University of Missouri Veterinary Medical Diagnostic Laboratory (VMDL) Annual Report – 2021

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Summary

In 2021, the VMDL processed approximately 55,756 accessions and performed more than 162,000 laboratory tests, which represent a 6.8% and a 9.3% annual increase in accessions and laboratory tests, respectively. The VMDL provided diagnostic service to veterinarians and owners from 102 MO counties/independent cities and 43 US states and Canadian provinces. In 2021, the VMDL retained NAHLN Level 1 Lab and FDA Vet-LRN Tier 1 Lab status.

The faculty taught (or co-taught) 37 DVM, graduate and undergraduate courses and 20 clinical/diagnostic rounds. The faculty led and participated in 29 funded research projects, including 16 new or active and 13 completed projects. The faculty and staff published 24 peer-reviewed research and diagnostic papers, submitted an additional 7 papers, and presented 13 conference posters and oral presentations. The faculty and staff actively participated in extension and outreach events and diversity, equity, and inclusion programs. In addition, the faculty and staff provided leadership service to many national and state organizations and programs, attended international, national, and state conferences and trainings.
Introduction

The University of Missouri Veterinary Medical Diagnostic Laboratory (VMDL) is one of two clinical units in the College of Veterinary Medicine. The VMDL is Missouri’s only full-service diagnostic lab for all animal species and is also the only lab in the state accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD). The faculty and staff are committed to excellence in diagnostic service, teaching, and research. The VMDL provides relevant, timely, and cost-effective diagnostic services to its clients and maintains a positive learning environment for the students.

The 2021 VMDL Annual Report outlines the major diagnostic, teaching, research, and organizational service activities. To track diagnostic caseload for professional DVM education and better service to the state of Missouri, 5-year data are presented. Owing to the recent improvement on data mining method, the diagnostic data for years 2017 to 2020 are more accurate and slightly different than those included in previous annual reports.

VMDL Organizational Structure

Anatomical Pathology – Dr. Gayle Johnson
Avian Diagnostics – Dr. Dan Shaw/Dr. Jeff Mitchell
Business Office – Mr. Kirk Thompson
Client Service/Sample Receiving – Dr. Lauren Delaney
Clinical Pathology – Dr. Angela Royal/ Ms. Cheryl Rojas
Director’s Office – Ms. Rachel Newton
Histology/Immunohistochemistry – Dr. Dae-Young Kim/Ms. Candace Kassel
Microbiology – Dr. Tamara Gull/Mr. Jesse Bowman
Molecular Diagnostics – Dr. Solomon (Wole) Odemuyiwa/Ms. Debra Sharpe
Quality Assurance – Mr. Eric Mathis/Mr. Brian Nodine
Serology/Immunology – Dr. Michael Zhang
Toxicology/Analytical Chemistry – Dr. Tim Evans/Dr. Xiangwei Du

**VMDL Client Outreach Programs**

Online Portal is available for clients to check results and charges in real-time.
FedEx Billable Stamps enables inexpensive next day delivery
Columbia area sample courier service is available
After-hours sample drop-off (a refrigerator is available at the VHC Small Animal Emergency Clinic)
VMDL attendance at regional VMA meetings

**External Advisory Board**

**Mission Statement**

To advise VMDL management on policies, development strategies, services, and collaborations with pertinent private, state, national and international organizations

**Advisory Board Membership**

The Advisory Board consists of 11 members representing Missouri Department of Agriculture, Missouri Department of Conservation, commodity groups, private practice, animal health industry, and the University of Missouri Veterinary Health Center.

**Advisory Board Members**

Steve Strubberg, DVM, Missouri State Veterinarian
Terry Gosch, DVM, USDA Area Veterinarian in Charge
Sherri Russell, DVM, Missouri Wildlife Veterinarian
Clark Fobian, DVM, Sedalia, MO, Past President AVMA
Bruce Addison, MS, President, Addison Biological Laboratory, Inc.
Tony Martin, DVM, Director of Animal Health Division, MFA, Inc.
Don Nikodim, Executive Vice President, Missouri Pork Association
Chuck Massengill, DVM, Missouri Cattlemen’s Association  
Joan Coates, DVM, MS, DACVIM-Neurology, MU VHC Interim Director  
John Middleton, DVM, PhD, ACVIM MU VHC Food Animal Service  
Philip Johnson, BVSc, MS, MRCVS, ACVIM, MU VHC Equine Service

