performed in 2015--**

<table>
<thead>
<tr>
<th>Test</th>
<th># Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovine Panel</td>
<td>358</td>
</tr>
<tr>
<td>Canine Panel</td>
<td>194</td>
</tr>
<tr>
<td>Caprine Panel</td>
<td>20</td>
</tr>
<tr>
<td>Chemistry Panel</td>
<td>61</td>
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<tr>
<td>Equine Panel</td>
<td>244</td>
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<tr>
<td>Feline Panel</td>
<td>54</td>
</tr>
<tr>
<td>Hepatic Panel</td>
<td>0</td>
</tr>
<tr>
<td>Porcine Panel</td>
<td>0</td>
</tr>
<tr>
<td>Renal Panel</td>
<td>4</td>
</tr>
<tr>
<td>Electrolyte Panel</td>
<td>6</td>
</tr>
<tr>
<td>Eye Fluid Panel</td>
<td>156</td>
</tr>
<tr>
<td>Fluid Exam</td>
<td>88</td>
</tr>
<tr>
<td>Urinalysis</td>
<td>88</td>
</tr>
<tr>
<td>CBC</td>
<td>496</td>
</tr>
<tr>
<td>CBC no diff</td>
<td>4</td>
</tr>
<tr>
<td>Differential Only</td>
<td>5</td>
</tr>
<tr>
<td>ACTH</td>
<td>18</td>
</tr>
<tr>
<td>K-9 TLI</td>
<td>6</td>
</tr>
<tr>
<td>T4</td>
<td>286</td>
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<tr>
<td>K-9 TSH</td>
<td>17</td>
</tr>
<tr>
<td>Cortisol</td>
<td>150</td>
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<tr>
<td>Cryptosporidia</td>
<td>63</td>
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<tr>
<td>Fecal Exam</td>
<td>918</td>
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<tr>
<td>Fibrinogen</td>
<td>115</td>
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<tr>
<td>Giardia Antigen</td>
<td>16</td>
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<tr>
<td>Parasite ID</td>
<td>0</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>202</td>
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</table>
The goal of the Quality Management System (QMS) is to ensure quality of all test results and continuous improvement of all services to clients. Our design of the QMS and Quality Assurance program is based on American Association of Veterinary Diagnostic Laboratory (AAVLD) requirements, International Standards Organization (ISO) guidelines and Organization of International Epizootics (OIE). In addition to fulfilling meeting these requirements, the UKVDL QMS helps fulfill the university’s mission of improving service delivery while achieving excellent human relations (internally and externally), sound leadership, and effective communications.

The Quality Assurance Section now consists of two employees, a Quality Assurance Manager and full-time Quality Assistant. The requirements for maintaining the QMS are continuously being updated. The Assistant Position was created to meet the increasing more stringent AAVLD Requirements, OIE, NAHLN and federal mandates.

Since 2010 UKVDL has been a part of the National Animal Health Laboratory Network (NAHLN). QA maintains UKVDL information on the NAHLN Portal. This portal provides information to NAHLN about the capacity of national laboratories in the event of a food animal outbreak. The section continues to prepare Quarterly Reports to the NAHLN and maintains the NAHLN Policies and Procedures.

To maintain conformance to all requirements, the QA Manager attended Quality Assurance Committee Meeting at the annual AAVLD meeting and also attended AAVLD auditor training. The QA Manager and Assistant attended a 4 day seminar at the USDA/NVSL facility about Quality Management System.

The Quality Assurance Section has implemented new Quality system software. This software has improved document control, streamlined internal audits, improved equipment inventory, improved Competency and Training Assessments and improved Corrective Action investigations. Quality Assurance will continue to monitor and update policies and procedures to meet the AAVLD Requirements. Two members of the AAVLD Accreditation team are scheduled to revisit UKVDL in 2016 to assure compliance with all non-conformance findings from the 2014 full Accreditation team visit.
Ruminant Extension

Dr. L. Michelle Arnold

The Ruminant Extension Veterinarian works closely with the College of Agriculture, Food and Environment (CAFE) faculty, UKVDL faculty and clients, county extension agents, producer organizations, state livestock commodity specialists, and state and federal regulatory agencies regarding all veterinary ruminant health issues. Perhaps most important is outreach to food animal veterinarians through regular continuing education programs, newsletters, and animal health bulletins. In addition, by developing this close working relationship between practicing veterinarians and UKVDL faculty, better diagnostic work-ups on challenging diagnostic cases and complex investigations result in more definitive answers for the producers of Kentucky.

