



2021

ANNUAL
REPORT



OADDL
College of Veterinary Medicine

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ACCREDITATION

The Oklahoma Animal Disease Diagnostic Laboratory is accredited as a full-service laboratory for all animal species by the American Association of Veterinary Laboratory Diagnosticians (AAVLD).

Current certification expires December 31, 2024.



MISSION STATEMENT

The Oklahoma Animal Disease Diagnostic Laboratory promotes the overall well-being of animals through diagnostic testing, instruction of professional veterinary students, and research in diseases of economic importance to Oklahoma and beyond.

VISION STATEMENT

The Oklahoma Animal Disease Diagnostic Laboratory will be recognized as a leader in veterinary diagnostics through excellence in diagnostic service, research efforts leading to improved animal disease testing and surveillance, and sustained accreditation by the American Association of Veterinary Laboratory Diagnosticians.

MESSAGE FROM THE DIRECTOR

We are very pleased to share with you our annual report for the 2021 calendar year. The state of OADDL remains strong in large part because of your continuous steadfast support.

I want to thank our two major stakeholders – the OSU College of Veterinary Medicine and the Oklahoma Department of Agriculture, Food and Forestry – for their support and advocacy for OADDL’s financial well-being.

I also want to thank our in-state and out-of-state clients for their business. We know you have plenty of choices on where to send your diagnostic specimens, so we do not take your business for granted. We work hard to earn and retain your business through the quality and reliability of the services we provide. We trust that you will maintain your partnership with us and never fail to make suggestions for improvement as you see fit.

Finally, I would like to recognize our outstanding faculty and staff for their dedication to OADDL’s mission and working very hard every day to accomplish it.

As mentioned above, the state of OADDL remains strong. In 2021, we continued to improve on our services - qualitatively and quantitatively. Following are some of our highlighted accomplishments in 2021:

- OADDL entered into a partnership arrangement with the Oklahoma State Department of Health, whereby OADDL will conduct rabies testing for the State going forward. This service started on 9/13/2021.

- The Parasitology Laboratory, previously administered by the Department of Veterinary Pathobiology, was integrated into OADDL and became one of its sections on 7/1/2021. Previously, that laboratory was used as a referral laboratory. This integration is expected to provide a better experience for clients using parasitology diagnostic services.
- Our caseload continues to grow, with accessions increasing by 19.8% and number of tests increasing by 10.7%.
- To improve the monitoring of storage conditions for essential reagents and client samples, we recently completed the installation of a lab-wide temperature/CO₂ monitoring system, which alerts us 24/7 when equipment temperature or CO₂ levels go outside pre-defined ranges.
- Several new tests were introduced ([see page 8](#)) to provided more timely service by increasing the number of tests performed in-house.

Please, enjoy the report and let us know if you have any suggestions for its improvement in subsequent years. Send any suggestions to oaddl@okstate.edu. Thank you.



**Jerry T. Saliki, DVM,
PhD, DACVM**

Professor and Director

WHAT OUR STAKEHOLDERS SAY ABOUT US

We love you guys! You are so much easier to work with than XXXXXXXX and we really appreciate the services you provide. Ya'll have been wonderful.

Dr. Windiate, on behalf of Tulsa Community College Veterinary Technology Program I want to thank you for the insightful zoom lecture on how to safely and properly handle lab samples. Thank you for this wonderful lecture.

I wanted to thank you for my recent time over at OADDL on the Applied Diagnostics rotation. It was truly a great experience. Everyone was so welcoming and wonderful. You have an extraordinary group of people working there and I was so blessed to meet them. I will genuinely miss seeing them everyday! They went above and beyond to make me feel at home – always offering to spend more time working with me and showing me what they do. I could not have asked for a better way to begin my 4th year.

Thank you so much for having me, and please extend my sincerest thanks to everyone at OADDL!

"Akhilesh, your lab is amazing. Thanks for getting those done so quickly. (And the results look just like we wanted them to! :)"

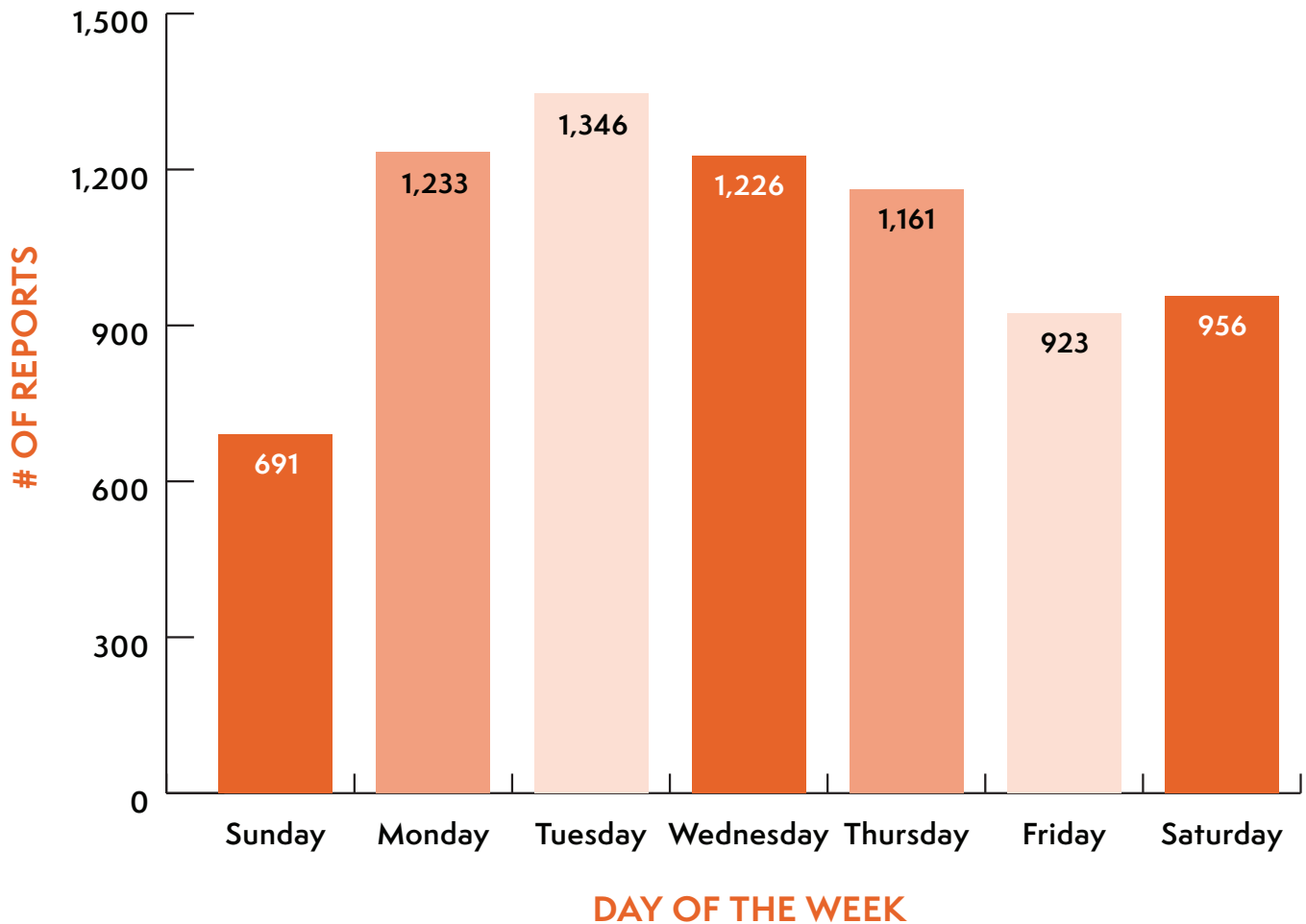
Bottom line is that Dustin [Histology Laboratory Manager] has been a real pleasure to work with – very skilled at what he does, very professional in our interactions, a good communicator, and clearly eager not only to do his job well but to learn from others in the process.

THANK YOU Dr. Taylor for all your work, professionalism and understanding. You're an amazing physician, who truly cares about loved ones and "trying" to help find closure in a time of need. You are an absolutely remarkable woman and doctor!

CLIENT SERVICE BEYOND BUSINESS HOURS

CY 2021

NUMBER OF AFTER-HOUR REPORTS *



TOTAL NUMBER OF AFTER-HOUR REPORTS IN 2021: 7,536

* Includes Preliminary, Final and Addend reports reviewed and sent by staff (no auto-generated reports).

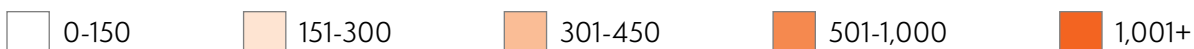
COUNTIES OF OKLAHOMA SERVED

CY 2021

COUNTY	# OF ACCESSIONS
Adair	120
Alfalfa	86
Atoka	96
Beaver	55
Beckham	241
Blaine	152
Bryan	270
Caddo	146
Canadian	328
Carter	322
Cherokee	107
Choctaw	154
Cleveland	642
Coal	55
Comanche	198
Cotton	107
Creek	286
Custer	94
Dewey	149
Ellis	92
Garfield	638
Garvin	308
Grady	227

COUNTY	# OF ACCESSIONS
Grant	136
Greer	18
Haskell	156
Hughes	553
Jackson	150
Jefferson	227
Johnston	38
Kay	380
Kingfisher	133
Kiowa	160
Latimer	196
Le Flore	189
Lincoln	940
Logan	576
Major	101
Marshall	162
Mayes	197
McClain	504
McCurtain	115
McIntosh	126
Muskogee	214
Noble	412
Nowata	47

COUNTY	# OF ACCESSIONS
Okfuskee	157
Oklahoma	1,957
Okmulgee	255
Osage	110
Ottawa	137
Pawnee	177
Payne	6,124
Pittsburg	195
Pontatoc	162
Pottawatomie	314
Pushmataha	47
Rogers	251
Seminole	149
Sequoyah	215
Stephens	427
Texas	1,239
Tulsa	882
Wagoner	168
Washington	169
Washita	75
Woods	51
Woodward	67



STATES SERVED

CY 2021

STATE	# OF ACCESSIONS
AK	1
AL	3
AR	1,288
AZ	14
CA	42
CO	100
CT	14
FL	206
GA	1
IA	8
ID	8
IL	8
IN	17
KS	398
LA	18
MA	1
MD	1
ME	3
MI	4
MN	93
MO	135
MS	9

STATE	# OF ACCESSIONS
MT	9
NC	74
ND	1
NE	16
NM	7
NY	20
OH	165
OK	18,351
OR	5
PA	13
RI	1
SC	1
SD	2
TN	8
TX	1,243
UT	1
VA	25
VT	1
WA	12
WI	7
WV	3
WY	4

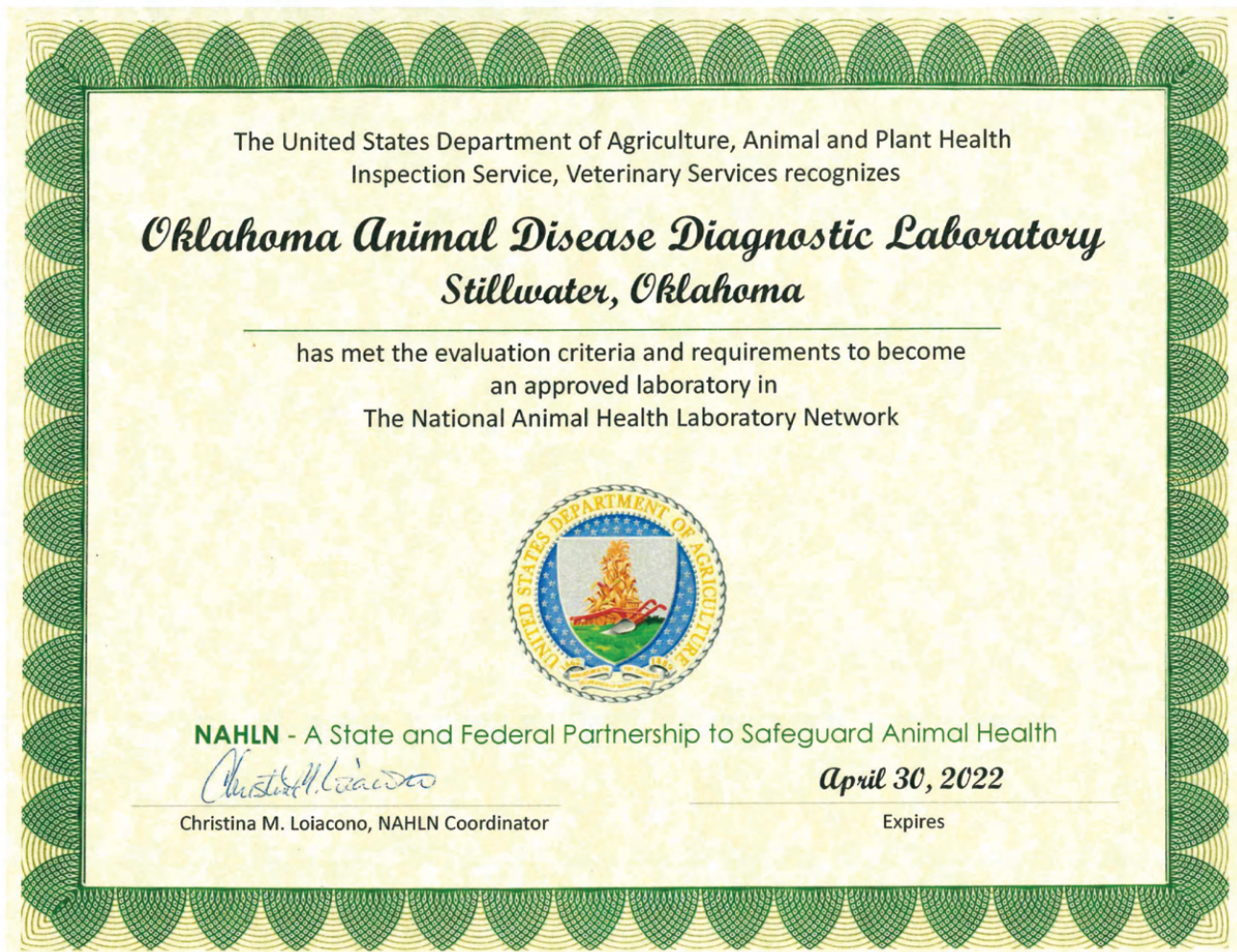
0-10

11-100

101-1,000

1,001+

NAHLN MEMBERSHIP AND VET-LIRN PARTICIPATION



NAHLN MEMBERSHIP

In 2021, OADDL undertook the following activities in support of the NAHLN's missions:

- Participated in FAD NAHLN exercise on sample submission, use of NCAH portal, pack/ship samples. June 2021 – Akhilesh Ramachandran, Robin Madden, Emily Cooper, Giselle Cino
- Participated in FAD-SAFE exercise, ODAFF and NAHLN. November 2021 – JT Saliki, Akhilesh Ramachandran, Robin Madden, Emily Cooper

VET-LIRN MEMBERSHIP

OADDL participates in the Veterinary Laboratory Investigation and Response Network (Vet-LIRN) - a network of animal health diagnostic laboratories that assist the U.S. Food and Drug Administration (FDA) in investigating potential problems with regulated animal feeds and drugs. OADDL is currently in the second year of a 5-Year cooperative grant in support of the lab's participation in Vet-LIRN. Activities in support of Vet-LIRN in 2021 include:

- Submission of bacterial isolates for FDA antimicrobial resistance study.
- Participation in a collaborative genome sequencing project.

NEW TESTS INTRODUCED

CY 2021

MOLECULAR DIAGNOSTICS

Porcine Circovirus Multiplex Real-Time PCR

(includes Porcine Circovirus Type 2 and Type 3 testing)

Samples: serum, oral fluids, fresh lung, lymph node, processing fluid

Test Fee: \$50.00

TAT: 2-3 business days

NECROPSY

Bovine Respiratory Disease (BRD) Field Necropsy Panel

(panel includes aerobic culture and sensitivity, BVDV ELISA and biopsy short report)

Samples: fresh ear notch in saline, fresh lung and formalin-fixed lung

Test Fee: \$100.00

TAT: 3-5 business days

SEROLOGY

Bovine Respiratory SN Profile 1

(profile includes IBR, BVDV Type I, PI3 and BRSV)

Sample: serum

Test Fee: \$30.00

TAT: 3-7 business days

Bovine Respiratory SN Profile 2

(profile includes IBR, BVDV Type I, BVDV Type II, PI-3 and BRSV)

Sample: serum

Test Fee: \$35.00

TAT: 3-7 business days

Rabies Direct Fluorescent Antibody (dFA) Test

Samples: intact brain, whole body, head

Test Fee: \$0.00

TAT: same business day

Small Ruminant Biosecurity Panel

(panel includes CAEV cELISA or OPPV cELISA, Johnes ELISA and CL SHI)

Samples: (caprine, ovine) serum

Test Fee: 1-10 samples: \$35.00

11+ samples: \$30.00

TAT: 2-7 business days

PARASITOLOGY

Cryptosporidium Stain

Sample: 1 g fresh feces each animal

Test Fee: \$15.00

TAT: 1-2 business day

Fecal Egg Count – McMaster Method

Sample: 4-6 g fresh feces each sample

Test Fee: 1-10 samples: \$18.00

11+ samples (discount package): \$15.00

TAT: same business day

Fecal Egg Count – Wisconsin Method

Sample: 2-6 g fresh feces each sample

Test Fee: 1-10 samples: \$25.00

11+ samples (discount package): \$21.00

TAT: same business day

Fecal Egg Count (McMaster) and Sedimentation – Discounted Test Package (8-10 samples)

Sample: 2-6 g fresh feces each animal

Test Fee: \$40.00

TAT: 1 business day

Baermann Method – Discount Package (11+ samples)

Sample: 8-10 g fresh feces each animal; vomitus

Test Fee: \$15.00

TAT: 1 business day

Centrifugal Fecal Flotation – Discount Package (11+ samples)

Sample: 3-5 g fresh feces each animal

Test Fee: \$15.00

TAT: same business day

Fecal Sedimentation – Discount Package (11+ samples)

Sample: 8-10 g fresh feces each animal

Test Fee: \$15.00

TAT: same business day

Centrifugal Fecal Flotation and Baermann – Discounted Test Package (11+ samples)

Sample: 10-15 g fresh feces each sample; vomitus

Test Fee: \$30.00

TAT: 1 business day

Centrifugal Fecal Flotation and Sedimentation – Discounted Test Package (11+ samples)

Sample: 10-15 g fresh feces each sample

Test Fee: \$32.00

TAT: same business day

D. immitis Antigen Pre and Post Heat Treatment - Discount Package (25-50 samples)

Samples: 1.0 mL serum or plasma each sample

Test Fee: \$18.00

TAT: same business day

D. immitis Antigen Pre and Post Heat Treatment + Heartworm Microfilaria (Modified Knott's) – Discount Package (25-50 samples)

Samples: 1.0 mL serum or plasma and 1-1.5 mL whole blood each sample

Test Fee: \$35.00

TAT: same business day

D. immitis Antigen Pre and Post Heat Treatment + Fecal Centrifugation – Discount Package (25-50 samples)

Samples: 1.0 mL serum or plasma and 3-5 g fresh feces each sample

Test Fee: \$22.50

TAT: same business day

D. immitis Antigen Pre and Post Heat Treatment + Heartworm Microfilaria (Modified Knott's) + Fecal Centrifugation – Discount Package (25-50 samples)

Samples: 1.0 mL serum or plasma and 1-1.5 mL whole blood and 3-5 g fresh feces each sample

Test Fee: \$37.00

TAT: same business day

SERVICE TO THE OKLAHOMA HORSE RACING COMMISSION



OADDL maintains an annually renewable service contract with the Oklahoma Horse Racing Commission (OHRC). The service provided is to conduct complete necropsies of all horses that die or are euthanized at OHRC-licensed racetracks: Remington Park, Will Rogers Downs, and Fair Meadows. Additionally, drug screens are pursued when indicated. This service falls under the recommendation of the American Association of Equine Practitioners (AAEP) to not only detail the pathologic findings in each case but to provide a database for epidemiological studies. The data is used in part to identify the catastrophic musculoskeletal injury (CMI) index, a number representing the rate of fatal musculoskeletal injuries to the number of horses that race. This Oklahoma-specific CMI can then be compared to the national rate of fatal injuries. Fifty horses were submitted to OADDL for necropsy during calendar year 2021. This is similar to the number of horses submitted each year for the past four years. The specifics for each case are compiled to describe the injuries, both



Photos By: Dustin Orona Photography

musculoskeletal and non-musculoskeletal. From this data, attempts can be made to determine the cause of the injuries and possibly develop prevention strategies. Additionally, injury and fatality patterns may be detected that could prompt more thorough investigation by the OHRC. This collaboration between OADDL and OHRC helps enhance Oklahoma's equine racing industry, while assuring continual improvement in equine welfare.

FUNDING SOURCES

STATE FUNDING

\$1,697,653

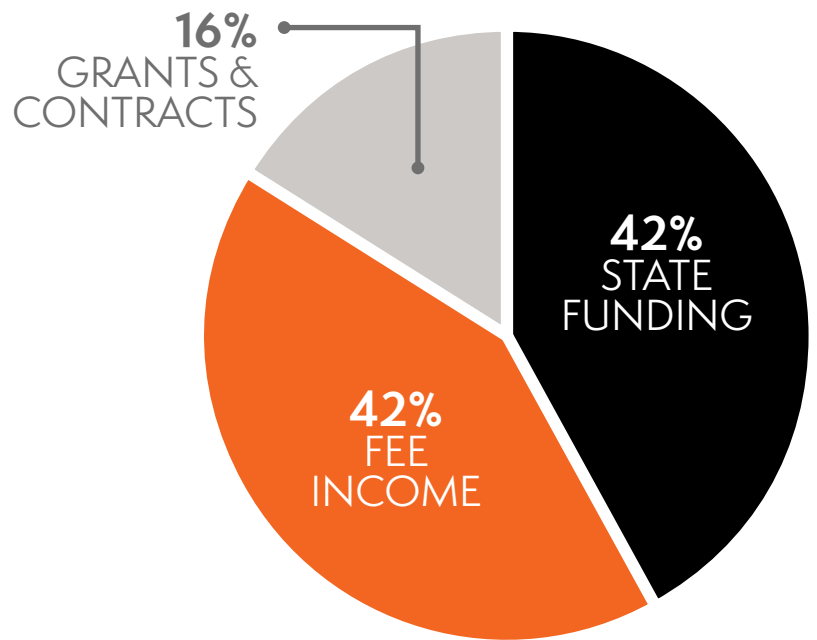
FEE INCOME

\$1,695,669

GRANTS & CONTRACTS

\$669,269

TOTAL: \$4,062,591



OADDL FUNDED CONTRACTS AND GRANTS

- NAHLN Level 1 Laboratory funding, OADDL: \$295,000
- Oklahoma Department of Agriculture, Food and Forestry funding to OADDL for Equipment: \$150,000
- Oklahoma Horse Racing Commission-renewed annual contract; **Saliki, J**
- VET-LIRN FDA 5-Year Grant Award: \$ 190,570 (FY 2021: \$55,160); **Ramachandran, A**
- FY21 Farm Bill, *Deep Learning Computational Algorithms for Disease Diagnosis by Genome Sequence* Grant: \$135,300; **Ramachandran A**
- FY21 Farm Bill, *Development of an Interactive Spatial Agrometrics Tool for the Calculation of Livestock (Cattle, Swine and Poultry) Populations in the United States at the County and Parish Level* Grant: \$15,784; **Ramachandran A**

QUALITY SYSTEM PROFICIENCY TESTING

CY 2021 PROFICIENCY TEST	AGENCY	LAB SECTION*
IBQAS **	AAVLD	Bacteriology (Lab-wide)
African Swine Fever (ASF) Real-Time PCR	NAHLN	Molecular Diagnostics (5)
Anaplasmosis ELISA	USDA	Serology (Lab-wide)
Antimicrobial Susceptibility Proficiency Test	NAHLN	Bacteriology (Lab-wide)
Avian Influenza AGID	USDA	results pending
Avian Influenza ELISA	USDA	results pending
Avian Influenza (AIV) Real-Time PCR	NAHLN	Molecular Diagnostics (6)
Avian Paramyxovirus Type 1 Real-Time PCR	NAHLN	Molecular Diagnostics (6)
Bluetongue ELISA	USDA	Serology (Lab-wide)
Bovine Leukemia Virus ELISA	USDA	Serology (Lab-wide)
<i>Brucella abortus</i> Card	USDA	Serology (4)
<i>Brucella abortus</i> FPA	USDA	Serology (4)
Classic Swine Fever (CSF) Real-Time PCR	NAHLN	Molecular Diagnostics (7)
Equine Infectious Anemia (EIA) ELISA	USDA	Serology (Lab-wide)
Foot and Mouth Disease Virus Real-Time PCR	NAHLN	Molecular Diagnostics (7)
Johne's Disease ELISA	USDA	Serology (Lab-wide)
Johne's Real-Time Direct PCR	USDA	Molecular Diagnostics (Lab-wide)
Johne's Real-Time Pooled Direct PCR	USDA	Molecular Diagnostics (Lab-wide)
MS/MG ELISA ***	PDRC****	Serology (Lab-wide)
MS/MG PCR ***	PDRC****	Molecular Diagnostics (Lab-wide)
NPIP Salmonella Group D Culture	NPIP	Bacteriology (Lab-wide)
Piroplasmosis c-ELISA	USDA	Serology (3)
Pseudorabies gB ELISA	USDA	Serology (4)
Rabies Direct Fluorescent Antibody (DFA)	WSLH †	Serology (2)
SARS-CoV-2 Inter-laboratory comparison	VetLIRN	Molecular (Lab-wide)
Swine Influenza Virus (SIV) Real-Time PCR	NAHLN	Molecular Diagnostics (6)

* (Lab-wide) indicates the laboratory is certified. (#) indicates the number of individuals authorized.