**Diagnostic Service Activities**

**Table 1. Five Year VMDL (Main Lab and Clinical Pathology) Accessions***

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Accessions</th>
<th>Main Lab</th>
<th>Clin Path</th>
<th>VHC/Main Lab (%)</th>
<th>VHC/Clin Path (%)</th>
<th>VHC/Total (%)</th>
<th>Non-VHC/Total (%)</th>
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</thead>
<tbody>
<tr>
<td>2017</td>
<td>45,680</td>
<td>25,598</td>
<td>20,082</td>
<td>3,879</td>
<td>19,170</td>
<td>23,049</td>
<td>22,631</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(15.15%)</td>
<td>(95.46%)</td>
<td>(50.45%)</td>
<td>(49.55%)</td>
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<tr>
<td>2018</td>
<td>48,560</td>
<td>27,741</td>
<td>20,819</td>
<td>4,160</td>
<td>20,046</td>
<td>24,206</td>
<td>24,354</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(15.00%)</td>
<td>(96.29%)</td>
<td>(49.85%)</td>
<td>(50.15%)</td>
</tr>
<tr>
<td>2019</td>
<td>51,830</td>
<td>27,142</td>
<td>24,688</td>
<td>4,353</td>
<td>23,954</td>
<td>28,307</td>
<td>23,523</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(16.04%)</td>
<td>(97.03%)</td>
<td>(54.62%)</td>
<td>(45.39%)</td>
</tr>
<tr>
<td>2020</td>
<td>52,214</td>
<td>27,189</td>
<td>25,025</td>
<td>4,264</td>
<td>23,768</td>
<td>28,032</td>
<td>24,182</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(15.68%)</td>
<td>(94.98%)</td>
<td>(53.69%)</td>
<td>(46.31%)</td>
</tr>
<tr>
<td>2021</td>
<td>55,756</td>
<td>29,015</td>
<td>26,741</td>
<td>4,340</td>
<td>26,043</td>
<td>30,383</td>
<td>25,373</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(17.59%)</td>
<td>(97.39%)</td>
<td>(54.59%)</td>
<td>(45.51%)</td>
</tr>
</tbody>
</table>

*A Main Lab accession may include multiple samples whereas each Clinical Pathology accession represents one test performed on one sample. VHC cases accounted for approximately 18% and 97% of main lab and clinical pathology accessions, respectively. From 2020 to 2021, total accessions increased 6.8%.

**Table 2. Five Year VMDL (Main Lab and Clin Path) Tests by Animal 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>Exotic /Wild</th>
<th>Non-Animal</th>
<th>Ovine</th>
<th>Porcine</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>10,327</td>
<td>19,126</td>
<td>54,401</td>
<td>22,86</td>
<td>9,391</td>
<td>8,205</td>
<td>16,861</td>
<td>8,191</td>
<td>718</td>
<td>4,147</td>
<td>133,653</td>
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<tr>
<td>2018</td>
<td>8,493</td>
<td>21,086</td>
<td>57,719</td>
<td>1,448</td>
<td>10,224</td>
<td>8,896</td>
<td>37,461</td>
<td>4,229</td>
<td>701</td>
<td>2,868</td>
<td>15,3125</td>
</tr>
<tr>
<td>2019</td>
<td>4,136</td>
<td>16,590</td>
<td>64,001</td>
<td>1,967</td>
<td>10,234</td>
<td>9,918</td>
<td>42,994</td>
<td>2,919</td>
<td>1,399</td>
<td>3,877</td>
<td>158,035</td>
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<tr>
<td>2020</td>
<td>4,164</td>
<td>17,029</td>
<td>68,744</td>
<td>1,835</td>
<td>9,191</td>
<td>10,347</td>
<td>26,541</td>
<td>4,672</td>
<td>838</td>
<td>4,887</td>
<td>148,248</td>
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</table>
Figure 1. Distribution of Diagnostic Tests by Animal Species

