



ANNUAL REPORT

MONTANA DEPARTMENT OF LIVESTOCK

Montana Veterinary Diagnostic Laboratory

Mission Statement

To serve the State of Montana by providing high quality, accurate, financially accessible and timely veterinary diagnostic testing, results and consultation; to assist state animal health officials in the diagnosis, control, and prevention of animal disease; and to contribute to state and national efforts to protect both animal and public health.

FISCAL YEAR

July 1, 2017 through June 30, 2018

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Director's Statement

The 2018 fiscal year was a period of transition, but also one of growth and opportunity. Our long serving Lab Director, Dr. Bill Layton, retired at the beginning of the fiscal year. Several other staff members retired during the year as well, necessitating the addition of new personnel. While the turnover in staff presented challenges, these changes forced us to evaluate new options and opportunities and resulted in a markedly strengthened cross-training program to ensure maintenance of laboratory services. In addition, we were able to take advantage of multiple open positions to initiate some restructuring of the laboratory and create new positions in the areas of most significant need.

We continue to strive to be at the cutting edge of laboratory and client service technology, and have recently developed multiple advancements in our Laboratory Information Management (LIM) System and client web portal, which will greatly enhance the client experience. I am excited to complete the final stages of testing, roll these new features out for our clients, and to hear the feedback.

This report contains a summary of test data from all sections of the Montana Veterinary Diagnostic Laboratory with the exception of the Montana Milk Laboratory, which is also housed within our facility.

We look forward to continuing to provide the highest quality diagnostic test services for disease diagnosis and surveillance in our great state in 2019 and beyond!

Sincerely,



Steve Smith, DVM, DACVP
Interim Director and Veterinary Pathologist
Montana Veterinary Diagnostic Laboratory

