A Message from the Director

The Veterinary Medical Diagnostic Laboratory (VMDL) Annual Report - 2014 is a compilation of data from Jan 1, 2014 to Dec 30, 2014. To monitor caseload, testing data from 2010 to 2013 are also included in this report. I hope this report provides you with a basic understanding of laboratory operations and an appreciation for the capacity and capability of our laboratory. I also hope you are encouraged by our achievements in service, teaching, and scholarly activity.

In 2014, several faculty and staff members emerged as section leaders, managers, or program coordinators. The VMDL renewed its membership with National Animal Health Response Network (NALHN) and became a Tier I Lab of Food and Drug Administration Veterinary Response Network (FDA Vet-LRN). The VMDL received 37,666 accessions and performed approximately 85,000 tests. VMDL faculty and staff taught 37 professional, graduate, and undergraduate courses and 17 clinical/diagnostic rounds. VMDL faculty and staff secured a number of extramural ($500,000) and intramural grants, published 44 peer reviewed papers and 1 book chapter, and gave 36 presentations at regional and national meetings.

In summary, VMDL faculty and staff strive to provide relevant, timely, and cost-effective diagnostic service to our clients and create a positive learning environment for our students. Over the past two years, we have been working closely with the American Association of Veterinary Laboratory Diagnosticians (AAVLD) Accreditation Committee to implement an effective Quality Assurance and Quality Control Program. Significant progress has been made in many areas of our laboratory.

Shuping Zhang, Professor and Director

April 9, 2015
The Veterinary Medical Diagnostic Laboratory (VMDL) Mission Statement

To provide appropriate and timely diagnostic support to veterinary practitioners, livestock and poultry interests, companion animal interests, wildlife conservationists, and state-federal regulatory officials.

To monitor domestic animals, indigenous wildlife, and zoo animals for diseases that are a threat to livestock health and public health.

To support the teaching mission of the College of Veterinary Medicine.

To create new knowledge through fundamental and translational research.

VMDL Advisory Board Mission Statement

To advise VMDL management on policies, long-term developmental strategies, and collaborations with relevant university, private, state, national and international organizations.

VMDL Advisory Board Membership

The Advisory Board consists of 12 members representing the State Veterinarian’s office, commodity groups, small animal practice, large animal practice, and the Veterinary Medical Teaching Hospital.

VMDL Advisory Board Members

Linda Hickam, DVM, State Veterinarian
Tony Martin, DVM, Director of Animal Health, MFA, Inc.
Don Nikodim, Executive Vice President, Missouri Pork Association
Steve Patterson, DVM, Bethel, MO
Kabel Robbins, DVM, Butterball, LLC
Steve Strubberg, DVM, Hermann, MO
Chuck Massengill, DVM, Missouri Cattlemen’s Association
Bruce Addison, President of Addison Biological Laboratory, Inc.
David Wilson, DVM, VMTH Director
Amy DeClue, DVM, VMTH Small Animal Service
Phillip Johnson, DVM, VMTH Equine Service
John Middleton, DVM, VMTH Food Animal Service
VMDL Organizational Structure

VMDL Section Leaders/Managers
Avian Diagnostics – Dr. Dan Shaw
Anatomical Pathology – Dr. Gayle Johnson
Bacteriology/Mycology – Dr. Bill Fales/Irene Ganjam
Business Office – Mr. Mike Wimmenauer
Clinical Pathology – Dr. Marlyn Whitney/ Cheryl Rojas
Director’s Office – Ms. Geri Hegstad
Histology – Dr. Dae-Young Kim/Candace Kassel
Molecular Diagnostics/Serology – Dr. Susan Schommer
Quality Assurance – Dr. Tom Reilly/Susan Martin
Sample Receiving – Ms. Geri Hegstad
Virology – Dr. Jeff Mitchell
Toxicology – Dr. Tim Evans

VMDL Program Coordinators
Anatomical Pathology Residency Program – Dr. Kei Kuroki
Clinical Pathology Residency Program – Dr. Charles Wiedmeyer
Equine Diagnostic Investigations – Dr. Fred Williams III
Food Animal Diagnostic Investigations – Dr. Tim Evans
Neuropathology and Oncopathology – Dr. Gale Johnson
Small Animal Internal Medicine Pathology – Dr. Dae-Young Kim
VMDL - A Member of National Animal Health Laboratory Network (NAHLN)

VMDL - A Tier I Member of FDA Veterinary Laboratory Response Network (VET-LRN)
### VMDL Service Activities