<table>
<thead>
<tr>
<th>Year</th>
<th>Avian Dx.</th>
<th>Ana Path</th>
<th>Histo/ IHC</th>
<th>Clin Path</th>
<th>Bacti /Myco.</th>
<th>Mol. Dx.</th>
<th>Serology /Immuno</th>
<th>Tox/Ana Chem</th>
<th>Total (% Change)</th>
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</thead>
<tbody>
<tr>
<td>2017</td>
<td>5,415</td>
<td>12,157</td>
<td>40,537</td>
<td>28,249</td>
<td>16,727</td>
<td>10,911</td>
<td>21,634</td>
<td>5,421</td>
<td>141,051 (N/A)</td>
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<tr>
<td>2018</td>
<td>4,411</td>
<td>12,882</td>
<td>40,376</td>
<td>29,126</td>
<td>15,246</td>
<td>9,872</td>
<td>38,515</td>
<td>3,890</td>
<td>154,318 (9.41%)</td>
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<tr>
<td>2019</td>
<td>1,604</td>
<td>12,934</td>
<td>42,373</td>
<td>31,797</td>
<td>13,761</td>
<td>8,548</td>
<td>46,646</td>
<td>3,335</td>
<td>160,998 (4.33%)</td>
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<tr>
<td>2020</td>
<td>1,822</td>
<td>13,051</td>
<td>45,270</td>
<td>35,206</td>
<td>13,720</td>
<td>7,717</td>
<td>27,539</td>
<td>3,222</td>
<td>147,547 (-8.35%)</td>
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<tr>
<td>2021</td>
<td>1,586</td>
<td>15,294</td>
<td>44,227</td>
<td>37,151</td>
<td>13,625</td>
<td>8,537</td>
<td>43,364</td>
<td>2,787</td>
<td>166,571 (10.16%)</td>
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</table>

Table 3. Five Year VMDL (Main Lab and Clin Path) Tests by Section
### Table 4. Distribution of VMDL Accessions in 102 MO Counties/Independent City

<table>
<thead>
<tr>
<th>County</th>
<th>Accession #</th>
<th>County</th>
<th>Accession #</th>
<th>County</th>
<th>Accession #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boone</td>
<td>35,538</td>
<td>Buchanan</td>
<td>140</td>
<td>Cedar</td>
<td>45</td>
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<tr>
<td>Saint Louis</td>
<td>1,502</td>
<td>Pettis</td>
<td>132</td>
<td>Ste. Genevieve</td>
<td>44</td>
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<tr>
<td>Saint Charles</td>
<td>846</td>
<td>Oregon</td>
<td>124</td>
<td>Platte</td>
<td>43</td>
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<tr>
<td>Greene</td>
<td>823</td>
<td>Cooper</td>
<td>122</td>
<td>Linn</td>
<td>40</td>
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<tr>
<td>Jackson</td>
<td>683</td>
<td>Howard</td>
<td>122</td>
<td>Bollinger</td>
<td>34</td>
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<tr>
<td>Cole</td>
<td>679</td>
<td>Lawrence</td>
<td>112</td>
<td>Carroll</td>
<td>32</td>
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<td>Callaway</td>
<td>642</td>
<td>Miller</td>
<td>107</td>
<td>Montgomery</td>
<td>32</td>
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<tr>
<td>Franklin</td>
<td>530</td>
<td>Texas</td>
<td>107</td>
<td>Lewis</td>
<td>31</td>
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<tr>
<td>Christian</td>
<td>458</td>
<td>Saline</td>
<td>102</td>
<td>Dallas</td>
<td>29</td>
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<tr>
<td>Johnson</td>
<td>442</td>
<td>Polk</td>
<td>100</td>
<td>Stoddard</td>
<td>29</td>
</tr>
<tr>
<td>Jefferson</td>
<td>418</td>
<td>Pulaski</td>
<td>100</td>
<td>Atchison</td>
<td>24</td>
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<tr>
<td>Not Specified</td>
<td>389</td>
<td>Putnam</td>
<td>100</td>
<td>Clay</td>
<td>21</td>
</tr>
<tr>
<td>Cape Girardeau</td>
<td>345</td>
<td>Shelby</td>
<td>99</td>
<td>Dent</td>
<td>21</td>
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<tr>
<td>St. Louis City</td>
<td>316</td>
<td>Scott</td>
<td>94</td>
<td>Benton</td>
<td>19</td>
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<tr>
<td>Webster</td>
<td>266</td>
<td>Taney</td>
<td>94</td>
<td>Mississippi</td>
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<td>Phelps</td>
<td>260</td>
<td>Macon</td>
<td>89</td>
<td>Maries</td>
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<tr>
<td>Camden</td>
<td>258</td>
<td>Pike</td>
<td>89</td>
<td>Perry</td>
<td>15</td>
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<tr>
<td>Butler</td>
<td>249</td>
<td>Nodaway</td>
<td>83</td>
<td>Chariton</td>
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<tr>
<td>St. Francois</td>
<td>211</td>
<td>Caldwell</td>
<td>73</td>
<td>Barton</td>
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<tr>
<td>Jasper</td>
<td>207</td>
<td>Grundy</td>
<td>71</td>
<td>Sullivan</td>
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<td>Randolph</td>
<td>207</td>
<td>Knox</td>
<td>68</td>
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<tr>
<td>Newton</td>
<td>206</td>
<td>Audrain</td>
<td>64</td>
<td>Shannon</td>
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<td>Cass</td>
<td>200</td>
<td>Laclede</td>
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<td>Clark</td>
<td>6</td>
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<tr>
<td>Marion</td>
<td>199</td>
<td>Wright</td>
<td>61</td>
<td>Scotland</td>
<td>5</td>
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<td>Gasconade</td>
<td>198</td>
<td>Osage</td>
<td>58</td>
<td>Dade</td>
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<tr>
<td>Lafayette</td>
<td>195</td>
<td>Bates</td>
<td>56</td>
<td>Harrison</td>
<td>4</td>
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<tr>
<td>McDonald</td>
<td>195</td>
<td>Crawford</td>
<td>56</td>
<td>Dekalb</td>
<td>3</td>
</tr>
<tr>
<td>Lincoln</td>
<td>192</td>
<td>Dunklin</td>
<td>56</td>
<td>Gentry</td>
<td>3</td>
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<td>Livingston</td>
<td>192</td>
<td>Vernon</td>
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<td>Henry</td>
<td>51</td>
<td>Ozark</td>
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<td>Warren</td>
<td>51</td>
<td>Ripley</td>
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<td>Ray</td>
<td>177</td>
<td>Madison</td>
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<td>Barry</td>
<td>153</td>
<td>Adair</td>
<td>47</td>
<td>Mercer</td>
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<td>Moniteau</td>
<td>149</td>
<td>Morgan</td>
<td>46</td>
<td>Stone</td>
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Table 5. Distribution of VMDL Accessions Outside Missouri

