



## University of Missouri Veterinary Medical Diagnostic Laboratory (VMDL) Annual Report – 2017

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### *Summary*

The University of Missouri Veterinary Medical Diagnostic Laboratory (MUVMDL) is a full service veterinary diagnostic laboratory and it is Missouri’s only laboratory accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD). The VMDL is also a Level II Lab of the National Animal Health Laboratory Network (NAHLN) and Tier I Lab of the FDA Veterinary Laboratory Response Network (FDA Vet-LRN). In 2017, the VMDL processed approximately 45,633 accessions and performed 107,300 diagnostic tests. In a 5-year period from 2013 to 2017, case accessions increased 18.5%. The VMDL diagnostic service was utilized by veterinarians and owners from 46 US states and 110 MO counties/independent city. In 2017, the VMDL faculty taught (or co-taught) 37 courses and 16 clinical/diagnostic rounds. The VMDL faculty and staff completed 5 extramurally funded projects and received 5 new grants, in addition to fee-for-service agreements. The VMDL faculty and staff published 42 peer-reviewed papers and 1 book chapter, presented 41 conference posters and presentations, served on many prestigious national and university committees, and attended 20 international, national and state conferences and trainings.



## College of Veterinary Medicine

University of Missouri-Columbia  
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**Veterinary Medical  
Diagnostic Laboratory**  
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### ***Introduction***

The Veterinary Medical Diagnostic Laboratory (VMDL) Annual Report - 2017 is a compilation of test data from Jan 1, 2017 to Dec 30, 2017. To monitor caseload, testing data from 2013 to 2017 are also included in this report.

The MU VMDL is a full service veterinary diagnostic laboratory and it is Missouri's only laboratory accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD). The faculty and staff of VMDL are committed to excellence in diagnostic service, teaching, and research. We strive to provide relevant, timely, and cost-effective diagnostic services to our clients and create a positive learning environment for our students.

### ***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.

### ***The 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 Health Center.

#### **VMDL Advisory Board Members**

Linda Hickam, DVM, Missouri State Veterinarian

Tony Martin, DVM, Director of Animal Health Division, MFA, Inc.

Don Nikodim, Executive Vice President, Missouri Pork Association

Steve Patterson, DVM, Bethel, MO

Clark Fobian, DVM, Sedalia, MO, Immediate Past President AVMA



Steve Strubberg, DVM, Hermann, MO

Chuck Massengill, DVM, Missouri Cattlemen’s Association

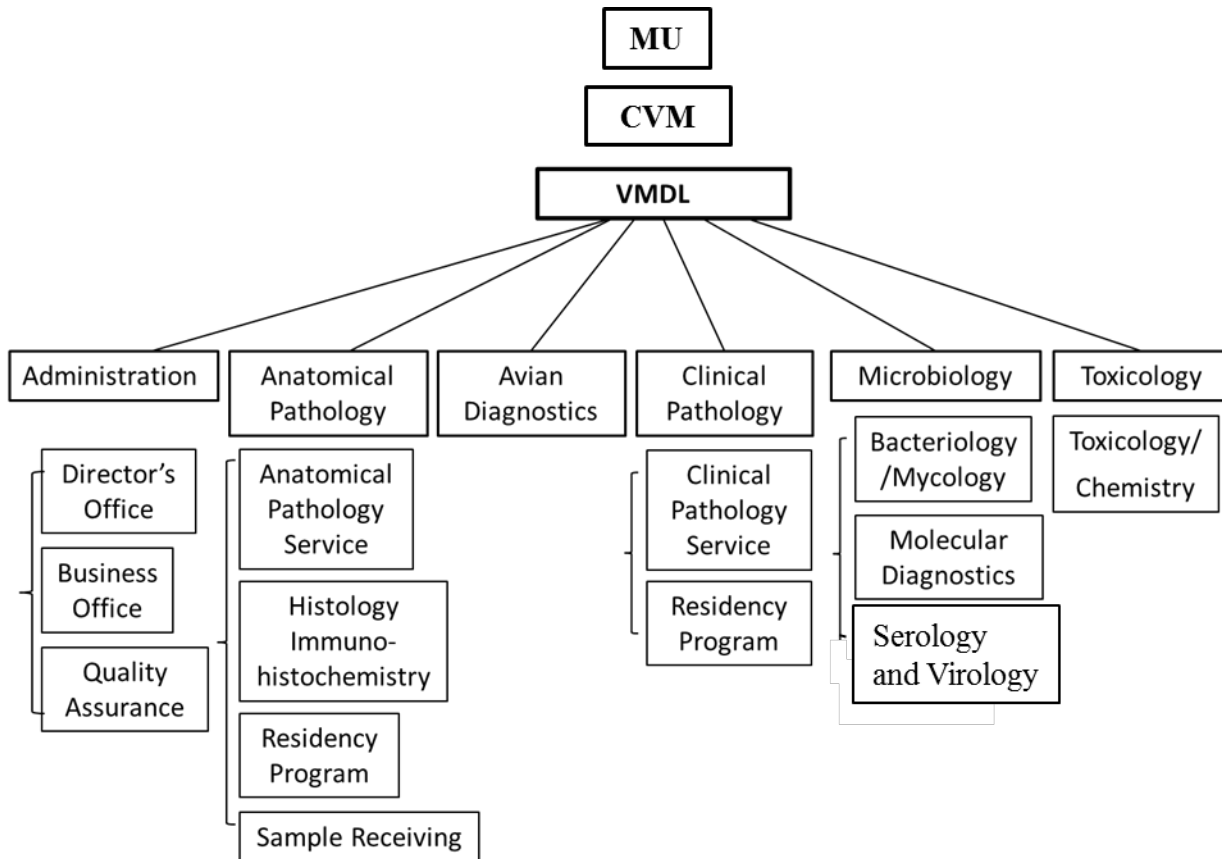
Bruce Addison, President, Addison Biological Laboratory, Inc.