** Internal Bacteriology Quality Assurance Survey

*** *Mycoplasma synoviae* and *Mycoplasma gallisepticum*

**** Poultry Diagnostic and Research Center

† Wisconsin State Laboratory of Hygiene

SURVEILLANCE AND REPORTABLE DISEASE TESTING

3-YEAR TREND

SURVEILLANCE AND REPORTABLE DISEASE TESTING	CALENDAR YEAR		
	2019	2020	2021
African Swine Fever (ASF) PCR ‡	4	7	0
Avian Influenza			
Avian Influenza ELISA	1,995	2,610	2,734
Avian Influenza PCR ‡	183	196	243
Avian Influenza Agar Gel Immunodiffusion (AGID)	11	6	2
Avian Paramyxovirus-1 (END) PCR ‡	223	119	62
<i>Bacillus anthracis</i> Culture	7	4	29
Bluetongue Disease			
Bluetongue c-ELISA	33	38	140
Bluetongue AGID	13	45	1
Bluetongue Virus PCR	91	48	33
Bluetongue Virus VI	11	0	0
<i>Brucella</i> spp.			
<i>Brucella abortus</i> BAPA	22	58	154
<i>Brucella abortus</i> Card Agglutination Test	4,399	4,327	5,297
<i>Brucella abortus</i> Complement Fixation (CF)	33	12	0
<i>Brucella abortus</i> RAP	4	0	0
<i>Brucella abortus</i> Standard Plate	4	9	4
<i>Brucella abortus</i> Fluorescent Polarization Assay (FPA)	1	1,665	3,441
<i>Brucella canis</i> AGID	1	2	0
<i>Brucella canis</i> Card Test	251	234	261
<i>Brucella canis</i> IFA	19	37	36
<i>Brucella canis</i> 2-Mercaptoethanol Tube Agglutination	1	2	0
<i>Brucella melitensis</i> Card Test	19	20	5
<i>Brucella ovis</i> ELISA	20	17	11
<i>Brucella</i> spp. Culture	76	59	57

* Includes In-house and Referral Laboratory testing
 ‡ NAHLN Messaging Testing

SURVEILLANCE AND REPORTABLE DISEASE TESTING (CONTINUED)

3-YEAR TREND

SURVEILLANCE AND REPORTABLE DISEASE TESTING	CALENDAR YEAR		
	2019	2020	2021
<i>Brucella</i> spp. PCR	3	2	1
Chronic Wasting Disease (CWD) IHC PrP	8	3	0
Classical Swine Fever (CSF) PCR †	4	7	0
<i>Coxiella burnetii</i> (Q-Fever)			
<i>Coxiella burnetii</i> (Q-Fever) Complement Fixation (CF)	10	1	0
<i>Coxiella burnetii</i> (Q-Fever) c-ELISA	12	2	4
<i>Coxiella burnetii</i> (Q-Fever) IFA	0	1	0
<i>Coxiella burnetii</i> (Q-Fever) PCR	17	7	2
Eastern Equine Encephalomyelitis (EEE) IgM Capture ELISA	28	16	24
Equine Infectious Anemia (EIA)			
Equine Infectious Anemia c-ELISA	2,155	1,994	2,436
Equine Infectious Anemia AGID			1
Equine Infectious Anemia PCR	1	0	0
Epizootic Hemorrhagic Disease (EHD) PCR	21	1	0
Equine Herpesvirus			
Equine Herpesvirus 1 (EHV-1) Real-Time PCR	1,189	211	84
Equine Herpesvirus 4 (EHV-4) PCR	6	4	8
Equine Herpesvirus SN	1	5	4
Equine Piroplasmiasis			
<i>Babesia caballi</i> c-ELISA	200	259	289
<i>Theileria (Babesia) equi</i> c-ELISA	264	400	505
Equine Viral Arteritis (EVA) Virus			
Equine Viral Arteritis (EVA) PCR	15	19	16
Equine Viral Arteritis (EVA) Virus Isolation	16	2	0
Equine Viral Arteritis (EVA) SN and VN	72	64	41

* Includes In-house and Referral Laboratory testing
 † NAHLN Messaging Testing

SURVEILLANCE AND REPORTABLE DISEASE TESTING (CONTINUED)

3-YEAR TREND

SURVEILLANCE AND REPORTABLE DISEASE TESTING	CALENDAR YEAR		
	2019	2020	2021
<i>Francisella tularensis</i> (Tularemia)			
Tularemia PCR	6	3	21
Tularemia Plate Agglutination Test	6		4
Foot & Mouth Disease Virus Real-Time PCR †	10	6	2
Infectious Laryngotracheitis (ILT)			
Infectious Laryngotracheitis ELISA	1	0	0
Infectious Laryngotracheitis Real-Time PCR		3	1
Johne's Disease			
Johne's Disease Complement Fixation (CF)	13	3	0
Johne's Direct Fecal Real-Time PCR (single and pooled)	267	328	172
Johne's Disease ELISA	2,354	2,704	2,673
Leptospirosis-canine			
<i>Leptospira</i> Microscopic Agglutination Test (canine)	53	25	32
<i>Leptospira</i> sp. Real-Time PCR (canine)	19	9	10
<i>Mycoplasma</i> spp. (avian)			
<i>Mycoplasma gallisepticum</i> / <i>Mycoplasma synoviae</i> ELISA	18,445	21,599	23,705
<i>Mycoplasma gallisepticum</i> / <i>Mycoplasma synoviae</i> PCR (single)	11	8	8
<i>Mycoplasma gallisepticum</i> / <i>Mycoplasma synoviae</i> PCR (pooled)	33	43	1
<i>Mycoplasma gallisepticum</i> Hemagglutination Inhibition	318	216	161
<i>Mycoplasma synoviae</i> Hemagglutination Inhibition	318	216	161
Porcine Reproductive and Respiratory Syndrome Virus (PRRSV)			
PRRSV ELISA	49	1,676	3,637
PRRSV Real-Time PCR (single and pooled samples)	7,524	10,016	7,009

* Includes In-house and Referral Laboratory testing
 † NAHLN Messaging Testing

SURVEILLANCE AND REPORTABLE DISEASE TESTING (CONTINUED)

3-YEAR TREND

SURVEILLANCE AND REPORTABLE DISEASE TESTING	CALENDAR YEAR		
	2019	2020	2021
Pseudorabies Virus			
Pseudorabies gB and g1 ELISA	3,647	5,462	7,958
Pseudorabies PCR	4	7	4
Rabies Virus			
Rabies Virus	59	53	250
Salmonella spp.			
Salmonella spp. Culture	268	222	198
Salmonella pullorum Agglutination-Rapid Serum Test	1	0	0
Salmonella pullorum Microagglutination Titer	2	0	6
Salmonella pullorum/typhoid Microagglutination Screen	18,302	21,957	23,700
Salmonella pullorum Screening (NPIP culture)	32	6	5
Streptococcus equi PCR	40	20	42
Swine Influenza Virus (SIV)			
Swine Influenza Virus (SIV) PCR-Domestic Swine ‡	3	4	0
Swine Influenza Virus (SIV) PCR (single and pooled samples)	3,303	3,093	1,589
Tritrichomonas foetus			
T. foetus Real-Time PCR (single and pooled samples)	7,517	6,597	6,525
Tritrichomonas foetus Culture	6	46	2
Vesicular Stomatitis Virus			
Vesicular Stomatitis Virus Neutralization-Indiana	42	37	14
Vesicular Stomatitis Virus Neutralization-New Jersey	42	37	14
West Nile Virus			
West Nile Virus IgM Capture ELISA	37	23	43
West Nile Virus PCR	2	1	0
Total Number of Tests	74,177	86,933	93,872

* Includes In-house and Referral Laboratory testing
 ‡ NAHLN Messaging Testing

PREVALENCE OF MAJOR DISEASE AGENTS IN DIAGNOSTIC SAMPLES

CY 2021

DISEASE PREVALENCE BY SPECIES

INTERPRETIVE NOTES:

1. This data includes only agent detection or antibody test results that indicate current infection with the disease agent as opposed to any antibody tests, which simply indicate exposure to the disease agent or vaccination.
2. The prevalence numbers shown here indicate only the prevalence in the diagnostic samples tested and not prevalence of the diseases in the general animal population.

EQUINE DISEASES

DISEASE	# OF TESTS	% POSITIVE
Equine Herpesvirus Type-1 PCR	82	2%
Leptospirosis MAT	57	60%
Leptospirosis PCR	3	0% ‡
Rabies Direct FA	12	8%
Salmonella spp. Culture	59	20%

CAPRINE DISEASES

DISEASE	# OF TESTS	% POSITIVE
BRSV PCR	1	0% ‡
BVDV ELISA	0	N/A
BVDV PCR	9	0% ‡
CAE ELISA	375	10%
Johne's Disease ELISA	587	4%
Johne's Disease PCR	89	87%
Leptospirosis MAT	4	0% ‡
Leptospirosis PCR	3	0% ‡
Rabies Direct FA	6	0% ‡

OVINE DISEASES

DISEASE	# OF TESTS	% POSITIVE
BVDV ELISA	0	N/A
BVDV PCR	10	0% ‡
CAE cELISA	179	3%
Johne's Disease ELISA	171	1%
Johne's Disease PCR	1	0% ‡

CANINE DISEASES

DISEASE	# OF TESTS	% POSITIVE
Canine Distemper Virus PCR	44	23%
Leptospirosis MAT	35	23%
Leptospirosis PCR	10	0% ‡
Parvovirus PCR	50	76%
Rabies Direct FA	98	0% ‡

FELINE DISEASES

DISEASE	# OF TESTS	% POSITIVE
Cytauxzoon spp. PCR	16	19%
Rabies Direct FA	70	2%
Trichostrongylus axei PCR	8	25%

‡ 0% = No Positive Test results for listed disease

PREVALENCE OF MAJOR DISEASE AGENTS IN DIAGNOSTIC SAMPLES (CONTINUED)

CY 2021

BOVINE DISEASES

DISEASE	# OF TESTS	% POSITIVE
Anaplasmosis cELISA	793	46%
Anaplasmosis PCR	118	43%
<i>Bibersteinia trehalosi</i> Culture	101	2%
BLV PCR	0	N/A
BRSV PCR	66	29%
BVDV ELISA	2,615	1%
BVDV PCR	146	5%
Coronavirus PCR	83	30%
<i>Histophilus somni</i> Culture	101	19%
IBR PCR	110	2%
Johne's Disease ELISA	1,917	5%

DISEASE	# OF TESTS	% POSITIVE
Johne's Disease PCR	159	8%
Leptospirosis MAT	335	51%
Leptospirosis PCR	11	0%
<i>Mannheimia haemolytica</i> Culture	101	33%
<i>Mycoplasma bovis</i> PCR	77	43%
<i>Pasteurella multocida</i> Culture	101	14%
Rabies Direct FA	19	5%
<i>Salmonella</i> spp. Culture	25	4%
Tritrichomoniasis PCR	10,225	0.4%
<i>Trueperella pyogenes</i> Culture	101	12%

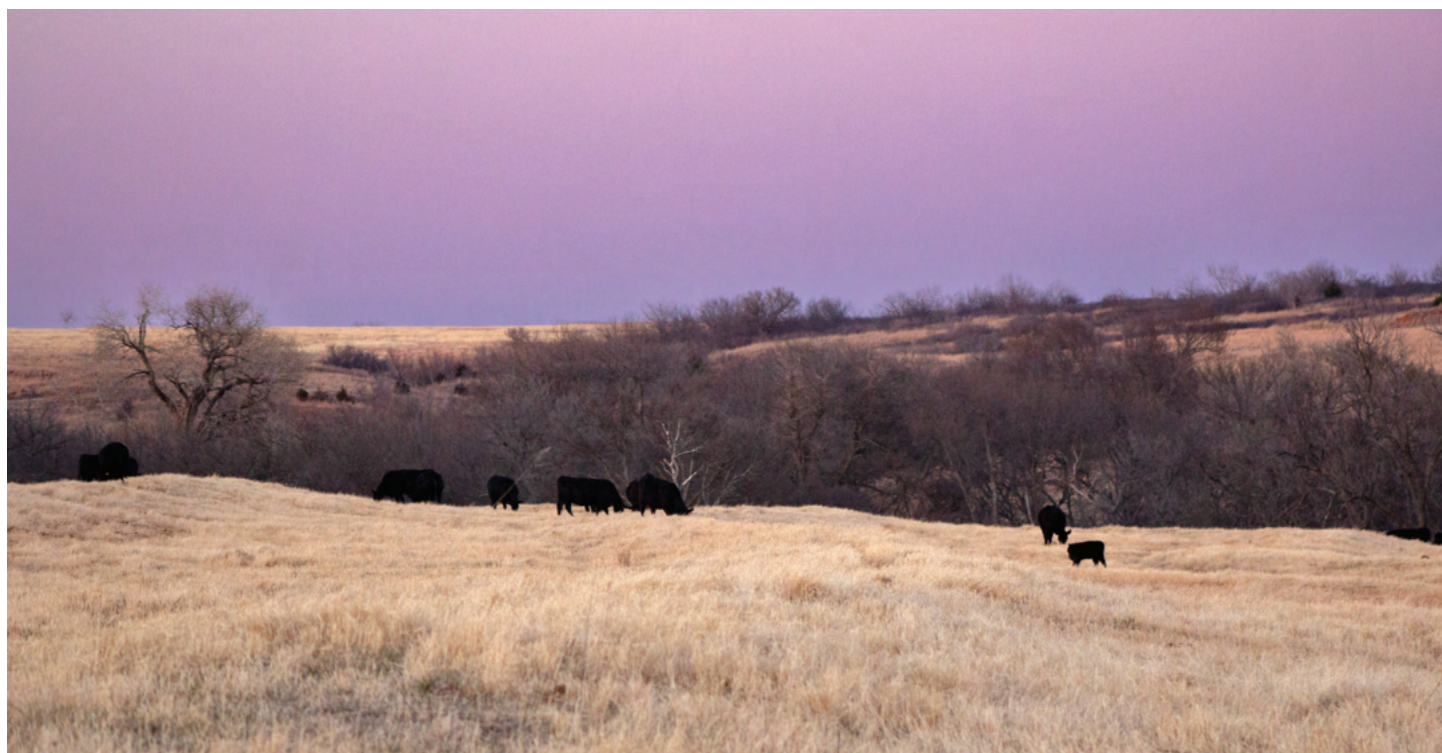


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ANTIMICROBIAL SUSCEPTIBILITY PROFILES: BOVINES AND CANINES

CY 2021

NOTE: Data reported as: % susceptible (# isolates tested)