DIAGNOSTIC LAB STAFF

Administration and Pathology

Steve Smith, DVM, DACVP
Veterinary Pathologist;
Interim Director

Jeff Marshall, BVSc, PhD
Veterinary Pathologist

Administrative Support

Tess Moore
Quality Manager

Cathy Ortega
Front Office

Michelle McReynolds
Front Office

Lauren Larios
Pathology / Administrative Assistant

Microbiology

Jessica Rogers
Technician

Kaylee Krantz
Technician

Diana Florian-Ospina
Biological Laboratory Aide

Molecular Diagnostics

June Pounder, PhD
Technician

Clinical Pathology

Cecilia Esparza
Clinical Laboratory Technologist

Katie Breen
Technician

Serology

Antonio Fuentes Sanchez
Technician

Virology

Sarah Horak
Technician

Bryan Tegner Jacobson
Technician

Histology

Dan Zou, PhD
Technician

Milk Laboratory

Julie Armstrong
Technician

Erin Burns
Technician

STAFF SERVICE MILESTONES

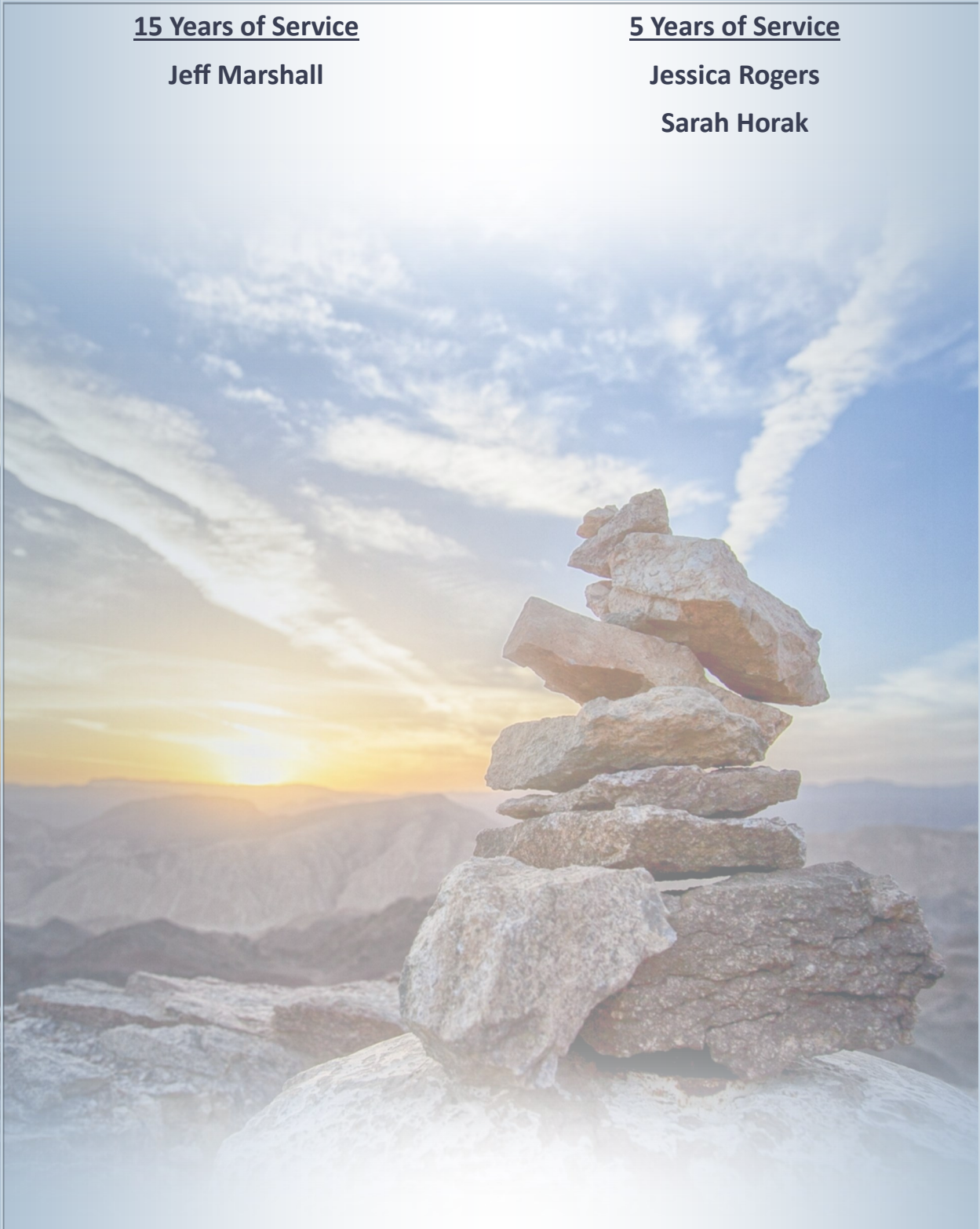
15 Years of Service

Jeff Marshall

5 Years of Service

Jessica Rogers

Sarah Horak



BUDGET AND FUNDING

MVDL is funded by multiple sources including Fee Income from tests performed, Montana State General Funds, Montana State Special Revenue (livestock head tax), and Federal Grant funds. Fee Income of approximately 50% is typical for State-run diagnostic test laboratories.

Although a substantial portion of MVDL’s budget is supplied by fee income, the ongoing support of the State of Montana, the livestock industry, and the National Animal Health Network (NAHLN) allow the laboratory to better fulfill our mission and serve the State of Montana.

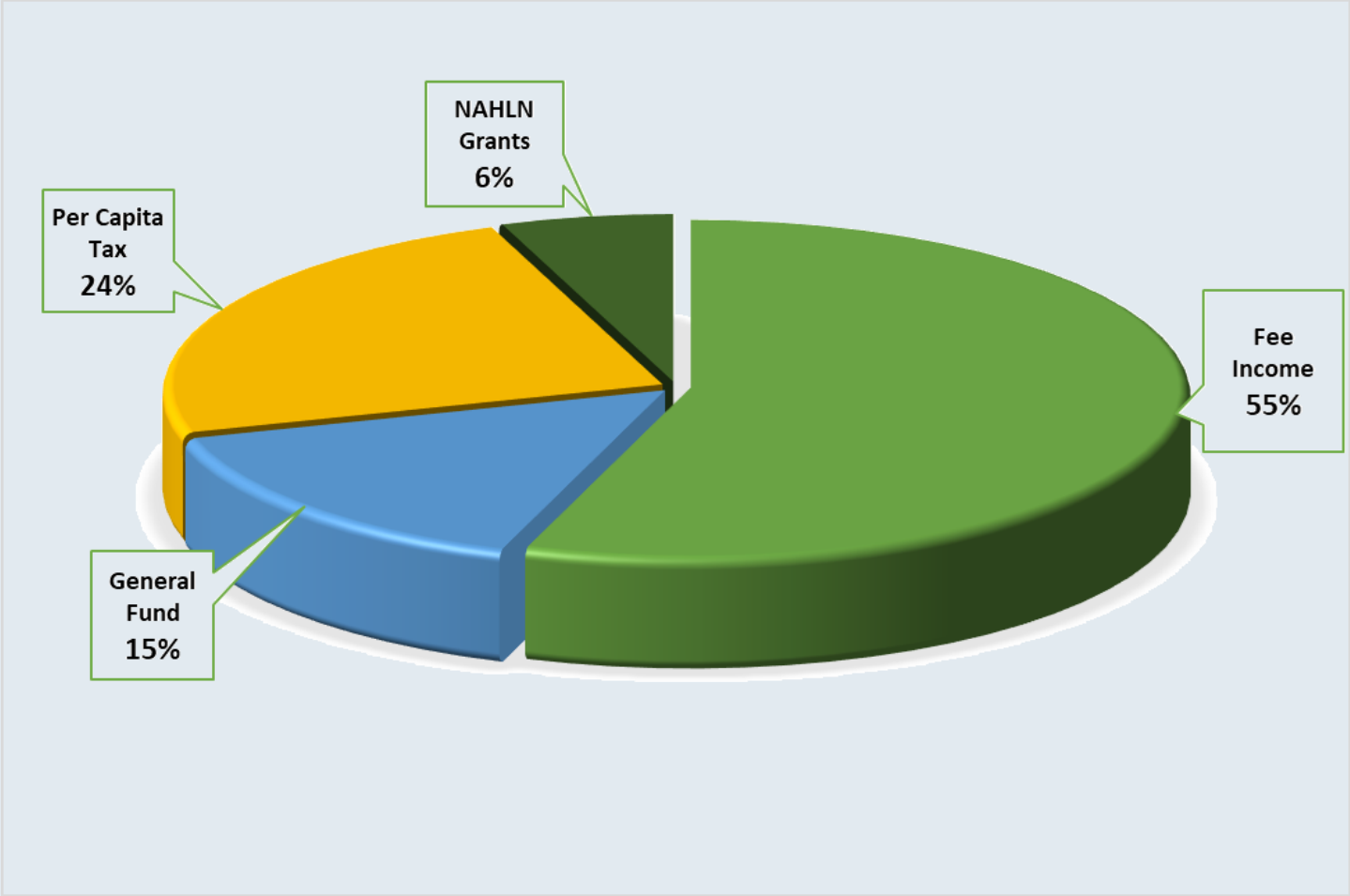


Fig. 5—Budget categories

2018 Fiscal Year	
Fee Income	\$1,178,575
General Fund	\$320,192
Per Capita Tax	\$509,284
NAHLN Grants	\$120,693

NAHLN

MVDL is a member of the National Animal Health Laboratory Network (NAHLN). The NAHLN supports U.S. animal agriculture by developing and increasing the capabilities and capacities of a national veterinary diagnostic laboratory network to support early detection, rapid response, and appropriate recovery from high-consequence animal diseases. It is a nationally coordinated network and partnership of Federal, State, and university-associated animal health laboratories. NAHLN veterinary diagnostic laboratories provide animal health diagnostic testing to detect biological threats to the nation’s food animals, thus protecting animal health, public health, and the nation's food supply. The MVDL has the capacity to perform NAHLN testing for seven different high impact animal diseases.