#### Five Year VMDL Clinical Pathology Accession/Specimen/Test

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>AVIAN</th>
<th>BOVINE</th>
<th>CANINE</th>
<th>CAPRINE</th>
<th>EQUINE</th>
<th>FELINE</th>
<th>MISC</th>
<th>OVINE</th>
<th>PORCINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>12,568</td>
<td>21</td>
<td>129</td>
<td>9,425</td>
<td>49</td>
<td>949</td>
<td>1,833</td>
<td>135</td>
<td>3</td>
<td>24</td>
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<tr>
<td>2011</td>
<td>12,401</td>
<td>16</td>
<td>129</td>
<td>9,484</td>
<td>44</td>
<td>849</td>
<td>1,699</td>
<td>102</td>
<td>66</td>
<td>12</td>
</tr>
<tr>
<td>2012</td>
<td>12,792</td>
<td>34</td>
<td>105</td>
<td>9,917</td>
<td>38</td>
<td>943</td>
<td>1,647</td>
<td>78</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>2013</td>
<td>13,334</td>
<td>31</td>
<td>71</td>
<td>10,394</td>
<td>46</td>
<td>965</td>
<td>1,728</td>
<td>74</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>2014</td>
<td>13,235</td>
<td>72</td>
<td>121</td>
<td>10,422</td>
<td>48</td>
<td>1,009</td>
<td>1,480</td>
<td>46</td>
<td>16</td>
<td>21</td>
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#### Five Year VMDL Main Lab Accessions

<table>
<thead>
<tr>
<th>Year</th>
<th>Accession</th>
<th>Number of Accessions (% of Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MO (81%)  VMTH (14%)  Research (1%)  Other (&lt;1%)</td>
</tr>
<tr>
<td>2010</td>
<td>24,047</td>
<td>19,443 (81%)  3,169 (13%)  1,344 (6%)  91 (&lt;1%)</td>
</tr>
<tr>
<td>2011</td>
<td>24,431</td>
<td>19,791 (81%)  3,516 (14%)  1,402 (6%)  201 (1%)</td>
</tr>
<tr>
<td>2012</td>
<td>24,923</td>
<td>19,911 (80%)  3,326 (13%)  1,451 (6%)  235 (1%)</td>
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<tr>
<td>2013</td>
<td>25,165</td>
<td>20,081 (80%)  3,126 (12%)  1,867 (7%)  91 (&lt;1%)</td>
</tr>
<tr>
<td>2014</td>
<td>24,431 (-734)</td>
<td>19,733 (81%)  3,241 (13%)  1,378 (6%)  79 (&lt;1%)</td>
</tr>
</tbody>
</table>

#### Five Year VMDL Main Lab Specimens by Species

<table>
<thead>
<tr>
<th>Year</th>
<th>AVIAN</th>
<th>BOVINE</th>
<th>CANINE</th>
<th>CAPRINE</th>
<th>EQUINE</th>
<th>FELINE</th>
<th>MISC</th>
<th>NON-ANIMAL</th>
<th>OVINE</th>
<th>PORCINE</th>
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<tbody>
<tr>
<td>2010</td>
<td>9,235</td>
<td>10,826</td>
<td>11,472</td>
<td>784</td>
<td>7,449</td>
<td>2,395</td>
<td>1,642</td>
<td>853</td>
<td>66</td>
<td>2,488</td>
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<tr>
<td>2011</td>
<td>6,974</td>
<td>15,397</td>
<td>23,734</td>
<td>1,116</td>
<td>10,340</td>
<td>4,707</td>
<td>2,663</td>
<td>843</td>
<td>365</td>
<td>3,891</td>
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<tr>
<td>2012</td>
<td>6,654</td>
<td>16,120</td>
<td>24,555</td>
<td>2,457</td>
<td>11,232</td>
<td>4,396</td>
<td>3,013</td>
<td>1,112</td>
<td>636</td>
<td>3,726</td>
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<tr>
<td>2013</td>
<td>6,523</td>
<td>14,528</td>
<td>25,779</td>
<td>1,603</td>
<td>10,374</td>
<td>5,024</td>
<td>3,267</td>
<td>1,273</td>
<td>356</td>
<td>4,509</td>
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<tr>
<td>2014</td>
<td>5,712</td>
<td>15,685</td>
<td>24,999</td>
<td>1,232</td>
<td>9,029</td>
<td>4,428</td>
<td>3,156</td>
<td>1,576</td>
<td>446</td>
<td>4,185</td>
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</tbody>
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## Distribution of Specimens by Species

