2008

South Dakota Animal Disease Research and Diagnostic Laboratory: Annual Report 2008

Animal Disease Research and Diagnostic Laboratory, South Dakota State University

South Dakota
Animal Disease Research & Diagnostic Laboratory

Annual Report 2008

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SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY

FY 2008 Annual Report

July 1, 2007 - June 30, 2008

MISSION: VETERINARY SCIENCE DEPARTMENT

To protect and improve the health of animals, the viability of the SD agricultural industry, and the welfare of society through high quality diagnostic, analytical, research, extension and teaching activities.

MISSION: DIAGNOSTIC LABORATORY

To provide high quality veterinary diagnostic services as a means to promptly and accurately establish causes of animal health problems. Such diagnoses will aid attending veterinarians and health officials in the treatment, control, prevention and surveillance of animal diseases to the benefit of the SD and national livestock industry, other animal owners, and public health.

MISSION: RESEARCH

To utilize contemporary methods in the biological and life sciences to elucidate mechanisms controlling health and disease in animals and humans by the development of methods to diagnose, moderate and eliminate diseases.

MISSION: TEACHING AND ADVISING

Provide cutting edge animal health and biomedical science courses for the training of undergraduate and graduate students that incorporate problem solving and critical thinking skills using traditional and applied genomic technology solutions. Effectively advise undergraduate students in the Pre-veterinary medicine curriculum, and MS and PhD graduate students. Provide degree programs to allow our students to be competitive in the animal health and biomedical science fields. Provide opportunities for practicing veterinarians and non-traditional students in the animal health field to obtain graduate degrees.

MISSION: VETERINARY EXTENSION

To provide outstanding educational opportunities for veterinarians, the livestock industry, extension educators, and other citizens regarding animal health, zoonotic diseases, and food safety issues; and position the ADRDL and Veterinary Science Department as primary sources of that information.

MISSION: OLSON BIOCHEMISTRY LABORATORY

To provide high quality, objective, and unbiased analytical services to the public. Consistent with the land grant mission and the university's agricultural chemistry heritage, the laboratory has emphasized service to the greater agricultural community.

South Dakota
Animal Disease Research and Diagnostic Laboratory

Annual Report—Fiscal Year 2008

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INTRODUCTION – DIRECTOR'S REPORT

Since 1887, the South Dakota Animal Disease Research and Diagnostic Laboratory (ADRDL) have maintained a proud tradition of providing quality veterinary diagnostic services to the state and region. As one of 42 accredited veterinary diagnostic laboratories in the U.S., the ADRDL serves animal owners by acting as a reference laboratory for animal health professionals and state/federal regulatory officials. As a reference laboratory, we provide the precise detailed animal disease information that is needed for those in charge of managing, treating and preventing diseases of animals. Many of the diseases we deal with are also potential human diseases, and thus the lab also plays a significant service role for public health surveillance. The laboratory serves all companion and food animal owners by working with the local veterinarian. We are proud to be an integral part of an agricultural infrastructure that works to feed the state, region, nation and world. The laboratory continues as a member of the *National Animal Health Network* (NAHLN) and signed its fourth cooperative agreement grant with USDA in that regard. The grant provides funds for important operational and coordination activities of the NAHLN.

The lab performed 414,223 test procedures in FY08 compared to 426,569 in FY07. Traditional postmortem testing for all species continues to be an important function of the lab and is steady compared to recent years. The laboratory conducted 528 rabies examinations during the past year. Our Food Safety section performed 888 tests this past year and continues to conduct test research and validation work as a member of the USDA/FDA *Food Emergency Response Network* (FERN).

As in previous recent years, a significant part of the workload is due to antemortem test requests. This proactive trend in disease management continues. The swine industry continues to test intensely for PRRS virus, and the boar stud industry does extensive semen testing. The cattle industry has increased surveillance for BVD virus by targeting carrier animals. The ADRDL offers several BVD carrier testing options including the now popular and quick ear-notch ELISA test, and offers a pooled PCR based ear notch test. Avian influenza Virus surveillance of both wild birds and domestic poultry continued for a third year in a row with the cooperation of the SD Animal Industry Board, the SD Department of Game Fish and Parks, and the US Fish and Wildlife Service. The ADRDL remains a USDA contract test laboratory for Chronic Wasting Disease (CWD) of deer and elk, and Scrapie of sheep. That surveillance screened 2, 061 animals in FY08.

The ADRDL continues to move forward in adapting new technology. The molecular group maintains proficiency in Foot and Mouth Disease and Classical Swine Fever (CSF/Hog Cholera). The ADRDL received a second year of funding from USDA NAHLN to participate in surveillance for CSF. The test was free to the client and the grant allowed for a bounty to defray other diagnostic fees as an incentive for submission.

Speed and easy access to test results 24 hours per day are the benefits of our Internet result service. We currently have 442 Veterinary Clinics with passwords. With

the password, clinics can access their case results (final or preliminary) over the Internet at their convenience in real time. The ADRDL user guide and submission forms have been refined and improved by the diligent work of Dr. Tanya Graham and our section leaders. All can also be accessed over the Internet through our homepage at http://vetsci.sdstate.edu.

In addition to diagnostic activities, the laboratory conducts research important to control natural diseases of livestock. In the back of this report is a list of the department's scholarly activities. Faculty and staff were involved with 16 publications in refereed science journals and 97 other publications. In addition they made 91 professional and scientific presentations during FY08. This list demonstrates the department's strong commitment to generate new knowledge and our willingness to update the scientific/professional community and the public on animal health matters.

It is apparent that those that wish to harm our nation may seek to destroy our food animal supply or attempt to spread zoonotic diseases. The laboratory is preparing to respond to such potential threats and our stakeholders are currently seeking funds to build a major high containment addition. The addition would allow us to work with high risk pathogens in a biosecure and safe environment (Biosafety Level 3) and is vital for us to fulfill our statutory mission and to meet future expectations that will be placed upon us in the event of a food animal or zoonotic disease crisis. Numerous stakeholder groups have come forward with organizational resolutions in support of the high containment addition. This is encouraging, because the need for high containment space in the ADRDL exists now and is rapidly growing. Without it, the laboratory cannot do all that is expected of us during a high containment situation in our state, region or country. Without it, our research program will lose opportunities. We greatly appreciate the support of all of our stakeholders in this important effort.

Speaking for the faculty and staff, we are proud to be considered an essential infrastructure of the State, and count it a privilege to serve all animal owners of South Dakota and the region through the ADRDL.

D H Zeman

David H. Zeman, DVM, PhD
Head & Director, SDSU VSD/ADRDL

PUBLICATION HIGHLIGHTS – 2007-2008

1) Canine Leptospirosis: A review of epizootiology, pathogenesis, and control – David Knudsen, DVM, MS, DACLAM

2) Update on the South Dakota Center for Infectious Disease Research and Vaccinology – Alan Young, PhD and David Francis, PhD

3) Failure of passive transfer and weak calf syndrome in beef calves: A case report from spring of 2007 – D. H. Zeman, DVM, PhD, DACVP

4) Test validation: What it is and why it's important to you and your clients – Tanya Graham, DVM, DACVP

5) Hardware disease associated with steel belted tires used as hay feeding stations: A new source of hardware for an old disease – D. H. Zeman, DVM, PhD, DACVP and Jennifer Poindexter-Runge, DVM

Canine Leptospirosis: a review of epizootiology, pathogenesis, and control

David Knudsen DVM
Department of Veterinary Science, SDSU

This presentation will review current literature and practice in the transmission, pathogenesis, and control of leptospirosis in animals, and offer for discussion some current issues in control of canine leptospiral disease in South Dakota.

Leptospirosis in dogs is a multisystemic disease caused by up to 11 different serovars of *Leptospira interrogans*. It is considered endemic in areas of the United States with alkaline soils and a subtropical climate. Both rural and suburban dogs may be exposed. An increase in case frequency has been reported since 1983 in endemic areas. Young adult, male dogs are over-represented in these cases, possibly because of increased exposure and exposing behaviors.

Leptospira survive in any wet area, including standing water and soils, but are also classically associated with animal reservoirs. To act as a reservoir, the host species must have a leptospiral serovar which has become "host-adapted" – mild or subclinical illness in the host followed by latent infection in the urogenital tract and persistent shedding. The dog is thought to act as a primary reservoir for *L. canicola*, *L. batavia*, and possibly *L. bratislava*. Other serovars have been associated with other reservoirs, typically wild rodents and carnivores. Two other domestic animals, cattle and pigs, have also been shown to be primary reservoirs for one or more serovars.

Acquisition of infection in dogs is mainly by inhalation of urine droplets, but has also been shown to transmit via bite wounds or any abraded skin, mucous membranes, or ingestion of contaminated food or fomites. Transplacental transmission and infection by venereal contact have also been demonstrated in dogs.

In acute disease, and depending on host status, serovar, and mode of infection, leptospira can cause a mild to severe renal or hepatic inflammation, with progression to either chronic interstitial nephritis or chronic active hepatitis. Clinical signs associated with acute infections are varied, and likely result from sequella of the inflammatory response. Most infections are subclinical, however peracute presentations are not uncommon. Dogs surviving acute infection enter a latent phase, in which the organism is continually shed in low numbers from urine or feces, possibly for the remainder of the dog's life. Dogs with pre-existing antibody titers generally eliminate the acute infection quickly and proceed directly to a subclinical, latent infection.

Current prevention and control strategies involve vaccination and avoidance of exposure. In endemic areas, an AAHA/ACVIM joint panel (2003) recommended an annual vaccination series of three vaccine doses spaced two to three weeks apart, using a vaccine product with as broad of a range of serovars as possible. The same joint panel did not recommend vaccination for dogs in non-endemic areas, chiefly because of limited serovar coverage in even the broadest vaccines and the incidence of adverse reactions with bacterial vaccines in general. Avoidance of exposure is difficult in most cases because of the social and exploratory nature of dog behavior.

Proceedings, 116th annual meeting of the South Dakota Veterinary Medical Association:141, 2007.

Update on the South Dakota Center for Infectious Disease Research and Vaccinology

Dr. Alan Young and Dr. David Francis

The Center for Infectious Disease Research and Vaccinology (CIDRV) was established to *foster research activities that will lead to the development of novel therapeutic and diagnostic technologies and products for infectious disease in humans and domestic animals.*

Substantial progress has been made during the past three years in our objective to establish a highly productive research center that is an economic asset to South Dakota. Major advances made during the third year of this center's existence are listed below in the next section, evidence that the center is a leader in state economic development.

We have exceeded the obligation of acquiring funds matching the 5-year contribution of the 2010 Grants program ($3.9M), and during the current year have nearly matched that amount. In addition, research activities in the Center have resulted in collaborations with a number of SBIR/STTR local industries, budding partnerships with regional biotechnology firms, and establishment of one new and viable South Dakota business. Four of five new faculty members recruited into the Center approximately two years ago have each successfully competed for at least $150,000 in national grants competitions, suggesting that they are well on their way to successful research careers. Two of our center's investigators now possess NIH RO1 grants, and others are pursuing that challenge. In addition, three of our investigators hold major consultantships, affirming industrial recognition of the Center's technical and intellectual strength.

Research foci in the CIDRV include clusters in porcine enteric disease, transmissible spongiform encephalopathies, bovine viral diarrhea virus, porcine reproductive and respiratory disease virus, and immunodeficiency viruses of humans and felines. Recent research accomplishments and updates on these diseases will be discussed, focusing on feline immunodeficiency virus (small animal session) and domestic animal disease (large animal session).

Proceedings, 116th annual meeting of the South Dakota Veterinary Medical Association: 75, 2007.

Failure of Passive Transfer and Weak Calf Syndrome in Beef Calves: A case report from spring of 2007

D. H. Zeman, DVM, PhD, DACVP

A north-central plains cow/calf beef producer experienced a serious outbreak of mixed infectious diseases during the spring calving season of 2007. The history included the observation that many of the affected calves appeared weak immediately after birth, and had difficulty standing and sucking milk from the cows. There were several hundred pregnant cows in the herd and over the previous few weeks between 50 to 100 neonatal calves had died.

Four live calves and one dead calf were submitted to the South Dakota State University Animal Disease Research and Diagnostic Laboratory on Saturday March 17, 2007. A variety of infectious diseases were identified as follows:

Calf A: Polyarthritis and Septicemia associated with mixed enteric bacteria including *E. coli.*

Calf B: Purulent Pyelonephritis associated with enteric bacteria including *E. coli.*

Calf C: Multifocal Mycotic Pneumonia. Rumenitis associated with Candidiasis. Purulent Peritonitis. Idiopathic Enterocolitis.

Calf D: Born dead. Submitted for infectious abortion screening; negative findings.

Calf E: Omphalophlebitis. Necrotizing Rumenitis associated with Clostridial disease. Failure of Passive Transfer of Immunity (800 mg/dl IgG1). * This was the only calf submitted alive.

Necropsy Summary: a variety of infectious diseases involving mixed bacteria and fungi were identified in all calves except the one born dead. There was no common agent identified from all of the calves. In addition, calf A was a very small calf, and calves B and C showed serous atrophy of heart fat. Due to these findings, failure of passive transfer of immunity (FPTI) was suspected and was confirmed by testing blood of the live calf. Additional blood samples were requested to determine if FPTI was a widespread problem in this herd.

A follow up submission of blood from five neonatal calves confirmed FPTI in two of the calves and partial FPTI or low normal in one other, as follows:

7 day old calf	- < 400 mg/dl IgG1	FPTI
9 day old calf	- < 400 mg/dl IgG1	FPTI
9 day old calf	- 1600 mg/dl IgG1	Partial FPTI or Low Normal
3 day old calf	- 2050 mg/dl IgG1	Normal
3 day old calf	- 3200 mg/dl IgG1	Normal

The *Weak Calf Syndrome* may have played a role in FPTI in this herd, since this was a common observation by the owner. Weak neonatal calves may be expected to have difficulty consuming adequate volumes of colostrum and nourishment.

Proceedings, 116th annual meeting of the South Dakota Veterinary Medical Association:7, 2007.

Test Validation:
What it is and why it's important to you and your clients.

Tanya D. Graham, DVM, DACVP

Test validation is required as a part of our AAVLD accreditation. This accreditation process ensures that the diagnostic laboratory meets or exceeds the standards described in the World Organization for Animal Health's Quality Standard and Guidelines for Veterinary Laboratories: Infectious Diseases, 2002 (ISO 17025). This guide emphasizes the selection of appropriate test methods that are widely accepted by scientists and regulators (i.e. allows for interstate or international movement of animals). In sections of the diagnostic laboratory that do not work with infectious diseases, the good laboratory practice principles in this document still apply.

The Manual of diagnostic tests and vaccines for terrestrial animals, 2004, defines test validation as "...a step wise process which confirms truthfulness of the test in question and it helps establish client confidence in the services offered by a diagnostic lab. During validation process, a test method is selected to find out how accurate and sensitive it is for the intended use... The reagents, growth media, machines, techniques etc. needed for the test method are standardized before the method is evaluated to determine how consistent it is in providing accurate results irrespective of the severity of the disease in the animals.

It is very important that the diagnostic labs validate test methods before using them to test client samples because using validated methods labs can help clients identify animals / birds as positive or negative for a disease (or a condition) on a consistent basis."

According to the AAVLD Essential Requirements for an Accredited Veterinary Medical Diagnostic Laboratory (Version 4.1 11.07.06) the user is not required to re-validate international or national standard methods, but each laboratory must document that the assay works in their laboratory.