David Wilson, DVM, MS, ACVS, MU VHC Director

Philip Johnson, BVSc, MS, MRCVS, ACVIM MU VHC Equine Service

John Middleton, DVM, PhD, ACVIM MU VHC Food Animal Service

### VMDL Organizational Structure



### VMDL Section Heads/Leaders

Avian Diagnostics – Dr. Dan Shaw Anatomical Pathology – Dr. Gayle Johnson

Bacteriology/Mycology – Dr. Tamara Gull/Ms. Irene Ganjam

Business Office – Mr. Mike Wimmenauer



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Clinical Pathology – Dr. Marlyn Whitney/ Cheryl Rojas

Director’s Office – Ms. Geri Hegstad

Histology – Dr. Dae-Young Kim/Candace Kassel

Molecular Diagnostics – Dr. Solomon (Wole) Odemuyiwa

Quality Assurance – Dr. Tom Reilly/Susan Martin

Sample Receiving – Ms. Geri Hegstad

Serology – Dr. Mike Zhang

Toxicology – Dr. Tim Evans

### VMDL Diagnostic 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. Gayle Johnson

Small Animal Internal Medicine Pathology – Dr. Dae-Young Kim

### VMDL Service Activities

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

Year	Total Accession	Main Lab	Clin Path	Source (%) and Type				
				MO/Others	VHC/Total	VHC/VMDL	Research	Other
2013	38,499	25,165	13,334	20,081 (52%)	16,460 (43%)	3,126 (12%)	1,867 (4.8%)	91 (<1%)
2014	37,666	24,431	13,235	19,733 (52%)	16,476 (44%)	3,241 (13%)	1,378 (3.6%)	79 (<1%)
2015	42,929	26,276	16,653	20,966 (49%)	20,475 (48%)	3,822 (15%)	1,390 (3.2%)	98 (<1%)
2016	48,674	30,089	18,585	29,257 (60%)	18,476 (38%)	4,028 (13%)	603 (1.2%)	338 (<1%)
2017	45,633	25,557	20,076	21,083 (46%)	22,479 (49%)	3,873 (15%)	967 (2.1%)	542 (1.2%)

\*A Main Lab accession may include multiple tests for multiple samples whereas each Clin Path accession represents one test performed on one sample.

Caseload increased 13.38% from 2015 to 2016 and decreased 6.7% from 2016 to 2017. In a 5-year period (2013 to 2017), caseload increased 18.5%.

More than 95% of clinical pathology accessions came from VHC.

Up to 15% of main lab accessions came from VHC.

The Necropsy Lab also supported 6 research projects in 2017.

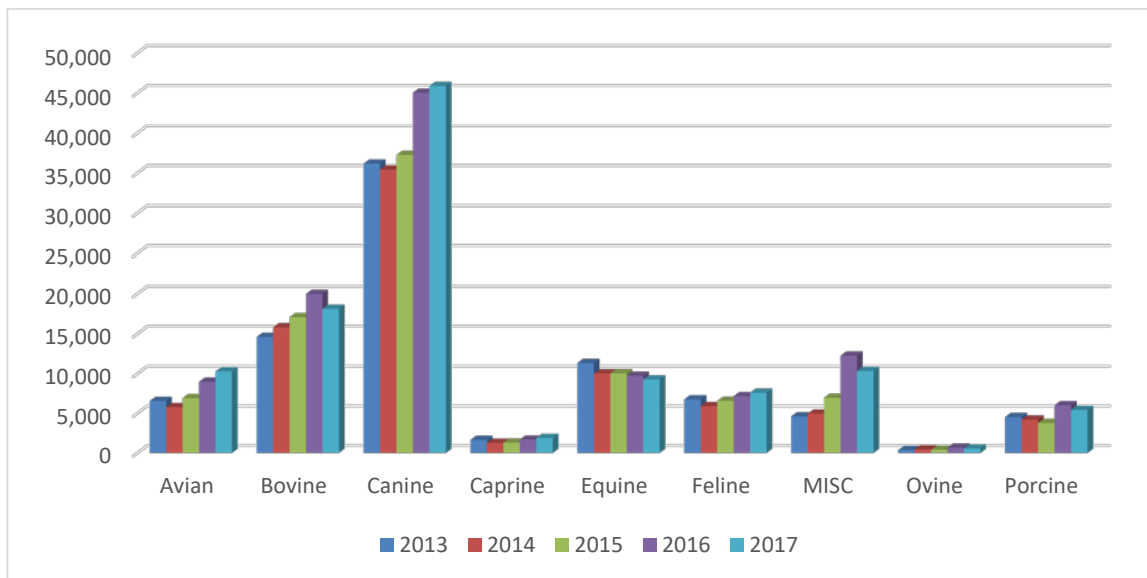


**Table 2. Five Year VMDL (Main Lab and Clin Path) Tests by Animal Species\***

Year	Total	Avian	Bovine	Canine	Caprine	Equine	Feline	MISC	Ovine	Porcine
2013	86,570	6,554	14,599	36,173	1,649	11,339	6,752	4,614	361	4,529
2014	83,869	5,784	15,806	35,421	1,280	10,038	5,908	4,964	462	4,206
2015	90,515	6,919	17,070	37,258	1,307	10,031	6,563	6,961	404	3,780
2016	111,506	8,977	19,971	45,036	1,682	9,726	7,159	12,269	671	6,015
2017	107,300	10,290	18,115	45,872	1,902	9,277	7,601	10,346	572	5,425

\*Data do not include non-technical procedures.