These include:

- ◆ Foot and Mouth Disease
- ◆ Classical Swine Fever
- ◆ Vesicular Stomatitis
- ◆ Avian Influenza (IAV-A)
- ◆ Swine Influenza (IAV-S)
- ◆ Pseudorabies
- ◆ Newcastle Disease (Avian Paramyxovirus)

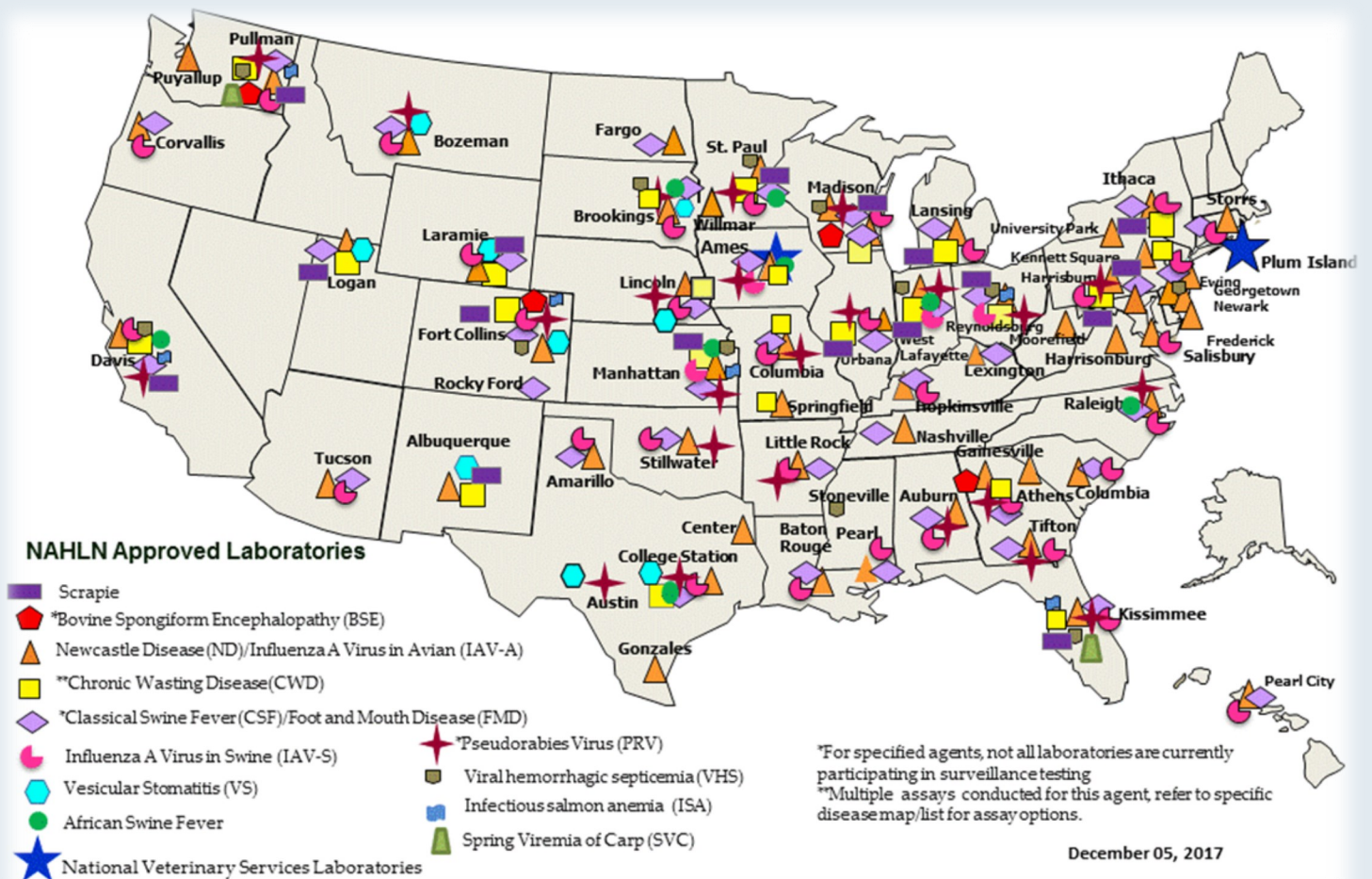


Fig. 6—NAHLN map (USDA)

ACCESSION AND TESTING DEMOGRAPHICS

An accession is a specimen or group of specimens from either a single animal or a herd, belonging to one owner, from a single submitter. Accessions are sometimes referred to as cases. Multiple individual tests may be performed on a single accession or specimen.