"Test methods may be classified as "validated for use" by meeting the following criteria.

1) Ongoing documentation of internal or inter-laboratory performance using known reference standard(s) for the species and/or diagnostic specimen(s) of interest, **AND** one or more of the following:

2) Endorsed or published by reputable technical organization
   e.g.: OIE Manual of Standards for Diagnostic Tests and Vaccines, US Food and Drug Administration's Bacteriologic Analytic Methods, Bergey's Manual of Determinative Bacteriology, American Society of Microbiology Manual of Clinical Laboratory Immunology, American Association of Avian Pathologists Isolation and Identification of Avian Pathogens, EPA protocols, American Fisheries Society Bluebook, AOAC, NAHLN;

3) Published in a peer-reviewed journal with sufficient documentation to establish diagnostic performance and interpretation of results;

4) Documentation of internal or inter-laboratory comparison to an accepted methodology or protocol."

The bottom line: we can't just take a test kit off the shelf and assume that it works. If you have questions about the use of a new collection system method or any deviation in the type of sample(s) to submit, please call the lab @ 605.688.5171 first. We will be happy to work with you and the kit manufacturer whenever possible.

Proceedings, 117th annual meeting of the South Dakota Veterinary Medical Association:61-62, 2008.

Hardware Disease Associated with Steel Belted Tires Used as Hay Feeding Stations: A New Source of Hardware for an Old Disease

DH Zeman, DVM, PhD, DACVP and Jennifer Poindexter-Runge, DVM

During late winter, seven cows from a herd of 330 crossbred beef cows had died over a period of a few weeks and several others had shown a variety of vague clinical signs including fever, lethargy, anorexia, excessive salivation, abortion, and agonal recumbence. On March 15, 2007 the owner delivered two dead cows to the South Dakota State University, Animal Disease Research and Diagnostic Laboratory in Brookings. These cows were the fourth and fifth to die during the current week.

Cow 1: Necropsy revealed this five-year-old cow to be in good body condition. A fetid rumen-like odor was noted when the right thoracic cage was removed. The pericardial sac was markedly distended and thickened. Approximately 3 gallons of brown, fetid fluid readily poured from the pericardial sac following puncture. The inner lining of the pericardium and the epicardial surface were diffusely covered by a thick (.25 inches) layer of yellow/tan exudate. A wire was observed extending from the reticulum, across the diaphragm and through the pericardial sac. The wire was 4 inches long and composed of thin, round, smooth metal. There were no other significant gross findings.

Cow 2: Necropsy revealed this nearly toothless older cow to be thin. The owner reported that this cow died rather suddenly compared to the others. Upon exposing the thoracic cavity there was no odor as described in cow 1. However, again the pericardial sac was markedly distended and appeared somewhat dark. The pericardial sac was opened and found to be distended and filled with a large blood clot. Further dissection revealed a thin smooth round wire extending from the reticulum into the pericardial sac as described in the previous cow. Unfortunately for this cow, the wire then precisely struck and punctured a large myocardial artery causing acute and severe hemorrhage into the pericardial sac (hemopericardium). The immediate cause of death was attributed to the cardiac tamponade syndrome. During cardiac tamponade, the heart has difficulty performing due to constrictive pressures of the pericardial blood clot on the softer portions of the heart such as the atria and vena cavas. Consequently, the flow of blood through the chambers is severely reduced or stopped and death ensues due to circulatory collapse.

The diagnostic summary was death due to classic Hardware Disease. The owner was sent home with the wire and instructed to look for the source. It was discovered that a large tire (large enough to encircle a round-bale) was being used as a hay feeding station. The tire had been split in half and contained steel belts formed by a myriad of thin small wires. Over time, as the cattle reached over the tire to feed on the hay bale, their necks tended to wear away the rubber and expose the wires, which would eventually break free and drop into the hay.

Based on this case, we would strongly discourage the use of steel belted tires for use as hay feeding stations.

Proceedings, 117th annual meeting of the South Dakota Veterinary Medical Association: 73, 2007.

FACULTY AND STAFF
July 1, 2007 – June 30, 2008

ADMINISTRATION
David Zeman, DVM, PhD, Head and Director
Tanya Graham, DVM, Associate Professor, Diplomate ACVP, Associate Director

PATHOLOGY
David Zeman, DVM, PhD, Professor, Diplomate ACVP – Section Leader
Larry Holler, DVM, PhD, Professor
Regg Neiger, DVM, PhD, Professor
Dale Miskimins, DVM, MS, Professor
David E. B. Knudsen, DVM, MS, Professor, Diplomate, ACLAM
Tanya Graham, DVM, Associate Professor, Diplomate ACVP
Angela Pillatzki, DVM, Instructor

BACTERIOLOGY
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Holly Kroschel, BS, Senior Microbiologist
Seema Das, BS, MS, Microbiologist
Cynthia Watt, BS, Microbiologist
Debra Murray, CLT, Microbiologist
Tracy Irion, Laboratory Aide

CLINICAL PATHOLOGY
David E. B. Knudsen, DVM, MS, Professor, Diplomate, ACLAM – Section Leader
Michael Hildreth, PhD, Professor
Debra Rust, BS, ASCP, Senior Microbiologist

EXTENSION
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Russell Daly, DVM, Assistant Professor

FOOD SAFETY
David Francis, PhD, Professor – Section Leader
Laura Ruesch, BS, Senior Microbiologist

HISTOPATHOLOGY/ELECTRON MICROSCOPY/IHC
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Margaret Perry, MS, Senior Microbiologist
Frank Qin, MS, Senior Microbiologist
Karen Belau, Laboratory Technician
Joel Zebill, Laboratory Technician

MOLECULAR DIAGNOSTICS
Jane Christopher-Hennings, DVM, MS, Professor – Section Leader
Travis Clement, BS, Senior Microbiologist
Roger Chapin, BS, Senior Microbiologist
Simon Althoff, BS, Microbiologist
Rebecca Hewer, BS, Microbiologist (2-11-08)

Aaron Lambert, BS, Microbiologist
Crystal Niemann, BS, Microbiologist
Gina Steinlicht, BS, Microbiologist (1-18-08)
Shelleen Weeks, BS, Microbiologist (5-28-08)

QUALITY CONTROL
Rajesh Parmar, MS, Laboratory Quality Manager
Shelleen Weeks, BS, Microbiologist, Assistant Quality Manager (5-28-08)

RESEARCH
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Alan Erickson, PhD, Professor
Michael Hildreth, PhD, Professor
Eric Nelson, PhD, Professor
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Feng Li, PhD, Research Associate Professor
Alan Young, PhD, Associate Professor
Ying Fang, PhD, Research Assistant Professor
Philip Hardwidge, PhD, Research Assistant Professor
Radhey Kaushik, PhD, Assistant Professor
Weiping Zhang, PhD, Research Assistant Professor
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Lyle Braun, MS, Senior Microbiologist
Stacy Lindblom-Dries, BS, Microbiologist
Collette Stacey-Oda, BS, Microbiologist (4-21-08)
Diane Baker, MS, Agriculture Research Manager Specialist
Dong He, MS, Bioimaging Research Associate
Jun Lin, MS, Biochemistry Research Associate
Mojun Zhao, MS, Researcher II
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Jaime Jungen, BS, Laboratory Technician (3-27-08)
Manal Mahmoud, DVM, MS, Visiting Scientist

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Station Biochemistry Personnel

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Aaron Singrey, BS, MS, Senior Microbiologist
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VIROLOGY
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Jerri Rogers, BS, Microbiologist (3-31-08)
Cindy Appelt, BS, Laboratory Technician
Christopher Chase, DVM, PhD, Professor
Lyle Braun, MS, Senior Microbiologist

CLERICAL STAFF
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Gerri Murphy, Word Processor
Evonne Freyberg, Secretary
Margaret Janssen, Secretary
Janice Kampmann, Secretary
Nan Nesbit, Secretary
Kim Hyland, Staff Assistant

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Jon Greseth, Computer Support Analyst

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Shirley Wiener, Senior Secretary
Kelly Bakken, Senior Secretary (11-16-07)
Sandra Gustafson, Senior Claims Clerk

MAINTENANCE
Jerry Anderson, Senior Building Maintenance Worker

NECROPSY
Myron Olson, Laboratory Technician

ADJUNCT PROFESSORS
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Stephen Hall, PhD
Richard Harland, DVM, MVS
Daniel Keil, PhD
Joan Lunney, PhD
Stephen Martin, PhD
Sarah Patrick, PhD
Carol Rinehart, PhD
Thillainayagam Sathiyaseelan, BVM, PhD

OLSON BIOCHEMISTRY LABORATORY

David Zeman, DVM, PhD, Director
Nancy Thiex, MS, Professor
Duane Matthees, PhD, Professor
Richard Larson, BS, Senior Chemist
Rose Neal, BS, Senior Chemist
Lawrence Novotny, BS, Senior Chemist
Terri Van Erem, BS, Senior Chemist
Regina Wixon, MS, Senior Chemist
Ritu Hooda, MS, Programmer/Analyst
Nancy Anderson, BS, Chemist
Bryan Gildemeister, BS, Chemist
Harold Manson, BS, Chemist
Shirley Mittan, MS, Chemist
Brian Steinlicht, BS, Chemist (1-18-08)
Michelle Hayes, BS, Laboratory Technician
Zelda McGinnis-Schlobohm, BS, Laboratory Technician
You Wang, MS, Laboratory Technician
Delores Bothe, Secretary

GRADUATE STUDENTS

Christopher Chase, DVM, PhD, Professor, Diplomate ACVM, Virology and Immunology
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Wei Bia, MS, Graduate Research Assistant
JingJing Bao, MS, Graduate Research Assistant
Elizabeth Brown, BS, Graduate Research Assistant
Frank Echtenkamp, BS, Graduate Research Assistant
Annissa Furr, BS, Graduate Research Assistant
Xaiofei Gao, MS, Graduate Research Assistant
Anna Hermanson, BS, Graduate Research Assistant (5-21-08)
Amber Johnson, BS, Graduate Research Assistant (5-21-08)
Kristina Mateo, MS, Graduate Research Assistant
Lindsey Reister, BS, Graduate Research Assistant
Kristen Rietsema, BS, Graduate Research Assistant (8-21-07)
Daniel Thum, BS, Graduate Research Assistant
Dan Wang, MS, Graduate Research Assistant
Mackenzie Westby, BS, Graduate Research Assistant (8-21-07)
Chengxian Zhang, BS, Graduate Research Assistant
Xiaoxin Zhou, BS, Graduate Research Assistant

SOUTH DAKOTA

ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY

AWARDS AND RECOGNITION

July 1, 2007 – June 30, 2008

Pins were awarded to the following individuals for years of service:

Ying Fang	10 years
Jon Greseth	10 years
Myron Olson	10 years
Shelleen Weeks	10 years
Tracy Irion	15 years
Lyle Braun	20 years
Regg Neiger	20 years
Linda Fawcett	25 years
Margaret Perry	25 years
David Francis	30 years
Pam Leslie-Steen	35 years
Nancy Thiex	35 years

SOUTH DAKOTA
ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY
ADVISORY COMMITTEE

JULY 1, 2007 – JUNE 30, 2008

Animal Disease Research and Diagnostic Laboratory
David H. Zeman, DVM, PhD, Head and Director

Animal Industry Board/South Dakota State Veterinarian
Sam Holland, DVM

South Dakota Cattlemen's Association
Tom Stenberg, DVM

South Dakota Federation of Dairy Farmers
Robert Ode

South Dakota Game, Fish, and Parks Department
Tom Kirschenmann

South Dakota Pork Producers Council
Jeremy Lehrman, Executive Director; and Lewis Bainbridge

South Dakota Poultry Industries
Darwin Britzman, PhD

South Dakota Sheep Grower's Association
Bill Aeschlimann

South Dakota State University, College of Ag/Bio Science
Gary Lemme, Dean

South Dakota Stockgrower's Association
Bob Hutchinson

Cow/Calf Producer (Representative-at-large)
Ralph Jones

South Dakota Veterinary Medical Association
Daryl Thorpe, DVM, Executive Director (2007)
Peggy Behrens, DVM (2007-2008)
Kevin Klozenbucher, DVM (Food Animal Representative)
Steve Smith, DVM (Member-at-large)
Jill Hyland Ayers, DVM (Companion Animal Representative)

SOUTH DAKOTA
ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY

HOURLY ASSISTANTS

JULY 1, 2007 – JUNE 30, 2008

Mariecil Aguiar, Laura Balius, Molly Beckfeld, Stephanie Biddle, Jennifer Bosch, Brandon Boswell, Kristin Braaksma, Tiffany Bradley, Rachel Breen, Holly Bruns, Molly Brunsting, Ruth Burroughs, Jenelle Bussard, Thomas Clark, Catherine Coursen, John Cox, Amber (VanHout) DeClercq, Anthony Donelan, Raeann Duede, Michael Dunn, Chantel Eisman, Christine Ferderer, Jenna Fier, Brandon Fishbach, Shawn Flottmeyer, James Francis, Jamie Gosch, Drew Grosz, Lisa (Goeden) Hagemann, Sherif Halawiesh, Nicole Hansen, Joseph Hemerka, Lori Hemish, Theresa Henrickson, Cody Hill, Nicholas Hite, Susan Holler, Kelley Johnson, Judge Kelley, Nicole Kohler, Cassandra Kotten, Tim Kruse, Megan Kuipers, Michael Lang, Jeremy Lemire, Heather Licht, Amanda Lindsay, Rebecca Lutter, Jessica Mediger, Tami Messenger, Amber Moberg, Michelle Monson, Katie Morris, Amanda Murphy, Jennifer Nachtigal, BreAnn Neiger, Julie K. Nelson, Gina Neu, Lindsey Olson, Amanda Oppold, Camille Owens, Paul Panitzke, Anna Petrowiak, Dana Rausch, Rachel Reimers, Lindsey Reister, Allison Richards, Naomi Ries, Scott Rippke, Andrew Rogen, Lori Rotert, Suzanne Roth, Anne Schafer, Phouvieng Sengsavang, Courtney Shade, Charles Stangohr, April Swartos, Nicole Taylor, Dan Timblin, Brett Tostenson, Heather Trayner, Lindsay VanOrt, Scott VanderPoel, and Michaela Vetter.

OLSON BIOCHEMISTRY LABORATORY

Matthew Alford, Amanda Beyer, Heidi Chilcoat, Christopher Couglin, Christina Fanning, Anna Fister, Jared Hammon, Luke Holmoe, Sarah Jensen, Alycia Krcil, Rachel Lewis, Heather Licht, Andrea Lucas, Laura Mehlbrech, Ballie Nash, Gonzalves Ntwali, Rashmika Parmar, Kathrine A. Richards, Laura Sanborn, Joseph Small, Cory Smith, Jacob Swanson, Derek Timm, Kendra Wiechmann, and Emily Winsel.