**Figure 1. Distribution of Diagnostic Tests by Animal Species**



**Table 3. Five Year VMDL (Main Lab and Clin Path) Tests by Section**

Year	Total	Avian	Bacti	Clin Path	Path/Histo	Mol	Sero	Vir	Tox	Other
2013	86,570	2,535	14,849	20,123	23,696	7,105	12,464	515	1,179	4,104
2014	83,869	2,145	14,094	18,632	22,306	7,521	12,994	588	1,558	4,031
2015	90,515	3,450	15,371	22,958	22,601	7,816	13,548	584	1,456	2,731
2016	111,506	5,374	18,896	26,516	32,282	9,094	14,039	949	4,355*	N/A
2017	107,300	5,414	18,017	28,211	27,818	10,283	12,551	676	4,330*	N/A

\*In 2016 and 2017, analytical chemistry tests were included in Toxicology section.



**Table 4. Distribution of VMDL Accessions in 110 MO Counties/Independent City\***

County	2016	2017	County	2016	2017	County	2016	2017	County	2016	2017
Boone	<u>28134</u>	<u>27541</u>	Pettis	172	169	Linn	78	62	Clark	36	18
St. Louis	<u>1628</u>	<u>1322</u>	Barry	<u>213</u>	<u>168</u>	Cedar	62	59	Maries	14	17
<i>Not Specified</i>	<i>1028</i>	<i>958</i>	St.			Audrain	60	58	Lewis	19	16
Greene	<u>1036</u>	<u>830</u>	Francois	0	166	Macon	74	58	Mississippi	21	15
St. Charles	811	711	Webster	146	158	Carroll	61	57	Perry	7	15
Jackson	566	580	Grundy	226	143	Morgan	49	56	Stoddard	38	15
Franklin	522	472	Polk	198	141	Crawford	32	52	Chariton	11	14
Cole	483	464	Saint Clair	111	140	Stone	98	51	Pulaski	15	14
			Howard	107	137	St.					
Johnson	<u>525</u>	<u>449</u>	Miller	143	125	Genevieve	56	48	Caldwell	27	13
Callaway	<u>495</u>	<u>431</u>	Nodaway	92	122	Vernon	37	45	McDonald	9	11
Jefferson	318	323	Cooper	119	116	Knox	45	41	Washington	31	11
Camden	262	290	Moniteau	0	115	Laclede	45	41	Harrison	21	10
Cape Girardeau	352	251	Osage	122	107	Madison	<u>74</u>	<u>41</u>	Shannon	13	10
Christian	304	237	Shelby	39	105	Dent	49	40	Clinton	3	9
Lafayette	261	237	Pike	81	102	Scotland	38	38	Ripley	10	9
Saline	172	232	Pike	81	102	Adair	57	37	Dade	2	6
Howell	286	230	Scott	118	99	Benton	62	36	Holt	0	3
Cass	236	225	Marion	98	98	Dallas	29	34	Schuyler	3	3
Phelps	272	217	Wright	122	98	Platte	55	33	Alameda	1	2
St. Louis City	72	213	Texas	146	94	Putnam	4	33	Gentry	4	2
Newton	180	210	Bates	98	89	Montgomery	47	32	Daviess	1	1
Jasper	272	204	Livingston	98	89	Taney	<u>66</u>	<u>32</u>	Douglas	1	1
Lincoln	252	203	Lawrence	145	86	Barton	20	29	Hickory	1	0
Gasconade	263	190	Dunklin	80	84	Andrew	<u>135</u>	<u>25</u>	Iron	0	1
Ray	149	189	Clay	<u>159</u>	<u>79</u>	Atchison	12	22	Mercer	0	1
Buchanan	204	178	Henry	27	79	DeKalb	9	21	Sullivan	5	1
Monroe	195	171	Oregon	66	74	Ozark	11	20	Wayne	0	1
Butler	203	170	Randolph	81	73	Bollinger	18	18			
			Warren	72	71						

\*Underline indicates a significant decrease in accessions from 2016 to 2017.



**Table 5. Distribution of VMDL Accessions in 46 Non-MO States**

State	2016	2017	State	2016	2017	State	2016	2017
Illinois	<u>805</u>	<u>732</u>	Pennsylvania	16	15	Wyoming	8	4
Arkansas	<u>781</u>	<u>564</u>	South Carolina	12	15	Colorado	4	3
Florida	534	502	Texas	11	15	Alaska	5	2
Oklahoma	<u>444</u>	<u>353</u>	Nebraska	11	14	Kentucky	13	2
Kansas	292	292	Georgia	1	11	Michigan	3	2
North Carolina	349	197	Manitoba	1	10	Tennessee	3	2
Iowa	114	189	Maryland	13	10	Vermont	2	2
North Dakota	170	128	Massachusetts	9	9	Connecticut	0	1
Minnesota	63	109	Puerto Rico	10	9	Maine	2	1
California	162	88	Wisconsin	21	8	Ontario	5	1
Montana	7	27	Indiana	21	7	Oregon	6	1
Virginia	11	25	New Mexico	2	6	Utah	2	1
Arizona	47	23	British Columbia	5	5	Washington	31	1
New York	6	17	Ohio	6	4	Idaho	5	0
Alabama	21	15	South Dakota	11	4	Rhode Island	5	0
						Delaware	1	0
2016	4,051 (8.3% of Total Accessions)							
2017	3,426 (7.5% of Total Accessions)							

\*Underline indicates a significant decrease in accessions from 2016 to 2017.