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<th>State</th>
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<th>State</th>
<th>Accession #</th>
<th>State</th>
<th>Accession #</th>
</tr>
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<tbody>
<tr>
<td>Illinois</td>
<td>1,045</td>
<td>Arizona</td>
<td>28</td>
<td>New Mexico</td>
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<tr>
<td>Arkansas</td>
<td>927</td>
<td>Pennsylvania</td>
<td>28</td>
<td>Georgia</td>
<td>3</td>
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<td>Oklahoma</td>
<td>521</td>
<td>Manitoba</td>
<td>24</td>
<td>Maine</td>
<td>3</td>
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<td>Florida</td>
<td>448</td>
<td>Massachusetts</td>
<td>24</td>
<td>Wyoming</td>
<td>3</td>
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<td>N. Carolina</td>
<td>378</td>
<td>New Jersey</td>
<td>24</td>
<td>Alaska</td>
<td>2</td>
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<tr>
<td>Kansas</td>
<td>233</td>
<td>Texas</td>
<td>19</td>
<td>Ontario</td>
<td>2</td>
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<td>California</td>
<td>185</td>
<td>South Carolina</td>
<td>18</td>
<td>Oregon</td>
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<td>104</td>
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<td>S. Dakota</td>
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<td>Puerto Rico</td>
<td>29</td>
<td>Maryland</td>
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</table>

Table 6. External Proficiency Tests

**Bacteriology/Mycology**
- Contagious Equine Metritis Culture
- *Listeria* and *Salmonella* in Raw Dog Food
- *Salmonella* Group D Culture and Serology

**Clinical Pathology**
- Chemistry-Routine
- Hematology
- Microscopy
- Urinalysis

**Foreign Animal Disease Data Transmission**
- APMV/NDV Electronic Messaging
- ASF Electronic Messaging
- CSF Electronic Messaging
- FMD Electronic Messaging
- IAV-A Electronic Messaging
- IAV-S Electronic Messaging
- Pseudorabies Electronic Messaging