SOUTH DAKOTA
LIST OF REPORTABLE AND QUARANTINABLE DISEASES
JULY 2007

ALL SPECIES	REPORTABLE	QUARANTINABLE
*Any foreign animal disease (see footnote)	X	X
Anaplasmosis	X	
Anthrax	X	X
Any disease associated with food borne illness	X	
Any new emerging disease (Syndromes)	X	
Atrophic Rhinitis	X	
Avian Chlamydiosis (Ornithosis - Psittacosis)	X	X
Avian Encephalomyelitis (Infectious Encephalomyelitis)	X	X
Avian Infectious Bronchitis	X	
Avian Infectious Laryngotracheitis	X	
Avian Influenza	X	X
Avian Pneumovirus	X	
Babesiosis	X	
Blastomycosis	X	
Bluetongue	X	
BLV (Enzootic Bovine Leukosis)	X	
Bovine Viral Diarrhea	X	
Bovine Spongiform Encephalopathy*	X	X
Brucellosis caused by *B.abortus*, *B. melitensis*,* *B.suis*, and *B.ovis*	X	X
Brucellosis caused by *B.canis*	X	
Campylobacteriosis	X	
Caprine Arthritis/Encephalitis	X	
Canine Ehrlichiosis	X	
Caseous Lymphadenitis	X	
Chronic Wasting Disease (Cervids)	X	X
Circovirus (Porcine)	X	
Contagious Agalactia (several *Mycoplasma* sp)	X	
Contagious Caprine Pleuropneumonia*	X	X
Contagious Equine Metritis	X	X
Cryptosporidiosis	X	
Cysticercosis (metacestode stage of *Taenia saginata* or Taenia solium	X	
Dermatophilosis	X	
Diphtheria (*Corynebacterium diphtheriae*)	X	
Duck Viral Enteritis	X	
Duck Viral Hepatitis	X	
Enzootic Abortion in Ewes (*Chlamydia*)	X	
Enzootic Hematopoietic Necrosis	X	
Equine Encephalomyelitis (Eastern & Western)	X	
Equine Infectious Anemia (EIA)	X	X
Equine Influenza (Type A)	X	

ALL SPECIES (con't)	REPORTABLE	QUARANTINABLE
Equine Rhinopneumonitis	X	
Equine Viral Arteritis	X	
Exotic Myiasis (screwworm)*	X	X
Fowl Cholera (*Pasteurella multocida*)	X	
Fowl Pox	X	
Fowl Typhoid	X	X
Glanders	X	
Giardiasis	X	
Hemorrhagic Septicemia (*Pasteurella multocida*)	X	
Herpesvirus of Salmonids	X	
Histoplasmosis	X	
Horse Mange (*Sarcoptes*)	X	
Hydatid Disease (*Echinococcus granulosus* or *Echinococcus multilocularis*)	X	
Infectious Bursal Disease	X	
Infectious Hematopoietic Necrosis	X	
Infectious Bovine Rhinotracheitis (IBR-IPV)	X	
Leishmaniasis	X	
Leptospirosis	X	
Listeriosis	X	
Lyme's Disease (*Borrelia burgdorferi*)	X	
Malignant Catarrhal Fever	X	
Marek's Disease	X	
Mycoplasma gallisepticum (MG)	X	
Mycoplasma synoviae (MS)	X	
Newcastle Disease	X	X
Ovine Pulmonary Adenomatosis	X	
Paramyxovirus (2-9)	X	
Paratuberculosis (Johne's disease)	X	
Plague (*Yersinia pestis*)	X	X
Potomac Horse Fever	X	
PRRS	X	
Pseudorabies	X	X
Pullorum Disease	X	X
Q-fever (*Coxiella burnetii*)	X	
Rabies	X	X
Rocky Mountain Spotted Fever	X	
Salmonellosis (*S.abortus ovis*)	X	
Salmonellosis (*Salmonella enteriditis*)	X	
Salmonellosis (Salmonella Newport MDR-Ampc)	X	
Salmonellosis (*Salmonella typhimurium*)	X	
Scabies	X	X
Scrapie	X	X
Spring Viremia of Carp	X	
Swine Vesicular Disease*	X	X
Toxic Substance Contamination	X	
Toxoplasmosis	X	

ALL SPECIES (con't)	REPORTABLE	QUARANTINABLE
Transmissible Gastroenteritis	X	
Transmissible Spongiform Encephalopathy (Feline & Mink)	X	X
Trichinosis (Trichinellosis)	X	
Trichomoniasis	X	
Tuberculosis	X	X
Tuberculosis (Avian)	X	
Tularemia (Francisella tularensis)	X	
Vesicular Exanthema*	X	X
Vesicular Stomititis*	X	X
Viral Hemorrhagic Septicemia	X	
Visna-Maedi (Chronic Progressive Pneumonia)	X	
West Nile Virus (flavivirus)	X	

***Foreign Animal Disease**

A foreign animal disease is a disease which is native to another country, but is not currently found in domestic animals, domestic poultry, wildlife or the environment of the United States.

Many foreign animal diseases can closely resemble domestic diseases, both clinically and grossly; therefore, veterinarians must be extremely vigilant. When examining animals, it is imperative that we remember to consider foreign animal diseases as a potential diagnosis.

Accredited veterinarians are responsible for notifying the State or Federal veterinarian whenever a foreign animal disease is suspected.

High Morbidity/High Mortality

Any incidents involving undiagnosed disease conditions causing high morbidity and/or high mortality must be reported immediately to the South Dakota Animal Industry Board.

Zoonoses/Food-borne Pathogens

Human illness related to an animal disease condition must be reported immediately to the South Dakota Animal Industry Board. (Zoonotic diseases)(Food-borne Pathogens)

Foreign Animal Diseases on OIE Lists

OIE List A Diseases

- Foot and Mouth Disease (FMD)
- Rinderpest
- Peste des Petits Ruminants
- Contagious Bovine Pleuropneumonia (*Mycoplasma mycoides mycoides*)
- Lumpy Skin Disease
- Rift Valley Fever
- Sheep Pox and Goat Pox
- African Horse Sickness
- African Swine Fever
- Classical Swine Fever (Hog Cholera)

OIE List B Diseases

- Heartwater (Cowdria ruminantium)
- Theileriosis (Theileria annulata, T. parva)
- Trypanosomiasis (Trypanosoma congolense, T. vivax, T. brucei brucei)
- Nairobi Sheep Disease
- Dourine (Trypanosoma equiperadum)
- Epizootic Lymphangitis (Histoplasma farciminosum)
- Equine Piroplasmosis or Babesiosis, Babesia (Piroplasma) equi, B. caballi)
- Glanders (Pseudomonas mallei)
- Horse Pox
- Japanese Encephalitis
- Surra (Trypansoma evansi)
- Venezuelan Equine Encephalomyelitis (VEE)
- Enterovirus Encephalomyelitis

SOUTH DAKOTA

ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY

NATIONAL ANIMAL HEALTH REPORTING SYSTEM (NAHRS)

JULY 1, 2007 – JUNE 30, 2008

OIE List A Diseases

Foot and Mouth Disease (FMD)
Vesicular Stomatitis (VS)
Swine Vesicular Disease
Rinderpest
Peste des Petits Ruminants
Contagious Bovine Pleuropneumonia (*Mycoplasma mycoides* ssp. *mycoides*)
Lumpy Skin Disease
Rift Valley Fever
Bluetongue
Sheep Pox and Goat Pox
African Hose Sickness
Afrian Swine Fever
Classical Swine Fever (Hog Cholera)
Highly Pathogenic Avian Influenza (Fowl Plague)
Exotic Newcastle Disease

OIE List B Diseases

Species	Disease
All Species	Anthrax (*Bacillus anthracis*)
All Species	Aujesky's Disease (Pseudorabies)
All Species	Echinococcosis/Hydatidosis
All Species	Heartwater (*Cowdria ruminantium*)
All Species	Leptospirosis
All Species	Q-Fever (*Coxiella burnetti*)
All Species	Rabies
All Species	Paratuberculosis/Johne's Disease (*Mycobacterium paratuberculosis*)
All Species	New and Old World Screwworm (*Cochliomyia (Callitroga) hominivorax, (Chrysomyia) bezziana*)
All Species	Trichinellosis (*Trichinela spiralis*)

Avian*	Avian Infectious Bronchitis
Avian	Avian Infectious Laryngotracheitis (ILT)
Avian	Avian Tuberculosis (*Mycobacterium avium*)
Avian	Duck Virus Hepatitis (DHV)
Avian	Duck Virus Enteritis (DVE)
Avian	Fowl Cholera/Avian Pasteurellosis (*Pasteurella multocida*)
Avian	Fowl Pox
Avian	Fowl Typhoid (*Salmonella gallinarum*)
Avian	Infectious Bursal Disease (Gumboro Disease)
Avian	Marek's Disease
Avian	Avian Mycoplasmosis (*Mycoplasma gallisepticum*)
Avian	Avian Chlamydosis/Ornithosis and Psittacosis (*Chlamydia psittaci*)
Avian	Pullorum Disease (*Salmonella pullorum*)
Bovine	Bovine Anaplamosis (*Anaplasma marginale, A. centrale*)
Bovine	Bovine Babesiosis (*Babesia bovis, B. bigemina*)
Bovine	Bovine Brucellosis (*Brucella abortus*)
Bovine	Bovine Genital Campylobacteriosis (*Campylobacter foetus* ssp. *venerealis*)
Bovine	Bovine Tuberculosis (*Mycobacterium bovis*)
Bovine	Bovine Cysticercosis (*Cysticercus bovis*)
Bovine	Dermatophilosis (*Dermatophilus congolensis*)
Bovine	Enzootic Bovine Leukosis (BLV)
Bovine	Hemorrhagic Septicemia (*Pasteurella multocida,* serotypes B/Asian or E/African)
Bovine	Infectious Bovine Rhinotracheitis/Infectious Pustular Vulvovaginitis (IBR/IPV)
Bovine	Theileriosis (*Theileria annulata, T. parva*)
Bovine	Trichomonosis (*Tritrichomonas (Trichomonas) foetus*)
Bovine	Trypanosomosis (Tse-tse borne, *Trypanosoma congalense, T. vivax, T. brucei* ssp. *brucei*)
Bovine	Bovine Malignant Catarrhal Fever (Malignant Catarrhal Fever, Wildebeest associated)
Bovine	Bovine Spongiform Encephalopathy
Caprine/Ovine	Ovine Epididymitis (*Brucella ovis* infection)
Caprine/Ovine	Caprine and Ovine Brucellosis (excluding *Brucella ovis*)
Caprine/Ovine	Caprine Arthritis/Encephalitis
Caprine/Ovine	Contagious Agalactia (*Mycoplasma agalactiae, M. capricolum, M. putrefaciens, M. mycoides* ssp. *mycoides, M. mycoides* ssp. *mycoides* LC)
Caprine/Ovine	Contagious Caprine Pleuropneumonia (*Mycoplasma capricolum* ssp. *capripneumoniae*
Caprine/Ovine	Enzootic Abortion of Ewes /Ovine Psittacosis (*Chlamydia psittaci*)
Caprine/Ovine	Ovine Pulmonary Adenomatosis
Caprine/Ovine	Nairobi Sheep Disease
Caprine/Ovine	Salmonellosis (*Salmonella abortus ovis*)

*Avian includes commercial poultry ONLY.

Caprine/Ovine	Scrapie
Caprine/Ovine	MAEDI-VISNA/Ovine Progressive Pneumonia
Equine	Contagious Equine Metritis (*Taylorella equigenitalis*)
Equine	Dourine (*Trypanosoma equiperdum*)
Equine	Epizootic Lymphagnitis (*Histoplasma farciminosum*)
Equine	Equine Encephalomyelitis (Eastern (EEE) or Western (WEE))
Equine	Equine Infectious Anemia (EIA)
Equine	Equine Influenza (Virus Type A)
Equine	Equine Piroplasmosis (Babesiosis, *Babesia (Piroplasma) equi, B. caballi*)
Equine	Equine Rhinopneumonitis (EHV-1 and EHV-4)
Equine	Glanders (*Pseudomonas mallei*)
Equine	Horse Pox
Equine	Equine Viral Arteritis (EVA)
Equine	Japanese Encephalitis
Equine	Horse Mange
Equine	Surra (*Trypanosoma evansi*)
Equine	Venezuelan Equine Encephalomyelitis (VEE)
Porcine	Atrophic Rhinitis of Swine (*Bordetella bronchiseptica, Pasteurella multocida*)
Porcine	Porcine Cysticercosis (*Cysticercus cellulosae*)
Porcine	Porcine Brucellosis (*Brucella suis*)
Porcine	Transmissible Gastroenteritis (TGE)
Porcine	Enterovirus Encephalomyelitis
Porcine	Porcine Reproductive and Respiratory Syndrome (PRRS)
Aquaculture**	Viral Hemorrhagic Septicemia
Aquaculture	Spring Viremia of Carp
Aquaculture	Infectious Hematopoietic Necrosis
Aquaculture	Epizootic Hematopoietic Necrosis
Aquaculture	*Oncorhynchus masou* Virus Disease

**Aquaculture includes commercial food fish ONLY.

South Dakota
Animal Disease Research and Diagnostic Laboratory

Analysis of Workload

July 1, 2007 - June 30, 2008

Requests for Laboratory Assistance

July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1,956	2,475	1,907	2,155	1,846	1,623	2,000	1,945	1,917	2,196	1,977	1,756	23,753

Laboratory Examinations

35,404	34,526	30,176	38,200	36,475	36,442	35,717	33,372	34,829	35,423	34,490	29,169	414,223

Work Load Comparison With Prior Years

Requests for Laboratory Assistance

FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08
17,237	17,626	22,135	23,852	24,907	26,919	24,187	25,923	25,551	25,281	23,753

Laboratory Examinations

268,147	282,726	462,066	497,205	561,026	530,407	477,987	448,569	440,519	426,569	414,223

South Dakota
Animal Disease Research and Diagnostic Laboratory

Total Laboratory Procedures Conducted – FY08

I.	Pathology			
	A.	Necropsy Cases		1,806
II.	Clinical Pathology			
	A.	Hematology		
		1.	Complete Blood Count (CBC)	795
		2.	Blood Count	162
		3.	Coombs	1
		4.	Hematocrits	24
		5.	Hemoglobin	12
		6.	Pre-surgical Evaluation	15
		7.	RBC	12
	B.	Urine and Fluids		
		1.	Urinalysis	69
		2.	Cytology	68
		3.	Fluids Analysis	13
		4.	Rumen pH	25
	C.	Clinical Chemistry		
		1.	Serum Chemistry Profiles	
			a. Dairy Management	174
			b. Electrolyte (Anion Gap)	4
			c. Equine	141
			d. Large Animal Pre-surgical	1
			e. NSAIDS	2
			f. Porcine	2
			g. Ruminant	105
			h. Small Animal	216
			i. Small Animal Pre-surgical	47
		2.	Individual Tests	
			a. Acetest	2
			b. Albumin	117
			c. Alkaline Phosphorus	4
			d. Alanine Transaminase (ALT)	4
			e. Amylase	1
			f. Aspartate Transamin	1
			g. Beta Hydroxybutyrate	113
			h. Bicarbonate	1
			i. Bile Acid	57
			j. Bilirubin, Direct	11
			k. Bilirubin, Total	2
			l. BUN	107
			m. Calcium	166

n.	Chloride		2
o.	Cholesterol		2
p.	Creatinine		2
q.	Creatinine Phosphokinase		1
r.	Gamma Glutamyl Transferase		3
s.	Globulin		1
t.	Glucose		30
u.	Iron		34
v.	Lactate Dehydrogen		1
w.	Lipase		35
x.	Magnesium		59
y.	Non-esterified Fatty Acid (NEFA)		325
z.	Phosphate		92
aa.	Potassium		37
bb.	Protein, Total		1
cc.	Sodium		3
dd.	Triglycerides		2
D.	Parasitology		
1.	Fecal Flotation		1,142
2.	Fecal Sedimentation		2
3.	Fluke Flotation		3
4.	Cryptosporidia Examination		899
5.	Fecal Occult Blood		2
6.	Hemoparasite Examination		9
7.	Knott's Test		1
8.	*Tritrichomonas* Culture		1,184
E.	Immunology		
1.	Bovine IgG Assay		95
2.	Cortisol		100
3.	Fecal ELISA		
a.	Coronavirus		946
b.	Rotavirus		921
4.	Giardia		90
5.	Parvovirus		42
6.	Thyroid Hormone		520
7.	Heartworm Antigen		15
III.	Histopathology		
A.	Histopathology		
1.	Immunohistochemistry		2,182
2.	Tissue Sections – H & E		18,084
3.	Tissue Sections – Special Stains		318
		Pathology Subtotal	**31,465**
IV.	Microbiology		
A.	Bacteriology		
1.	Aerobic Culture		15,915
2.	Anaerobic Culture		2,069
3.	Antimicrobial Susceptibility Panels		1,593