I consider the entire network of industry stakeholders to be partners with me in lowering morbidity and mortality rates, attaining higher rates of production, and adding more pounds sold to return profits throughout the agricultural community. I continue to be involved in collaborative research projects within the University with the dairy, beef and small ruminant industries, especially those involving diagnostic veterinary medicine.

The livestock disease risk and occurrence, its diagnosis, treatment, prevention and control form the core of the information disseminated from this position. New University research, governmental directives, and other stakeholder concerns are also communicated broadly for discussion and action to benefit producers throughout Kentucky.

Highlights

- Updated and presented the herd health portion of Master Cattleman in 11 regions and 2 Master Grazer sessions. These programs directly affected many farming enterprises representing significant numbers of KY cattle.

- Hosted two well-attended food animal veterinary continuing education meetings at the diagnostic laboratory (UKVDL) and one at the Breathitt Veterinary Center (BVC). A total of 24 hours of continuing education was made available to food animal veterinarians at no cost to them. Outside sponsors covered the costs of the events. The Winter CE meeting at the UKVDL was sponsored by Zoetis Animal Health. Fifty-seven food animal veterinarians attended the winter meeting. A summer meeting was held in August at the UKVDL sponsored by Boehringer Ingelheim Animal Health. Seventy-nine were in attendance. The final CE meeting was held at Breathitt Veterinary Center in November. Bayer Animal Health sponsored the event that was attended by 39 food animal veterinarians primarily from the western portion of the state.
- Pasture to Plate is a new demonstration/educational effort to increase the knowledge base of producers on all aspects of cattle production from genetics to consumers. The overall goal of this program is for cattlemen to learn and experience all phases of feeder calf growth from feeder through the eating experience. Topics covered in the program included receiving programs, feeding to finish programs, nutrient management, live animal evaluation, carcass evaluation, taste panel evaluation, consumer preferences and healthfulness of beef. Dr. Arnold developed and presented the health modules for six sessions.

- Continued to work with the Extension Dairy Specialist, Dr. Jeffrey Bewley, teaching the "Cow Signals" training course for dairy producers. This program originated in the Netherlands and teaches how to read the body language of cows to improve management techniques.

- Dr. Arnold continued to teach the health portion of the undergraduate classes in beef and dairy science and a veterinary lecture to the careers class.

- Continued development of the new extension program: Improving Reproductive Efficiency in Beef Cattle in Northern KY with Drs. Les Anderson, Jeff Lehmkuehler, and Darrh Bullock. These meetings are very specific and target one topic with extensive question and answer periods. This year the program expanded into Eastern KY. The herd health portion is an in-depth examination of vaccination protocols, abortion diagnostics, and pre- and post-calving problems. This is a unique program of classroom sessions, field day demonstrations, and on-farm case studies.

- Dr. Arnold published several fact sheets on Forage Related Cattle Disorders. These include: Staggers (Tremorgenic Syndrome) (Vet-35), Acute or Atypical Interstitial Pneumonia (AIP) with Dr. Jeff Lehmkuehler (Animal Science) (ID-231), and Slaframine Toxicosis or “Slobbers” in cattle and horses with Dr. Ray Smith (Animal Science) (ID-230).

- Joined the BVD Task Force at the request of the KY State Veterinarian (Dr. Stout) to discuss BVD PI testing and the new law regarding the movement of positive calves as well as brainstorm long term solutions.

- Participated in numerous field days, producer meetings and farm visits throughout the state to educate producers in best management practices, identify existing problems and promote prevention through realistic on-farm changes.

- Dr. Arnold writes a monthly health article for Cow Country News, the newsletter of the KY Cattlemen’s Association. In addition, Dr. Arnold is a regular contributor to the KVMA newsletter, Off the Hoof (UK Beef
electronic newsletter), and KY Dairy Notes (UK Dairy electronic newsletter).

- Dr. Arnold educated producers, extension personnel and veterinarians about the new Veterinary Feed Directive. This new government strategy, scheduled to begin January 2017, will affect the way antibiotics administered through the feed or water are sold to the public and change the labeled indications for these products.