**External Proficiency Tests**

**Clinical Pathology**

Chemistry-Routine

Hematology

Microscopy

Urinalysis

**Bacteriology**

AAVLD Interlaboratory Bacteriology Quality Assurance Survey

Contagious Equine Metritis (CEM) Culture

Johne’s Direct Fecal PCR & Liquid Culture

Salmonella Group D Culture and Serology - National Poultry Improvement Plan (NPIP)

**Molecular Diagnostics**





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- Avian Influenza virus (AIV) RT-PCR
- Avian Paramyxovirus (APMV)-1/Exotic New Castle Virus RT-PCR
- Classical Swine Fever Virus (CSFV) RT-PCR
- Foot-and-Mouth Disease Virus (FMDV) RT-PCR
- Swine Influenza Virus (SIV) RT-PCR

### Serology

- Bluetongue Serology
- Bovine Leukemia Virus (BLV) Serology
- Brucellosis Serology
- Chronic Wasting Disease (CWD) ELISA
- Equine Infectious Anemia (EIA)
- Johne's ELISA
- Pseudorabies Virus (PRV) gB & gI ELISA

### Toxicology

- Aflatoxin HPLC
- Deoxynivalenol (DON) HPLC
- Fumonisin HPLC

## VMDL Participation in National Diagnostic Network

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

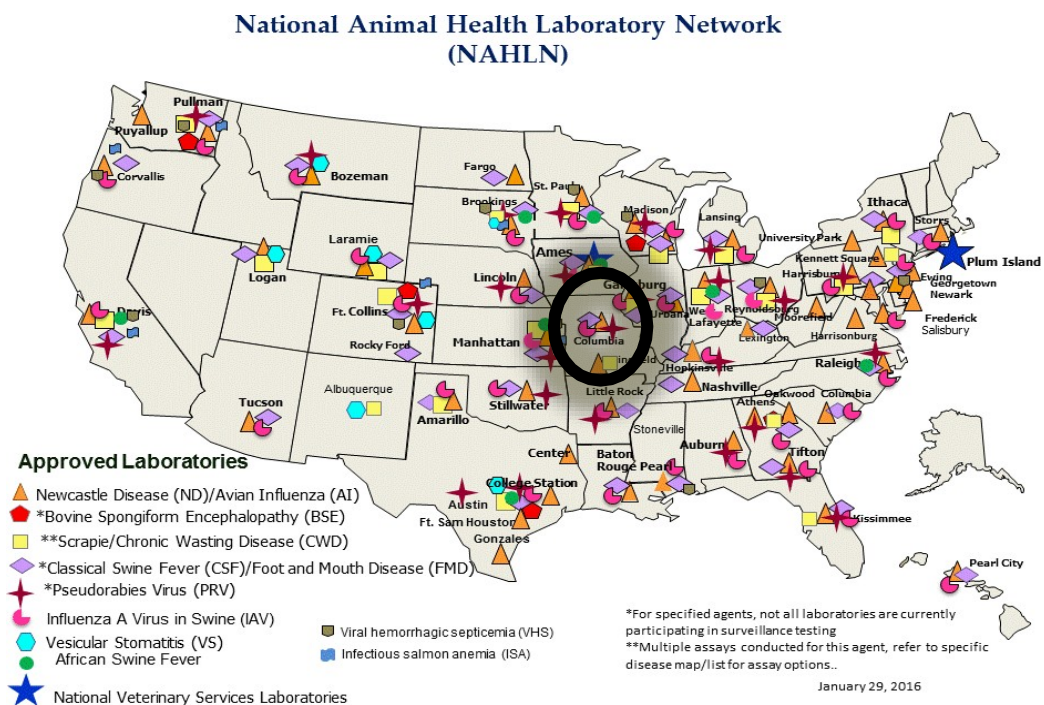
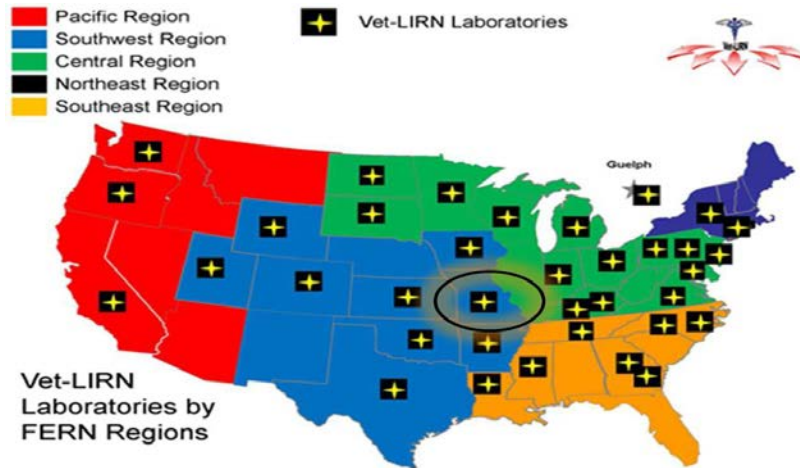






Figure 4. Tier I Member of FDA Veterinary Laboratory Response Network (Vet-LRN)



### ***VMDL Client Outreach Programs***

The VMDL offers an online portal for its clients to check their results in real-time as we work on their samples.

VMDL continues to offer the FedEx Express Prepaid Stamps to all its clients which enables inexpensive next day delivery from clients’ office to the VMDL for laboratory testing.