Five Year VMDL Main Lab Cases (Tests) by Section
(Testing details are available in VMDL Annual Report Saved on CVM Shared Drive)

<table>
<thead>
<tr>
<th>Year</th>
<th>Avian</th>
<th>Bacti</th>
<th>Clin Path</th>
<th>Ana Path</th>
<th>Molecular</th>
<th>Ser</th>
<th>Vir</th>
<th>Tox</th>
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<tbody>
<tr>
<td>2010</td>
<td>334</td>
<td>5,225</td>
<td>2,994</td>
<td>7,842</td>
<td>2,344</td>
<td>6,535</td>
<td>195</td>
<td>567</td>
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<tr>
<td></td>
<td>(2,426)</td>
<td>(15,932)</td>
<td>(6,411)</td>
<td>(11,187)</td>
<td>(7,676)</td>
<td>(15,306)</td>
<td>(522)</td>
<td>(1,276)</td>
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<tr>
<td>2011</td>
<td>634</td>
<td>9,882</td>
<td>4,605</td>
<td>20,649</td>
<td>7,930</td>
<td>7,837</td>
<td>200</td>
<td>524</td>
</tr>
<tr>
<td></td>
<td>(2,247)</td>
<td>(11,155)</td>
<td>(4,605)</td>
<td>(23,115)</td>
<td>(7,930)</td>
<td>(12,944)</td>
<td>(299)</td>
<td>(894)</td>
</tr>
<tr>
<td>2012</td>
<td>922</td>
<td>13,525</td>
<td>4,361</td>
<td>18,830</td>
<td>4,978</td>
<td>7,863</td>
<td>291</td>
<td>749</td>
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<tr>
<td></td>
<td>(2,490)</td>
<td>(19,102)</td>
<td>(5,258)</td>
<td>(22,062)</td>
<td>(9,498)</td>
<td>(13,723)</td>
<td>(491)</td>
<td>(1,277)</td>
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<tr>
<td>2013</td>
<td>792</td>
<td>13,937</td>
<td>5,435</td>
<td>20,743</td>
<td>4,821</td>
<td>7,956</td>
<td>244</td>
<td>682</td>
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<tr>
<td></td>
<td>(2,535)</td>
<td>(18,953)</td>
<td>(6,789)</td>
<td>(23,696)</td>
<td>(7,105)</td>
<td>(12,464)</td>
<td>(515)</td>
<td>(1,179)</td>
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<tr>
<td>2014</td>
<td>731</td>
<td>13,585</td>
<td>4,676</td>
<td>20,141</td>
<td>5,051</td>
<td>7,475</td>
<td>268</td>
<td>889</td>
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<tr>
<td></td>
<td>(2,145)</td>
<td>(17,957)</td>
<td>(5,397)</td>
<td>(22,306)</td>
<td>(7,521)</td>
<td>(12,994)</td>
<td>(588)</td>
<td>(1,558)</td>
</tr>
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2014 Teaching Activities

Courses (n=40, bold=coordinated by VMDL Faculty)

BioMed 3200  Comparative Hematology, On-line
AS 140/2140  Companion Animals
AS 325/4977  Horse Production
AS 440/9001  Mycotoxins
AS 4978  Swine Production
BIOMED 3310  Equine Health Topics (3)

BioMed 4100  Veterinary Clinical Chemistry, On-line (3)
BioMed 4110/VPB 7110  Veterinary Cytology Semester-based (2)
BioMed 4120  Principles of Toxicology Semester-based (3)

MMI 8040  Mechanisms of Microbial Pathogenesis
P_HLTH 8001  Applied Epidemiology (3)

V_PBIO 7120  Principles of Toxicology (3)

VBMS 5506  Veterinary Cellular Biology and Molecular Biology – Part 1 (2)
VBMS 5507  Veterinary Pharmacology (3)
VBMS 5508  Veterinary Pharmacology (2)
VBMS 5509  Veterinary Toxicology (3)

Vet Med 402D  Grand Rounds
Vet Med 8402B  Neurology Journal Club
Vet Med 8402D  Clinicopathologic Case Conference

VMS 6400  Food Animal Medicine and Surgery I (6)
VMS 6720  Equine Medicine, Surgery, or Ambulatory Practice (2-6)
VMS 6987  Problem-Based Clinical Preparation (1)
VMS 6996  Advanced Dermatology (1)
VMS 8036  Advanced Physiology of Dog and Cat (2)
VMS 8415  Advanced Veterinary Internal Medicine-Neurology (2).