4.	*Campylobacter* Culture		324
5.	*Clostridium difficile* Toxin A/B II		36
6.	*Clostridium* Direct FA		2
7.	Darkfield Screen		123
8.	*Escherichia coli* K99 IFA		488
9.	Giemsa Anthrax Screen		76
10.	Johne's Culture		392
11.	*Leptospira* FA		443
12.	Listeria Culture		19
13.	Milk Bulk Tank Culture		9
14.	Milk Sample Culture		330
15.	Mycology Culture		1,212
16.	*Mycoplasma* Culture		499
17.	*Mycoplasma* Milk Screen		35
18.	Non-specific Fluorescence Test		223
19.	*Salmonella* Culture		1
20.	*Salmonella* Serotyping		214
B.	Food Safety		
1.	*E. coli* Petrifilm		111
2.	*E. coli* 0157:H7 PCR		79
3.	*E. coli* 0157:H7 Culture 4		4
4.	Fast Antimicrobial Screen		40
5.	*Listeria monocytogenes*		64
6.	*Listeria* spp		123
7.	Modified Fast Antimicrobial Screen		3
8.	*Salmonella* BAX PCR		400
9.	*Salmonella* RTE		64
		Microbiology Subtotal	**24,891**
C.	Serology		
1.	Anaplasmosis		
	Competitive Enzyme-linked Immunoassay		1,134
	CF		109
2.	Avian Influenza		
	Agar Gel Immunodiffusion (AGID)		2,529
3.	Bluetongue		
	Agar Gel Immunodiffusion		12
	Enzyme-Linked Immunoassay (ELISA)		1,163
4.	Bovine Leukosis Virus		
	AGID		1,663
	ELISA		6,003
5.	Bovine Respiratory Syncytial Virus		
	SN		188
6.	Bovine Viral Diarrhea Virus		
	Antigen Capture ELISA (Serum)		265
	ELISA (Ear Notch)		17,275

7.	Bovine Viral Diarrhea Virus I	
	SN	1,267
8.	Bovine Viral Diarrhea Virus II	
	SN	1,237
9.	*Brucella*	
	BAPA	946
	Card	10,389
	CF	1,159
	Plate	791
	Rivanol	65
	Tube	55
10.	*Brucella* – Canine	
	Rapid Slide Agglutination Test (RSAT)	177
11.	*Brucella ovis*	
	ELISA	1,915
12.	Caprine Arthritis Encephalitis	131
13.	Chronic Wasting Disease (BioRad ELISA)	2,573
14.	Epizootic Hemorrhagic Disease	
	AGID	32
15.	Equine Infectious Anemia	
	AGID	86
	ELISA	2,668
16.	Feline Immunodeficiency Virus	
	ELISA	18
17.	Feline Infectious Peritonitis	
	ELISA	12
18.	Feline Leukemia Virus	
	ELISA	18
19.	Infectious Bovine Rhinotracheitis	
	SN	860
20.	*Leptospira*	
	bratislava	1,755
	canicola	1,755
	grippotyphosa	1,755
	hardjo	1,755
	icterohaemorrhagiae	1,755
	pomona	1,755
21.	*Mycoplasma hyopneumoniae*	
	ELISA	4,652
22.	*Neospora*	
	ELISA	425
23.	Ovine Progressive Pneumonia	
	AGID	203
24.	Parainfluenza-3	
	SN	154
25.	Paratuberculosis (Johne's)	
	ELISA	66,402

26. Porcine Parvovirus
    - HI 291
27. Porcine Respiratory and Reproductive Syndrome
    - ELISA 119,745
    - Fluorescent Focus Neutralization (FFN) 1,016
    - IFA (US Strain) 5,264
    - IFA (Euro Strain) 2,424
28. Pseudorabies
    - ELISA 11
    - gB ELISA 2,992
    - Latex Agglutination 310
29. Swine Influenza Virus
    - H1N1 2,372
    - H3N2 2,342

Serology Subtotal 273,873

D. Virology

1. Bovine
    a. Bovine Respiratory Syncytial Virus ELISA 23
    b. Bovine Respiratory Syncytial Virus FA 598
    c. Bovine Viral Diarrhea Virus ELISA 2,709
    d. Bovine Viral Diarrhea Virus FA 1,482
    e. Coronavirus FA 500
    f. Herpes Infectious Bovine Rhinotracheitis VI 4
    g. Infectious Bovine Rhinotracheitis Virus FA 933
    h. Parainfluenza-3 Virus FA 17
    i. Rotavirus FA 487
    j. Virus Isolation 1,958
2. Canine
    a. Adenovirus FA 8
    b. Coronavirus FA 27
    c. Distemper Virus FA 29
    d. Herpesvirus FA 21
    e. Parvovirus FA 38
    f. Virus Isolation 10
3. Equine
    a. Herpesvirus FA 28
    b. Rotavirus FA 2
    c. Virus Isolation 27
4. Feline
    a. Chlamydia FA 1
    b Feline Infectious Peritonitis FA 5
    c. Feline Panleukopenia Virus FA 14
    d. Viral Rhinotracheitis 10
    e. Virus Isolation 126
5. Fish
    a. Viral Hemorrhagic Septicemia VI 145

6.	Ovine		
	a.	Border Disease Virus FA	96
	b.	Coronavirus FA	23
	c.	Parainfluenza-3 Virus FA	27
	d.	Respiratory Syncytial Virus FA	37
	e.	Rotavirus FA	23
	f.	*Toxoplasma* IFA	81
	g.	Virus Isolation	24
7.	Porcine		
	a.	Circovirus II FA	630
	b.	Parvovirus FA	2
	c.	Porcine Reproductive & Respiratory Syndrome Virus FA	549
	d.	Porcine Reproductive & Respiratory Syndrome Virus VI	307
	e.	Pseudorabies FA	10
	f.	Rotavirus FA	271
	g.	Swine Influenza Virus Directigen	35
	h.	Swine Influenza Virus FA	478
	i.	Transmissible Gastroenteritis Virus FA	277
	j.	Virus Isolation	79
8.	Wild/Other Animal		
	a.	Adenovirus FA	3
	b.	Bovine Viral Diarrhea Virus FA	44
	c.	Coronavirus FA	4
	d.	Distemper Virus FA	23
	e.	Infectious Bovine Rhinotracheitis Virus FA	13
	f.	Respiratory Syncytial Virus FA	8
	g.	Rotavirus FA	4
	h.	Virus Isolation	60
9.	Rabies		528
		Virology Subtotal	**12,838**
V.	Molecular Diagnostics		
1.	Avian Influenza		3,340
2.	BLV		262
3.	BVD		947
4.	BVD Typing		3
5.	Circovirus		987
6.	Circovirus Sequencing		9
7.	Classical Swine Fever		646
8.	*Clostridium* Genotype		160
9.	*Escherichia coli*		171
10.	Johne's		1,010
11.	*Lawsonia intracellularis*		30
12.	*Mycoplasma bovis*		23
13.	*Mycoplasma hyopneumoniae*		557

	14.	PRRS	
		a. Semen/Tissue	8,268
		b. Serum	39,439
	15.	PRRS Sequencing	959
	16.	Swine Influenza	111
	17.	*Tritrichomonas foetus*	2,080
		Molecular Diagnostics Subtotal	**59,002**
VI.		Prion Contract Testing	
	1.	Prion CWD and Scrapie	2,061
		Contract Testing Subtotal	**2,061**
VII.		Analytical Chemistry	
		Diagnostic (feed, water, and animal specimens)	
	1.	Total Analyses	9,362
	2.	Total Samples	731
		Toxicology Subtotal	**10,093**
VIII.		Summary of Laboratory Procedures	
	A.	Pathology	31,465
	B.	Microbiology	24,891
	C.	Serology	273,873
	D.	Virology	12,838
	E.	Molecular Diagnostics	59,002
	F.	Prion Contract Testing	2,061
	G.	Toxicology/Chemistry	10,093
		Total Laboratory Procedures	**414,223**

SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY
IN VITRO ANTIMICROBIAL DRUG SENSITIVITY TESTS
JULY 1, 2007 – JUNE 30, 2008

AVIAN

The antimicrobial susceptibility test report does not represent a treatment recommendation. The veterinarian treating the animals has sole responsibility for recommending therapy and providing information on withholding and/or withdrawal times for market consumption.

S = Susceptible; R = Resistant; M= Moderately Susceptible; N/A = Not Applicable

	Bordetella avium			*Escherichia coli*			Gram-Negative Bacteria			Hemolytic *Escherichia coli*		
	S	M	R	S	M	R	S	M	R	S	M	R
Amoxacillin	5	0	0	17	0	11	2	0	0	1	0	0
Ceftiofur	2	3	0	26	0	2	2	0	0	1	0	0
Clindamycin	0	0	5	0	0	28	0	0	2	0	0	1
Enrofloxin	5	0	0	28	0	0	2	0	0	1	0	0
Erythromycin	0	5	0	0	0	28	0	0	2	0	0	1
Florfenicol	3	2	0	16	10	2	2	0	0	0	1	0
Gentamycin	5	0	0	14	2	12	2	0	0	1	0	0
Neomycin	5	0	0	19	0	9	2	0	0	1	0	0
Novobiocin	4	0	1	0	0	28	0	0	2	0	0	1
Oxytetracycline	5	0	0	3	0	25	2	0	0	0	0	1
Penicillin	0	0	5	0	0	28	0	0	2	0	0	1
Spectinomycin	0	5	0	3	7	18	0	2	0	0	1	0
Streptomycin	5	0	0	7	0	21	2	0	0	1	0	0
Sulphadimethoxine	5	0	0	6	0	22	2	0	0	1	0	0
Sulphathiazole	0	5	0	0	6	22	0	2	0	0	1	0
Tetracycline	5	0	0	3	0	25	2	0	0	0	0	1
Trimethoprim / Sulphamethoxazole	5	0	0	22	0	6	2	0	0	1	0	0
Tylosin Tartrate	N/A			N/A			N/A			N/A		

AVIAN IN VITRO SENSITIVITY TESTS CON'T)

	Klebsiella sp.			*Ornithobacterium rhinotrachealis*			*Pasteurella multocida*			*Pasteurella* sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Amoxacillin	0	0	1	1	0	0	1	0	0	3	0	0
Ceftiofur	1	0	0	0	1	0	1	0	0	3	0	0
Clindamycin	0	0	1	1	0	0	0	0	1	0	0	3
Enrofloxin	1	0	0	1	0	0	1	0	0	3	0	0
Erythromycin	0	0	1	1	0	0	0	1	0	1	1	1
Florfenicol	0	0	1	1	0	0	1	0	0	3	0	0
Gentamycin	0	0	1	0	0	1	1	0	0	3	0	0
Neomycin	0	0	1	0	0	1	1	0	0	3	0	0
Novobiocin	0	0	1	1	0	0	1	0	0	0	0	3
Oxytetracycline	0	0	1	1	0	0	1	0	0	0	1	2
Penicillin	0	0	1	0	0	1	1	0	0	0	0	3
Spectinomycin	0	0	1	0	1	0	0	1	0	1	2	0
Streptomycin	0	0	1	0	0	1	1	0	0	3	0	0
Sulphadimethoxine	0	0	1	0	0	1	1	0	0	2	0	1
Sulphathiazole	0	0	1	0	0	1	0	0	1	0	1	2
Tetracycline	0	0	1	1	0	0	1	0	0	0	1	2
Trimethoprim / Sulphamethoxazole	1	0	0	0	0	1	1	0	0	3	0	0
Tylosin Tartrate	N/A			N/A			0	0	1	N/A		

AVIAN IN VITRO SENSITIVITY TESTS (CON'T)

	Salmonella sp.			*Staphylococcus* coagulase -			*Staphylococcus* coagulase +		
	S	M	R	S	M	R	S	M	R
Amoxacillin	2	0	7	2	0	0	0	2	0
Ceftiofur	8	0	1	2	0	0	2	0	0
Clindamycin	0	0	9	1	0	1	2	0	0
Enrofloxin	9	0	0	2	0	0	2	0	0
Erythromycin	0	0	9	1	0	1	2	0	0
Florfenicol	4	5	0	1	1	0	0	2	0
Gentamycin	6	0	3	1	0	1	2	0	0
Neomycin	6	0	3	1	0	1	2	0	0
Novobiocin	0	0	9	1	0	1	2	0	0
Oxytetracycline	4	0	5	0	0	2	0	0	2
Penicillin	0	0	9	2	0	0	0	0	2
Spectinomycin	0	6	3	0	0	2	0	0	2
Streptomycin	4	0	5	1	0	1	2	0	0
Sulphadimethoxine	4	0	5	2	0	0	2	0	0
Sulphathiazole	0	6	3	0	2	0	0	1	1
Tetracycline	4	0	5	0	0	2	0	0	2
Trimethoprim / Sulphamethoxazole	9	0	0	2	0	0	2	0	0
Tylosin Tartrate	N/A			N/A			N/A		

SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY
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JULY 1, 2007 – JUNE 30, 2008

BOVINE

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Enrofloxacin is NOT to be used in cattle intended for dairy production and NOT to be used in calves to be processed for veal.