### ***VMDL Faculty Teaching Activities***

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

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AS 140/2140	Companion Animals
AS 325/4977	Horse Production
BioMed 3200	Comparative Hematology
BioMED 3310	Biomedical Pathophysiology Online
BioMed 4100	Veterinary Clinical Chemistry, On-line
BioMed 4110/V_PBIO 7110	Veterinary Cytology
BioMED 4120	Principles of Toxicology On-line
LAB_AN 9437	Lab Animal Pathology
MMI 8050	Mechanisms of Microbial Pathogenesis
MICROB 9001	Topics in Microbiology
P Health 8001	Human Health and the Environment
V_BSCI 5506	Veterinary Cellular Biology



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V_BSCI 5507	Veterinary Pharmacology
V_BSCI 5508	Veterinary Pharmacology
V_BSCI 5509	Veterinary Toxicology
V_M_S 6400	Food Animal Medicine & Surgery I
V_M_S 6420	Equine Medicine and Surgery I
V_M_S 6987	Problem-Based Learning Clinic Preparation
V_M_S 6996	Advanced Dermatology
V_M_S 8036	Advanced Physiology of Dog and Cat
V_M_S 8402	Seminar in Veterinary Clinical Sciences
V_M_S 8402 B	Seminar in Veterinary Clinical Sciences
V_M_S 8402 D	Clinicopathologic Case Conference (CPC)
V_M_S 8415	Advanced Veterinary Neurology
V_M_S 8485	Problems in Veterinary Clinical Science
V_PBIO 5552	Veterinary Bacteriology 1
V_PBIO 5553	Veterinary Bacteriology 2
V_PBIO 5554	Veterinary Virology
V_PBIO 5575	General Veterinary Pathology
V_PBIO 5576	Veterinary Systemic and Special Pathology I
V_PBIO 5577	Veterinary Systemic and Special Pathology II
V_PBIO 5578	Veterinary Clinical Pathology
V_PBIO 6647	Diagnostic Pathology and Special Species Medicine I
V_PBIO 6679	Diagnostic Pathology and Special Species Medicine II
V_PBIO 8434	Advanced Clinical Pathology
V_PBIO 8435	Advanced Microscopy in Veterinary Clinical Pathology
V_PBIO 9090	Area Veterinary Pathobiology Dissertation Research

### **Clinical and Diagnostic Rounds and Seminars (n=16)**

Chemistry Rounds

Comparative Orthopaedic Laboratory (COL) journal club

Cytology Rounds

Dermatology Rounds

Food for Thought Rounds



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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

Neurology Rounds

Ophthalmic Pathology Rounds

Slide treats

VMDL-Food Animal Monthly Rounds

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### **Residency Training Programs**

Anatomical Pathology Resident Training

Clinical Pathology Resident Training

Clinical and Diagnostic Microbiology (new)

### **International Programs**

1. Department of Food Science and Engineering (USP) at the University of Sao Paulo (USP), Pirassununga, São Paulo, Brazil – Collaborative training and research
2. Agencia de Regulación y Control de la Bioseguridad y Cuarentena para Galápagos or Agency for Biosafety and Quarantine Regulation and Control for the Galápagos (ABG) – Building diagnostic capacity and collaborative research

### ***VMDL Faculty/Staff Academic Service & Leadership Activities***

#### **National/State**

1. American Association of Veterinary Laboratory Diagnosticians (AAVLD), Directors Committee, Government Relations Committee, Bacteriology and Mycology Subcommittee, Antimicrobial Subcommittee, Publication Committee, Dr. Shuping Zhang
2. American Association of Veterinary Laboratory Diagnosticians (AAVLD), Quality Assurance Committee, Ms. Susan Martin, Dr. Tom Reilly, Dr. Shuping Zhang
3. American Association of Veterinary Laboratory Diagnosticians (AAVLD), Epidemiology Committee, Virology Committee, Dr. Mike Zhang
4. American Board of Veterinary Toxicologists, Dr. Evans
5. American Board of Veterinary Toxicologists, Dr. Evans
6. American College of Veterinary Microbiologists (ACVM), Budget Committee, Exam Committee, Drs. tamara Gull, Shuping Zhang
7. American College of Veterinary Pathologists, Exam Committee, Drs. Linda Berent, Angela Royal



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8. Journal of Veterinary Diagnostic Investigation (JVDI) Editorial Board, Dr. Shuping Zhang
9. Missouri Biosecurity Working Group
10. NAHLN Antimicrobial Surveillance Working Group, Dr. Shuping Zhang
11. Phi Zeta Veterinary Honor Society, Dr. Chuck Wiedmeyer
12. USAHA-AAVLD Joint Committee on the Environment and Toxicology, Dr. Evans

### University

1. MU Campus Conflict of Interest Committee, Dr. Chuck Wiedmeyer
2. MU Chancellor's Committee on Student Conduct, Dr. Chuck Wiedmeyer
3. MU Chancellor's Standing Committee on Safety, Dr. Evans
4. MU Chancellor's Standing Committee on Safety, Dr. Evans
5. MU Council of International Initiative (CII), Dr. Shuping Zhang
6. MU Engagement Council, Drs. Evans and Zhang
7. MU Faculty Equity Panel, Dr. Shuping Zhang
8. MU Masters in Public Health Program, Dr. Evans

### College/Department

1. CVM Academic Research Advisory Board, Dr. Shuping Zhang
2. CVM Administrator Evaluation Committee, Dr. Kei Kuroki
3. CVM Admissions and Scholarships Committee, Dr. Dae-Young Kim & Dr. Mike Zhang
4. CVM AES Research Committee, Dr. Evans
5. CVM Animal Resources Committee, Drs. Jeff Mitchell, Mike Zhang
6. CVM Computer Committee, Dr. Kei Kuroki
7. CVM COR Grant Review Committee, Dr. Gayle Johnson
8. CVM Curriculum Committee, Dr. Evans
9. CVM Faculty Responsibility Committee, Dr. Angela Royal
10. CVM Safety Committee, Dr. Shuping Zhang
11. CVM VHC Advisory Board, Dr. Shuping Zhang
12. Pathobiology Non-Tenure Track Promotion Committee, Drs. Dae-Young Kim, Shuping Zhang
13. Vet Pathobiology Promotion and Tenure Committee, Dr. Gayle Johnson

### *VMDL Faculty Scholarly Activities*

#### Extramural Grants and Contracts

1. Kei Kuroki, Seamless Healing of Avascular Meniscus Tears by Stem Cell Recruitment, COLUMBIA UNIV. \$239,281. 2017-10-24.
2. Johnson, PJ (PI), Martinez-Lemus, LA (Co-I), Wiedmeyer, CE (Co-I). Role of endothelial glycocalyx in equine health and disease USDA Animal Health Formula Funds. \$8000. 2017 - 2018.