- Continued to serve as the attending IACUC veterinarian for the UK Swine Unit and attending veterinarian on several research projects. Dr. Arnold also serves on two graduate committees for PhD candidates.

- Continued to expand the database of food animal veterinarians with email addresses and cell phone numbers to enhance the speed of communication and decrease postal expenses. The list currently has approximately 400 veterinarians and 288 veterinary clinics.

- Participated in producer meetings, conference calls, and program development with faculty from 6 southeastern land grant institutions funded by the Southeast Quality Milk Initiative (SQMI) grant. This is a multi-state grant for $3M over a 5 year funding period that began in February 2013. Dr. Arnold spoke and helped coordinate the two-day SQMI Annual Meeting held in Russellville, KY. The University of Kentucky prints and distributes the SQMI Quarterly Newsletter to veterinarians throughout the Southeast identified as active in dairy practice.

- Managed cases at the UK Veterinary Diagnostic Laboratory including recording in-depth histories, determining necessary tests, participating in complex disease investigations, and interpretation and communication of results to veterinarians and producers.

Kentucky veterinarians, extension agents, producers, government entities and the University benefit from a strong livestock sector and health is a major component. In 2015, this position served to reach each of these stakeholders for the overall improvement of livestock health and sustainability of the food animal veterinary profession.

Serology

Meg Steinman, Section Head

The mission of the Serology Section is to provide accurate and timely results for both diagnostic and regulatory testing. The results generated provide veterinarians and regulatory personnel with data upon which to base their decisions. This section offers a wide variety of tests by various types of methodologies; the tests and numbers listed below are just a sampling.
Poultry: This section participates in annual USDA audits to maintain status as an NPIP approved laboratory. Personnel from this section have attended National Poultry Improvement Plan (NPIP) approved training courses. In 2015 the serology laboratory tested 11,482 samples for antibody to Avian Influenza, 21,876 samples for antibody to *Salmonella pullorum*, 30,615 samples for antibody to *Mycoplasma gallisepticum*, and 30,615 samples for *Mycoplasma synoviae*.

Equines: This section successfully passed USDA-APHIS audits and proficiency tests to continue to offer Equine Infectious Anemia (EIA) antibody testing and piroplasmosis testing. In 2015, we ran 15,327 ELISA and 408 AGID EIA tests. The serology section continues to monitor equines moving through the state stockyards for EIA antibody, testing 3,221 specimens. All employees of this section passed the required NVSL proficiency testing for piroplasmosis testing *Babesia caballi* (391 samples) and *Theileria equi* (391 samples). We tested 1,145 serum samples for antibody to Contagious Equine Metritis (CEM-CF). Serology performs antibody screening tests for Leptospira in equines for diagnostic and regulatory purposes. In 2015, we tested approximately 5,100 serums.

Bovines: The serology section offers a variety of antibody tests performed on serum from bovines and other ruminant species. In 2015 we began to offer a serum test on ruminants to determine pregnancy status and tested 1,397 samples. Other testing done include 524 specimens for antibodies to *Anaplasma marginale*, 99 specimens for antibody to Bluetongue virus, 127 samples for EHD antibody, 377 specimens for antibodies to the Bovine Leukemia Virus, 1,625 serums for Johne's (*Mycobacterium paratuberculosis*) antibodies, approximately 500 samples for Leptospira antibodies, and 359 specimens for antibody to *Neospora caninum*. This lab is also active in regulatory screening for antibodies to *Brucella abortus*, testing approximately 1,100 samples.

Small ruminants: The serology section runs testing on small ruminants, including *Brucella melitensis* (50) and small lentivirus virus antibody (279).

Canine and feline: This section offers a variety of tests that can be run on dogs and cats. In 2015 the lab was requested to offer a rapid test to determine pregnancy. We began offering a rapid test to determine pregnancy, and hope to begin getting requests. A few examples of the testing done in 2015 include 123 for antibodies to histoplasmosis and blastomycoses. Serology also offers *Brucella canis testing*, an important test for breeding, and tested 99 samples. We also are running tests for Lyme Disease, Canine heartworm, *Ehrlichia* and *Anaplasma*, testing 31 samples. Feline testing offered includes FIP testing (35 tests), FeLV (40), FIV (38) and Toxoplasmosis (135 tests). This is just a sampling of the tests we run for these species.
Porcine: This section also offers regulatory testing for swine. In 2015 we tested 125 samples for Pseudorabies and Brucella antibodies.