S = Susceptible; R = Resistant; M = Moderately Susceptible; N/A = Not Applicable

	Actinobacillus sp.			*Bacillus* sp.			*Campylobacter foetus* ssp. *foetus*			*Campylobacter jejuni*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	3	0	0	1	0	0	1	0	0
Ceftiofur	1	0	0	3	0	0	1	0	0	0	0	1
Chlortetracycline	0	1	0	3	0	0	1	0	0	0	0	1
Clindamycin	0	0	1	2	0	1	1	0	0	1	0	0
Danofloxacin	0	0	1	3	0	0	1	0	0	1	0	0
Enrofloxin	0	0	1	3	0	0	1	0	0	1	0	0
Florfenicol	1	0	0	3	0	0	1	0	0	1	0	0
Gentamycin	1	0	0	3	0	0	1	0	0	1	0	0
Neomycin	0	0	1	3	0	0	1	0	0	1	0	0
Oxytetracycline	0	0	1	3	0	0	1	0	0	0	0	1
Penicillin	0	0	1	3	0	0	1	0	0	0	0	1
Spectinomycin	0	0	1	2	1	0	1	0	0	1	0	0
Sulphadimethoxine	1	0	0	3	0	0	1	0	0	1	0	0
Tiamulin	1	0	0	0	0	3	0	0	1	1	0	0
Tilmicosin	0	1	0	3	0	0	1	0	0	1	0	0
Trimethoprim / Sulphamethoxazole	0	0	1	3	0	0	1	0	0	1	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

BOVINE IN VITRO SENSITIVITY TEST (CON'T)

	Campylobacter sp.			*Corynebacterium* sp.			*Enterococcus durans*			*Enterococcus* sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	0	1	0	1	0	0	12	0	0
Ceftiofur	1	0	0	1	0	0	0	0	1	10	0	2
Chlortetracyline	1	0	0	1	0	0	1	0	0	2	6	4
Clindamycin	1	0	0	0	0	1	0	0	1	10	2	0
Danofloxacin	1	0	0	1	0	0	0	0	1	0	0	12
Enrofloxin	1	0	0	1	0	0	1	0	0	1	9	2
Florfenicol	1	0	0	1	0	0	1	0	0	10	2	0
Gentamycin	1	0	0	1	0	0	0	0	1	9	3	0
Neomycin	1	0	0	1	0	0	0	0	1	10	0	2
Oxytetracycline	1	0	0	1	0	0	1	0	0	2	1	9
Penicillin	1	0	0	0	0	1	1	0	0	12	0	0
Spectinomycin	1	0	0	0	1	0	0	0	1	1	2	9
Sulphadimethoxine	1	0	0	1	0	0	0	0	1	2	0	10
Tiamulin	1	0	0	1	0	0	0	0	1	9	0	3
Tilmicosin	1	0	0	1	0	0	0	1	0	7	2	3
Trimethoprim / Sulphamethoxazole	1	0	0	0	0	1	1	0	0	12	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

BOVINE IN VITRO SENSITIVITY TEST (CON'T)

	Escherichia coli			*Escherichia coli*--K99			*Escherichia ferguson*			Gram-Negative Bacteria		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	33	0	28	0	0	19	0	0	2	4	0	3
Ceftiofur	48	6	7	10	3	6	2	0	0	4	0	3
Chlortetracycline	20	0	41	0	0	19	0	0	2	1	1	5
Clindamycin	0	0	61	0	0	19	0	0	2	1	0	6
Danofloxacin	54	0	7	18	0	1	2	0	0	7	0	0
Enrofloxin	58	0	3	18	0	1	2	0	0	7	0	0
Florfenicol	7	28	26	1	5	13	0	2	0	3	1	3
Gentamycin	52	2	7	12	1	6	2	0	0	7	0	0
Neomycin	41	0	20	1	0	18	2	0	0	4	0	3
Oxytetracycline	20	0	41	0	0	19	0	0	2	1	0	6
Penicillin	0	0	61	0	0	19	0	0	2	1	0	6
Spectinomycin	0	39	22	0	2	17	0	2	0	1	5	1
Sulphadimethoxine	24	0	37	4	0	15	0	0	2	3	0	4
Tiamulin	0	0	61	0	0	19	0	0	2	2	0	5
Tilmicosin	0	0	61	0	0	19	0	0	2	1	0	6
Trimethoprim / Sulphamethoxazole	42	0	19	9	0	10	2	0	0	5	0	2
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

BOVINE IN VITRO SENSITIVITY TEST (CON'T)

	Hemolytic *Escherichia coli*			*Histophilus somni*			*Klebsiella pneumoniae*			*Mannheimia haemolytica*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	8	0	0	80	1	1	0	0	2	83	0	14
Ceftiofur	7	0	1	80	0	2	2	0	0	97	0	0
Chlortetracycline	4	3	1	79	2	1	1	0	1	91	5	1
Clindamycin	0	0	8	55	24	3	0	0	2	0	1	96
Danofloxacin	7	0	1	80	0	2	2	0	0	90	0	7
Erythromycin	8	0	0	80	2	0	2	0	0	92	4	1
Florfenicol	4	4	0	78	2	2	1	1	0	92	0	5
Gentamycin	7	1	0	44	16	22	2	0	0	93	0	4
Neomycin	7	0	1	19	0	63	2	0	0	70	0	27
Oxytetracycline	4	0	4	53	4	25	1	0	1	69	11	17
Penicillin	0	0	8	75	5	2	0	0	2	38	45	14
Spectinomycin	0	7	1	61	4	17	0	2	0	87	0	10
Sulphadimethoxine	7	0	1	41	0	41	1	0	1	67	0	30
Tiamulin	0	0	8	82	0	0	0	0	2	12	0	85
Tilmicosin	0	0	8	80	0	2	0	0	2	82	8	7
Trimethoprim / Sulphamethoxazole	8	0	0	79	0	3	2	0	0	0	96	1
Tulathromycin	N/A			78	0	4	N/A			93	0	4
Tylosin Tartrate	N/A			60	14	8	N/A			0	0	97

BOVINE IN VITRO SENSITIVITY TEST (CON'T)

	Micrococcus sp.			*Moraxella bovis*			*Moraxella ovis*			*Moraxella* sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	8	0	0	10	0	1	1	0	0
Ceftiofur	1	0	0	8	0	0	11	0	0	1	0	0
Chlortetracycline	1	0	0	8	0	0	11	0	0	1	0	0
Clindamycin	1	0	0	0	8	0	0	10	1	0	1	0
Danofloxacin	1	0	0	8	0	0	11	0	0	1	0	0
Enrofloxin	1	0	0	8	0	0	11	0	0	1	0	0
Florfenicol	1	0	0	8	0	0	10	0	1	1	0	0
Gentamycin	1	0	0	8	0	0	11	0	0	1	0	0
Neomycin	1	0	0	8	0	0	11	0	0	1	0	0
Oxytetracycline	1	0	0	8	0	0	11	0	0	1	0	0
Penicillin	0	0	1	4	0	4	5	0	6	0	0	1
Spectinomycin	1	0	0	6	2	0	2	8	1	0	1	0
Sulphadimethoxine	1	0	0	7	0	1	9	0	2	0	0	1
Tiamulin	1	0	0	8	0	0	11	0	0	1	0	0
Tilmicosin	1	0	0	8	0	0	10	0	1	1	0	0
Trimethoprim / Sulphamethoxazole	1	0	0	8	0	0	10	0	1	1	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

BOVINE IN VITRO SENSITIVITY TEST (CON'T.)

	Pasteurella multocida			*Pasteurella trehalosi*			*Pasteurella* sp.			*Pseudomonas aeruginosa*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	124	0	2	0	0	1	15	0	3	0	0	2
Ceftiofur	126	0	0	1	0	0	18	0	0	0	0	2
Chlortetracycline	119	7	0	0	0	1	13	4	1	0	0	2
Clindamycin	0	3	123	0	0	1	0	2	16	0	0	2
Danofloxacin	117	0	9	0	0	1	15	0	3	1	0	1
Enrofloxin	124	1	1	0	0	1	15	0	3	2	0	0
Florfenicol	121	1	4	1	0	0	16	0	2	0	0	2
Gentamycin	118	2	6	1	0	0	17	0	1	1	0	1
Neomycin	73	0	53	0	0	1	11	0	7	2	0	0
Oxytetracycline	88	5	33	0	0	1	8	0	10	0	0	2
Penicillin	106	0	20	0	0	1	5	0	13	0	0	2
Spectinomycin	20	84	22	1	0	0	2	12	4	0	0	2
Sulphadimethoxine	78	0	48	1	0	0	12	0	6	0	0	2
Tiamulin	35	0	91	1	0	0	10	0	8	0	0	2
Tilmicosin	108	3	15	1	0	0	13	2	3	0	0	2
Trimethoprim / Sulphamethoxazole	123	0	3	1	0	0	15	0	3	0	0	2
Tulathromycin	119	1	6	N/A			N/A			N/A		
Tylosin Tartrate	6	16	104	N/A			N/A			N/A		

BOVINE IN VITRO SENSITIVITY TEST (CON'T.)

	Pseudomonas putrefaciens			*Pseudomonas* sp.			*Salmonella* sp.			*Staphylococcus* coagulase -		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	1	1	0	2	37	0	83	3	0	0
Ceftiofur	0	0	1	1	0	2	45	0	75	3	0	0
Chlortetracycline	1	0	0	0	0	3	30	1	89	2	1	0
Clindamycin	0	0	1	0	0	3	0	0	120	1	2	0
Danofloxacin	1	0	0	1	0	2	119	0	1	3	0	0
Enrofloxin	1	0	0	1	0	2	120	0	0	3	0	0
Florfenicol	1	0	0	0	1	2	15	30	75	3	0	0
Gentamycin	1	0	0	2	0	1	104	5	11	3	0	0
Neomycin	1	0	0	2	0	1	61	0	59	3	0	0
Oxytetracycline	0	0	1	0	0	3	30	0	90	1	0	2
Penicillin	0	0	1	0	0	3	0	0	120	2	0	1
Spectinomycin	0	0	1	1	1	1	0	62	58	1	1	1
Sulphadimethoxine	0	0	1	0	0	3	17	0	103	3	0	0
Tiamulin	0	0	1	0	0	3	0	0	120	2	0	1
Tilmicosin	0	0	1	0	0	3	0	0	120	2	1	0
Trimethoprim / Sulphamethoxazole	0	0	1	1	0	2	101	0	19	3	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

BOVINE INVITRO SENSITIVITY TEST (CON'T.)

	Staphylococcus epidermidis			*Streptococcus* sp.		
	S	M	R	S	M	R
Ampicillin	1	0	0	1	0	0
Ceftiofur	1	0	0	1	0	0
Chlortetracycline	0	1	0	0	0	1
Clindamycin	1	0	0	1	0	0
Danofloxacin	1	0	0	0	0	1
Enrofloxin	1	0	0	0	1	0
Florfenicol	1	0	0	1	0	0
Gentamycin	1	0	0	0	1	0
Neomycin	1	0	0	0	0	1
Oxytetracycline	0	0	1	0	0	1
Penicillin	1	0	0	1	0	0
Spectinomycin	0	1	0	0	1	0
Sulphadimethoxine	1	0	0	0	0	1
Tiamulin	1	0	0	1	0	0
Tilmicosin	1	0	0	1	0	0
Trimethoprim / Sulphamethoxazole	1	0	0	1	0	0
Tulathromycin	N/A			N/A		
Tylosin Tartrate	N/A			N/A		

SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY
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MILK SAMPLES

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	Enterobacter cloacae			*Enterobacter* sp.			*Enterococcus* sp.			Environmental *Streptococcus*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	1	0	0	1	1	0	0	8	0	0
Ceftiofur	1	0	0	1	0	0	1	0	0	8	0	0
Cephalothin	0	0	1	0	0	1	1	0	0	8	0	0
Erythromycin	0	0	1	0	0	1	1	0	0	8	0	0
Oxacillin	0	0	1	0	0	1	1	0	0	8	0	0
Penicillin	0	0	1	0	0	1	1	0	0	8	0	0
Penicillin / Novobiocinova	0	0	1	0	0	1	1	0	0	8	0	0
Pirlimycin	0	0	1	0	0	1	1	0	0	7	0	1
Sulphadimethoxine	1	0	0	1	0	0	1	0	0	5	0	3
Tetracycline	1	0	0	1	0	0	1	0	0	3	3	2

	Escherichia coli			Hemolytic *Escherichia coli*			*Klebsiella pneumoniae*			*Pseumonas aeruginosa*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	7	0	0	1	0	0	0	0	2	0	0	1
Ceftiofur	7	0	0	1	0	0	2	0	0	0	0	1
Cephalothin	7	0	0	1	0	0	2	0	0	0	0	1
Erythromycin	0	0	7	0	0	1	0	0	2	0	0	1
Oxacillin	0	0	7	0	0	1	0	0	2	0	0	1
Penicillin	0	0	7	0	0	1	0	0	2	0	0	1
Penicillin / Novobiocinova	0	0	7	0	0	1	0	0	2	0	0	1
Pirlimycin	0	0	7	0	0	1	0	0	2	0	0	1
Sulphadimethoxine	5	0	2	1	0	0	1	0	1	0	0	1
Tetracycline	6	0	1	1	0	0	2	0	0	0	0	1

MILK SAMPLES IN VITRO SENSITIVITY TESTS (CON'T)

	Pseudomonas sp.			*Serratia marcescens*			*Staphylococcus* coagulase -			*Staphylococcus* coagulase +		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	1	0	0	1	5	0	1	7	0	2
Ceftiofur	0	0	1	1	0	0	6	0	0	8	0	1
Cephalothin	0	0	1	0	0	1	6	0	0	8	0	1
Erythromycin	0	0	1	0	0	1	5	0	1	8	0	1
Oxacillin	0	0	1	0	0	1	6	0	0	8	0	1
Penicillin	0	0	1	0	0	1	5	0	1	7	0	2
Penicillin / Novobiocinova	0	0	1	0	0	1	6	0	0	9	0	0
Pirlimycin	0	0	1	0	0	1	5	0	1	8	0	1
Sulphadimethoxine	0	0	1	0	0	1	4	0	2	8	0	1
Tetracyline	1	0	0	0	0	1	4	0	2	8	0	1

SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY
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OVINE

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S = Susceptible; R = Resistant; M= Moderately Susceptible; N/A = Not Applicable

	Actinobacillus sp.			*Campylobacter foetus* ssp. *foetus*			*Campylobacter jejuni*			*Escherichia coli*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	1	0	2	0	0	12	0	2	1	0	1
Ceftiofur	2	0	0	0	1	1	0	0	14	2	0	0
Chlortetracycline	2	0	0	1	0	1	0	0	14	0	0	2
Clindamycin	0	1	1	1	1	0	13	0	1	0	0	2
Danofloxacin	2	0	0	1	0	1	14	0	0	2	0	0
Enrofloxin	2	0	0	1	1	0	14	0	0	2	0	0
Florfenicol	2	0	0	2	0	0	14	0	0	0	2	0
Gentamycin	2	0	0	2	0	0	14	0	0	2	0	0
Neomycin	2	0	0	2	0	0	14	0	0	2	0	0
Oxytetracycline	2	0	0	1	0	1	0	0	14	0	0	2
Penicillin	0	0	2	0	0	2	0	0	14	0	0	2
Spectinomycin	0	2	0	2	0	0	14	0	0	0	2	0
Sulphadimethoxine	2	0	0	1	0	1	2	0	12	2	0	0
Tiamulin	1	0	1	1	0	1	13	0	1	0	0	2
Tilmicosin	2	0	0	2	0	0	14	0	0	0	0	2
Trimethoprim / Sulphamethoxazole	2	0	0	1	0	1	1	0	13	2	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

OVINE IN VITRO SENSITIVITY TESTS CON'T)

	Gram-Negative Bacteria			*Histophilus somni*			*Mannheimia haemolytica*			*Pasteurella multocida*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	3	0	0	1	0	0	10	0	0	3	0	0
Ceftiofur	3	0	0	1	0	0	10	0	0	3	0	0
Chlortetracycline	3	0	0	1	0	0	9	1	0	3	0	0
Clindamycin	0	0	3	1	0	0	0	1	9	0	0	3
Danofloxacin	3	0	0	1	0	0	10	0	0	3	0	0
Enrofloxin	3	0	0	1	0	0	10	0	0	3	0	0
Florfenicol	3	0	0	1	0	0	10	0	0	3	0	0
Gentamycin	3	0	0	1	0	0	10	0	0	3	0	0
Neomycin	3	0	0	0	0	1	10	0	0	3	0	0
Oxytetracycline	3	0	0	1	0	0	8	0	2	3	0	0
Penicillin	0	0	3	1	0	0	5	5	0	2	0	1
Spectinomycin	0	2	1	1	0	0	10	0	0	0	3	0
Sulphadimethoxine	2	0	1	1	0	0	10	0	0	2	0	1
Tiamulin	0	0	3	1	0	0	8	0	2	0	0	3
Tilmicosin	0	0	3	1	0	0	10	0	0	3	0	0
Trimethoprim / Sulphamethoxazole	3	0	0	1	0	0	0	10	0	3	0	0
Tulathromycin	N/A			1	0	0	10	0	0	3	0	0
Tylosin Tartrate	N/A			0	1	0	0	0	10	0	0	3

OVINE IN VITRO SENSITIVITY TESTS (CON'T)

	Pasteurella sp.			*Salmonella* sp.			*Staphylococcus aureus*		
	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	0	0	2	N/A		
Ceftiofur	1	0	0	2	0	0	2	0	0
Chlortetracycline	0	1	0	0	0	2	1	0	1
Clindamycin	0	0	1	0	0	2	2	0	0
Danofloxin	1	0	0	2	0	0	2	0	0
Enrofloxin	1	0	0	2	0	0	2	0	0
Florfenicol	1	0	0	0	2	0	0	2	0
Gentamycin	1	0	0	2	0	0	2	0	0
Neomycin	1	0	0	0	0	2	2	0	0
Oxytetracycline	1	0	0	0	0	2	1	0	1
Penicillin	0	0	1	0	0	2	N/A		
Spectinomycin	0	1	0	0	0	2	0	0	2
Sulphadimethoxine	1	0	0	0	0	2	1	0	1
Tiamulin	0	0	1	0	0	2	2	0	0
Tilmicosin	1	0	0	0	0	2	1	0	1
Trimethoprim / Sulphamethoxazole	1	0	0	2	0	0	2	0	0
Tulathromycin	N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A		

SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY
IN VITRO ANTIMICROBIAL DRUG SENSITIVITY TESTS
JULY 1, 2007 – JUNE 30, 2008

PORCINE

The antimicrobial susceptibility test report does not represent a treatment recommendation. The veterinarian treating the animals has sole responsibility for recommending therapy and providing information on withholding and/or withdrawal times for market consumption.