BOVINES

ANTIBIOTIC	<i>Mannheimia haemolytica</i>	<i>Histophilus somni</i>	<i>Pasteurella multocida</i>
Ceftiofur	100% (27)	100% (14)	100% (13)
Danofloxacin	56% (27)	86% (14)	100% (13)
Enrofloxacin	56% (27)	86% (14)	100% (13)
Florfenicol	81% (27)	71% (14)	100% (13)
Gamithromycin	80% (10)	67% (6)	100% (5)
Penicillin	70% (27)	71% (14)	92% (13)
Spectinomycin	70% (27)	57% (14)	29% (13)
Tetracycline	50% (10)	50% (6)	29% (5)
Tildipirosin	90% (10)	83% (6)	43% (5)
Tilmicosin	63% (27)	29% (14)	43% (13)
Tulathromycin	67% (27)	36% (14)	43% (13)

CANINES

ANTIBIOTIC	URINE		EARS		SKIN & WOUNDS
	<i>Escherichia coli</i>	<i>Staph. pseudintermedius</i>	<i>Pseudomonas aeruginosa</i>	<i>Staph. pseudintermedius</i>	<i>Staph. pseudintermedius</i>
Amikacin	96% (53)	100% (14)	67% (21)	100% (16)	100% (38)
Amoxicillin/ Clavulanic Acid	77% (53)	71% (14)	0% (21)	75% (16)	68% (38)
Ampicillin	62% (53)	50% (14)	0% (21)	44% (16)	18% (38)
Cefalexin	70% (53)				
Cefazolin	70% (53)	71% (14)	0% (21)	75% (16)	68% (38)
Cefovecin	70% (53)	71% (14)		75% (16)	55% (38)
Cefpodoxime	70% (53)	71% (14)		75% (16)	68% (38)
Ceftazidime	81% (53)		100% (21)		
Cephalothin		71% (14)		75% (16)	68% (38)
Chloramphenicol	81% (53)	93% (14)	0% (21)	88% (16)	87% (38)

ANTIMICROBIAL SUSCEPTIBILITY PROFILES: BOVINES AND CANINES (CONTINUED)

CY 2021

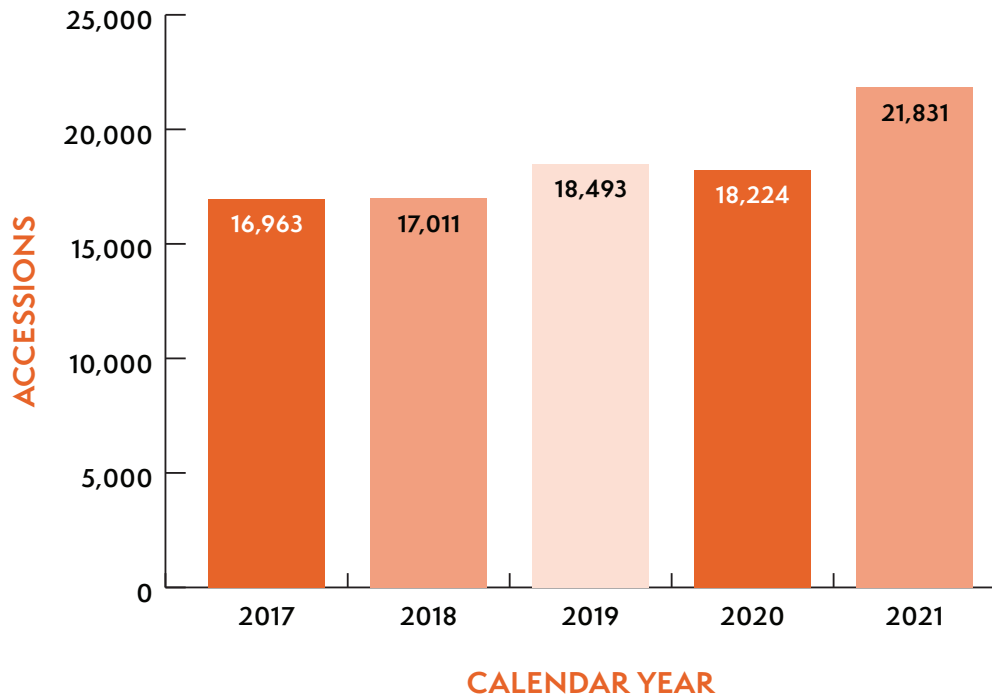
CANINES (CONTINUED)

ANTIBIOTIC	URINE		EARS		SKIN & WOUNDS
	<i>Escherichia coli</i>	<i>Staph. pseudintermedius</i>	<i>Pseudomonas aeruginosa</i>	<i>Staph. pseudintermedius</i>	<i>Staph. pseudintermedius</i>
Clindamycin		86% (14)		69% (16)	66% (38)
Doxycycline	75% (53)		0% (21)		
Enrofloxacin	68% (53)	71% (14)		63% (16)	63% (38)
Gentamicin	91% (53)	79% (14)	67% (21)	69% (16)	76% (38)
Imipenem	100% (53)	71% (14)	71% (21)	75% (16)	68% (38)
Marbofloxacin	70% (53)	71% (14)		63% (16)	68% (38)
Minocycline		64% (14)		88% (16)	68% (38)
Orbifloxacin	68% (53)				
Oxacillin + 2% NaCl		71% (14)		75% (16)	68% (38)
Piperacillin/ Tazobactam	98% (53)		100% (21)		
Pradofloxacin	70% (53)	36% (14)		25% (16)	26% (38)
Tetracycline	77% (53)	64% (14)	0% (21)	81% (16)	63% (38)
Trimethoprim/ Sulfamethoxazole	75% (53)	71% (14)	0% (21)	75% (16)	61% (38)

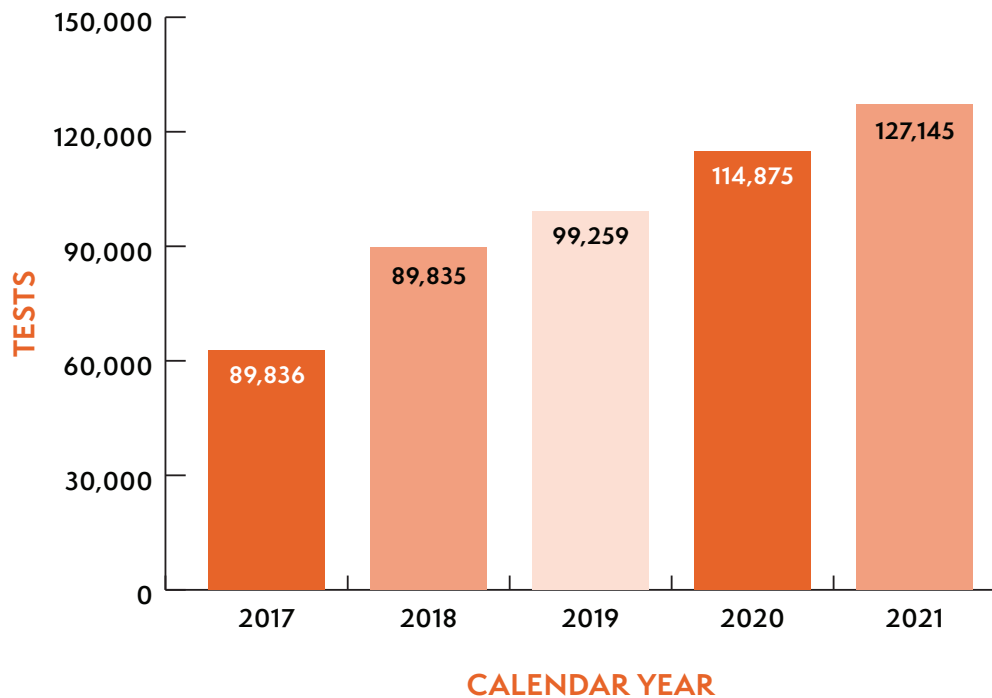
ACCESSIONS AND GENERAL TESTING

5-YEAR TREND

5-YEAR ACCESSION TREND



5-YEAR TEST TREND

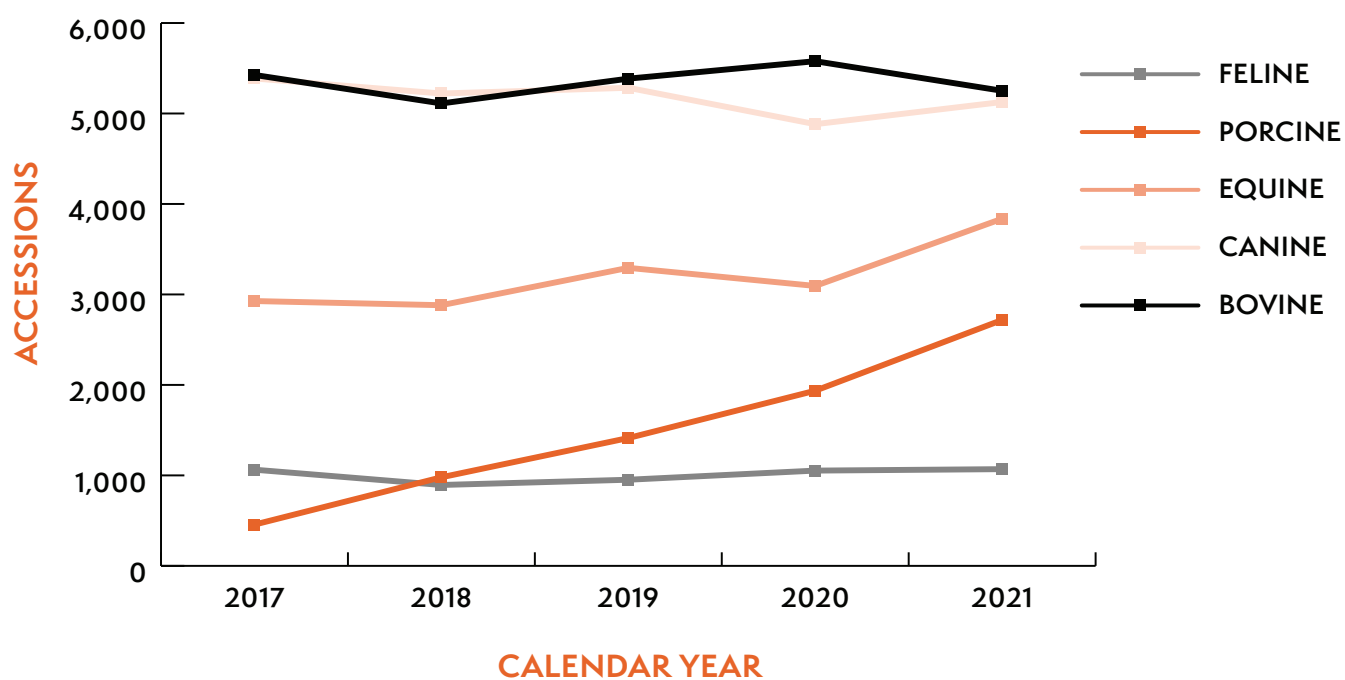


ACCESSIONS BY SPECIES

5-YEAR TREND

SPECIES	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Bovine	5,426	5,111	5,385	5,578	5,251	-6%
Canine	5,387	5,221	5,284	4,882	5,127	5%
Equine	2,927	2,881	3,294	3,094	3,837	24%
Porcine	456	979	1,413	1,936	2,718	40%
Feline	1,063	894	952	1,053	1,069	2%
Avian	468	554	637	436	520	19%
Caprine	278	315	391	322	435	35%
Sm An Other	308	343	350	280	344	23%
Ovine	53	73	81	81	115	42%
Alpaca/Llama	43	41	54	50	54	8%
Lg An Other	38	40	61	49	53	8%
Multiple Species	22	34	40	27	38	41%
Camelid	13	10	16	11	16	45%
Caged Pet Mammal	1	8	14	13	7	-46%