Section Head Additional Activities:

- Meg Steinman serves on a National Animal Health Laboratory Network Exercises and Drills Working Group. The purpose of this group is to develop exercises to help prepare for a disease outbreak in the food animal. This year the committee developed a training exercise to determine a laboratory’s ability to implement a response plan to keep the food supply safe. Findings from the exercises will help determine the strengths and weaknesses of the individual laboratory, and identify what needs to be in place to help respond.
- Meg Steinman is a member of the Poultry Health Advisory Board for KY. Meetings this year centered around the outbreak of AI that occurred and plans for managing should an outbreak hit KY.

Toxicology

Dr. Cynthia L. Gaskill, Section Head

The primary mission of the UKVDL Toxicology section is to provide toxicological diagnostic testing capabilities and consultations to Kentucky veterinarians, UKVDL pathologists, county extension agents, livestock producers, pet owners, state officials, and others. A large variety of toxicological tests are available, including analyses for metals and minerals; organic compounds including a multitude of pesticides, drugs and other chemicals; biological toxicants such as plant, insect, bacterial and fungal toxins; and numerous other toxicants. Tests are performed in tissues, gastrointestinal contents, biological fluids, baits, feeds, forages, water, soil, and many other substances.

Consultation services include assistance with therapeutic advice, differential diagnoses, residue considerations, toxicological risk assessments, determination of appropriate tests, appropriate sample collection and submission recommendations, interpretation of analytical results, and other general toxicological information. Alerts, updates and toxicological information regarding cases of poisoning or contaminated animal feeds are also provided to the State Veterinarian’s office.

The Toxicology section personnel consist of Cynthia Gaskill, DVM PhD ABVT, clinical veterinary toxicologist and section head; Lori Smith, PhD, senior analytical chemist; Michelle Helm, BSc, technician; Kyle Francis, MSc, research analyst; Joseph Johnson, BSc, research analyst; Boying Liang, PhD, post-doctoral scholar, and student interns.

Highlights

- In 2015, the Toxicology section handled a number of herd food animal poisoning cases involving toxicants such as arsenic, lead and organochlorine pesticides. We worked in cooperation with state and federal agencies for
these cases. We provided analyses of blood, tissues and feeds to evaluate herd animals for evidence of exposure, and source and tissue residue information to assist the state veterinarian with quarantine/withholding time decisions, and provided toxicological information related to toxicokinetics, environmental considerations, treatments, and other considerations. This work helped prevent contamination of the human food supply.

• The most common causes of poisoning diagnosed at the UKVDL in 2015 included:
  - **Cattle, sheep, goats:** Yew (Taxus), nitrate, arsenic, botulism, sodium, lead, organochlorine pesticides, copper, cyanide, poison hemlock, sulfur, ionophores, buckeye
  - **Horses:** Botulism, yew (Taxus)
  - **Dogs and cats:** Anticoagulant rodenticides, bromethalin, ivermectin, carbofuran, ethylene glycol, lead

• We received continued funding from several federal and other grants, totaling over $150,000 for this calendar year (total funding of $675,000 over several years). This funding provides support for instrumentation, personnel, and supplies to develop analytical methods and complete inter-laboratory validations studies, to investigate poison cases involving drugs and feeds, and to develop methods to detect fescue-associated toxicants in biological samples. Our FDA grants involves collaboration with several veterinary diagnostic laboratories including the Davis California Animal Health and Food Safety laboratory, Iowa State University Veterinary Diagnostic laboratory, the Washington Animal Disease Diagnostic Laboratory, and others.

• We hired 2 additional full time analysts (Kyle Francis and Joseph Johnson) using grant funding

• We provided serum and plasma cobalt analyses for several horse racing jurisdictions. We performed over 4,500 cobalt analyses in 2015.

• New ICP-MS and UPLC instrumentation was installed which will increase our analytical capabilities, shorten analytical test run times, and free up instrument time for method development.