S = Susceptible; R = Resistant; M= Moderately Susceptible; N/A = Not Applicable

	Actinobacillus pleuropneumoniae			*Actinobacillus suis*			*Actinobacillus* sp.			Beta *Streptococcus* sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	4	0	1	13	0	1	4	0	6	2	0	0
Ceftiofur	5	0	0	14	0	0	10	0	0	2	0	0
Chlortetracycline	4	1	0	14	0	0	3	2	5	0	0	2
Clindamycin	0	5	0	0	0	14	0	2	8	1	0	1
Danofloxacin	5	0	0	14	0	0	10	0	0	0	0	2
Enrofloxin	5	0	0	14	0	0	10	0	0	2	0	0
Florfenicol	5	0	0	14	0	0	10	0	0	2	0	0
Gentamycin	1	3	1	14	0	0	10	0	0	2	0	0
Neomycin	0	0	5	13	0	1	6	0	4	1	0	1
Oxytetracycline	1	0	4	5	0	9	0	1	9	0	0	2
Penicillin	2	2	1	1	0	13	0	0	10	2	0	0
Spectinomycin	3	2	0	0	14	0	0	9	1	1	0	1
Sulphadimethoxine	4	0	1	12	0	2	5	0	5	2	0	0
Tiamulin	5	0	0	4	0	10	4	0	6	1	0	1
Tilmicosin	5	0	0	11	3	0	8	0	2	1	0	1
Trimethoprim / Sulphamethoxazole	0	5	0	14	0	0	10	0	0	2	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	0	0	5	N/A			N/A			N/A		

PORCINE IN VITRO SENSITIVITY TESTS CON'T)

	Bordetella bronchiseptica			*Enterococcus durans*			*Enterococcus* sp.			*Erysipelothrix rhusiopathiae*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	28	20	6	1	0	0	1	0	0	2	0	0
Ceftiofur	1	0	53	0	0	1	1	0	0	2	0	0
Chlortetracycline	53	0	1	0	0	1	0	0	1	0	0	2
Clindamycin	0	0	54	0	0	1	0	0	1	1	1	0
Danofloxacin	20	0	34	0	0	1	0	0	1	2	0	0
Enrofloxin	54	0	0	1	0	0	0	1	0	2	0	0
Florfenicol	47	6	1	0	1	0	1	0	0	0	2	0
Gentamycin	54	0	0	0	0	1	1	0	0	0	0	2
Neomycin	52	0	2	0	0	1	1	0	0	0	0	2
Oxytetracycline	53	0	1	0	0	1	0	0	1	0	0	2
Penicillin	0	0	54	0	0	1	1	0	0	2	0	0
Spectinomycin	0	0	54	0	0	1	0	0	1	2	0	0
Sulphadimethoxine	6	0	48	0	0	1	0	0	1	0	0	2
Tiamulin	0	0	54	0	0	1	0	0	1	2	0	0
Tilmicosin	29	17	8	0	0	1	1	0	0	2	0	0
Trimethoprim / Sulphamethoxazole	48	0	6	1	0	0	1	0	0	2	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

PORCINE IN VITRO SENSITIVITY TESTS (CON'T)

	Escherichia coli			Gram-Negative Bacteria			*Haemophilus parasuis*			Hemolytic *Escherichia coli*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	22	0	64	1	0	2	97	0	0	15	0	26
Ceftiofur	53	1	32	3	0	0	96	0	1	29	1	11
Chlortetracycline	8	3	75	0	0	3	94	3	0	3	5	33
Clindamycin	0	0	86	0	0	3	8	50	39	0	0	41
Danofloxacin	80	0	6	3	0	0	96	0	1	39	0	2
Enrofloxin	81	0	5	3	0	0	96	1	0	39	2	0
Florfenicol	7	45	34	0	0	3	97	0	0	5	14	22
Gentamycin	57	11	18	3	0	0	96	0	1	29	4	8
Neomycin	58	0	28	3	0	0	89	0	8	23	0	18
Oxytetracycline	8	0	78	0	0	3	87	2	8	3	0	38
Penicillin	0	0	86	0	0	3	9	0	88	1	0	40
Spectinomycin	1	41	44	0	2	1	91	3	3	1	16	24
Sulphadimethoxine	26	0	60	1	0	2	69	0	28	8	0	33
Tiamulin	0	0	86	0	0	3	78	0	19	0	0	41
Tilmicosin	0	0	86	0	0	3	88	7	2	0	0	41
Trimethoprim / Sulphamethoxazole	72	0	14	2	0	1	96	0	1	28	0	13
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			0	0	1

PORCINE IN VITRO SENSITIVITY TESTS (CON'T)

	Klebsiella pneumoniae			*Mannheimia haemolytica*			*Pasteurella multocida*			*Pasteurella* sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	1	2	0	0	117	1	0	1	0	0
Ceftiofur	1	0	0	2	0	0	118	0	0	1	0	0
Chlortetracycline	0	0	1	2	0	0	115	3	0	0	1	0
Clindamycin	0	0	1	0	0	2	0	0	118	0	0	1
Danofloxin	1	0	0	2	0	0	118	0	0	1	0	0
Enrofloxin	1	0	0	2	0	0	118	0	0	1	0	0
Florfenicol	0	1	0	2	0	0	118	0	0	1	0	0
Gentamycin	0	0	1	2	0	0	118	0	0	1	0	0
Neomycin	0	0	1	2	0	0	116	0	2	1	0	0
Oxytetracycline	0	0	1	1	0	1	92	1	25	0	1	0
Penicillin	0	0	1	1	1	0	115	0	3	1	0	0
Spectinomycin	0	0	1	0	1	1	8	110	0	0	1	0
Sulphadimethoxine	0	0	1	2	0	0	97	0	21	1	0	0
Tiamulin	0	0	1	1	0	1	9	0	109	1	0	0
Tilmicosin	0	0	1	2	0	0	104	9	5	1	0	0
Trimethoprim / Sulphamethoxazole	0	0	1	0	2	0	118	0	0	1	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			0	0	2	3	9	106	N/A		

PORCINE IN VITRO SENSITIVITY TESTS (CON'T)

	Salmonella sp.			*Staphylococcus aureus*			*Staphylococcus* coagulase -			*Staphylococcus* coagulase +		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	29	0	29	0	0	6	5	0	2	0	0	2
Ceftiofur	47	0	11	5	1	0	7	0	0	2	0	0
Chlortetracycline	9	0	49	0	1	5	0	0	7	0	0	2
Clindamycin	0	0	58	1	1	4	2	1	4	1	0	1
Danofloxin	56	0	2	6	0	0	7	0	0	2	0	0
Enrofloxin	58	0	0	6	0	0	7	0	0	2	0	0
Florfenicol	16	23	19	0	5	1	2	5	0	0	2	0
Gentamycin	49	0	9	6	0	0	6	0	1	2	0	0
Neomycin	44	0	14	4	0	2	5	0	2	2	0	0
Oxytetracycline	9	0	49	0	0	6	0	0	7	0	0	2
Penicillin	0	0	58	0	0	6	1	0	6	0	0	2
Spectinomycin	0	24	34	0	0	6	0	0	7	0	0	2
Sulphadimethoxine	5	0	53	5	0	1	4	0	3	2	0	0
Tiamulin	0	0	58	3	0	3	2	0	5	1	0	1
Tilmicosin	0	0	58	2	0	4	5	0	2	1	0	1
Trimethoprim / Sulphamethoxazole	49	0	9	6	0	0	6	0	1	2	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	0	0	1	N/A			N/A			N/A		

PORCINE IN VITRO SENSITIVITY TESTS (CON'T)

	Staphylococcus epidermidis			*Staphylococcus hyicus*			*Streptococcus dysgalactiae*			*Streptococcus dysgalactiae* ssp. *equisimilis*		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	5	0	2	1	0	0	1	0	0
Ceftiofur	1	0	0	7	0	0	1	0	0	1	0	0
Chlortetracycline	0	0	1	2	3	2	0	1	0	0	0	1
Clindamycin	0	0	1	3	0	4	0	0	1	0	0	1
Danofloxin	1	0	0	7	0	0	1	0	0	0	0	1
Enrofloxin	1	0	0	7	0	0	1	0	0	1	0	0
Florfenicol	0	0	1	6	1	0	1	0	0	1	0	0
Gentamycin	0	1	0	6	1	0	0	0	1	0	0	1
Neomycin	1	0	0	7	0	0	1	0	0	1	0	0
Oxytetracycline	0	0	1	1	0	6	0	0	1	0	0	1
Penicillin	0	0	1	3	0	4	1	0	0	1	0	0
Spectinomycin	0	0	1	0	0	7	0	0	1	0	0	1
Sulphadimethoxine	1	0	0	6	0	1	1	0	0	1	0	0
Tiamulin	0	0	1	5	0	2	0	0	1	0	0	1
Tilmicosin	0	0	1	5	0	2	0	0	1	0	0	1
Trimethoprim / Sulphamethoxazole	1	0	0	7	0	0	1	0	0	1	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

PORCINE IN VITRO SENSITIVITY TESTS (CON'T)

	Streptococcus suis			*Streptotoccus* sp.		
	S	M	R	S	M	R
Ampicillin	140	3	0	2	0	2
Ceftiofur	142	0	1	2	0	2
Chlortetracycline	13	20	110	0	0	4
Clindamycin	42	2	99	0	0	4
Danofloxin	80	0	63	1	0	3
Enrofloxin	139	4	0	4	0	0
Florfenicol	142	1	0	4	0	0
Gentamycin	141	0	2	2	0	2
Neomycin	123	0	20	2	0	2
Oxytetracycline	10	6	127	0	0	4
Penicillin	114	26	3	2	0	2
Spectinomycin	49	83	11	3	1	0
Sulphadimethoxine	71	0	72	0	0	4
Tiamulin	129	0	14	2	0	2
Tilmicosin	45	0	98	0	0	4
Trimethoprim / Sulphamethoxazole	143	0	0	4	0	0
Tulathromycin	N/A			N/A		
Tylosin Tartrate	N/A			N/A		

South Dakota
Animal Disease Research and Diagnostic Laboratory

Salmonella Isolations
July 1, 2007 - June 30, 2008

	Total	Bovine	Porcine	Canine	Caprine	Equine	Ovine	Meat Insp.	Avian Misc.	Chicken	Pheasant	Turkey
agona	9	3	6									
anatum	2	1										1
braenderup	1									1		
brandenburg	3	1										2
bredeney	1											1
cerro	3	3										
chailey	1		1									
cholerasuis kunzendorf	71		71									
derby	15		15									
dublin	280	280										
4,5,12:i:-	56	3							53			
4,12: nonmotile	1										1	
give	29	29										
hadar	1											1
heidelberg	8		7							1		
III 61:-:1,5,7	3						3					
infantis	3	2						1				
johannesburg	2		1	1								
livingstone	1		1									
london	0											
manhattan	1		1									
montevideo	11	10	1									
muenster	193	193										
9,12: nonmotile	2	2										
newport	6	6										
ohio	2		2									

SALMONELLA ISOLATIONS (continued)

	Total	Bovine	Porcine	Canine	Caprine	Equine	Ovine	Meat Insp.	Avian Misc.	Chicken	Pheasant	Turkey
orion var 15+, 34+	1		1									
panama	1	1										
pomona	13	13										
reading	1	1										
saint paul	1											1
schwarzengrund	2	1										1
senftenberg	65	1	27						37			
6:7 non-motile	1		1									
typhimurium	30	5	22			1	2					
typhimurium copenhagen	11	5	6									
uganda	53	52			1							
worthington	1		1									
TOTAL	**885**	**612**	**164**	**1**	**1**	**1**	**5**	**1**	**90**	**2**	**1**	**7**

A blank field indicates a zero amount.