**Molecular Diagnostics**
- African Swine Fever rPCR
- Classical Swine Fever Virus rRT-PCR
- Foot-and-Mouth Disease Virus rRT-PCR
- Mycoplasma gallisepticum PCR
- Mycoplasma synoviae PCR
- Swine Influenza Virus rRT-PCR
- SARS-CoV-2 rRT-PCR

**Serology/Immunology**
- Bluetongue ELISA
- Bovine Leukemia Virus ELISA
- Brucellosis Serology
- Chronic Wasting Disease ELISA
- Equine Infectious Anemia ELISA
- Johne’s ELISA
- Pseudorabies Virus gB & gl ELISA

**Toxicology**
- Aflatoxin in Feedstuffs HPLC
- Aflatoxin M1 in Tissues HPLC
- Deoxynivalenol in Feedstuffs HPLC
- Fumonisin in Feedstuffs HPLC
VMDL Participation in National Programs

Figure 3. Level I Lab of National Animal Health Laboratory Network (NAHLN)

[Map of NAHLN Laboratory Designations – August 2021]

Figure 4. Tier I Member of FDA Veterinary Laboratory Investigation and Response Network (Vet-LIRN)

[Map of Tier I Member of FDA Veterinary Laboratory Investigation and Response Network (Vet-LIRN)]
### Teaching Activities

**Didactic and Laboratory Courses (N = 37; Bold: Coordinated by VMDL Faculty)**

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<thead>
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<th>Code</th>
<th>Title</th>
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<td>Companion Animals</td>
</tr>
<tr>
<td>AS 325/4977</td>
<td>Horse Production</td>
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<tr>
<td>BioMed 3200</td>
<td>Comparative Hematology</td>
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<td>BioMed 4100</td>
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<td>Principles of Toxicology Online (Undergraduate Level)</td>
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<td>Mechanisms of Microbial Pathogenesis</td>
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<td>P_Health 8150</td>
<td>Human Health and the Environment</td>
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<td>Veterinary Pharmacology</td>
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<td>Equine Medicine and Surgery I</td>
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<td>V_M_S 6987</td>
<td>Problem-Based Learning Clinic Preparation</td>
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<td>Veterinary Systemic and Special Pathology I</td>
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<td>Diagnostic Pathology and Special Species Medicine I</td>
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<td>V_PBIO 6679</td>
<td>Diagnostic Pathology and Special Species Medicine II</td>
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<td>V_PBIO 8435</td>
<td>Advanced Microscopy in Veterinary Clinical Pathology</td>
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<tr>
<td>V_PBIO 9090</td>
<td>Area Veterinary Pathobiology Dissertation Research</td>
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**Clinical and Diagnostic Rounds and Seminars (N = 20)**

- Chemistry Rounds
- Comparative Orthopaedic Laboratory (COL) journal club
- Cytology Rounds
- Dermatology Rounds
- Equine Journal Club
- Food for Thought Rounds
- Food Animal/ Equine Clinical Case Rounds
- Food Animal Journal Club
- Gross Pathology Rounds
- Hematology Rounds
- Human Health and the Environment
- Image Review
- Joint Pathology Center Wednesday Slide Conference
- Mentoring International Students
- Mentoring Pre-Vet Students (Including Pre-Vet Scholars)
- Mentoring Veterinary Professional Students at VET Orientation for VM-1s
- Neurology Rounds
- Ophthalmic Pathology Rounds
- Slide Treats
- VMDL-Food Animal Monthly Rounds

**Residency Training Programs**

- Anatomical Pathology
- Clinical Pathology
- Clinical and Diagnostic
- Microbiology
Scholarly Activities

New and Active Grants

1. Kemin Industries
   Investigators: Bailey (PI), Du X (Co-PI)
   Duration: 06/01/2021 – 03/31/2022.
   Title: Use of mycotoxin binders in beef cattle diets containing ergot-like alkaloids
   Award: $81,259, Amount for MU VMDL: $1,000.