• Several new methods were developed and validated including an anticoagulant rodenticide screen in liver tissue and fumonisins B1 and B2 in feeds.

• We hosted student interns from the Forensic Science Internship program at Eastern Kentucky University and a post-doctoral scholar.

• Our post-doctoral scholar, Dr. Boying Liang, won an American Association of Veterinary Laboratory Diagnosticians (AAVLD) Trainee Travel Award to present her work at the 2015 AAVLD conference in Rhode Island.
• We continued providing forage ergovaline analyses for the University of Kentucky Pasture Evaluation program and for producers and UK extension agents.

• We participate in numerous proficiency programs to ensure quality results, and revised and reviewed a number of Toxicology Standard Operating Procedures.

The UKVDL Toxicology section participated in several additional research projects directly applicable to improvements in diagnostic offerings. Funding from these projects helped support instrumentation and personnel also used for diagnostic purposes. 2015 projects included:

• Completion of a study investigating moxidectin concentrations in brain tissue and serum in horses post-therapeutic dosing to help with diagnostic interpretation.
• Evaluation of Kentucky barn owls for evidence of chemical contaminations.
• Strontium concentrations in serum samples post-dosing in horses.
• Serum bromide concentrations in Idaho cattle exposed to forages contaminated with methyl bromide.
• Liver metal concentrations in Kentucky racehorse break-down cases

<table>
<thead>
<tr>
<th>2015 TOXICOLOGY TESTS</th>
<th>Total number of analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulant rodenticide panel – Liver. Panel includes analyses for 8 ACR compounds. LC-MS/MS method</td>
<td>104</td>
</tr>
<tr>
<td>Arsenic - whole blood. ICP-MS method</td>
<td>180</td>
</tr>
<tr>
<td>Bromide – serum. IC method</td>
<td>139</td>
</tr>
<tr>
<td>Clostridium botulinum – sent to referral lab. PCR method</td>
<td>16</td>
</tr>
<tr>
<td>Cobalt – serum, plasma, blood. ICP-MS method</td>
<td>4,547</td>
</tr>
<tr>
<td>Ergovaline – UPLC method</td>
<td>291</td>
</tr>
<tr>
<td>Ethylene glycol/glycolic acid panel – GC/FID method</td>
<td>8</td>
</tr>
<tr>
<td>GC/MS organic compound screen</td>
<td>68</td>
</tr>
<tr>
<td>Lead – whole blood. ICP-MS and anodic stripping voltammetry methods</td>
<td>70</td>
</tr>
<tr>
<td>Metal panels – liver and kidney tissue, blood, feeds, water, environmental samples. Panel includes analyses for 14 different inorganic elements. ICP-MS method</td>
<td>2,548</td>
</tr>
</tbody>
</table>
Trace mineral panels – liver and serum. Panel includes analyses for 7 trace elements. ICP-MS method 2,758

Moisture contents – forages 48

Mycotoxin panel – feeds. Panel includes analyses for 6 mycotoxins. HPLC and GC methods 24

Nitrate/nitrite panel – ocular fluid, serum, water, forages, other. IC and colorimetric methods 394

pH – forage, rumen contents, other samples. pH meter 29

Plant ID 6

Selenium – serum, blood. ICP-MS method 122

Sodium – brain. ICP-MS method 8

Strontium – serum. ICP-MS method 150

Other tests (misc. tests including those with < 4 requests each). Various methods 87

**TOTAL NUMBER OF ANALYSES:** 11,597

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**Epidemiology**  
*Dr. Jacqueline L. Smith, Section Head*

The UKVDL Epidemiology section plans and conducts veterinary epidemiological research experiments that lead to the earliest detection of animal disease outbreaks, with our primary mission being to provide animal disease surveillance, and assist veterinarians in the investigation of serious and unusual disease problems. Daily monitoring of finalized necropsy and lab testing data streams provide near real-time disease cluster analysis.

The section also conducts data acquisition and statistical analysis in support of the Office of the State Veterinarian, USDA, and to provide animal health situational awareness for industry stakeholders. Many of these studies lead to publication in peer-reviewed journals and lay publications. Disease reporting to the state veterinarian (reportable infectious diseases, disease of interest, emergency disease notification) is performed weekly for the typical endemic diseases, while unusual or emergency disease situations are reported immediately.