South Dakota
Animal Disease Research and Diagnostic Laboratory

Serology

July 1, 2007 - June 30, 2008

Disease	Positive	Negative	Other*	Total
Anaplasmosis				
Competative Enzyme-Linked Immunoassay	63	1,063	8	1,134
CF	0	109	0	109
Avian Influenza	144	2,381	4	2,529
Bluetongue				
Agar Gel Immunodiffusion (AGID)	0	12	0	12
Enzyme-Linked Immunoassay (ELISA)	60	1,101	2	1,163
Bovine Leukosis Virus				
AGID	318	1,343	2	1,663
ELISA	832	5,163	8	6,003
Bovine Respiratory Syncytial Virus				
SN	138	49	1	188
Bovine Viral Diarrhea Virus				
ACE	0	264	1	265
ELISA	99	17,151	25	17,275
Bovine Viral Diarrhea Virus I				
SN	1,035	214	18	1,267
Bovine Viral Diarrhea Virus II				
SN	1,091	129	17	1,237
Brucella				
BAPA	5	938	3	946
Card	7	10,378	4	10,389
CF	0	1,158	1	1,159
Plate	3	775	13	791
Rivanol	0	65	0	65
Tube	0	55	0	55
Brucella - Canine				
Rapid Slide Agglutination Test (RSAT)	14	163	0	177
Brucella ovis				
ELISA	6	1,905	4	1,915
Caprine Arthritis Encephalitis	82	49	0	131
Chronic Wasting Disease (BioRad ELISA)	32	2,539	2	2,573
Epizootic Hemorrhagic Disease				
AGID	9	23	0	32
Equine Infectious Anemia				
AGID	0	85	1	86
ELISA	1	2,665	2	2,668
Feline Immunodeficiency Virus				
ELISA	2	16	0	18

Disease	Positive	Negative	Other*	Total
Feline Infectious Peritonitis				
ELISA	8	3	1	12
Feline Leukemia Virus				
ELISA	1	17	0	18
Infectious Bovine Rhinotracheitis				
SN	733	125	2	860
Leptospira				
Bratislava	86	1,667	2	1,755
Canicola	95	1,658	2	1,755
Grippotyphosa	119	1,634	2	1,755
Hardjo	45	1,708	2	1,755
Icterohemorrhagiae	107	1,646	2	1,755
Pomona	190	1,562	3	1,755
Mycoplasma hyopneumoniae				
ELISA	1,327	3,322	3	4,652
Neospora				
ELISA	60	363	2	425
Ovine Progressive Pneumonia				
AGID	3	200	0	203
Parainfluenza-3				
SN	141	11	2	154
Paratuberculosis (Johne's)				
ELISA	6,236	59,967	199	66,402
Porcine Parvovirus				
HI	257	28	6	291
Porcine Respiratory and Reproductive Syndrome				
ELISA	7,746	111,899	100	119,745
Fluorescent Focus Neutralization (FFN)	413	601	2	1,016
IFA				
European	118	2,298	8	2,424
North American	448	4,806	10	5,264
Pseudorabies				
ELISA	0	11	0	11
g B ELISA	1	2,988	3	2,992
Latex Agglutination	0	310	0	310
Swine Influenza Virus				
H1N1	810	1,551	11	2,372
H3N2	914	1,417	11	2,342
TOTAL	23,799	249,585	489	273,873

South Dakota
Animal Disease Research and Diagnostic Laboratory

Rabies Examinations

July 1, 2007 - June 30, 2008

	Positive		Negative			
	Human Exposure	No Human Exposure	Human Exposure	No Human Exposure	Untestable	Total Specimens
Bat	1	1	61	31	4	98
Beaver	0	0	1	0	0	1
Bison	0	0	0	1	0	1
Bovine	0	1	17	43	17	78
Canine	0	0	68	13	1	82
Coyote	0	0	0	1	0	1
Deer	0	0	0	6	0	6
Equine	0	0	2	6	2	10
Feline	0	2	117	33	1	153
Ferret	0	0	0	1	0	1
Fox	0	0	1	0	0	1
Goat	0	0	0	3	0	3
Gopher	0	0	0	1	0	1
Mink	0	0	0	1	0	1
Mole	0	0	0	1	0	1
Mountain Lion	0	0	1	0	0	1
Mouse	0	0	2	0	0	2
Muskrat	0	0	1	3	1	5
Opossum	0	0	1	2	1	4
Otter	0	0	1	0	0	1
Ovine	0	0	0	4	1	5
Raccoon	0	0	6	16	3	25
Rat	0	0	1	0	0	1
Skunk	3	10	2	23	3	41
Squirrel	0	0	4	1	0	5
Total	**4**	**14**	**286**	**190**	**34**	**528**

South Dakota
Animal Disease Research and Diagnostic Laboratory

Positive Rabies Cases

July 1, 2007 - June 30, 2008

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Total
BAT	1	0	0	0	0	1	0	0	0	0	0	0	2
BOVINE	0	0	0	0	0	0	0	0	0	0	1	0	1
FELINE	0	0	0	1	1	0	0	0	0	0	0	0	2
SKUNK	2	1	0	1	0	0	1	2	1	1	2	2	13
TOTAL	**3**	**1**	**0**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**18**

South Dakota
Animal Disease Research and Diagnostic Laboratory

Molecular Diagnostics

July 1, 2007 - June 30, 2008

BOVINE

Disease	Positive	Negative	Other	Total
Bovine Leukosis Virus	7	255	0	262
Bovine Viral Diarrhea Virus				
Whole Blood/Serum	14	489	2	505
Ear Notch	17	425	0	442
Typing	1	0	0	1
Mycobacterium paratuberculosis (Johne's)	181	786	0	967
Mycoplasma bovis	16	7	0	23
Tritrichomonas foetus	19	2,054	7	2,080

PORCINE

Disease				
Circovirus	606	380	1	987
Classic Swine Fever	0	646	0	646
Lawsonia intracellularis	16	14	0	30
Mycoplasma hyopneumoniae	129	428	0	557
Porcine Respiratory and Reproductive Syndrome (PRRS)				
Semen/Tissue	355	7,912	1	8268
Serum	4,066	35,330	43	39,439
Swine Influenza	11	100	0	111

OTHER SPECIES

Disease				
Mycobacterium paratuberculosis (Johne's)				
Bison	0	7	0	7
Caprine	4	4	0	8
Deer	0	1	0	1
Milk	13	7	0	20

AVIAN

Disease				
Avian Influenza	478	2,858	4	3,340

South Dakota
Animal Disease Research and Diagnostic Laboratory

Molecular Diagnostic-Clostridium Genotyping

July 1, 2007 - June 30, 2008

Species	Genotype A	Genotype A/ Beta 2 Toxin	Genotype A/ Beta 2 toxin/ Enterotoxin	Genotype C	Genotype C/ Beta 2 Toxin	Genotype D	Genotype E/ Enterotoxin	Genotype E/ Beta 2 Toxin/ Enterotoxin
ALPACA	1	0	0	0	0	0	0	0
BOVINE	206	15	1	2	16	0	1	4
CANINE	0	9	0	0	0	0	0	0
CAPRINE	0	1	0	0	0	0	0	0
DEER	34	0	0	194	0	0	0	0
ELK	1	0	0	0	0	0	0	0
EQUINE	2	0	0	0	1	0	0	0
MINK	2	0	0	0	0	0	0	0
OVINE	137	0	0	0	0	2	0	0
PORCINE	31	240	0	1	0	0	0	0
TOTAL	414	265	1	197	17	2	1	4

FY 2008 BVD Summary

Test	No. cases	No. samples	No. positives	No. pos cases	Pos. sample rate	Pos. case rate
Ear Notch ELISA	683	16174	87	60	0.54%	8.78%
Pooled PCR + ELISA to ID indiv's	145	17540	12	8	0.07%	5.52%
Immunohistochemistry	169	1238	8	5	0.65%	2.96%
Outgrowth ELISA	74	2659	1	1	0.04%	1.35%
Serum ACE	45	265	0	0	0.00%	0.00%
	1116	37876	108	74	0.29%	6.63%

FY 2007 BVD Summary

Test	No. cases	No. samples	No. positives	No. pos cases	Pos. sample rate	Pos. case rate
Ear Notch ELISA	703	19832	72	54	0.36%	7.68%
Pooled PCR + ELISA to ID indiv's	160	21222	41	22	0.19%	13.75%
Immunohistochemistry	250	2556	11	10	0.43%	4.00%
Outgrowth ELISA	174	2478	3	3	0.12%	1.72%
Serum ACE	14	266	1	1	0.38%	7.14%
	1301	46354	128	90	0.28%	6.92%

FY 2006 BVD Summary

Test	No. cases	No. samples	No. positives	No. pos cases	Pos. sample rate	Pos. case rate
Ear Notch ELISA	619	16182	163	73	1.01%	11.79%
Pooled PCR + ELISA to ID indiv's	75	9808	5	7	0.05%	9.33%
Immunohistochemistry	418	4462	46	25	1.03%	5.98%
Outgrowth ELISA	485	9562	3	3	0.03%	0.62%
	1597	40014	217	108	0.54%	6.76%
TOTALS FY 2006-08	4014	124244	453	272	0.36%	6.78%

* "Pooled PCR + ELISA to ID indiv's" = No. samples refers to # of ear notches included in the pools.
No. positives refers to ear notches within the positive pools that were subsequently ID-d by AC ELISA. These are not included in the "Ear Notch ELISA" category
No. positive cases means cases in which (+) pools were identified (some pools were PCR (+) but no individuals (+) on AC ELISA)

SOUTH DAKOTA

ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY

DIAGNOSES BY SPECIES

Diagnoses for each animal species are listed in alphabetical order under various organ systems by the following scheme:

0 Body as a Whole (multisystemic disease and all toxicoses)

1 Integumentary

2 Musculoskeletal

3 Respiratory (including nasal passages)

4 Cardiovascular

5 Hemic and Lymphatic

6 Digestive (including lip, oral structures, liver, and pancreas)

7 Urogenital (including prepuce, scrotum, vulva, and mammary gland)

8 Endocrine

9 Nervous

X Special Senses (including eyelid and pinna)

DIAGNOSIS BY SPECIES AND ORGAN SYSTEM
July 1, 2007 - June 30, 2008

AVIAN, MISCELLANEOUS

	TOTAL
BODY AS A WHOLE	
Abscess	1
Adenoma, undifferentiated	1
Amyloidosis	1
Avian, tuberculosis, *Mycobacterium*	3
Botulism	3
Circovirus identified -- no disease	1
Dehydration	2
Malnutrition	15
No diagnosis	9
Peritonitis	1
Poxvirus infection	1
Septicemia	6
Septicemia, bacterial, miscellaneous	1
Septicemia, *Escherichia coli*	4
Starvation/inanition	2
Sudden death	1
Trauma	2
West Nile virus infection	9
West Nile virus PCR positive	2
CARDIOVASCULAR	
Bacterial pericarditis	1
Cardiomyopathy	1
DIGESTIVE	
Bacterial enteritis	1
Clostridium perfringens /intestine	1
Coccidiosis	2
Enteritis colitis	1
Gastrointestinal parasitism	3
Hepatitis	2
Intestine enteritis, *Salmonella*	1
Intestine enteritis, *Clostridium perfringens*	2
Intestine enteritis, mycotic	1
Intestine perforation	1
Liver abscess	1
Liver hepatitis, necrotic	1
Ulcerative enteritis	1

HEMIC AND LYMPHATIC

Blood parasite, Hemoproteus	1
Spleen infarction	1
Spleen splenitis	1

INTEGUMENTARY

Dermatitis, poxvirus	2
Foreign body granuloma	1
Gangrene	1
Panniculitis	1
Papilloma	1

NERVOUS

Brain encephalomalacia	1

RESPIRATORY

Airsacculitis	2
Aspiration pneumonia	2
Avian influenza viral infection	2
Avian influenza virus PCR positive	105
Bacterial pneumonia	1
Bronchopneumonia	1
Lung pneumonia, mycotic	1
Rhinitis	1

CHICKEN

BODY AS A WHOLE

Avian, tuberculosis, *Mycobacterium*	1
Peritonitis	2
Septicemia	1
Septicemia, bacterial, miscellaneous	1
Septicemia, *Escherichia coli*	1
Septicemia, *Salmonella*	3

CARDIOVASCULAR

Bacterial pericarditis	1
Myocarditis	2

DIGESTIVE

Intestine enteritis, coccidia	1
Liver hepatitis, necrotic	1

HEMIC AND LYMPHATIC	
Lymphoproliferative, Marek's, herpes	2
MUSCULOSKELETAL	
Arthritis	1
RESPIRATORY	
Airascculitis	1
Bronchopneumonia	1
Laryngitis	1
Lung pneumonia, bacterial, miscellaneous	1
Lung pneumonia, *Bordetella* sp.	1
Tracheitis	1
UROGENITAL	
Neoplasm ovary, carcinoma	1

PHEASANT

BODY AS A WHOLE	
Malnutrition	4
Peritonitis	1
Septicemia	1
Septicemia, *Arcanobacterium pyogenes*	1
Septicemia, *Escherichia coli*	3
Septicemia, *Salmonella*	1
Starvation/inanition	1
CARDIOVASCULAR	
Bacterial pericarditis	2
DIGESTIVE	
Avian, ingluvitis	1
Clostridium perfringens, intestine	1
Coccidiosis	2
Gastrointestinal parasitism	1
Intestine enteritis, *Salmonella*	1
Intestine obstruction	1
NERVOUS	
Brain meningitis, *Escherichia coli*	1
RESPIRATORY	
Bronchopneumonia	1

Sinus sinusitis	1
Sinusitis, *Mycoplasma*	2

TURKEY

BODY AS A WHOLE	
Adenovirus	2
Malnutrition	3
No diagnosis	1
Peritonitis	1
Salmonellosis	6
Septicemia	3
Septicemia, *Escherichia coli*	9
CARDIOVASCULAR	
Bacterial pericarditis	2
Heart, epicarditis	1
Heart, round heart syndrome	1
DIGESTIVE	
Avian, ingluvitis	1
Coccidiosis	1
Enteritis, idiopathic	1
Esophagitis	1
Gastrointestinal parasitism	1
Hepatitis	2
Intestine enteritis, adenovirus	1
Intestine enteritis, *Clostridium perfringens*	1
Intestine parasitism, cestodes	1
Intestine enteritis, rotavirus	1
Intestine enteritis, *Salmonella*	2
Intestine perforation	1
INTEGUMENTARY	
Bacterial dermatitis	1
Dermatitis, poxvirus	3
MUSCULOSKELETAL	
Arthritis	1
Joint arthritis, *Staphylococcus* sp.	1
Synovitis	1
RESPIRATORY	
Aspiration pneumonia	1

Avian influenza virus PCR positive	1
Bacterial pneumonia	1
Bronchopneumonia	3
Lung pneumonia, *Bordetella* sp.	4
Lung pneumonia, *Escherichia coli*	1
Lung pneumonia, *Pasteurella multocida*	1
Pneumonia, *Ornithobacterium rhinotracheale*	1

ALPACA

RESPIRATORY

Interstitial pneumonia	1

CARDIOVASCULAR

Intestine enteritis, coccidia	1

DIGESTIVE

Intestine parasitism, strongyles	1

UROGENITAL

Abortion, placentitis	1
Idiopathic abortion	1

ENDOCRINE

Anemia	1

ANTELOPE

BODY AS A WHOLE

No diagnosis	1

DIGESTIVE

Intestine enteritis, coccidia	1

BAT

NERVOUS

Rabies	2

BISON (AMERICAN)

BODY AS A WHOLE	
Copper deficiency	4
Malignant catarrhal fever	1
Septicemia, *Arcanobacterium pyogenes*	1
Septicemia, bacterial, miscellaneous	1
Trauma	1
DIGESTIVE	
Enteritis, idiopathic	1
Gastointestinal parasitism	1
Liver abscess	1
Rumen rumenitis	1
HEMIC AND LYMPHATIC	
Anaplasmosis	1
Lymphadenitis, bacterial	1
INTEGUMENTARY	
Mastitis	1
RESPIRATORY	
Bronchointerstitial pneumonia	1
Bronchopneumonia	1
Lung pneumonia, *Arcanobacterium pyogenes*	1
Lung pneumonia, bacterial, miscellaneous	1
Lung pneumonia, *Mycoplasma* sp.	3
Lung pneumonia, *Mycoplasma bovis*	1
UROGENITAL	
Metritis	1
Prepuce bacteriological examination	2

BOVINE

BODY AS A WHOLE	
Abscess	3
Actinobacillosis	2
Amyloidosis	2
Anaphylaxis (type 1 hypersensitivity)	4
Anthrax	1
Autolysis	24
BVD infection	4