5-YEAR ACCESSION TREND: TOP 5 SPECIES



ACCESSIONS BY LABORATORY UNIT

5-YEAR TREND

YEAR	MICRO-BIOLOGY*	MOLECULAR DIAGNOSTICS	OUTSOURCED TESTING	PARASITOLOGY	PATHOLOGY**	SEROLOGY	TOXICOLOGY	TOTAL # OF ACCESSIONS
2021	2,260	5,885	70	1,809	5,329	6,234	244	21,831
2020	2,200	5,317	43		5,093	5,353	261	18,267
2019	2,456	4,800	17		5,755	5,131	351	18,510
2018	2,178	4,219			5,716	4,544	354	17,011
2017	2,222	4,165			5,900	4,430	246	16,963

* Includes Bacteriology, Mycology and Mycoplasmaology
 ** Includes Necropsy and Histology



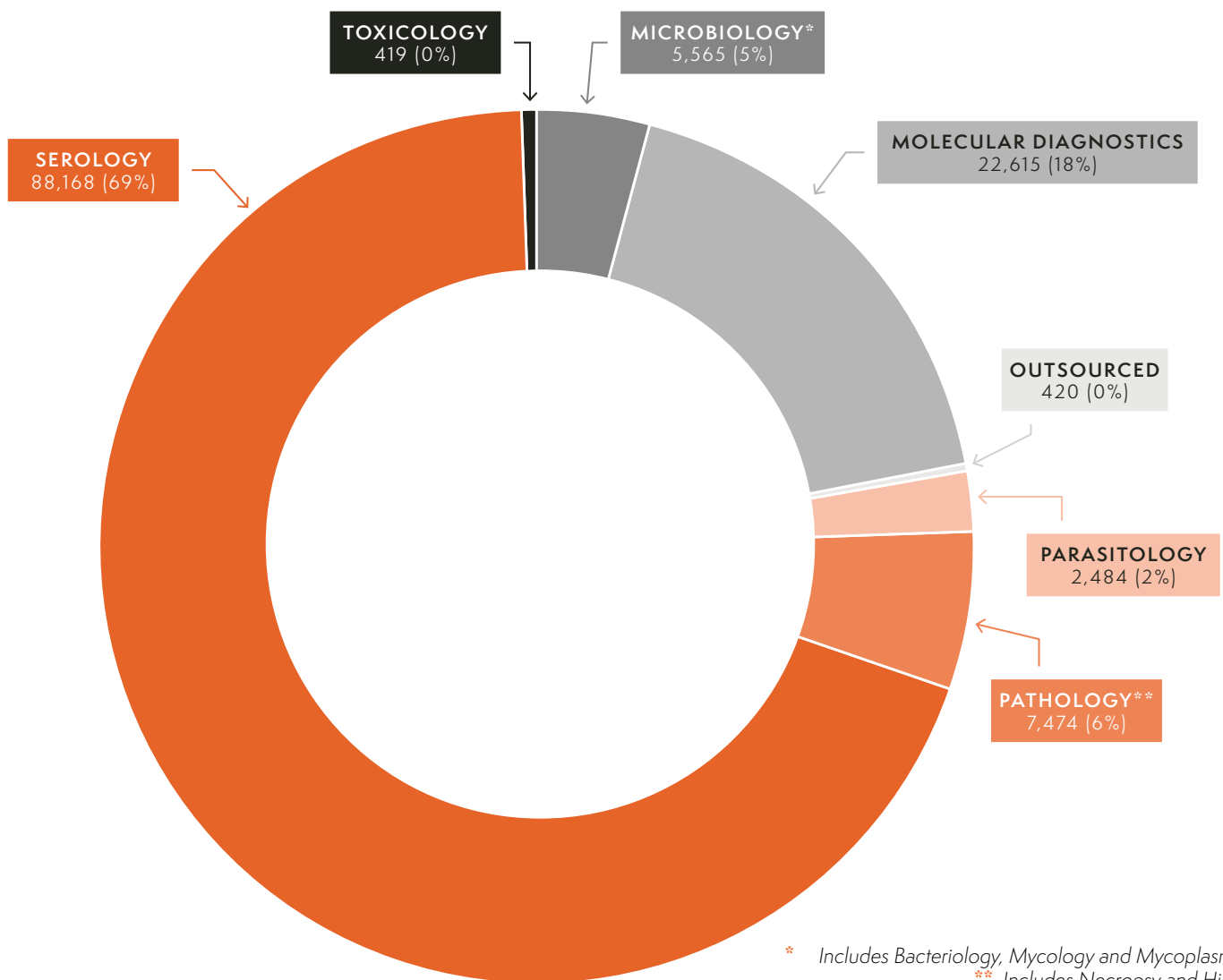
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TEST NUMBERS BY LABORATORY UNIT

5-YEAR TREND

YEAR	MICROBIOLOGY*	MOLECULAR DIAGNOSTICS	OUTSOURCED TESTING	PARASITOLOGY	PATHOLOGY**	SEROLOGY	TOXICOLOGY
2021	5,565	22,615	420	2,484	7,474	88,168	419
2020	4,866	26,720	466		6,663	76,170	499
2019	4,082	22,775	318		7,921	62,617	685
2018	5,155	16,248			7,259	60,489	684
2017	4,574	11,403			7,777	38,512	472

NUMBER OF TESTS PER LAB UNIT: CY 2021



* Includes Bacteriology, Mycology and Mycoplasmaology
 ** Includes Necropsy and Histology

MICROBIOLOGY

MYCOLOGY

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Fungal Culture *	123	111	124	117	106	-9%
Histoplasma Enzyme Immunoassay **				6	53	783%
Referral Lab Testing					1	N/A
Research Testing	76	30	12	8	0	-100%
Diff-Quik/Gram Stain	1	0	0	0	0	N/A
Direct Examination	1	0	0	0	0	N/A
Total Tests Per Year	201	141	138	131	159	21%

* Includes individual testing from Test Package
 ** In-house and Referral Laboratory Testing

MYCOPLASMOLOGY

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
<i>Mycoplasma spp.</i> Culture	33	26	11	8	15	88%
Total Tests Per Year	33	26	11	8	15	88%

MICROBIOLOGY (CONTINUED)

BACTERIOLOGY TEST PACKAGES

5-YEAR TEST TREND

TEST PACKAGE	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Anaerobic Culture, Aerobic Culture and up to 2 Antibiotic Susceptibilities	278	392	464	385	480	25%
Aerobic Culture and up to 2 Antibiotic Susceptibilities	439	492	498	374	409	9%
Urine Culture and up to 2 Antibiotic Susceptibilities	362	448	398	329	334	2%
Fungal Culture, Aerobic Culture and up to 2 Antibiotic Susceptibilities	61	53	13	58	62	7%
Salmonella Culture with Antibiotic Susceptibility	21	12	61	29	34	17%
Total Test Packages Per Year	883	1,005	1,434	1,175	1,319	12%



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MICROBIOLOGY (CONTINUED)

BACTERIOLOGY

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Aerobic Culture ‡	1,885	2,074	2,264	1,733	1,957	13%
Antibiotic Susceptibility Test ‡	948	1,233	1,179	1,050	1,196	14%
Research Testing	206	209	97	636	597	-6%
Anaerobic Culture ‡	326	453	552	545	554	2%
<i>Clostridium perfringens</i> Culture	118	121	157	119	213	79%
<i>Mycobacterium paratuberculosis</i> Culture μ				12	191	1492%
<i>Campylobacter fetus</i> Culture	211	238	244	228	162	-29%
<i>Salmonella</i> spp. Culture ‡	151	165	181	168	149	-11%
Milk Culture	54	130	98	107	94	-12%
<i>Brucella</i> spp. Culture	65	73	76	59	57	-3%
Blue Green Algae-Microscopic Screening	71	33	40	25	50	100%
Salmonella Culture (Environmental Sample)	71	77	87	54	49	-9%
<i>Campylobacter jejuni</i> Culture	36	33	36	39	48	23%
<i>Clostridium</i> sp. Culture	14	28	40	26	35	35%
<i>Bacillus anthracis</i> Culture	6	6	7	4	29	625%
<i>Salmonella pullorum</i> Screening	2	7	32	6	5	-17%
Gram Stain	4	5	3	1	3	200%
<i>Tritrichomonas foetus</i> Culture	135	93	6	46	2	-96%
All Other Tests	19	9	11	8	0	-100%
Total Tests Per Year	4,322	4,987	5,110	4,866	5,391	11%

‡ Includes individual tests from Test Packages
 μ Referral Laboratory testing

MOLECULAR DIAGNOSTICS

PANELS

4-YEAR TEST TREND

TEST	CALENDAR YEAR				% CHANGE
	2018	2019	2020	2021	
Bovine Respiratory Disease PCR Panel-Comprehensive *	18	43	49	71	45%
Bovine Viral Respiratory PCR Panel-Basic **	1	3	0	3	N/A
Total Panels Per Year	19	46	49	74	51%

* Includes Bovine Viral Diarrhea Virus (BVDV), Bovine Respiratory Syncytial Virus (BRSV), Infectious Bovine Rhinotracheitis Virus (IBR), Bovine Coronavirus (BCV), and Mycoplasma bovis

** Includes BVDV, BRSV, and IBR

MOLECULAR DIAGNOSTICS

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
PRRS Virus Real-Time PCR (single and pooled) μ	2,116	5,537	7,517	10,094	7,009	-31%
<i>T. foetus</i> Real-Time PCR	6,056	5,183	4,922	5,107	5,009	-2%
Porcine Coronavirus Multiplex PCR (single and pooled)		778	2,114	4,625	4,781	3%
Swine Influenza Virus PCR (single and pooled) μ		1,251	3,303	3,110	1,589	-49%
<i>T. foetus</i> Real-Time PCR (pooled)	1,118	1,600	1,288	1,490	1,516	2%
Porcine <i>Mycoplasma hyopneumoniae</i> Real Time PCR (single and pooled)				5	412	8140%
Avian Influenza PCR	743	184	183	196	243	24%
BRSV PCR *	14	25	52	57	205	260%
Johne's Direct Fecal Real-Time PCR (single and pooled)	250	265	267	328	172	-48%
Bovine Viral Diarrhea Virus PCR *	109	139	191	146	166	14%

μ In-house and/or Referral Laboratory Testing

* Includes individual testing from Molecular Diagnostics Panels

MOLECULAR DIAGNOSTICS (CONTINUED)

MOLECULAR DIAGNOSTICS (CONTINUED)

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
SARS (CoV-2) Real Time PCR-Environmental				93	157	69%
<i>Anaplasma marginale</i> PCR	105	71	147	95	122	28%
Infectious Bovine Rhinotracheitis (IBR) Virus PCR *	97	84	112	91	110	21%
Bovine Coronavirus PCR *	40	54	104	93	90	-3%
Equine Herpesvirus 1 (EHV-1) Real-Time PCR	69	61	1,189	211	84	-60%
<i>Mycoplasma bovis</i> PCR *	25	47	49	55	83	51%
Canine Respiratory Panel (qPCR) μ				56	78	39%
Avian Paramyxovirus-1 (END) PCR	114	122	223	119	62	-48%
Canine Parvovirus PCR	35	30	44	53	50	-6%
Canine Distemper Virus PCR	46	266	66	31	46	48%
<i>Clostridium perfringens</i> Multiplex PCR	50	56	56	56	44	-21%
SARS (CoV-2) N1 and N2 Gene Real Time PCR				22	44	100%
<i>Streptococcus equi</i> PCR		7	40	20	42	110%
COVID-19 PCR (non-human) μ				11	35	218%
Bluetongue Virus PCR	106	20	82	48	33	-31%
Rotavirus Antigen ELISA	45	48	55	42	30	-29%
16S Sequencing	21	35	18	35	30	-14%
<i>Leptospira</i> sp. Real-Time PCR	61	62	46	36	29	-19%
Canine Herpesvirus PCR			3	15	29	93%
Tissue Culture PCR	9	13	13	12	21	75%

μ In-house and/or Referral Laboratory Testing

* Includes individual testing from Molecular Diagnostics Panels

MOLECULAR DIAGNOSTICS (CONTINUED)

MOLECULAR DIAGNOSTICS (CONTINUED)

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Tularemia PCR		6	6	3	21	600%
Bovine Respiratory (Viral and Bacterial) Panel (qPCR)					18	N/A
Fungal 28S Sequencing	18	15	11	5	17	240%
Equine Viral Arteritis PCR μ				19	16	-16%
<i>Cytauxzoon felis</i> PCR	15	11	13	8	16	100%
Porcine Circovirus (Type 2 and Type 3) PCR μ				11	15	36%
Nucleic Acid Sequencing μ					13	N/A
General Molecular PCR	12	8	10	3	11	267%
Ehrlichia PCR	9	11	13	12	10	-17%
All Other Tests	130	267	142	310	157	-49%
Total Tests Per Year	11,413	16,256	22,279	26,723	22,615	-15%

μ In-house and/or Referral Laboratory Testing
 * Includes individual testing from Molecular Diagnostics Panels