VMS 8485  Problems in Veterinary Clinical Sciences (1-3)

VPB 5552  Veterinary Bacteriology I (3)
VPB 5553  Veterinary Bacteriology II (2.5)
VPB 5554  Veterinary Virology (2.5)
VPB 5575  General Veterinary Pathology (3)

VPB 5576  Veterinary Systemic and Special Pathology I (3)
VPB 5577  Veterinary Systemic and Special Pathology II (3)

VPB 5578  Veterinary Clinical Pathology (3)
VPB 6647  Diagnostic Pathology and Special Species Medicine (8)

VPB 6679  Diagnostic Pathology and Special Species Medicine II (3-6)

VPB 8411  Seminar in Histopathology (1)
VPB 8432  Advanced Histopathology (5)

VPB 8434  Advanced Clinical Pathology (4)

VPB 8435  Advanced Microscopy in Veterinary Clinical Pathology (1)

VPB 8436  Pathogenic Mechanisms in Veterinary Pathobiology (3)

Student Mentoring/Diagnostic Rounds (n=20)

Chemistry Rounds 1 hour/week
Clinical Pathology Journal Club 1 hour/week
Comparative Orthopaedic Laboratory (COL) journal club

Cytology Rounds 1 hour/week

Dermatology Rounds

Dermatopathology Rounds ½ hour every other week

Equine House Officers

Follow-up round

Food for Thought Rounds 1 hour every 6-8 weeks

Graduate Student Mentoring

Hematology Rounds 1 hour every 6-8 weeks

Image Review 1 hour every 6-8 weeks

Joint Pathology Center Wednesday Slide Conference

Ophthalmic Pathology Rounds 1 hour/month

Pathology/Oncology Rounds 1 hour/week

Pre-vet Mentoring

Treat Rounds (Histopathology) 1 hour every other week

Veterinary Research Scholars Program

VMDL-Food Animal Monthly Rounds

VMDL-VMTH Pathology weekly Rounds

**Student Contact Hours (n=5,039)**

![Distribution of Student Contact Hours](image)
2014 Scholarly Activities

Extramural Funding to MU VMDL

(Total Dollar Amount=$504,549)

3. Casteel, S. PI. Bioavailability Study at IR Site 22 (Former Naval Weapons), 2014 – 2015. $56,509
8. Kuroki, K. Co-I. Pivotal Anchor Study
9. Rottinghaus GE. Co-PI. MU Center for Botanical Interaction Studies. NIH, $10,246,711, 2010-2014 (Co-I 10% effort).
11. Rottinghaus GE. Co-PI. Ergoamine concentrations in tall fescue samples from test plots in Kentucky and Georgia. AgResearch USA Limited, 2015. ($21,000).

Intramural Grants to VMDL

1. Raghuraman Kannan (PI), Kim, DY (Co-PI). Non-Invasive Imagine Of Sentinel Lymph Nodes In Melanoma: Multifunctional Radio Fluorescent Nanoconjugates (MRFn) Agency: Mizzou Advantage, 2014-2016. Amount: $55,000; 5%
2. Johnson, PJ (PI), Wiedmeyer, CE (Co-I), Bukoski, A (Co-I), Whelchel, D (Co-I), Evans, T (Co-I) Development of a lithium chloride continuous rate infusion protocol for the prevention of acute laminitis in horses, USDA Animal Health Formula Funds, $13,202. 02/19/2015 – 01/25/2016

Publications (n=44)


Book Chapter (1)


Presentations (n=41)


15. Erin Burton (presenter), Mitchell W, Royal A.  Hemophagocytic histiocytic sarcoma in a dog. MAVP (Midwest Association of Veterinary Pathologists) in Madison WI, 2014


23. **Johnson GC**, Coates JR, O’Brien DP, Katz ML, Johnson GS. Degenerative Myelopathy of Old Dogs. Invited speaker, research discussion, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, Oct 2, 2014
34. **Piech T** (presenter), **Royal A**. Eccentrocytosis in a DKA dog. MAVP (Midwest Association of Veterinary Pathologists) in Madison WI, 2014

Professional Programs

1. Shaw, DP. Chair, Turkey and Broiler health Management School. University of Missouri and Hampton Inn, Columbia, MO. 3-4 May 2014.