2. FDA Vet-LIRN U18FD007511
   Investigators: Du X (PI), Evans T (Co-PI)
   Duration: 09/06/2021 – 08/31/2022.
   Title: Enhancing food contaminant surveillance capacity using ultra-performance liquid chromatography
   with UV/fluorescence detection
   Award: $173,000

3. DHHS/NIH 1R01HD092254-01A1
   Investigators: Lucy MC (PI), Evans TJ (Co-I, 2.5% shared credit), Gull T (Co-I, 2.5% Shared credit)
   Duration: 08/15/18 – 04/20/23
   Title: Uterine microbiome: Functional significance in establishing the uterine program postpartum

4. Purdue University
   Investigator: Evens T (PI)
   Duration: 08/01/2021 – 07/31/2022
   Title: See Us-Be Us: Inspiring future veterinarians using a Veterinary STEM Ecosystem
   Award: $1,500

5. NIFA/USDA
   Investigators: Adkins P (PI), Evans T (Co-PI, 30% Shared credit)
   Duration: 09/01/2020 – 08/31/2023
   Title: Show-Me VET ECHO: Veterinary Education and Training (VET) through Extension for
   Community Healthcare Outcomes (ECHO) Program
   Award: $238,228

6. Kemin Industries
   Duration: 06/01/2021 – 03/31/2022
   Investigators: Bailey E, Evans T (Co-PI, 20% shared credit)
   Title: Use of Mycotoxin Binders in Beef Cattle Diets Containing Ergot-like Alkaloids
   Award: $69,725

7. ACVS Surgeon-in-training Research Grant
   Investigators: Byer B, Skinner O, Gull T (Co-I), Mickelson M (PI)
Duration: 4/1/21 – 9/30/22
Title: Effect of subcutaneous lavage on bacterial contamination in dogs and cats undergoing gastrointestinal surgery.
Award: $12,555

8. MU CVM Phi Zeta Grant
Investigator: Ierardi R (PI), Raghavan R (Mentor)
Duration: 12/1/2021 – 11/30/2022
Title: A cross-sectional study to determine prevalence, geographic distribution, and herd-level risk factors of bovine anaplasmosis in Missouri beef cattle.
Award: $200 gift card plus additional funds to help pay publication fees (up to $1,000) or travel costs to attend a scientific meeting (up to $500)

9. CHILDRENS MERCY HOSPITAL
Investigators: Middleton J (PI), Kim DY (Co-I, 15% shared credit)
Duration: 03/15/2018 – 12/31/2022
Title: Fetal Lamb Tracheal Occlusion
Award: $327,843

10. NIH OFFICE OF THE DIRECTOR
Investigators: Wells KD (PI), Prather R (Co-PI), Green J (Co-I), Safranski T (Co-I), Schnabel R (Co-I), Kim DY (Co-I, 5% shared credit)
Duration: 06/01/2019 – 05/31/2024
Title: Swine Somatic Cell Genome Editing Center
Award: $8,631,151 (2021: $133,557)

11. Missouri Department of Conservation 450Zhang
Investigators: Zhang S (PI), Zhang M (Co-PI), Almasri M (Co-PI).
Duration: 01/01/2020 – 02/28/2023
Title: Development and Application of MEMS-based Biosensor and RT-QulC Assay for the Detection of Chronic Wasting Disease Prion in Anti- and Post-Mortem Cervid Samples.
Award: Total $657,011 (2021: $187,068)

12. FDA Vet-LIRN NIH 1U18FD006670-03
Investigators: Zhang S (PI), Evans T (Co-PI), Johnson GC (Co-PI), Gull T (Co-PI), Shen Z (Co-PI), Odemuyiwa S (Co-PI)
Duration: 06/01/2021 – 05/31/2022
Title: FDA Vet-LIRN Site - Tier I Lab Renewal
Award: $46,549 (Direct: $34,999)

13. USDA 2021-37624-35453
Project Director: Zhang, S
Duration: 08/08/2021 – 07/31/2022
Title: NAHLN Level 1 Lab - Maintaining and Further Improving Capacity and Capabilities
Award: $250,000 (Direct: $227,273)

14. USDA AP21VSD&B000C129
Project Director: Zhang S
Duration: 09/01/2021 – 08/31/2023
Title: NAHLN Level Infrastructure II
Award: $281,200 (Direct: $255,635)

15. USDA-APHIS/MDNR
Investigator: Zhang S.
Duration: 2021 – 2022
Title: A multicenter validation of RT-QuIC assay for sensitive detection of Chronic Wasting Award: $35,000 (Direct: $31,818)

16. USDA AP21VSD&B000C028
Investigator: Zhang, S
Duration: 03/01/2020 – 02/28/2023
Title: Validation of ASR1 Peptoids-ELISA for the Detection of Chronic Wasting Disease Prion in Samples with Low Prion Burden
Award: $116,323 (Direct: $105,740)

Completed Grants

1. ACVIM Resident Research Grant
Investigators: Walker K (PI), Gull T (Co-I)
Duration: 07/01/19 – 06/30/21
Title: Bacterial culture and susceptibility of septic foot lesions of adult bovine originating from cow-calf operations.
Award: $9,285.