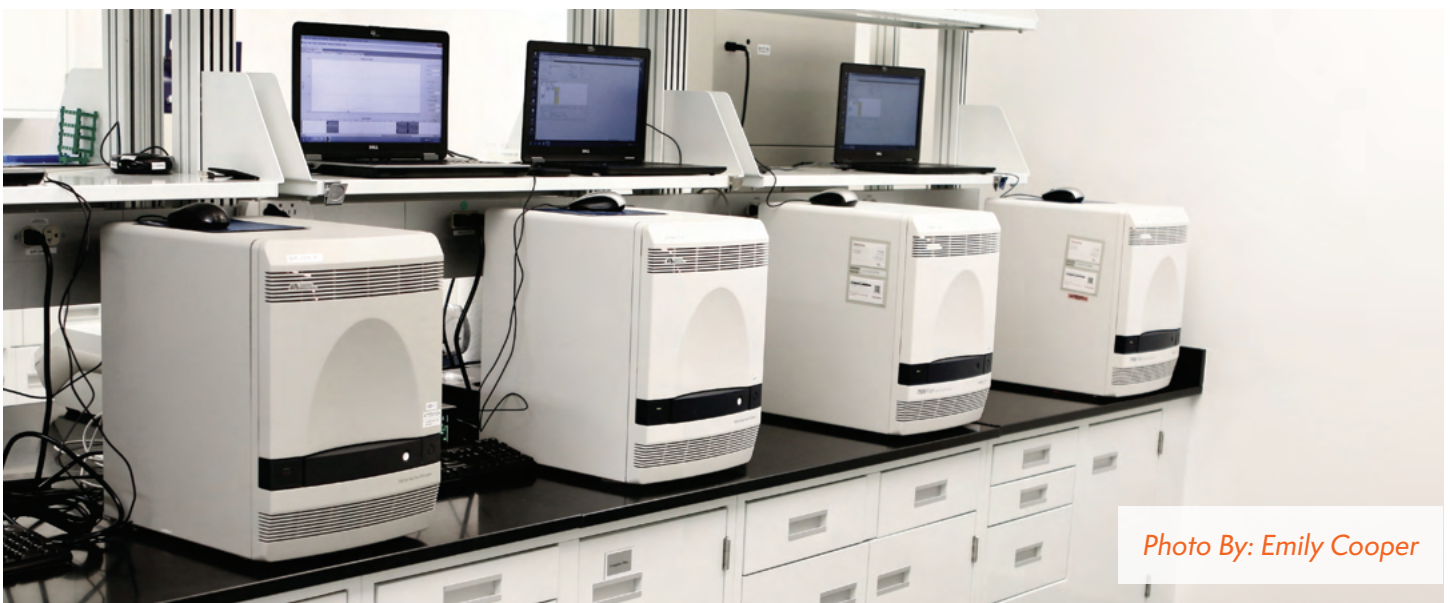


Photo By: Emily Cooper

PARASITOLOGY

PARASITOLOGY

1-YEAR TEST TREND

TEST	CALENDAR YEAR (JAN-DEC)
	2021
Centrifugal Flotation/Direct Smear	798
Fecal Egg Count	380
Centrifugal Fecal Flotation	336
Canine Heartworm Antigen Test	319
Modified Knott's	252
Gross Parasite Identification	71
Fecal Sedimentation	63
Centrifugal Flotation/Direct Smear (Research)	62
Fecal Egg Count - Wisconsin Method	45
Giardia Antigen	39
Baermann Method	34
Fecal Egg Count-McMaster Method	20
Feline Post Heat Treatment Heartworm Antigen	13
Feline Heartworm Antigen (DiroCHEK)	11
Tick Identification	11
Centrifugal Fecal Flotation/Baermann	5
Centrifugal Fecal Flotation/Sedimentation	5
Heartworm Antigen Heat Reversal	4
Feline Heartworm Ab & Heat Reversal Antigen	3
Feline Heartworm Antibody (Heska Solo Step)	3
Fecal Culture / Identification	2
Fecal Egg Count-McMaster Method/Sedimentation	2
Gross Parasite Identification >5 Specimens	2
Hemoparasite Exam (Wright-Giemsa Stain)	2
Centrifugal Fecal Flotation/Fecal Egg Count	1
Heartworm Antigen	1
Total Tests	2,484

PATHOLOGY

NECROPSY

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Gross Necropsy	907	916	953	757	876	16%
Rabies Examination	81	60	59	53	250	372%
Spinal Examination	9	29	14	10	6	-40%
Tissue Preparation	5	7	7	4	2	-50%
Small Animal Limb Examination with Disposal	7	4	6	0	1	N/A
Research/Special Studies Necropsy	0	45	37	0	0	N/A
Chronic Wasting Disease	0	6	7	3	0	-100%
Total Tests Per Year	1,026	1,080	1,096	827	1,135	37%



Photo By: Emily Cooper

PATHOLOGY (CONTINUED)

MISCELLANEOUS NECROPSY DATA

CY 2021

NECROPSY ACCESSIONS BY SPECIES

SPECIES	# OF ACCESSIONS
Canine	230
Bovine	141
Equine	141
Avian	99
Caprine	70
Feline	58
Small Animal Other	57
Ovine	28
Porcine	25
Large Animal Other	11
Caged Pet Mammal	6
Alpaca	5
Non-Human Primate	3
Camel	1
Llama	1

NECROPSY ACCESSIONS BY TEST TYPE

TEST TYPE	# OF ACCESSIONS
Necropsy only	65
Necropsy + Histology only	340
Necropsy + Histology + Other Testing	457
Necropsy + Other Testing (no Histology)	14

NECROPSY ACCESSIONS BY CLIENT

CLIENT	# OF ACCESSIONS
Total # of Necropsy Accessions	876
VTH * Accessions	288
Client Accessions (not VTH)	588

* Veterinary Teaching Hospital

PATHOLOGY (CONTINUED)

RABIES TESTING

5-YEAR TREND

NOTE: Rabies testing at OADDL began on September 13, 2021.

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Canine	31	13	20	12	98	717%
Feline	17	11	8	10	70	600%
Small Animal Other *	10	18	12	15	41	173%
Bovine	11	8	8	11	19	73%
Equine	10	9	5	3	12	300%
Caprine	1	0	4	1	6	500%
Large Animal Other **	0	0	0	1	3	200%
Porcine	0	0	1	0	1	N/A
Alpaca	1	0	1	0	0	N/A
Ovine	0	1	0	0	0	N/A
Total Tests Per Year	81	60	59	53	250	372%

* CY 2021 Small Animal Other: skunk (14), raccoon (12), bat (8), gopher (2), rabbit (2), mole (1), opossum (1), squirrel (1)

** CY 2021 Large Animal Other: bobcat (1), coyote (1), deer (1)



Photo By: Clarissa Walton / Fulton Farms

PATHOLOGY (CONTINUED)

RABIES TESTING BY SPECIES

CY 2021

SPECIES	TOTAL # OF TESTS	POSITIVE RESULT	NEGATIVE RESULT	NO RESULT †
Canine	98	0	96	2
Feline	70	2	68	0
Bovine	19	1	17	1
Skunk	14	6	7	1
Equine	12	1	11	0
Raccoon	12	0	12	0
Bat	8	0	7	1
Caprine	6	0	5	1
Gopher	2	0	2	0
Rabbit	2	0	1	1
Bobcat	1	0	1	0
Coyote	1	0	1	0
Deer	1	1	0	0
Mole	1	0	1	0
Opossum	1	0	1	0
Porcine	1	0	1	0
Squirrel	1	0	1	0
Total	250	11	232	7

† Unsatisfactory sample per OSDH

PATHOLOGY (CONTINUED)

HISTOLOGY

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Histo-Short Report	3,440	3,283	3,480	2,950	2,818	-4%
Special Stains	781	1,056	1,465	1,177	1,456	24%
Histo Necropsy Workload	698	741	785	644	747	16%
Slide Preparation--No Interpretation	1	4	1	232	350	51%
Histo-Long (Detailed) Report	384	274	233	195	231	18%
Decalcification	98	88	157	141	138	-2%
Zoo Pathology Surveillance	106	124	131	88	113	28%
Immunohistochemistry (IHC) r	78	129	138	83	113	36%
Additional Biopsy > 3 Tissues Submitted	129	148	140	71	105	48%
H & E Recut	15	17	38	65	76	17%
Poultry Histopathology	65	62	43	20	53	165%
H & E Slide for Research	95	93	111	74	41	-45%
Unstained Sections for Research		6	13	30	19	-37%
Paraffin Scrolls For PCR	6	12	27	25	26	4%
Special Stains for Research	7	4	6	7	16	129%
Special Stains for Teaching	4	4	3	4	12	200%
IHC for PI BVDV r	574	101	36	8	6	-25%
H & E Slide for Teaching	13	7	5	5	6	20%
Duplicate H & E	8	2	1	6	5	-17%
All Other Tests	73	24	9	11	8	-27%
Total Tests Per Year	6,575	6,179	6,822	5,836	6,339	11%

r Referral laboratory testing

PATHOLOGY (CONTINUED)

MICELLANEOUS BIOPSY-RELATED DATA

CY 2021

SPECIAL STAIN	# OF REQUESTS
GMS	413
Gram's	346
Acid Fast (Ziehl-Neelsen)	137
Fite's Acid Fast	83
PAS	104
Toluidine Blue	51
Giemsa	93
Iron (Prussian Blue)	42
Trichrome	40
Congo Red	33
Copper (Rhodanine)	25
Melanin-Bleach	26
Steiner	15
Von Kossa	13
Fontana-Masson	18
Bile/Bilirubin (Hall's)	5
PTAH	12
Alcian Blue 2.5	0
Luxol Fast Blue	0
Total Stains	1,456

BIOPSY SLIDES: CY 2021	# OF SLIDES
H&E Stains	
Total Number of H&E Slides	12,312
H & E From Biopsy	6,353
H & E From Necropsy	4,382
H & E - Research	249
H & E - Teaching	216
IHC Stains	
IHC Slides for BVDV PI (Ear Notch)	6
IHC Slides (not including BVDV PI)	69
Special Stains	
Total Number of Special Stains Slides	1,456
Total Number of Biopsy Slides	14,720

BIOPSY DATA: CY 2021	TOTAL
Biopsy Only Accessions	2,643
Biopsy + Other Testing (except Necropsy) Accessions	128
Number of Short-Format Reports	2,818
Number of Detailed-Format Reports	231

SEROLOGY

PANELS AND PROFILES

5-YEAR TEST TREND

PANEL/ PROFILE	TESTS	CALENDAR YEAR					% CHANGE
		2017	2018	2019	2020	2021	
Pseudorabies gB ELISA & Brucella	Pseudorabies gB ELISA, <i>B. abortus</i> Card Test	1,768	3,377	3,646	3,773	4,466	18%
Swine Serology Panel 1 **	Brucella Fluorescence Polarization Assay (FPA), Pseudorabies gB ELISA, PRRSV ELISA				1,665	3,029	82%
Bovine Serum ELISA Panel	BVDV Antigen Capture ELISA, BLV ELISA, Johne's ELISA	644	871	255	300	261	-13%
Abortion Panel Bovine	BVDV Antigen Capture ELISA, BVD Type 1 SN, IBR SN, Lepto MAT, Neospora ELISA, <i>B. abortus</i>	242	261	306	224	185	-17%
Bovine Respiratory SN Profile 2 *	IBR, BVDV Type 1, BVDV Type 2, PI-3, BRSV					179	N/A
Small Ruminant Biosecurity Panel *	CAE/OPP cELISA, Johnes ELISA					68	N/A
Swine Serology Panel 2 *	Pseudorabies gB ELISA, <i>B. abortus</i> FPA					54	N/A
Canine Tick Profile	<i>E. canis</i> SNAP, RMSF IFA, Lyme, <i>Anaplasma phagocytophilum</i> / <i>A. platys</i>	36	44	43	46	28	-39%
Bovine Respiratory SN Profile 1 *	IBR, BVDV Type 1, PI-3, BRSV					11	N/A
Tick Panel ELISA	<i>Anaplasma phagocytophilum</i> / <i>A. platys</i> , <i>Ehrlichia canis</i> / <i>E. ewingii</i> , <i>Borrelia burgdorferi</i>	1	-	-	2	1	-50%
Goat Abortion Panel **	Buetongue Virus AGID, <i>B. abortus</i> AGGL, Q-Fever ELISA, Toxoplasma IgG IFA, Leptosira MAT				3	1	-67%

* Panel introduced in CY 2021

** Panel introduced in CY 2020

SEROLOGY (CONTINUED)

PANELS AND PROFILES (CONTINUED)

5-YEAR TEST TREND

PANEL/ PROFILE	TESTS	CALENDAR YEAR					% CHANGE
		2017	2018	2019	2020	2021	
Bovine Respiratory Panel **	BRSV VN, BVDV-1a VN, BVDV-1b VN, BVDV-2 VN, IBR VN, <i>H. somni</i> AGGL, <i>M. haemolytica</i> AGGL, PI-3 VN				10	-	-100%
Total Panels/Profiles Per Year		2,697	4,553	4,250	6,023	8,283	38%