3. Shuping Zhang. NAHLN Level II Member Lab. USDA. \$120,693. 2017-2018.
4. Shuping Zhang, Tim Evans, Gayle Johnson, Tom Reilly. FDA CVM Vet-LRN Vet Diagnostic Lab Program. NIH/FDA. \$16,500, 2017-2018.
5. Shuping Zhang, FDA CVM Vet-LRN Tier I Vet Diagnostic Lab Supplement. NIH/FDA. \$5,000, 2017-2018.
6. Kei Kuroki, et al. Assessment of an Impact Model for Sub-chondroplasty Treatment in Dogs, ZIMMER HOLDINGS INC. \$262,373, Completed in 2017.
7. Kei, Kuroki et al. Supplement III - Pivotal Anchor Study, ARTHREX, INC. \$52,478. Completed in 2017.
8. Shuping Zhang and Mahmoud Almasri. Biosensor for rapid detection of *Salmonella* in food and clinical samples. Coulter Foundation. \$143,698, 2016-2017. Completed in 2017.

#### **Publications (N = 42)**

1. Burton EN, Johnson GC, Royal AB. Pathology in Practice (Chondrosarcoma in a dog). J Am Vet Med Assoc 251(8): 903-905, 2017
2. Clemensen AK, Provenza FD, Lee ST, Gardner DR, Rottinghaus GE, Villalba JJ. Plant secondary metabolites in alfalfa, birdsfoot trefoil, reed canarygrass, and tall fescue unaffected by two different nitrogen sources. Crop Science, 57(2):964-970, 2017
3. Clemensen AK, Rottinghaus GE, Lee ST, Provenza FD, and Villalba JJ. How planting configuration influences plant secondary metabolites and total N in tall fescue (*Festuca arundinaceus* Schreb.), alfalfa (*Medicago sativa* L.), and birdsfoot trefoil (*Lotus corniculatus* L.): implications for grazing management. Grass and Forage Sci May 29, 2017 doi: 10.1111/gfs.12298
4. Cook JL, Kuroki K, Stoker AM, Monibi FA, Roller BL. Meniscal biology in health and disease. Connect Tissue Res 58:225-237, 2017
5. Cook JL, Smith P, Stannard JP, Pfeiffer F, Kuroki K, Bozynski CC, Cook C. A canine arthroscopic anterior cruciate ligament reconstruction model for study of synthetic augmentation of tendon allografts. J Knee Surg 30:704-711, 2017
6. Cross TW, Zidon T, Welly R, Park YM, Britton S, Koch L, Rottinghaus GE, de Godoy M, Padilla J, Swanson K, Viera-potter V. Soy Improves cardiometabolic health and cecal microbiota in female low-fit rats. Nature Scientific Reports 7:9261, 2017 doi:10.1038/s41598-017-08965-0
7. Di Gregorio MC, Jager AV, Souto PC, Costa AA, Rottinhghaus GE, Passarelli D, Budiño FE, Corassin CH, Oliveira CAF. Determination of serum aflatoxin B1-lysine to evaluate the in vivo efficacy of an aflatoxin-adsorbing feed additive in pigs fed aflatoxin B1-contaminated diet. Mycotoxin Research 33:93-102, 2017 doi 10.1007/s12550-016-0267-5
8. Fortin JS, Calcutt MJ, Kim DY. Sublingual pythiosis in a cat. Acta Veterinaria Scandinavica. 59:63 2017 DOI 10.1186/s13028-017-0330-z



9. Fortin JS, Calcutt MJ, Nagy DW, Kuroki K. Intestinal histoplasmosis in a captive reindeer (*Rangifer Tarandus*), Missouri, USA. *J Zoo Wild Med* 48:925-928, 2017
10. Franklin SP, Stoker AM, Bozynski CC, Kuroki K, Clarke KM, Johnson JK, Cook JL. Comparison of platelet-rich plasma, stromal vascular fraction (SVF), or SVF with an injectable PLGA nanofiber scaffold for the treatment of osteochondral injury in dogs. *J Knee Surg* 2017 doi: 10.1055/s-0037-1606575.
11. Grant SA, Smith SE, Schmidt H, Pfeiffer F, Kuroki K, Sherman S, White RA, Grant DA. In vitro bone tunnel evaluation of nanoparticle-grafts using an ACL reconstruction rabbit mode. *J Biomed Mater Res A*. 105:1071-1082, 2017
12. Grzelak, AK, Davis, DJ, Caraker, SM, Crim, MJ, Spitsbergen, JM, Wiedmeyer, CE. Stress leukogram induced by acute and chronic stress in zebrafish (*Danio rerio*). . *Journal of the American Association of Laboratory Animal Science*, 67:4; 1-7, 2017
13. Guess TM, Razu SS, Kuroki K, Cook JL. Function of the anterior intermeniscal ligament. *J Knee Surg*. 31:68-74, 2018. doi: 10.1055/s-0037-1600089. Epub 2017 Mar 29.
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15. Jasim I, Abdulla A, Shen Z, Zhang S, Alalem M, Dewik M, Almasri M. An impedance biosensor for simultaneous detection of low concentration of salmonella serogroups in poultry samples. *IEEE/Transducer conf.*, pp. 726-729, 2017
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  37. Whitney MS. Put it to practice: viewing blood smears to maximize the value of the CBC. *Proceedings of the Annual Meeting of the Missouri Veterinary Medical Association*, 2017.
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  42. Zhang MZ, Yang M, Rollins D, Zhang S. Differentiation of *Corynebacterium uropygiale* strains from Northern Bobwhite (*Colinus virginianus*) and Turkeys (*Meleagris gallopavo*). *Poult Fish Wildl Sci* 5(2):186, 2017. doi: 10.4172/2375-446X.1000186