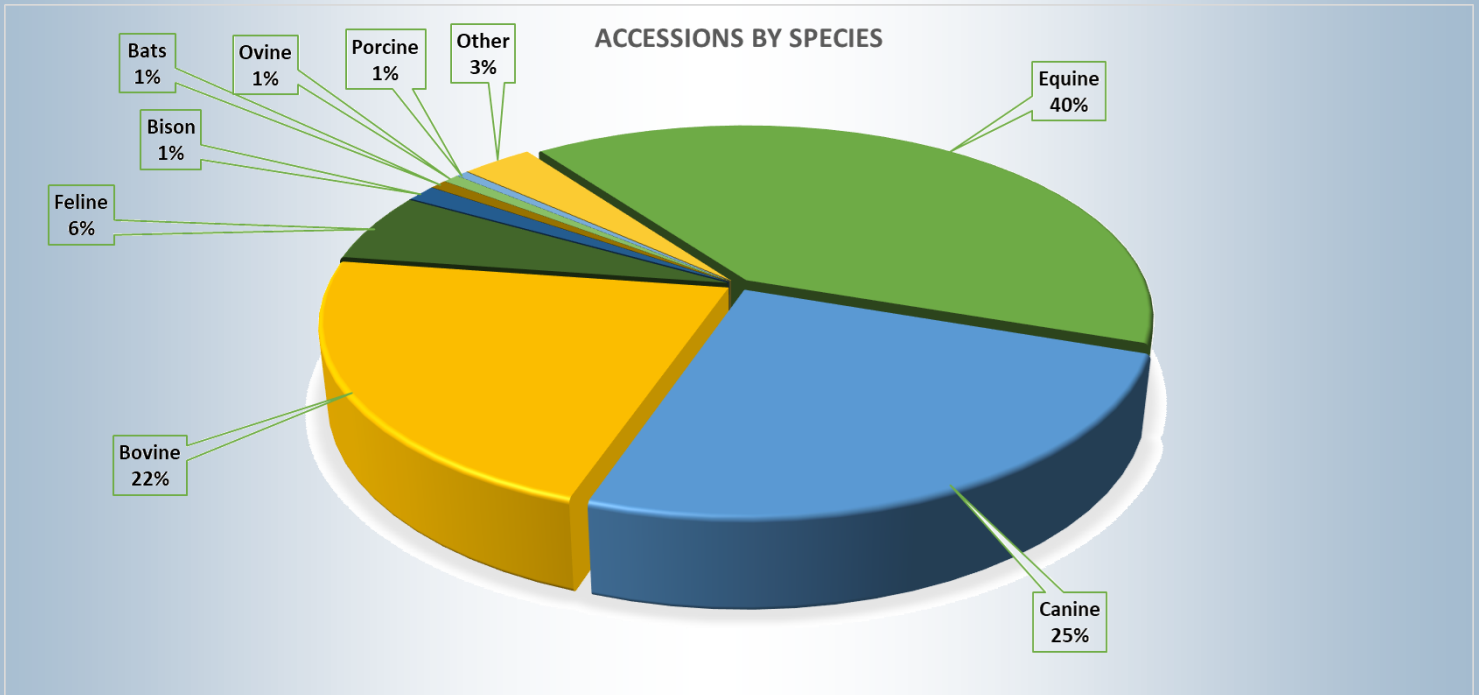


Fig. 7—Accessions by Species

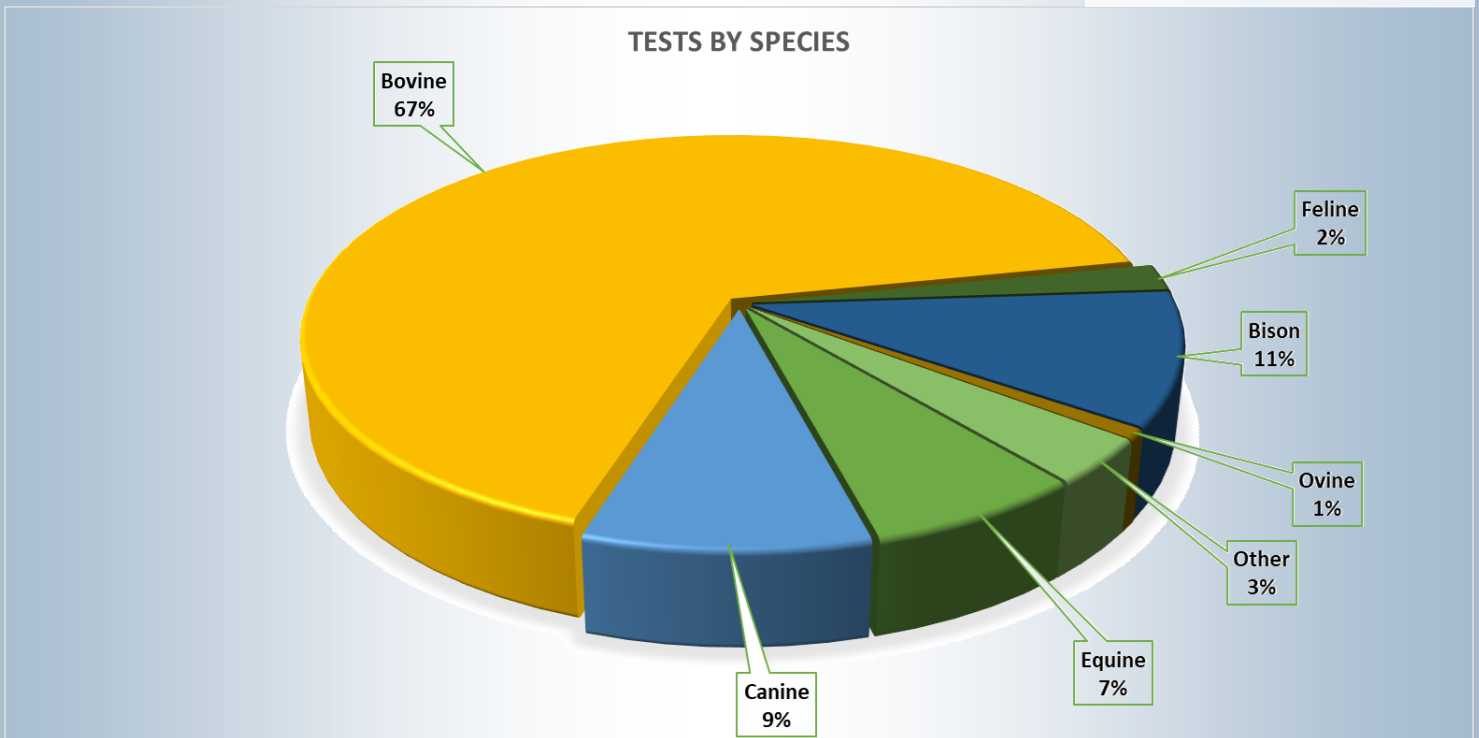


Fig. 8—Tests by Species

A C C E S S I O N A N D T E S T I N G D E M O G R A P H I C S

Total Accession and Test Data:

Species	Accessions	Tests
Equine	8,262	13,595
Canine	5,124	17,794
Bovine	4,521	130,651
Feline	1,211	4,132
Other	767	7,765
Wildlife	311	2,202
Bison	285	20,765
Ovine	152	1,512
Porcine	112	660
Caprine	79	543
Total	20,824	199,619

Total Referrals Sent to Other Laboratories: 966

Historical Accession and Testing Data:

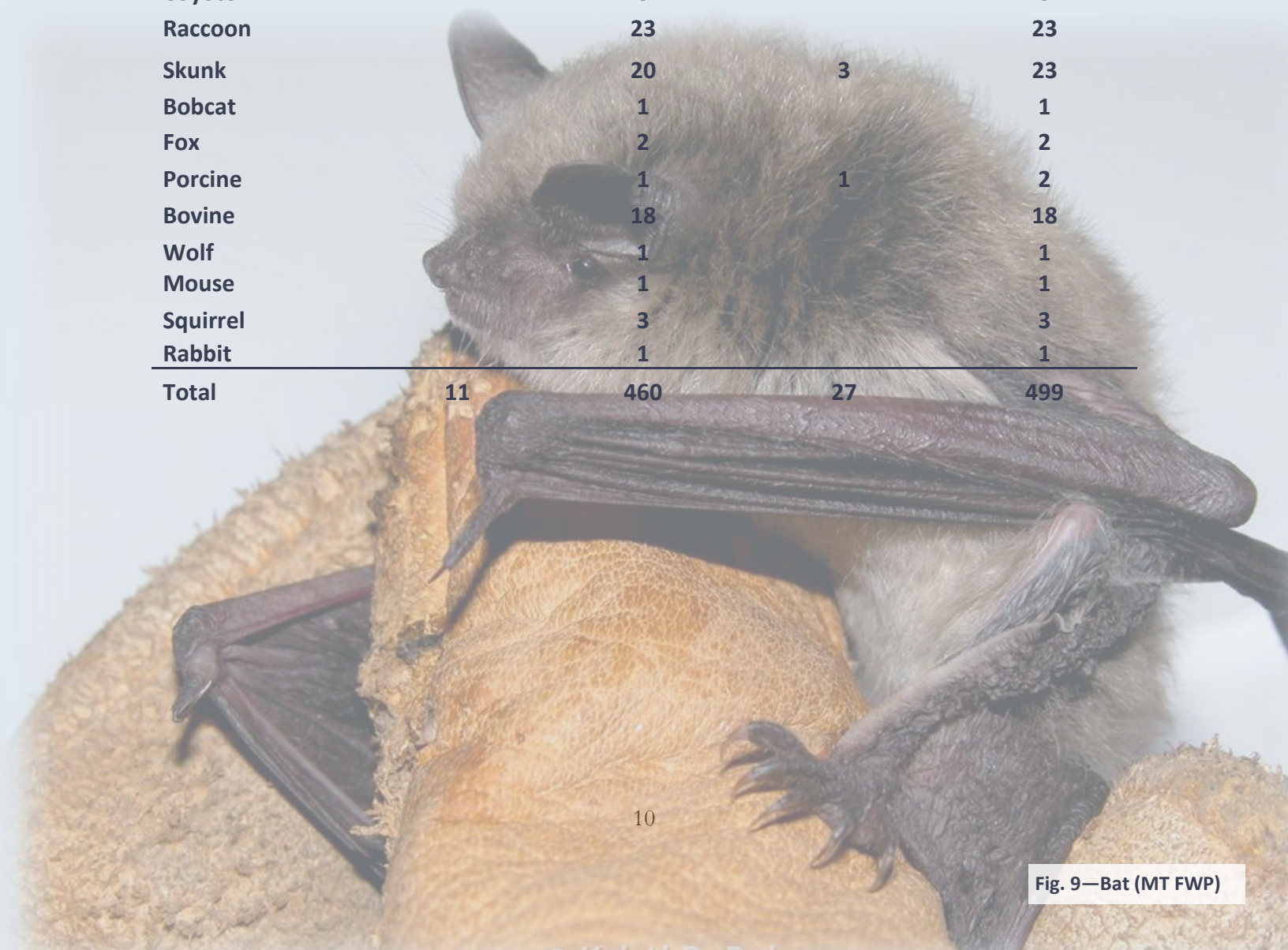
With our recent change in Laboratory Information Management (LIM) Systems, we have changed our methodology for counting some individual tests, so historical test data is not yet relevant, though accession data can be compared to previous years. NOTE: Accession data for FY 2016 is based on an eleven-month period, due to our transition to the new LIMS.

	2018	2017	2016	2015	2014
Total Accessions	20,824	21,923	20,366	23,585	19,521

R A B I E S S U M M A R Y

One very important public health function of the MVDL is rabies testing within the State of Montana. During Fiscal Year 2017, all positive rabies tests were in bats. The majority of rabies testing in bats and identification of positive samples occurs during warmer months, when bats are more active.