In-depth field investigations to better characterize disease outbreaks for identifying causative etiology through the collection of diagnostic specimens and recommending diagnostic testing are provided free of charge to any farm/producer in the state of Kentucky at the request of a local client with the approval of the UKVDL administration.
**Highlights**

- Conducted 261 telephone consults regarding suggestions, recommendations and information related to animal health issues.
- Statistical requests (from UKVDL faculty, UK faculty, state and federal officials, local veterinarian) - 197 requests (1-10 hrs each)
- Graphics requests: 173 (2-10 hrs each)
- Reportable disease reports sent: 52 weekly reports (approximately 1hr each week)
UK Veterinary Diagnostic Laboratory Faculty and Professional Veterinary Scientists
2015

Arnold, Michelle, DVM, ABVP Ruminant Veterinarian, Associate Professor
Bryant, U.K., DVM, Associate Professor
Bolin, D.C., DVM, PhD, DACVP, Associate Professor
Carter, C.N., DVM, MS, PhD, DACPVM, DSNAP, Professor and Director (R)
Cassone, L.M.C., BS, DVM, DACVP, Assistant Professor
Coyle, Kathryn, DVM, DACVP, Laboratory Animal Pathology Service
Erdal Erol, DVM MS PhD, Associate Professor & Head, Diagnostic Microbiology
Gaskill, C.L., DVM, PhD, Associate Professor
Jackson, C.B., DVM, DACVP, DACPVM, Professor
Janes, Jennifer, DVM PhD, DACVP, Assistant Professor
Kennedy, L.A., DVM, ACVP, Assistant Professor
Loynachan, A.T., BS, DVM, PhD, Associate Professor
Maples, Deborah, DVM, Head, Diagnostic Services
Smith, Jacqueline, MS PhD, Section Head, Epidemiology
**Books and Book Chapters:**


**Refereed Journal Publications**


Erol E, Jackson C, Horohov D, Locke S, Smith J, Carter CN: Elevated serum amyloid A levels in cases of aborted equine fetuses due to fetal and placental infections, Submitted to Theriogenology.

Velineni S, Timoney J; Artiushin S; Donahue M; Steinman M: Multiple specificities of IgM in equine fetuses infected with *Leptospira interrogans* indicate a competent immune response, under review.

**Abstracts/Posters**


Carossino M, AT Loynachan, JR Campos, B Nam, IF Canisso, YY Go, PJ Timoney, KM Shuck, P Henney, MH Troedsson, RF Cook, T Swerczek, EL Squires, E Bailey and UBR Balasuriya. Sites of equine arteritis virus persistence in the stallion’s reproductive tract and characterization of the local inflammatory response to the virus. Conference of Research Workers in Animal Disease (CRWAD), Chicago, IL USA. 2015.


Francis KA, Smith LL, Gaskill CL. *Applied mass spectrometry in veterinary diagnostic testing.* Presented by KF at the Ohio Mass Spectrometry Symposium, Columbus Ohio, May 2015

Janes JG, Kennedy LA, Garrett KS. Observation of pre-existing lesions of the third metacarpal and metatarsal bone in Thoroughbred catastrophic breakdown


Kennedy L. The Kentucky Horse Racing Necropsy Program: An Integrative Approach to the Investigation of Catastrophic Injuries in Thoroughbred Racehorses. American College Of Veterinary Pathologists, annual meeting, Minneapolis MN, October 2015.


Liang B, Smith LL, Gaskill CL. Quantitation of eight anticoagulant rodenticides in animal liver by LC-MS/MS with a d-SPE clean-up method. Presented by LS; abstract in Proceedings, 58th AAVLD Annual conference, Providence Rhode Island, Oct 2015


Presentations

Arnold LM. Cow Signals. Barren County (1/6/15) and Adair County (1/29/15) Dairy Meetings.


Arnold LM. *Pasture to Plate Health Considerations* at Princeton (5/26/15 and 9/29/15)), Eden Shale (5/27/15 and 9/30/15), and Morgan County (10/1/15).


Arnold LM. *Preparing for the Veterinary Feed Directive*. Appalachian Cow-Calf Conference. Morehead, KY (11/7/15) and Morehead Cattle Producers Meeting (12/17/15) at Dickerson Agricultural Complex, MSU.