#### Abstracts, Posters, and Presentations (n=41)

1. Berent L. Clinical teaching and learning: From theory to practice. *Primary Care Veterinary*



Educators World Symposium October 27-29, 2017. Columbia, MO

2. Charles A. Maitz, John D. Brockman, Ming Yang, Shuping Zhang, James Stannard, David Volgas, John M Gahl. Demonstration of the bactericidal effects of the boron neutron capture reaction. The 63rd Annual Meeting of Radiation Research Society, October 15-18, 2017. Cancun, Mexico
3. Cook JL, Smith P, Stannard JP, Pfeiffer FM, Kuroki K, Bozynski CC, Cook CR. Effects of synthetic augmentation of tendon allografts for complete ACL reconstruction in a translational animal model. Orthopaedic Research Society. March 19-22, 2017. San Diego, CA
4. Evans TJ. What killed the cow? Greene County Extension Meeting. March 21, 2017. Springfield, MO
5. Evans TJ. Toxicology case reports and Toxicology considerations for reproduction (2 hrs). Kansas State University 79th Annual Conference for Veterinarians. June 2-4, 2017, Manhattan, KS
6. Evans TJ. Various topics pertaining to small animal toxicology (6 hrs). Emerald Coast Veterinary Conference. June 28-July 2, 2017. Miramar Beach, FL
7. Evans TJ. What can a veterinary diagnostic laboratory do for you (8 hrs)? MU Southwest Research Center Field Day. September 8-9, 2017. Mount Vernon, MO
8. Fales W, Gull T, Bowman J, Ganjam I, Reilly T, Robbe-Austermann S. A Curve from Versatrek. AAVLD, October 2017. San Diego, CA
9. Fortin JS, Calcutt MJ, Nagy DW, Kuroki K. Intestinal histoplasmosis in a captive reindeer (*Rangifer tarandus*). ACVP, November 11, 2017. Vancouver, Canada
10. Fortin JS, Hakim CH, Korte S, Johnson GC, Duan D. Widespread severe myodegeneration in a homozygous female dog with dystrophin deficiency. ACVP, November 2017. Vancouver, Canada
11. Fortin JS, Calcutt MJ, Nagy DW, Kuroki K. Intestinal histoplasmosis in a captive reindeer (*Rangifer tarandus*), Missouri, USA. AAVLD, October 12-18, 2017. San Diego, CA
12. Franklin SP, Lin A, Burke E, Stoker AM, Bozynski CC, Kuroki K, Guldberg R, Holmes S. dGEMRIC and Epic-microCT imaging in a canine model of knee osteoarthritis. Orthopaedic Research Society, Paper #428. San Diego, CA. March 19-22, 2017.
13. Franklin SP, Stoker AM, Bozynski CC, Kuroki K, Clarke K, Cook JL. Comparison of PRP, stromal vascular fraction, and stromal vascular fraction supplemented with a biodegradable nanofiber polymer for the treatment of cartilage pathology in dogs. Orthopaedic Research Society. March 19-22, 2017. San Diego, CA
14. Gosselin VB, Middleton J, Zhang MZ. Diagnostic performance of a competitive ELISA using frozen-thawed milk for identification of Small Ruminant Lentivirus-infected goats. CVM Research Day, University of Missouri. May 5, 2017. Columbia, MO
15. Jasim I, Abdulla A, Shen Z, Zhang S, Alalem M, Dewik M, Almasri M. An Impedance