Species	Positive	Negative	Unsuitable	Total
Bat	11	133	18	162
Badger			1	1
Rodent		1		1
White-tailed deer		1		1
Equine		12	1	13
Canine		120		120
Feline		112	3	115
Caprine		2		2
Coyote		8		8
Raccoon		23		23
Skunk		20	3	23
Bobcat		1		1
Fox		2		2
Porcine		1	1	2
Bovine		18		18
Wolf		1		1
Mouse		1		1
Squirrel		3		3
Rabbit		1		1
Total	11	460	27	499



BRUCELLA SUMMARY

Several of our highest volume tests are for *Brucella abortus*, and these also serve our public health mission. The following table represents the five highest volume *Brucella* tests performed by the MVDL.

Tests by Month	RAP	BAPA	CF	FPA	Card
July	1,633	388	58	42	12
August	1,612	373	160	711	135
September	4,894	457	160	1,069	154
October	22,662	312	228	1,002	69
November	21,900	451	48	1,814	109
December	10,615	245	139	1,018	39
January	7,181	387	174	1,304	106
February	1,355	360	86	1,750	10
March	2,253	490	196	781	50
April	1,779	740	236	774	92
May	3,337	281	95	77	3
June	1,697	375	94	85	11

RAP: Rapid Automated Presumptive Test
BAPA: Buffered Acidified Plate Antigen Test
CF: Complement-Fixation Test
FPA: Fluorescent Polarization Assay
Card: Standard Card Test

P R O F I C I E N C Y T E S T I N G

MVDL performs routine proficiency testing as a means of maintaining compliance with applicable regulations and as a means of assuring the integrity of its testing methods and personnel. The following table summarizes the proficiency tests completed in FY2018.

FY2018 MVDL Proficiency Testing Participation	Section
Heartworm Serology	Clinical Microbiology
Inter-Laboratory Microbiology Quality Assurance Survey	Clinical Microbiology
Microbiology Quality Assurance	Clinical Microbiology
NVSL/NPIP Salmonella Group D Isolation	Clinical Microbiology
Chemistry Panel	Clinical Pathology
Endocrine Panel	Clinical Pathology
Hematology Panel	Clinical Pathology
Urinalysis Panel	Clinical Pathology
Urinalysis Identification	Clinical Pathology
Anaplasmosis Serology	Clinical Serology
Avian Influenza AGID/ELISA	Clinical Serology
Bluetongue Virus	Clinical Serology
Brucella ovis Serology	Clinical Serology
Brucellosis Serology	Clinical Serology
Equine Infectious Anemia AGID	Clinical Serology
Equine Infectious Anemia ELISA	Clinical Serology
Johnes Serology	Clinical Serology
Vesicular Stomatitis Complement Fixation	Clinical Serology
Bovine Leukosis Virus	Clinical Virology
Rabies DFA	Clinical Virology
Messaging	Laboratory
Avian Influenza (AIV, NDV, SIV) Real Time RT-PCR	Molecular Diagnostics
Avian Paramyxovirus-1 Real Time RT-PCR	Molecular Diagnostics
Classical Swine Fever Virus rRT PCR	Molecular Diagnostics
Foot & Mouth Disease Virus rRT PCR	Molecular Diagnostics
Influenza A Virus (Swine) Real Time RT-PCR	Molecular Diagnostics
NVSL/NPIP Salmonella Group D Isolation	Molecular Diagnostics
Vesicular Stomatitis rRT-PCR	Molecular Diagnostics



Fig. 11—AAVLD logo (AAVLD)



Fig. 12—VLA logo (VLA)

T E S T D A T A — S E R O L O G Y

MVDL provides a comprehensive suite of serology test methods, the bulk of which serve to support the Brucellosis surveillance program managed by the Animal Health Bureau of the DOL and screening for Equine Infectious Anemia. The following table details the number of individual tests conducted in FY2018 by test type.

Test Type	FY17	FY18
B. abortus RAP	78,678	81,057
B. abortus FPA	8,043	10,184
EIA AGID (total)	6,098	6,282
B. abortus BAPA	4,474	4,970
EIA ELISA (total)	1,278	1,922
Brucella abortus/suis - CF	1,840	1,667
M. avium paratuberculosis ELISA	1,823	1,612
Bluetongue ELISA	1,333	1,069
EHD AGID	1,324	1,016
Anaplasma cELISA	959	939
B. abortus Card	888	788
B. ovis ELISA	938	723
B. abortus SPT (1:50)	579	393
B. abortus STT (1:50)	361	242
CAE/OPP cELISA	385	182
B. canis RSAT	113	78
B. canis 2ME-RSAT	4	17
B. abortus Rivanol	12	13
Salmonella Pullorum	60	5
B. abortus STT (1:25)	51	3
Avian Influenza AGID	21	2
B. abortus SPT (1:25)	5	
Bluetongue ELISA Retest	6	
M. avium paratuberculosis ELISA Retest	3	
Total	109,276	113,164

TEST DATA — VIROLOGY

Test Type	FY17	FY18
Bovine Viral Diarrhea ELISA	1,846	2,043
Leptospira (5 Routine Serovars)	1,474	1,326
Bovine Leukemia Virus ELISA	1,010	1,025
Infectious Bovine Rhinotracheitis SN	807	771
Bovine Virus Diarrhea Type 1 SN	874	745
Bovine Virus Diarrhea Type 2 SN	874	745
Rabies - Small Animal	456	461
Bovine Respiratory Syncytial Virus SN	415	315
Pseudorabies ELISA	196	184
Parainfluenza-3 HI	442	161
FeLV/FIV Combo Rapid Immunoassay (SNAP)	155	116
Leptospira (7 Routine Serovars)	174	112
Bovine Leukemia Virus AGID	90	92
Feline Infectious Peritonitis ELISA	55	56
Vesicular Stomatitis (Ind)	25	54
Vesicular Stomatitis (NJ)	25	54
Bovine Viral Diarrhea - Virus Isolation	59	49
Large Animal Rabies	30	38
Canine Distemper Virus FA	12	31
West Nile Virus IgM ELISA	15	31
Leptospira FA	23	19
FeLV Rapid Immunoassay (SNAP)	3	18
Canine Parvovirus Rapid Immunoassay (SNAP)	10	8
Rabies Carcass Disposal	25	29
Canine Parvovirus FA		2
Bovine Respiratory Syncytial Virus FA	1	
Feline Panleukopenia Virus FA	1	
Leptospira Bratislava MAT	1	
Leptospira Canicola MAT	1	
Leptospira Pomona MAT	1	
Bovine Rotavirus ELISA	53	
Total	9,153	8,485