* Panel introduced in CY 2021

** Panel introduced in CY 2020

SEROLOGY

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
<i>Mycoplasma gallisepticum</i> / <i>Mycoplasma synoviae</i> ELISA	8,414	18,008	18,445	21,599	23,705	10%
<i>Salmonella pullorum/typhoid</i> Microagglutination Screen		10,199	18,302	21,957	23,700	8%
<i>Brucella abortus</i> BAPA, Card, CF, FPA and STP μ *	2,459	3,906	4,370	6,065	8,896	47%
Pseudorabies (PRV) gB and g1 ELISA μ *	1,787	3,390	3,647	5,462	7,958	46%
PRRS ELISA *	25			1,676	3,637	117%
Avian Influenza ELISA	841	1,802	1,995	2,610	2,734	5%
Johne's Disease ELISA and CF μ *	1,923	2,602	2,354	2,707	2,673	-1%
BVDV Antigen Capture ELISA *	4,385	4,284	3,295	3,446	2,644	-23%
Equine Infectious Anemia (EIA) ELISA and AGID μ	1,735	1,787	2,155	1,994	2,437	22%
Bovine Pregnancy ELISA	639	609	737	1,406	1,676	19%
Bovine Leukemia Virus (BLV) ELISA and AGID μ *	1,864	2,018	1,507	1,754	1,580	-10%

μ In-house and/or Referral Laboratory Testing

* Includes individual tests from Serology Panels and Profiles

SEROLOGY (CONTINUED)

SEROLOGY (CONTINUED)

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
<i>Anaplasma</i> c-ELISA *	743	437	546	563	805	43%
CAE c-ELISA / OPP c-ELISA	138	401	533	422	555	32%
Goat and Sheep Pregnancy ELISA	151	214	548	523	509	-3%
<i>Theileria (Babesia) equi</i> c-ELISA μ	256	215	264	400	505	26%
BVDV Type I Serum Neutralization SN and VN μ *	575	387	465	446	449	1%
<i>Neospora</i> c-ELISA μ *	442	283	330	239	448	87%
Infectious Bovine Rhinotracheitis (IBR) SN *	398	344	309	284	411	45%
<i>Leptospira</i> Microscopic Agglutination (MAT) *	836	502	665	542	389	-28%
<i>Brucella canis</i> Card Test, AGID, IFA and Tube Agglutination μ *	230	421	270	279	307	10%
<i>Babesia caballi</i> c-ELISA μ	139	130	200	259	289	12%
BRSV SN and VN μ *	7	-	-	31	249	703%
BVDV Type II Serum Neutralization SN and VN μ *	21	-	-	11	225	1945%
Parainfluenza 3 SN and VN μ *	7	48	166	144	204	42%
Caseous Lymphadenitis SHI μ	26			160	173	8%
<i>Mycoplasma gallisepticum</i> Hemagglutination Inhibition μ	57	117	156	216	161	-25%
<i>Mycoplasma synoviae</i> Hemagglutination Inhibition μ	57	117	156	216	161	-25%
Bluetongue c-ELISA and AGID μ *	59			86	141	64%
Rocky Mountain Spotted Fever (RMSF) IFA *	85	94	82	107	95	-11%
Equine Protozoal Myeloencephalitis (EPM) IFAT μ	41			40	72	80%
Vitamin D					60	N/A
West Nile Virus (WNV) IgM ELISA μ	29			23	43	87%
Equine Viral Arteritis (EVA) SN and VN μ *	52			64	41	-36%

μ In-house and/or Referral Laboratory Testing

* Includes individual tests from Serology Panels and Profiles

SEROLOGY (CONTINUED)

SEROLOGY (CONTINUED)

5-YEAR TEST TREND

TEST	CALENDAR YEAR					% CHANGE
	2017	2018	2019	2020	2021	
Lyme Disease SNAP *	38	44	43	48	29	-40%
<i>E. canis</i> / <i>E. ewingii</i> SNAP *	37	44	43	48	29	-40%
<i>Anaplasma phagocytophilum</i> / <i>A. platys</i> SNAP *	37	44	43	48	29	-40%
Vesicular Stomatitis Virus VN (Indiana and New Jersey) μ				74	28	-62%
Heartworm ELISA *	-	1	13	46	28	-39%
Eastern Equine Encephalitis (EEE) IgM ELISA μ	12			16	24	50%
Canine Herpesvirus VN μ				24	14	-42%
<i>Brucella ovis</i> ELISA μ	18			17	11	-35%
All Other Tests	9,109	8,041	49	118	44	-63%
Total Tests Per Year	37,672	60,489	61,688	76,170	88,168	16%

μ In-house and/or Referral Laboratory Testing

* Includes individual tests from Serology Panels and Profiles



Photo By: Emily Cooper

OUTSOURCED TESTING

3-YEAR TEST TREND

TEST	CALENDAR YEAR (JAN-DEC)			% CHANGE
	2019	2020	2021	
Cytology	119	246	107	-57%
Complete Blood Count (CBC only/CBC with Path Review)	17	29	65	124%
CBC and Blood Chemistry Panel	36	36	32	-11%
Thyroid Testing (T3, T4, Panel)	19	10	27	170%
Urinary Calculi Analysis		15	25	67%
Blood Chemistry Panel only	12	2	23	1050%
Progesterone Level	15	18	18	0%
Fructosamine	13	24	17	-29%
Urinalysis	15	8	17	113%
Equine Pregnancy Panel	1	0	9	N/A
Cortisol Level	4	11	8	-27%
Potassium Bromide Level	5	8	8	0%
BUN/Creatinine	1	0	7	N/A
Fluid Analysis with Cytology		11	7	-36%
All Other Tests	61	48	50	4%
Total Tests Per Year	318	466	420	-10%

TOXICOLOGY

5-YEAR TEST TREND

NOTE: Except where indicated as In-house all Toxicology testing is performed at a referral laboratory.

TEST	CALENDAR YEAR: JAN-DEC					% CHANGE
	2017	2018	2019	2020	2021	
Mineral Panel *	66	72	116	98	92	-6%
Water Quality	53	61	55	98	63	-36%
Nitrate Quantitation - Aqueous Fluid	76	116	120	72	55	-24%
Nitrate Quantitation - Forage	27	35	27	11	25	127%
Trace Mineral - Lead	11	19	30	17	20	18%
Drug Screen/Quantitation	7	26	17	24	17	-29%
GC/MS Toxicant Screen				7	17	143%
Mycotoxin Screen	14	18	17	10	17	70%
Forage Analysis	9	12	7	5	16	220%
Toxicology - Special Testing †	37	44	14	12	14	17%
Petroleum Hydrocarbon Screen	17	14	28	4	12	200%
Anticoagulant/Rodenticides	12	16	6	11	10	-9%
Cyanide (In-house)	5	15	5	8	9	13%
Bone Marrow Fat Analysis			7	11	7	-36%
Trace Mineral - Copper	55	90	74	30	5	-83%
Vitamin A Analysis			16	8	5	-38%
All Other Tests	83	146	146	73	35	-52%
Total Tests Per Year	472	684	685	499	419	-16%

* **Mineral Panel** includes Mineral Panels, Metal and Mineral Panels and Heavy Metal and Mineral Panels
 † **Special Testing** includes Toxic Element Panel, Proximate Analysis, Gossypol, Fenbendazole Drug Screen, Vitamin D, Carbon Monoxide, Bile Acids, Pyrrolizidine Alkaloids, Bromide, Urea

TEST RELATED SUPPLIES SENT TO CLIENTS

5-YEAR TREND

TEST	CALENDAR YEAR: JAN-DEC					% CHANGE
	2017	2018	2019	2020	2021	
<i>Tritrichomonas foetus</i> PBS Transport Tube		1,689	9,157	11,028	11,339	3%
3 oz. 10% Buffered Formalin Jar	1,157	851	722	720	954	33%
Histo Mailers					111	N/A
<i>Campylobacter fetus</i> Media	194	212	207	228	106	-54%
Bacterial Culturette w/o Charcoal	45	24	208	52	104	100%
Molecular Avian Influenza Swabs	74	270	141	62	34	-45%
BHI Broth Media	147	271	130	35	32	-9%
<i>Tritrichomonas foetus</i> Transport Medium Pouch *	4,842	6,357	2,315	28	0	-100%
Total Supplies	6,238	9,133	12,609	12,153	12,680	4%

* OADDL no longer carries this supply.



Photo By: Clarissa Walton / Fulton Farms

OADDL BOARD OF ADVISORS

BOARD MEMBER

Dr. K. Shawn Blood

Dr. Becky Brewer

Dr. Fawn Reely

Dr. Rod Hall

Dr. Steve Hart (Board Chair)

Dr. Michael Johnston

Dr. Rosslyn Biggs

Dr. W. H. Mitchell (Vice Chair/Secretary)

Dr. Ken Powell

Dr. Carlos Risco

Dr. Donna Slater

Mr. Stan Stromberg

Dr. Jeff Studer

Dr. Michael Tripp (Past Chair)

Dr. Bret White

Dr. Barry Whitworth

GROUP REPRESENTED

Pharmaceutical Industry

USDA APHIS Area Veterinarian in Charge (AVIC)

OVMA Member, Sr. Territory Sales Manager at Boehringer-Ingelheim Animal Health

State Veterinarian

Small Ruminant Industry

Equine Industry

Oklahoma Cattleman's Association Member, Vice Chair Beef Production Committee

Mixed Animal Practice

Poultry Industry

Dean, College of Veterinary Medicine

Small Animal Practice

Director of Food Safety Services

Director, CVM Veterinary Medical Hospital

Swine Industry

Food Animal Practice

Oklahoma Cooperative Extension

PERSONNEL: ADMINISTRATION, FACULTY, AND STAFF

CY 2021

ADMINISTRATION POSITION

Jerry Saliki	Professor OADDL Director Section Head: Serology Section Head: Rabies Laboratory
Emily Cooper	Assistant Director/Quality Manager Section Head: Receiving Office
Ryan Van Fleet	Coordinator of Business Office Coordinator of Human Resources Section Head: General Office

FACULTY

POSITION

AREAS OF INTEREST

Giselle Cino **	Assistant Professor Anatomic Pathologist Section Head: Pathology Services	Infections Disease Swine Diseases Emerging and Transboundary Diseases Ocular Pathology
Valerie McElliott	Assistant Professor Pathologist	Musculoskeletal Pathology Neuropathology Electron Microscopy
Craig Miller	Assistant Professor Pathologist	Infectious Disease Neoplastic Disease Immunopathology
Sunil More	Assistant Professor Pathologist	Respiratory Disease Infectious Disease
Akhilesh Ramachandran	Associate Professor Section Head: Microbiology Section Head: Molecular Diagnostics	Bacteriology Molecular Diagnostics
Jerry Ritchey	Professor Pathologist	Infectious Disease Cardiopathology Central Nervous System

** Joined OADDL in CY 2021

PERSONNEL: ADMINISTRATION, FACULTY, AND STAFF (CONTINUED)

CY 2021

FACULTY

Tim Snider

POSITION

Professor
Pathologist

AREAS OF INTEREST

Gastrointestinal Disease
Reproductive Pathology
Infectious Pathology

Brianne Taylor **

Assistant Professor
Pathologist

Infectious Disease
Equine Pathology

STAFF

Allen, Noah

LABORATORY UNIT

Microbiology

POSITION

Senior Laboratory Technologist

Bircher, Noelle

Microbiology

Senior Laboratory Technologist

Broyles, Brigett*

General Office

Medical Records Technician

Caseltine, Shannon**

Serology

Laboratory Supervisor

Clouse, Cayla*

Receiving Office; Necropsy

Diagnostic Technician

DeRaps, Michele**

Accounting

Accounting Specialist

Doty, Sharlie*/**

Accounting

Accounting Specialist

Ellingson, Matea*/**

Histology

Senior Laboratory Technologist

Encarnacioun-A., Perla*

Histology

Senior Laboratory Technologist

Forsythe, Kaycee*

Molecular Diagnostics

Senior Laboratory Technologist

Hamilton, Brianne

Serology

Senior Laboratory Technologist

Hergenreder, Katie**

Molecular Diagnostics

Senior Laboratory Technologist

Hoyt, Amy

Serology

Laboratory Manager

Johns, Carolyn

Receiving Office; Necropsy

Receiving Office and Necropsy Supervisor

Lau, Emily**

Receiving Office; Necropsy

Senior Laboratory Technologist

Lawrence, Allison**

Receiving Office; Necropsy

Senior Laboratory Technologist

Looper, Emily**

Parasitology

Senior Laboratory Technologist

Madden, Robin

Molecular Diagnostics

Laboratory Manager

Maloney, Shannon**

General Office

Medical Records Technician

McKay, Kelli*/**

General Office

Medical Records Technician

Medellin, Alejandra

Molecular Diagnostics

Senior Laboratory Technologist

Olko, Emmy**

Receiving Office; Necropsy

Diagnostic Technician

Patil, Girish

Molecular Diagnostics

Post-Doctoral Fellow

Peake, Brittanie**

Molecular Diagnostics

Laboratory Supervisor

Pettit, Dustin

Histology

Laboratory Manager

* Left OADDL in CY 2021
** Joined OADDL in CY 2021

PERSONNEL: ADMINISTRATION, FACULTY, AND STAFF (CONTINUED)

CY 2021

STAFF

Shore, Eleanor^{*/**}
Stair, Eron
Stanley, Crystal
Talbot, Danyelle^{*}
Talent, Scott
Taylor, Stephanie
Whisman, Emily^{**}
Windiate, Victoria