2. Phi Zeta Resident Grant
Investigators: McCurdy K, Gull T (Faculty Mentor) and McCracken M.
Duration: 12/1/2020 – 11/30/2021
Title: Effect of Intra-articular Morphine on the Antimicrobial Activity of Amikacin in Equine Synovial Fluid.
Award: $1,000

3. USDA Animal Health Formula Funds
Investigators: Gull T (PI), Kittana H, Calcutt M and Odemuyiwa S.
Duration: 10/1/2020 – 9/30/2021
Title: Multi-locus sequence typing of divergent Mannheimia isolates and molecular and serological detection of leukotoxin from cases with and without disease
Award: $8,000
4. ABK BIOMEDICAL INC.
Investigators: Bryan J (PI) and Kim DY (Co-I, 20% shared credit)
Duration: 08/01/2020 – 02/02/2021
Title: Evaluation of Eye90™ Radioembolic Microspheres radiopacity and delivery in healthy rabbits.
Award: $28,398.00.

5. ABK Biomedical Inc.
Investigators: Bryan J (PI), Kim DY (Co-I, 20%), Lattimer J (Co-I), Maitz C (Co-I), Schlink S (Co-I).
Title: Evaluation of Eye90™ Radioembolic Microspheres radiopacity and delivery in healthy rabbits.
Award: $48,659.

6. DEPT. OF DEFENSE W81XWH1810430
Investigators: Stannard JP (PI), Kuroki K (Co-I, 2% shared credit, 5% FTE)
Duration: 01/09/18 – 08/31/21
Title: A biologic joint replacement strategy to treat patients with post-traumatic osteoarthritis – Expansion.
Award: $1,989,044 (Direct $1,302,402)

7. NIH/NIAMS/Columbia University R01AR071316
Investigators: Lee CH (PI), Cook JL (Consortium PI), Kuroki K (Co-I, 5% shared credit, 2% FTE)
Duration: 09/06/17 – 06/30/21
Title: Seamless healing of avascular meniscus tears by stem cell recruitment.
Award: Total $2,970,249, MU award $1,121,817 ($752,298 direct)

8. NIH/NIAMS/Columbia University R01AR068133
Investigators: Hung C (PI), Cook JL Consortium PI, Kuroki K (Co-I, 20% shared credit, 5% FTE)
Duration: 06/01/16 – 05/31/21
Title: Incorporation of dexamethasone delivery with engineered cartilage.
Award: $406,820 (Direct $265,029)

9. USDA/UGA AP20VSD&B00c018
Investigator: Shen Z (PI)
Duration: 03/01/2020 – 02/28/2021
Title: United front to develop harmonized NGS training and procedures to increase the capabilities and capacity of NAHLN laboratories in response to antimicrobial resistance (AMR).
Award: $81,311 (Direct: $73,919, Indirect: $7,392).

10. FDA Vet-LIRN 1U18FD006670-01.
Investigators: Zhang S (PI), Evans T (Co-PI), Johnson GC (Co-PI), Gull T (Co-PI), Zhang MZ (Co-PI), Odemuyiwa S (Co-PI).
Duration: 06/10/2020 – 05/31/2021
Title: Maintaining FDA Vet-LIRN Tier I Lab.
Award: $39,900 (Direct: $30,000).