TEST DATA — MICROBIOLOGY

Test Type	FY17	FY18
Campylobacter Culture	3,023	2,366
Aerobic Culture	2,027	2,038
Trichomonas foetus Culture	2,562	2,024
Fecal Flotation	741	766
Mycoplasma Culture	302	368
Gram Stain	430	348
Salmonella Culture	352	337
Salmonella Enteritidis Culture	304	276
Small Animal Enteric Sensitivity	233	232
Small Animal Staph Sensitivity	228	220
Brucella Culture	214	177
Cryptosporidia	150	171
Additional Isolate - Aerobic	207	150
Heartworm ELISA	114	130
Abortion panel	100	92
Giardia antigen ELISA	71	81
Small Animal Enterococcus Sensitivity	87	80
Small Animal Beta-Strep Sensitivity	99	69
Bovine Respiratory Disease Sensitivity	45	56
Equine Beta Strep Sensitivity	63	53
Dermatophyte/PAS	55	29
Small Animal Pseudomonas Sensitivity	35	28
Equine Enteric Sensitivity	28	21
Small Animal Pasteurella Sensitivity	19	21
Small Animal Alpha-Strep Sensitivity	18	17
Equine Staph Sensitivity	26	16
Mastitis Staph Sensitivity	14	12
Equine Enterococcus Sensitivity	8	11
Fungal, non-dermatophyte	15	11
Ecto-parasite Exam	19	10
Occult Blood Test	11	9
Anaerobic Culture	19	8
Small Animal Sensitivity	11	8
Bovine Enteric Sensitivity	14	7

TEST DATA — MICROBIOLOGY
(CONTINUED)

Test Type	FY17	FY18
Bovine Staphylococcus Sensitivity	13	7
Bovine Salmonella Sensitivity	10	6
Endoparasite ID	8	6
Equine Pseudomonas Sensitivity	4	6
Equine Abortion Panel	3	5
Anthrax Lateral-Flow Test	3	5
Equine Alpha Strep Sensitivity	5	5
Liver Fluke Sedimentation	42	5
Heartworm Filtration	3	4
Bovine Enterococcus Sensitivity	2	3
Coccidia Smear	2	3
Equine Pasteurella Sensitivity	6	3
Mastitis Enteric Sensitivity	8	3
Trichinella - Pepsin Degradation	5	3
Bovine Alpha Strep Sensitivity	2	2
Mastitis Alpha Strep Sensitivity		2
Acid Fast Exam	5	1
Bovine Beta Strep Sensitivity		1
Direct Microscopic Exam		1
Dirofilaria immitis		1
Listeria Culture		1
Maceration-Flotation		1
Small Animal Acinetobacter Sensitivity	3	1
Small Animal Salmonella Sensitivity	1	1
Additonal Isolate - Anaerobic	2	
Coliform Count	4	
Electronic Somatic Cell Count	3	
Mastitis Pasteurella Sensitivity	2	
Total	11,780	10,318

TEST DATA — MOLECULAR DIAGNOSTICS (PCR)

Test Type	FY17	FY18
Tritrichomonas foetus Individual PCR	3,006	2,910
Tritrichomonas foetus Pooled PCR	1,423	1,409
Salmonella Enteritidis PCR Screen	592	698
M. avium paratuberculosis PCR	251	434
Bovine Rotavirus/Coronavirus Multiplex PCR	178	162
BVD Pooled PCR	97	121
E. coli K99 PCR	35	37
BVD Individual PCR	86	35
Avian Influenza Matrix PCR	56	17
Avian Paramyxovirus (Matrix) PCR	7	3
Bovine Coronavirus PCR	9	1
IBR PCR	15	
Swine Influenza PCR	3	
Total	5,758	5,827



Fig. 14—Lab bench (MVDL)

TEST DATA – CLINICAL PATHOLOGY

Test Type	FY17	FY18
Small Animal CBC/Differential	1,520	1,249
Canine Small Animal Panel	1,297	1,000
Canine Clinical Profile	863	677
Urinalysis	461	454
Large Animal CBC/Differential	361	375
Large Animal Chemistry Panel	398	365
Canine Thyroid Panel	454	360
Total T4	371	308
Feline Small Animal Panel	374	295
Large Animal Profile	275	293
Urinalysis with Culture/Sensitivity	252	282
ACTH Stimulation	302	277
Dexamethasone Suppression	208	264
Total T4	375	256
Cortisol	158	164
Phenobarbital	199	143
Feline Small Animal Clinical Profile	167	137
Thyroid panel	157	87
Free T4	100	83
Bile Acid	75	77
Nitrate (Semi-quantitative)	73	76
Clin Path comment	74	70
Feline Infectious Anemia	109	67
Feline Profile	105	67
Small Animal Hepatic Panel	64	62
Small Animal Pre-Anesthetic Panel	56	55
Small Animal Pre-Anesthetic Profile	51	53
Fluid analysis	51	49
PLI	68	48
Canine Health Screen	67	43
Small Animal Renal Panel	23	26
TSH	32	24
Ck	14	20
AST	28	19
Prothrombin Time	28	14
Electrolytes	7	13