LABORATORY UNIT

Molecular Diagnostics
Histology
Serology
Accounting
Microbiology
General Office
Histology
OADDL Informatics;
CVM Laboratory Safety

POSITION

Senior Laboratory Technologist
Senior Laboratory Technologist
Senior Laboratory Technologist
Accounting Specialist
Laboratory Manager
Medical Records Data Entry Technician
Senior Laboratory Technologist
Coordinator

* Left OADDL in CY 2021
** Joined OADDL in CY 2021

INSTRUCTION OF VET MED AND OSU STUDENTS

- HIBE 1000 Honors Course: Future of Veterinary Medicine/**Taylor B**
- VBSC 5000 Master's Research and Thesis/**Miller C (IOR)**
- VBSC 5023 Pathobiology/**Ritchey J (IOR)**
- VBSC 6000 PhD Research and Dissertation/**Miller C (IOR)**
- VCS 7072 Veterinary Diagnostics/**McElliott V (IOR), Cino G, Miller C, More S, Ramachandran A, Ritchey J, Rudd J, Scimeca R, Snider T, Taylor B,**
- VCS 7532 Applied Diagnostics/**Ritchey J (IOR), Saliki J (co-IOR)**
- VCS 7912 Grand Rounds/**Taylor B**
- VMED 7253 Veterinary Immunology/**Ritchey J (IOR)**
- VMED 7264 General Pathology/**More S, Ritchey J**
- VMED 7323 Parasitology II/**Scimeca R (1 lecture)**
- VMED 7454 Veterinary Virology/**Miller C, McElliott V**
- VMED 7563 Musculoskeletal system/**McElliott V**
- VMED 7591 International Veterinary Medicine/**Cino G**
- VMED 7614 Cardiopulmonary System/**More S, Ritchey J**
- VMED 7662 Urinary System/**Taylor B**
- VMED 7933 Diagnostics (Year IV)/**Ritchey J**

AWARDS, HONORS, CERTIFICATIONS

- **Craig Miller**, DVM, PhD, DACVP, named Director of the Immunopathology Core Laboratory, Oklahoma Center for Respiratory and Infectious Diseases
- **Jerry Ritchey**, DVM, PhD, DACVP, University Advising Excellence Award, Oklahoma State University
- **Jerry Ritchey**, DVM, PhD, DACVP, OSU-CVM, Class of 2021 Commencement Address (by class vote)
- **Jerry Saliki**, DVM, PhD, DACVP, President of the American Association of Veterinary Laboratory Diagnosticians.
- **Brianne Taylor**, DVM, DACVP, achieved diplomate status, American College of Veterinary Pathologists, September 2021
- **Brianne Taylor**, DVM, DACVP Faculty vetter, Iben House, OSU College of Veterinary Medicine
- **Brianne Taylor**, DVM, DACVP Faculty advisor, OSU College of Veterinary Medicine

OUTREACH AND PRESENTATIONS TO THE PUBLIC AND CLIENTS

- **Giselle Cino**, Sai Narayanan, Evan Crisman, Martin Furr, Akhilesh Ramachandran, Girish Patil. Tularemia Diagnosed in a Foal and a Cat. *OADDL E-News*. Summer 2021.
- **Giselle Cino**. *Invited speaker*. 3rd Annual Veterinary Diagnostic Conference, Hangzhou, China. *Trueperella abortusuis* in swine abortions – Is this an emerging pathogen? June 25-27, 2021.
- **Giselle Cino**. *Invited speaker*. Paraguayan Association of Swine Producers - 2021 - Good porcine practice series, Asuncion, Paraguay. “Enfermedades mas communes en cerdos: Obtencion de muestras para diagnostico” (“Common diseases in pigs: Sample collection for diagnostics”). May 25, 2021.
- **Valerie McElliott**, DVM, PhD, DACVP: Cache Valley Virus, an Emerging Pathogen for Oklahoma? *OADDL E-News*. Summer 2021.
- **Craig Miller**, DVM, PhD, DACVP: “So you want to be a Veterinarian?” Oral presentation at 2021 OSU Medicine Pre-Health Round Up; October 1, 2021; Audience: High school students with STEM interests.
- **Craig Miller**, DVM, PhD, DACVP: “So you want to be a Veterinarian?” Oral presentation at 2021 Stillwater Middle School Career Day; December 17, 2021; Audience: Middle school students with career interests in veterinary medicine.
- **Craig Miller**, DVM, PhD, DACVP: Member of the Advocacy and Policy Committee in the American College of Veterinary Pathologists; Chair of subcommittee tasked with addressing pathologic errors in scientific publications.
- **Ruth Scimeca**, VMD, MSc, PhD, DACVP: Tools to manage and detect internal parasites of ruminants and horses. Meeting; Summer seminar. OVMA, June 18-19, 2021.
- **Ruth Scimeca**, VMD, MSc, PhD, DACVP: Parasites and Production. *OADDL E-News*. Winter 2021.
- **Brianne Taylor**, DVM, DACVP, Annual OADDL Summary Report. Oklahoma Horse Racing Commission. May 2021.

ATTENDANCE AT MEETINGS

- **Cino, G:** 2021 American Association of Swine Veterinarians
- **Cino, G:** 2021 AAVLD Annual Meeting, October 21-25, 2021
- **Cooper, E:** 2021 AAVLD Annual Meeting, October 21-25, 2021, Virtual
- **Miller, C:** 2021 ACVP Annual Meeting, October 30-November 2, 2021; *Oral Presenter*
- **Miller, C:** 2021 INTERACT Research Symposium, October 12, 2021; *Invited Speaker*
- **Miller, C:** 2021 National Veterinary Scholars Symposium, August 4-6, 2020
- **Miller, C:** OSU CVM 2021 Phi Zeta Research Day, April 8, 2021
- **Ramachandran, A:** 2021 AAVLD Annual Meeting, October 21-25, 2021
- **Ritchey, J:** 2021 ACVP Annual Meeting, October 30-November 2, 2021; Oral presenter
- **Saliki, J:** 2021 AAVLD Annual Meeting, October 21-25, 2021
- **Taylor B:** 2021 AAVLD Annual Meeting, October 21-25, 2021, Virtual
- **Windiate, V:** 2021 AAVLD Annual Meeting, October 21-25, 2021

POSTERS, SCIENTIFIC PRESENTATIONS, SCIENTIFIC PUBLICATIONS

PUBLICATIONS:

- Aakur, S. N., Bagavathi, A., **Narayanan, S.**, Indla, V., **Ramachandran, A.**, Ramnath, V. L. (2021). "MG-NET: Leveraging Pseudo-imaging for Multi-modal Metagenome Analysis." International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI). Springer, Cham.
- Aakur, S. N., **Narayanan, S.**, Indla, V., Indla, V., Bagavathi, A., **Ramachandran, A.**, and Ramnath, V. L. (2021). "Metagenome2Vec: Building Contextualized Representations for Scalable Metagenome Analysis." IEEE International Conference on Data Mining Workshops.
- BinXi Wu, Brandy Kastl, **Ada G. Cino-Ozuna**, Nora L. Springer, David Biller, William Whitehouse, Loren Easterwood, Thu Annelise Nguyen. Feline sarcomatoid renal cell carcinoma (sRCCs) with peritoneal carcinomatosis and ascites. *Journal of Veterinary Diagnostic Investigation*. 2022;34(1):153-159. doi:10.1177/10406387211054826
- Chu K, Dugat D, Nafe L, **Ritchey J.** Omental hemangiosarcomas in five dogs. *Vet Rec Case Rep*. 2021. <https://doi.org/10.1002/vrc2.60>
- Ronald Dijkman, Muneeswaran Selvaraj, Hans Hendrik Gad, Rune Hartmann, **Sunil More**, Stanley Perlman, Volker Thiel, Rudragouda Channappanavar. Effective interferon (IFN)- λ treatment regimen to control lethal MERS-CoV infection in mice. bioRxiv

POSTERS, SCIENTIFIC PRESENTATIONS, SCIENTIFIC PUBLICATIONS (CONTINUED)

- Indla, V., Indla, V., **Narayanan, S., Ramachandran, A.**, Bagavathi, A., Ramnath, V. L., Aakur, S. N. (2021). "Sim2Real for Metagenomes: Accelerating Animal Diagnostics with Adversarial Co-training." The 25th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD).
- Kao Y, **Peake B, Madden R**, Cowan S, **Scimeca R**, Thomas J, Reichard M, **Ramachandran A, Miller C***. A probe-based droplet digital polymerase chain reaction assay for early detection of feline acute cytauxzoonosis. *Veterinary Parasitology*, 292, p.109413. <https://doi.org/10.1016/j.vetpar.2021.109413>
- Alexandra K Ford, Brian V. Lubbers, Lisa Tokach, **A. Giselle Cino-Ozuna***(corresponding author). Placentitis and abortion in domestic pigs (*Sus scrofa domesticus*) associated with *Trueperella abortusuis*, an emerging pathogen of swine in US. *J of Swine Health Prod.* 2022;30(2)
- Avellar, H.K., Williams, M.R., Brandao, J., **Narayanan, S., Ramachandran, A.**, Holbrook, T.C., Schoonover, M.J., Bailey, K.L., Payton, M.E., Pai, K.K. *et al.* (2021) Safety and efficacy of cold atmospheric plasma for the sterilization of a *Pasteurella multocida*-contaminated subcutaneously implanted foreign body in rabbits. *Am J Vet Res*, **82**, 118-124.
- **Fu DJ, Ramachandran A, Miller C***. Streptococcus pluranimalium meningoencephalitis in a horse. *Journal of Veterinary Diagnostic Investigation*. 2021 Jun 10:10406387211023465.
- Harshini Ashar, Deepan Kishore, Danielle Dugat, Akansha Singh, Tina Neel, **Sunil More**, Ashish Ranjan. Focussed Ultrasound Canine Cancer Project, FocUS Archive 2021
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GLOSSARY

Ab	Antibody	IgM	Immunoglobulin M
AGGL	Agglutination Test	IHC	Immunochemistry
AGID	Agar Gel Immunodiffusion Assay	ILT	Infectious Laryngotracheitis
ASF	African Swine Fever	IOR	Instructor of Record
BAPA	Buffered Acidified Plate Antigen	MAT	Microscopic Agglutination Test
BCV	Bovine Coronavirus	MCT	Mast Cell Tumor
BHI	Brain Heart Infusion Medium	MIC	Minimal Inhibitory Concentration
BLV	Bovine Leukemia Virus	mL	Milliliter
BRD	Bovine Respiratory Disease	MS/MG	<i>Mycoplasma synoviae</i> / <i>Mycoplasma gallisepticum</i>
BRSV	Bovine Respiratory Syncytial Virus	NPIP	National Poultry Improvement Plan
BUN	Blood Urea Nitrogen	OHRC	Oklahoma Horse Racing Commission
BVD/BVDV PI	Bovine Viral Diarrhea/BVD Virus Persistently Infected	OSDH	Oklahoma State Department of Health
c-ELISA	Competitive (blocking) ELISA	OPG	Oocyst Per Gram of Feces
CAE/CAEV	Caprine Arteritis Encephalitis/CAE Virus	OPP/OPPV	Ovine Progressive Pneumonia/OPP Virus
CBC	Complete Blood Count	OVMA	Oklahoma Veterinary Medical Association
CF	Compliment Fixation	PAS	Periodic Acid-Schiff stain
CL	Caseous Lymphadenitis	PCR	Polymerase Chain Reaction
CoV-2	Coronavirus 2	PI-3	Parainfluenza-3 Virus
CVM	College of Veterinary Medicine	PrP	Protease resistant Protein
dFA	Direct Fluorescent Antibody	PRRS/PRRSV	Porcine Reproductive and Respiratory Syndrome/ PRRS Virus
EEE	Eastern Equine Encephalitis	PTAH	Phosphotungstic Acid Hematoxylin stain
EHD	Epizootic Hemorrhagic Disease	qPCR	Quantitative Polymerase Chain Reaction
EHV	Equine Herpesvirus	RAP	Rapid Automated Presumptive
EIA	Equine Infectious Anemia	RHD	Rabbit Hemorrhagic Disease
ELISA	Enzyme-Linked Immunosorbent Assay	RMSF	Rocky Mountain Spotted Fever
END	Exotic Newcastle Disease	SARS	Severe Acute Respiratory Syndrome
EVA	Equine Viral Arteritis	SHI	Synergistic Hemolysin Inhibition
FA	Fluorescent Antibody	SIV	Swine Influenza Virus
FPA	Fluorescence Polarization Assay	SN	Serum Neutralization
g	Gram	sp./spp.	specie/species
GC/MS	Gas Chromatography/Mass Spectrometry	STP	Standard Plate Test
GMS	Grocott's Methenamine Silver stain	TAT	Turnaround Time
H&E	Hematoxylin and Eosin Stain	VTH	OSU CVM Veterinary Teaching Hospital
IBR	Infectious Bovine Rhinotracheitis	VN	Virus Neutralization
IFA/IFAT	Indirect Fluorescent Antibody/IFA Test	WNV	West Nile Virus
IgG	Immunoglobulin G		