Carter CN, *Equine Leptospirosis: We now have a vaccine!* Presented to the 7th Annual Kentucky Breeders Short Course, Fayette County Extension Office, Lexington, KY Saturday January 20, 2016.

Carter CN, *Public Health Contributions of Veterinary Diagnostic Laboratories*, 1st annual meeting of the Center for Animal Health in Appalachia, Lincoln Memorial University College of Veterinary Medicine, Ewing, VA, Oct 2015.


Carter CN, *Overview of the DVM Training Programs by the University of Kentucky in support of the Lincoln Memorial University (LMU) College of Veterinary Medicine*. Presented to the LMU Dean, faculty and staff, Jul 28, 2015

Gaskill CL. *Introduction to the UKVDL and veterinary toxicology*. Presentation for the Franklin county 4-H Livestock club and FFA, UKVDL, May 2015

Gaskill CL. *Poisonous pasture plants and horses*. Presentation for the UK Cooperative Extension service Pastures Please program, Lexington, KY, Feb. 2015


Gaskill CL. *Update on the illicit use of cobalt in racehorses*. Presentation for the 4th Annual UK Equine Showcase, Lexington KY, Jan 2015
Gaskill CL, Lea K, Smith L, Coleman R, Smith RS. Tall fescue ergovaline concentration based on sample handling and storage method. Presented by CG at the AOAC International Midwest meeting, Bozeman MT, June 2015

Gaskill CL. Update on moxidectin poisoning in horses. Presentation for the 4th Annual UK Equine Showcase, Lexington KY, Jan 2015

Jackson, C. Zika Virus Update, Kentucky One Health Meeting, Kentucky Horse Park, Lexington, KY 20 Aug 15.

Loynachan AT. Concurrent Equine herpesvirus 1 and Clostridium piliforme hepatitis in a foal. 58th Annual AAVLD/USAHA Meeting. Providence, RI USA. 2015.

Lay/Extension Publications

Carter CN: Editor, Diagnostic Laboratory Rounds. Kentucky Veterinary News, Spring, Summer, Fall, Winter, 2015 editions.


Arnold, L.M. and Jeff Lehmkuhler. 2015. Forage Related Cattle Disorders: Acute or Atypical Interstitial Pneumonia (AIP). University of Kentucky College of Agriculture, Food and Environment Extension Factsheet. ID-231.

Arnold, L.M. 2015. Preventing Neonatal calf Diarrhea or “Calf Scours”. Off the Hoof (December).


Manifestations of Equine Herpesvirus-1”, Equine Disease Quarterly, October 2015


### Research Projects


Davis C, Steinman, M. Chagas Titors in Canines Samples in the state of KY, Western Kentucky University.
Gaskill CL, Smith LL. Validation of LC-MS/MS analyses of animal tissue and feed matrices for toxicants. FDA Vet-LIRN. $494,980. 2013-2018

Gaskill CL, Smith LL. Fescue associated alkaloids in tissues and forages. USDA ARS SCA. $69,000. 2013-2015

Gaskill CL, Erol E, Carter CN. FDA Vet-LIRN veterinary diagnostic laboratory cooperative agreement program funding to increase sample analyses in the event of animal food or drug related illness. FDA Vet-LIRN. $82,500. 2012-2017

Gaskill CL, Erdal E, Carter CN. FDA Vet-LIRN veterinary diagnostic laboratory cooperative agreement program funding travel supplement. FDA Vet-LIRN. $5,000 2015-2016

Janes JG, MacLeod JN, Reed SM. Identifying Genetic Determinants in Wobbler Syndrome. Co-principal investigator. Gluck Equine Research Foundation Fall Cycle. 2015-2016. $25,000.


Genbank Register

None submitted

Patent's/Copyrights

Utility patent update, Aug 2015: Carter CN; Smith J

January 31, 2014

VIA EMAIL CORRESPONDENCE

Mr. Donald G. Keach
Intellectual Property Development Director
University of Kentucky Intellectual Property Development Office
A144 ASTeCC
Lexington, KY 40506-0286

Title: Health Monitoring System
Serial No.: 14/161,277
Filed: January 22, 2014
Inventors: CARTER, et al.
Our Docket No.: 13177N/1821US
Your Ref No.: UKR/1821