11. USDA/APHIS AP20VSD&B000C082
Project Director: Zhang S
Duration: 9/1/2020 – 08/31/2021
Title: Maintaining NAHLN Level I Member Lab. US Department of Agriculture.
Award: $295,000 (Direct: $265,500)

12. FDA Vet-LIRN/KSU 1U18FD006990-01
Investigators: Zhang S (PI), Gull T (Co-PI).
Duration: 9/15/2020 – 8/31/2021
Title: Prototype reporting and veterinarian and animal owner educational materials for cases of antimicrobial resistant bacteria of public health importance in companion animals.
Award: $7,500

13. USDA/APHIS AP20VSD&B000C017
Investigator: Zhang S (PI)
Duration: 03/01/2020 – 02/28/2021
Title: Enhancing Testing Capacity in Biosafety Level-3 Laboratory for Improved Detection of and Response to Foreign Animal Diseases. USDA.
Award: $104,108 (Direct: $9,369.7, Indirect: $10,411).

**Peer Reviewed Publications**

**Published**


In Press and Submitted


Scientific Presentations


12. **Williams III F**. Ruminant Abortions (Invited Talk), Penn State Spring Symposium, June 8, 2021


**Extension/Outreach/Engagement Presentations**

1. Delaney L. Under the Scope – VMDL Quarterly Newsletter
2. Ierardi R and Delaney L. Diagnostic Lab Report to Academy of Veterinary Consultants (AVC)
3. Ierardi R. Diagnostic Pathology of Bacillary Hemoglobinuria & Related Conditions. MU Extension CVM Update, virtual meeting, 5/4/2021
4. **William III F**. Pathology of Birds for the Avian Club, 9/29/2021
5. **Williams III F**. What Pathologists Do! For the Pre-vet club, 11/3/2021

**Diversity, Equity, and Inclusion Activities**

**Williams III F**. Introduction of veterinary medicine to students in local elementary schools so that the underserved children get to learn about veterinary medicine as a career choice.

**Williams III F**. A memebr of the League of Veta-Humanz (a human being with superpowers who protects animal and public health; synonym: veterinarian). This program is supported by the Science Education Partnership Award (SEPA) program of the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health (NIH). [https://vet.purdue.edu/vetahumanz/vetahumanz/dr-fred-williams-iii/](https://vet.purdue.edu/vetahumanz/vetahumanz/dr-fred-williams-iii/)

**William III F**. Faculty advisor for VOICE (Veterinary As One Inclusive Community), a student-run organization that seeks to increase awareness, respect, and sensitivity to differences among all individuals and communities in the field of veterinary medicine.

**Williams III F**. Presentation: Black voices in pathology panel for the C. L. Davis Pathology Foundation, 1/8/2021

**Williams III F**. Presentation to the VOICE Club: Diversity and my journey as a pathologist, 3/24/2021

**Zhang S**. Creation of AAVLD DEI Committee

**National and State Leadership Activities**

1. **Evans T**. AAVLD Committee on Environment Chair
2. Evans T. ABVT Student Award Committee and Education Committee member
3. Gull T. ACVIM Examination Committee Chair, ACVIM/ACVPM Consensus Statement Contributor
4. Gull T. ACVM Examination Committee and Biosecurity Committee
5. Gull T. CLSI (Vet09) Revision Working Group
6. Royal A. Member of ACVP Certifying Exam Assembly and Administration Group (Clinical Pathology).
7. Zhang S. AAVLD President, Bacteriology/Mycology/Antimicrobial Subcommittees, Quality Assurance Committee, Government Relations Committee, Strategic Planning Committee, and Workforce Development Committee.
8. Zhang S. Missouri Biosecurity Working Group

Major Annual Professional Meetings and Trainings

1. American Association of Veterinary Laboratory Diagnosticians (AAVLD) Annual Meeting
2. AAVLD Accreditation Auditor Training
3. American College of Veterinary Internal Medicine (ACVIM) Annual Meeting
4. American College of Veterinary Microbiologists (ACVM) Annual Meeting
5. Combined Annual Meetings of the American College of Veterinary Pathologists (ACVP) and American Society for Veterinary Clinical Pathology (ASVCP)
6. American Veterinary Medical Association (AVMA) Annual Meeting
7. Conference for Research Workers in Animal Diseases (CRWAD) Annual Meeting
8. Midwest Association of Veterinary Pathologists Annual Meeting
9. Missouri Veterinary Medical Association (MVMA) Annual Meeting and District Meetings
10. Missouri Biosecurity Working Group Quarterly Meetings
11. Missouri Captive Wild Animal Health Meetings
12. NAHLN Preparedness Weekly Conference
13. USAHA/AAVLD Government Relations Meeting
14. Veterinary Laboratory Investigation and Response Network Monthly Conference