TEST DATA — CLINICAL
PATHOLOGY

Test Type	FY17	FY18
Feline Health Screen	12	13
Activated Partial Thromboplastin Time	27	12
Feline Geriatric Panel	17	12
Fibrinogen (Heat Precipitated)	5	11
Calcium	6	9
Coombs	15	9
Large Animal Health Screen	6	9
Albumin	7	8
Blood Count	13	7
ALP	14	6
Glucose	2	6
Magnesium	4	5
BUN	11	4
Reticulocytes	1	4
Total Bilirubin	3	4
Total T3	1	4
Creatinine	13	3
Hemotropic Parasite Screen		3
Amylase	15	2
Canine Endocrine Panel	4	2
Equine Fitness Profile	6	2
Gamma-glutamyl Transferase	7	2
Total Protein	3	2
ALT	15	1
CSF analysis		1
Direct Bilirubin		1
Expanded Electrolytes Panel	10	1
Feline Anemia Panel	3	1
Globulin	1	1
Potassium	1	1
Cholesterol	2	
Coagulation Panel	10	
Creatine Kinase	11	
Phosphorous	7	
Sodium	1	
TCO2	1	
Total	9,471	7,998

TEST DATA — HISTOLOGY

Test Type	FY17	FY18
Hematoxylin & Eosin	2,807	2,592
Slide Processing (number of slides)	240	303
Gram (Brown & Brenn)	126	161
CWD Tissue Processing	113	134
PAS	129	110
Phloxine B Eosin	56	76
Toluidine blue	79	63
Giemsa	47	34
Acid Fast (Ziehl Neelsen)	57	30
GMS	40	25
Warthin-Starry	47	24
Melanin Bleach	37	23
Decalcification	24	21
Slide Processing (hours)	16	18
CD-3 IHC	18	15
CD-79a IHC	19	15
Histology processing comment	10	14
Acid Fast (Fite's)	7	9
BVD IHC	7	9
Purl's Prussian blue	3	8
Canine Coronavirus IHC	4	7
Melan-A IHC	17	7
West Nile Virus IHC	0	7
IBR IHC	5	6
Cytokeratin IHC	11	5
Duplicate Hematoxylin & Eosin	4	5
Masson's Trichrome	14	5
MUM-1 IHC	8	5
Congo Red	5	3
MAC-387 IHC	9	3
Toxoplasma IHC		3
Alcian Blue pH 2.5		2
CDV IHC	8	2
Chlamydia IHC		2
Factor VIII IHC	7	2

TEST DATA — HISTOLOGY

Gram (Brown & Hopps)	33	2
Mast Cell Tryptase IHC	1	2
Mucicarmine	2	2
Alcian Blue pH 1.0		1
BCV IHC	6	1
BRSV IHC	2	1
e-Cadherin IHC	7	1
Fontana Masson	2	1
Gimenez		1
Jone's Basement Membrane		1
Lambda light chain IHC	2	1
Oil Red O	1	1
Rhodanine	1	1
S100 IHC		1
Turnbull blue		1
Vimentin IHC	11	1
Von Kossa	2	1
Additional per slide	4	
Alcian Blue PAS Hematoxylin	1	
Brucella IHC	1	
CD-117 IHC	1	
CD-18 IHC	1	
Desmin IHC	4	
EHV IHC	1	
Macchiavello	3	
Steiner & Chapman	6	
Total	4,066	3,768

S E R V I C E F E E S — P A T H O L O G Y

Service	FY17	FY18
Carcass Disposal (lbs)	27,636	28,432
Case Summary	3,328	3,032
Histopathology 1-3 slides	2,469	2,283
Additional Information	438	501
Cytology	398	313
Histopathology 4-6 slides	165	139
Ruminant Diarrhea Panel (6-21d)	85	96
Necropsy Small Animal	47	46
Fetal Necropsy	49	41
Histopathology 7-10 slides	52	37
Necropsy Other Species	27	33
Ruminant Diarrhea Panel (1-5d)	26	22
Necropsy Large Animal >500#	16	19
Necropsy Large Animal <150#	14	15
Necropsy Large Animal <500#	10	15
Histopathology >10 slides	21	11
Diarrhea Panel (>31d)	7	10
Ruminant Diarrhea Panel (<30d)	17	9
Necropsy Small Ruminant >20#	7	5
Necropsy Small Ruminant <20#	4	4
Insurance/Legal case hourly fee		3
Remains Return/Transfer		3
Necropsy Swine <250#		1
Equine Diarrhea Panel (6-21d)		1
Equine/Porcine Diarrhea Panel (1-5d)	2	1
Necropsy Swine <25#	3	
Porcine Diarrhea Panel (6-30d)	1	
Total	34,822	35,072

Closing Remarks

In FY2018, the MVDL processed 20,824 accessions representing a total of 199,619 individual diagnostic tests. Relative to FY2017, these totals represent a 5% decrease in the total number of accessions and a 5.4% increase in the total number of diagnostic tests.

As we move forward into fiscal year 2019, I sincerely believe that the MVDL is on the threshold of amazing growth and improvement. We have a streamlined organizational structure that will provide for expertise we've never had before, we have multiple new tests and panels in development, and we excitedly look forward to bringing new staff members on board and rolling out significant improvements in client service and accessibility.

Over the past year, the MVDL has been actively participating in a legislative laboratory study project and working with design consultants to complete the necessary programming and cost analysis steps for a new building project. This will address all of our current needs, and also pave the way for future growth and development.

As was also the case last year, much change is on the horizon, but we are excited about the potential that it brings. We will continue to do all that we can to provide the best possible veterinary diagnostic services to the State of Montana.

Once again, thank you for granting us the opportunity to serve you!

Sincerely,



Steve Smith, DVM, DACVP
Interim Director and Veterinary Pathologist
Montana Veterinary Diagnostic Laboratory



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Bozeman, MT 59718

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<http://liv.mt.gov/Diagnostic-Lab>