- Biosensor for Simultaneous Detection of Low Concentration of *Salmonella* Serogroups in Poultry Samples. Transducer June 18-22, 2017. Kaosiung, Taiwan.
16. Jasim I, Abdullha A, Shen Z, Zhang S, Alalem M, Dewik M, Almasri M. An Impedance Biosensor for Simultaneous Detection of Low Concentration of *Salmonella* Serogroups in Turkey Ready-to-Eat (RTE) Products. International Association for Food Protection. July 9-12, 2017. Tampa, FL.
  17. Kuroki K. Biologic repair strategies. Society of Toxicologic Pathology. 36Th Annual Symposium. June 24-29, 2017. Montreal, Quebec, Canada
  18. Martin S, Reilly T, Zhang S. Employing the RADAR Approach to Improve AAVLD and Quality System Compliance. AAVLD. October 12 -18, 2017. San Diego, CA.
  19. Miller P, Mitchell Jr. WJ, and Odemuyiwa SO. Evolution of coronaviruses in captive ruminants. 2017 Veterinary Research Scholars Program, Boehringer Ingelheim-NIH Symposium. August 3 – 6, 2017, Washington, DC
  20. Mitchell NM, Pastrana-Negron A, Mohamed A, Reddy PG, and Odemuyiwa SO. Surveillance for and characterization of non-primate hepacivirus in east Alabama. Abstract P115; 98th Conference of Research Workers in Animal Diseases, December 3-5, 2017, Chicago, IL
  21. Monibi FA, Stoker AM, Pfeiffer FM, Kuroki K, Sherman SL, Cook JL. Molecular evaluation of a novel decellularized meniscal repair scaffold on fibroblast-like synoviocytes. Orthopaedic Research Society. March 19-22, 2017. San Diego, CA.
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  23. Nuelle CW, Stokes DC, Kuroki K, Cook JL, Sherman SL. What is the location and extent of pathology in surgical cases of chronic biceps tendinopathy undergoing subpectoral biceps tenodesis. Arthroscopy Association of North America. May 18-20, 2017. Denver, CO
  24. Pithua P, Mugisha L, Khaita ML, and Odemuyiwa SO. Leptospirosis in abattoir workers in Uganda: a risk assessment pilot. The 98th Conference of Research Workers in Animal Diseases, December 3-5, 2017, Chicago, IL
  25. Roller BL, Kuroki K, Bozynski CC, Pfeiffer FM, Cook JL. Use of a novel magnesium-based resorbable bone cement for augmenting anchor and tendon fixation. Orthopaedic Research Society, March 19-22, 2017. San Diego, CA
  26. Rothacker TM. Hypereosinophilia in a dog. ACVP/ASVCP meeting in Vancouver, BC Nov 5 – 8, 2017 (Angela Royal as Mentor).
  27. Royal A. Lecture and laboratory sessions - Lumps, bumps, and the cells you'll see. 125th Annual MVMA Conference. January 20, 2017. Columbia MO



28. Shahzad S, Shen Z, Straka K, Daugherty E, Thompson D, Zhang MZ, Mitchell J, Zhang S, Stich RW. Preliminary development of a PCR-based assay panel to screen ticks collected from elk in Missouri. The 98th Annual Conference of Research Workers in Animal Diseases (CRWAD), December 1-5, 2017. Chicago, IL
29. Shen Z, Stich WR, Zhang MZ, Mitchell WJ, Zhang S. A Real-time PCR panel for detection of tickborne pathogens in veterinary specimens. AAVLD. October 12 -18, 2017. San Diego, CA
30. Shen Z, Zhang MZ, Almasri M, Zhang S. Detection of low concentrations of *Salmonella* in food produces with an impedance biosensor. AAVLD. October 12 -18, 2017. San Diego, CA
31. Shoemake C. Chemistry Case Presentation: Mesenteric volvulus in a kangaroo. ACVP/ASVCP meeting in Vancouver, BC Nov 5 - 8, 2017 (Angela Royal as Mentor). Columbia, MO
32. Whitney MS. A good smear job: the value of the blood smear (what the hematology instrument doesn't see). Annual Conference of the Missouri Veterinary Medical Association, January 20, 2017. Columbia, MO
33. Whitney, MS. Hematology case discussions: the diagnostic usefulness of blood smear examination - Interactive digital laboratory session. Annual Conference of the Missouri Veterinary Medical Association. January 20, 2017. Columbia, MO
34. Williams F. Necropsy of exotic animals. Exotics Symposium Wetlab. University of Missouri. January 15, 2017. Columbia, MO
35. Williams F. Snake necropsy wet lab. University of Missouri. Necropsy Lab. September 18, 2017. Columbia, MO
36. Williams, F. STEM Talk. The BIOME School. October 2, 2017. St. Louis, MO
37. Yang M, Zhang C, Fales WH, Zhang MZ, Shaw D, Zhang S. Serovar Distribution and antimicrobial susceptibility of *Salmonella enterica* isolates from avian samples between 2010 and 2016. AAVLD. October 12 -18, 2017. San Diego, CA
38. Yang M, Zhang C, Zhang MZ, Zhang S. Linear avian beta-defensin-12 analogue-3 with therapeutic potential properties. ASM Missouri Valley Branch Meeting. March, 2017. Springfield, MO
39. Yang M, Zhang C, Zhang S. Novel membrane-active and salt-resistant antimicrobial peptides. MU Life Science Week. April, 2017. Columbia, MO
40. Zhang C, Yang M, Fales WH, Zhang MZ, Middleton J, Zhang S. Serovar distribution and antimicrobial susceptibility of *Salmonella enterica* isolates from ruminant samples from 2010 to 2016. AAVLD. October 12 -18, 2017. San Diego, CA
41. Zinn M, Kuroki K. A case of feline progressive histiocytosis with pulmonary metastasis. ACVP. Nov 11, 2017, Vancouver, Canada

**Book Chapter (n=1)**



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1. Wiedmeyer CE (100% Contribution) "Evaluation of Hepatic Function and Injury" Clinical Chemistry of Laboratory Animals – 3rd Edition. Editors: Greg Travlos, Judith Prescott, David Kurtz - 2017. (Invited contribution)

### **Major Annual Professional Meetings and Trainings Attended by VMDL Faculty and Staff**

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AAVLD/NAHLN Auditors Training

AAVLD/NAHLN Quality Assurance Training

American Association of Avian Pathologists

American Association of Veterinary Medical Colleges

American College of Veterinary Pathologists

American Society for Veterinary Clinical Pathologists

American Association of Veterinary Laboratory Diagnosticians

American Society for Veterinary Clinical Pathology

American Veterinary Medical Association

American Society of Microbiology

CVC Central in Kansas

Emerald Coast Veterinary Conference

FDA Vet-LIRN Annual Conference

Kansas State University 79th Annual Conference for Veterinarians

Midwest Poultry Confederation

Missouri Department of Agriculture State and Federal Conference

Missouri University Southwest Research Center Field Day

Missouri Veterinary Medical Association

Monthly MVMA West Central meetings

Primary Care Veterinary Educators Symposium

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