BVD virus infection (virus isolation)	18
BVD virus PCR positive	12
Congenital anomaly	1
Copper deficiency	20
Copper higher than normal	8
Copper marginal	5
Deficiency of iron	1
Emaciation	7
Failure passive transfer (colostrum)	3
Hamartoma	2
Heat prostration	1
Hemorrhage	4
Herpesvirus DN599 infection virus isolation	13
Hypoglycemia	1
IBR, viremia	1
Infectious bovine rhinotracheitis virus isolation	3
Lead toxicosis	13
Malnutrition	2
Mycoplasma sp. isolation	16
Nitrate/nitrite toxicosis	2
No diagnosis	109
No histologic diagnosis	5
Normal tissue	35
Omphalitis (navel ill)	4
Organophosphate toxicosis	1
Peritonitis	26
Selenium higher than normal	1
Septicemia	8
Septicemia, *Arcanobacterium pyogenes*	8
Septicemia, bacterial, miscellaneous	10
Septicemia, *Escherichia coli*	10
Septicemia, *Histophilus somni*	1
Septicemia, *Mannheimia haemolytica*	2
Septicemia, mycotic	1
Septicemia, *Salmonella*	50
Septicemic *Pasteurella multocida*	1
Toxicosis, copper	2
Toxicosis, ammonia	1
Toxicosis, urea	1
Zinc higher than normal	4

CARDIOVASCULAR

Bacterial pericarditis	8
Blood vessels thrombosis	1
Cardiomyopathy	1

Heart anomaly	1
Heart endocarditis	1
Heart endocarditis, valvular	1
Heart failure, congestive	2
Heart, epicarditis	2
Myocardial necrosis	3
Myocarditis	8
Right-sided congestive heart failure	1
Vasculitis	1
CHEMISTRY	
Nitrate level, toxic	1
DIGESTIVE	
Abomasum abomasitis	12
Abomasum abomasitis, BVD	1
Abomasum abomastitis, *Clostridium* sp.	12
Abomasum abomasitis, Mycotic	8
Abomasum dilatation	1
Abomasum displacement	2
Abomasum perforation	5
Abomasum rupture	1
Abomasum ulceration	7
Atrophic enteritis	2
Bacterial enteritis	24
Cholangitis	1
Clostridium perfringens / feces	5
Clostridium perfringens / intestine	18
Colitis	7
Cryptosporidiosis	139
Enteritis due to BVD	12
Enteritis, idiopathic	140
Enteritis, Johne's disease	91
Enteritis, older bovine total cases	237
Enteritis, young calf total cases	469
Esophagitis	4
Feces, rotavirus (EM)	9
Gastrointestinal intussusception	1
Gastrointestinal parasitism	5
Giardiasis	1
Hepatic lipidosis	6
Hepatitis	14
Hepatitis likely toxic	1
Hepatopathy	2
Intestinal accident	1

Intestine anomaly	1
Intestine enteritis, *Clostridium perfringens*	81
Intestine enteritis, *Clostridium perfringens* Type A	13
Intestine enteritis, *Clostridium perfringens* Type A Beta 2	7
Intestine enteritis, *Clostridium perfringens* Type C	3
Intestine enteritis, *Clostridium perfringens* Type E	1
Intestine enteritis, coccidia	62
Intestine enteritis, coronavirus	76
Intestine enteritis, *Enterococcus durans*	1
Intestine enteritis, *Escherichia coli*	16
Intestine enteritis, *Escherichia coli* (AEEC)	9
Intestine enteritis, necrotic	3
Intestine enteritis, rotavirus	198
Intestine enteritis, *Salmonella*	75
Intestine parasitism, cestodes	1
Intestine parasitism, nematodirus	3
Intestine parasitism, strongyles	6
Intestine perforation	1
Intestine, jejunal hemorrhagic syndrome	4
Liver abscess	2
Liver congestive heart failure (right)	1
Liver hepatitis, necrotic	8
Liver hepatitis, parasitic	1
Rumen acidosis / grain overload	3
Rumen rumenitis	9
Rumen rumenitis, mycotic	2
Rumen tympany, bloat	8
Stomatitis	1
Traumatic reticulitis/peritonitis	2
Viral enteritis	3

HEMIC AND LYMPHATIC

Anaplasmosis	1
Anemia	1
Hematoma	1
Hemosiderosis	1
Icterus	1
Lymphadenitis, bacterial	1
Lymphosarcoma	3
Neoplasm, lymphosarcoma abomasum	2
Neoplasma, leukemia	1
Spleen, rupture	1
Splenitis	1

INTEGUMENTARY	
Cellulitis	4
Chronic hyperplastic dermatitis	2
Dermatitis, dermatophilus	1
Dermatitis, focal	1
Dermatitis, non-specific	1
Dermatitis, parasitic, lice	1
Dermatopathy ringworm	2
Fibroma	1
Fibropapilloma	1
Mastitis	5
Mastitis (*Staphylococcus aureus)*	11
Milk sample mastitis, bulk tank	6
Milk sample mastitis, clinical	45
Milk sample mastitis, subclinical	9
Neoplasm, squamous cell carcinoma	1
Papilloma	1
Pyogranuloma	1
MUSCULOSKELETAL	
Arthritis	2
Fractured bone	2
Joint arthritis, *Arcanobacterium pyogenes*	2
Joint arthritis, *Mycoplasma bovis*	1
Joint arthritis, *Mycoplasma* sp.	6
Joint arthritis, *Staphylococcus* sp.	1
Joint, coxofemoral luxation	1
Muscle myositis, *Clostridium*	2
Myopathy	6
Myositis	6
Synovitis	1
NERVOUS	
Brain encephalitis, abscess	1
Brain encephalitis, *Histophilus somni*	3
Brain encephalitis, non-suppurative	4
Brain encephalitis, suppurative	2
Brain encephalitis, viral, miscellaneous	1
Brain encephalomalacia, polio	19
Brain encephalopathy	1
Brain meningitis, *Arcanobacterium pyogenes*	2
Brain meningitis, *Escherichia coli*	1
Brain meningitis, non-suppurative	5
Brain meningitis, suppurative	8
Brain, meningoencephalitis	3

Listeria monocytogenes encephalitis	4
Meningitis	3
Rabies	1

RESPIRATORY

Aspiration pneumonia	12
Bronchointestinal pneumonia	41
Bronchopneumonia	2
Fibrinous pneumonia	1
Infarct pulmonary	1
Interstitial pneumonia	22
Laryngitis	1
Lung edema	4
Lung hemorrhage	1
Lung pleuritis	4
Lung pneumonia, abscess	3
Lung pneumonia, acute atypical interstitial	12
Lung pneumonia, *Arcanobacterium pyogenes*	3
Lung pneumonia, bacterial, miscellaneous	9
Lung pneumonia, BRSV	29
Lung pneumonia, BVD	10
Lung pneumonia, *Escherichia coli*	1
Lung pneumonia, *Histophilus somni*	75
Lung pneumonia, IBR	3
Lung pneumonia, *Mannheimia haemolytica*	91
Lung pneumonia, *Mycoplasma* sp.	123
Lung pneumonia, *Pasteurella multocida*	103
Lung pneumonia, *Salmonella* sp.	17
Lung pneumonia, *Pasteurella* sp.	5
Lung pulmonary, atelectasis	1
Lung pulmonary, congestion	1
Lung pulmonary, emphysema	1
Meconium aspiration syndrome	13
Nasal isolation, bacterial, miscellaneous	2
Nasal isolation, *Pasteurella multocida*	3
Nasal isolation, IBR	2
Nasal isolation, *Mannheimia haemolytica*	1
Pleuritis	2
Pneumonia, *Mycoplasma bovis*	11
Pneumonitis	3
Rhinitis	1
Tracheitis	5

SPECIAL SENSES	
Ear, otitis interna	1
Eye keratoconjunctivitis, *Moraxella*	31
Uveitis	1
UROGENITAL	
Abortion, *Arcanobacterium pyogenes*	19
Abortion associated with *Neospora* -like organism	8
Abortion due to BVD	1
Abortion due to *Campylobacter*	2
Abortion, *Campylobacter jejuni*	1
Abortion due to IBR	5
Abortion due to *Listeria monocytogenes*	2
Abortion of undetermined cause	2
Abortion, hepatitis	5
Abortion, myocarditis	7
Abortion placentitis	77
Abortion, pneumonia	36
Abortion, *Salmonella* sp.	2
Bacterial abortion	3
Chronic tubulointerstitial nephritis	6
Dystocia	2
Endometritis, bacterial	2
Granulosa cell tumor	1
Idiopathic abortion	166
Kidney infaraction	2
Kidney nephrosis	1
Kidney pyelonephritis	2
Metritis	7
Mycotic abortion	11
Nephritis	9
Prepuce bacteriological examination	168
Pyelonephritis	2
Pyometra	1
Semen, PRRS PCR positive	1
Urethral obstruction (urolithiasis)	1
Uterus perforation (rupture)	1
Vaina bacteriological examination	9
Vas deferens	2

CANINE

BODY AS A WHOLE

Abscess	3
Anaplastic carcinoma (undifferentiated)	2
Anaplastic sarcoma	3
Anaplastic tumor	1
Blastomycosis	2
Canine distemper	2
Copper deficiency	1
Fat steatitis	1
Granular cell tumor	2
Hemorrhage	2
Herpesvirus infection, canine	2
Hypoglycemia	1
Inflammatory mass	1
Leiomyosarcoma	1
Leptospirosis	1
Lipoma	22
Lipomona, infiltrative	1
Liposarcoma	1
Mesothelioma	2
Neoplasm, adenoma (site not specified)	1
Neoplasm, carcinoma miscellaneous	1
Neoplasm, polyp	1
Neoplasm, round cell tumor (site not specified)	1
No diagnosis	54
Normal tissue	10
Peritonitis	2
Polyp	2
Polyp, inflammatory	1
Septicemia	3
Septicemia, *Escherichia coli*	2
Septicemia, *Streptococcus* sp.	1
Speciment unsuitable	1
Starvation / inanition	1
Trauma	5

CARDIOVASCULAR

Artery aneurysm	1
Blood vessels neoplasm, hemangioma (site not specified)	1
Myocardial necrosis	1
Vasculitis	2

DIGESTIVE

Acanthomatous epulis	7
Anal gland carcinoma	2
Bacterial enteritis	1
Bile duct carcinoma	1
Cholangitis	1
Coccidiosis	2
Enteritis, idiopathic	9
Epulis	11
Esophagitis	1
Gastric ulcer	1
Gastrointestinal intussusception	2
Gastrointestinal parasitism	2
Giardiasis	8
Gingival hyperplasia	3
Gingivitis	4
Glossitis	3
Hepatic glycogenosis	1
Hepatic lipidosis	2
Hepatitis	1
Hepatopathy	1
Intestinal torsion	1
Intestine enteritis, *Clostridium perfringens*	2
Intestine enteritis, *Clostridium perfringes* Type A Beta 2	3
Intestine enteritis, *Escherichia coli*	4
Intestine enteritis, *Escherichia coli* (AEEC)	4
Intestine enteritis, parvovirus	18
Intestine hemorrhage	1
Intestine parasitism, ascarids	3
Intestine parasitism, cestodes	2
Intestine parasitism, strongyles	1
Liver hepatitis, necrotic	2
Lymphocytic plasmacytic enteritis	1
Odontoma	1
Oral neplasm, fibrosarcoma	1
Oral neoplasm, melanoma	5
Oral neoplasm, squamous cell carcinoma	3
Oral stomatitis	1
Viral enteritis	1

HEMIC AND LYMPHATIC

Hemangioma	8
Hemangiopericytoma	2
Hemangiosarcoma	3
Hematoma	1

Hemosiderosis	1
Lymphadenitis	1
Lymphosarcoma	10
Neoplasma, leukemia	1
Plasma cell neoplasm, plasmacytoma	2
Splenic hematoma	1

INTEGUMENTARY

Alopecia	1
Bacterial dermatitis	1
Basal cell carcinoma	3
Basal cell tumor	5
Calcinosis circumscripta	1
Cellullitis	9
Chronic hyperplastic dermatitis	5
Collagen hyperplasia	8
Contact dermatitis	1
Dermal fibrosis (collagen nevus)	5
Dermal hair follicle cyst	7
Dermatitis, cryptococcus, neoformans	1
Dermatitis granulomatous	3
Dermatitis, lick granuloma	2
Dermatitis, mycotic (fungal)	3
Dermatitis, non-specific	3
Dermatitis, parasitic, demodex	2
Dermatitis, pemphigus vegetans	1
Dermatitis, scar	1
Dermatitis, seborrhea	2
Dermatophytosis ringworm	10
Discoid lupus erythematosis	1
Epidermal cyst	5
Fibroma	4
Fibropapilloma	1
Fibrosarcoma	2
Focal adnexal dysplasia	1
Folliculitis	2
Foreign body granuloma	2
Furunculosis	5
Histiocytoma	18
Keratoacanthoma	1
Malignant melanoma	3
Mammary adenoma	5
Mammary carcinoma	3
Mammary carcinoma adenocarcinoma	6
Mast cell tumor, grade I, well differentiated	19

Mast cell tumor, grade II, differentiated	11
Mast cell tumor, grade III, poorly differentiated	3
Mastitis *(Staphylococcus aureus)*	4
Meibomian gland adenoma	4
Melanoma	13
Milk sample mastitis, clinical	1
Mixed mammary tumor	13
Myxoma	2
Neoplasm, cutaneous lymphoma	4
Neoplasm, neuroendocrine (Merkel)	2
Neoplasm, papilloma	3
Neoplasm, perianal gland adenoma	10
Neoplasm, pilomatrioxoma	6
Neoplasm, sebaceous gland adenoma	14
Neplasm, sesbaceous gland carcinoma	1
Neoplasm, squamous cell carcinoma	8
Neoplasm, trichoblastoma	4
Neoplasm, trichoepithelioma	4
Panniculitis	3
Pyogranuloma	3
Round cell tumor	1
Sebaceous epithelioma	4
Sebaceous gland cyst1	
Sebaceous gland hyperplasia	5
Sebaceous gland inflammation	2
Sweat gland cyst	1

MUSCULOSKELETAL

Joint arthritis, bacterial, miscellaneous	1
Myositis	2
Osteoma	1
Osteomyelitis, bacterial	1
Osteomyelitis, idiopathic	1
Osteopathy	1
Osteosarcoma	4
Rhabdomyosarcoma	1
Synovitis	1

NERVOUS

Brain encephalitis, canine distemper	1
Brain encephalitis, non-suppurative	2
Brain encephalomalacia, multifocal	1
Brain hemorrhage	1
Brain, meningoencephalitis	2
Meningioma	1

Meningitis	2
Nerve neoplasm, Schwannoma	9
Neurofibroma	1
Neurofibrosarcoma	1
RESPIRATORY	
Aspiration pneumonia	1
Bronchitis	1
Bronchointerstitial pneumonia	2
Bronchopneumonia	1
Interstitial pneumonia	1
Lung edema	2
Lung hemorrhage	1
Lung pleuritis	1
Lung pneumonia, *Bordetella* sp.	5
Lung pneumonia, *Escherichia coli*	1
Lung pneumonia, parasitic, miscellaneous	1
Lung pneumonia, *Pasteurella multocida*	1
Lung pneumonia, *Streptococcus equi*	1
Lung pneumonia, *Streptococcus* sp.	3
Lung pulmonary, atelectasis	1
Nasal carcinoma	1
Nasal isolation, *Pasteurella multocida*	1
Pleural cavity pyothorax	1
SPECIAL SENSES	
Ear otitits interna	1
Ear conjunctivitis	1
Meibomian adenocarcinoma	1
Otitis externa	15
UROGENITAL	
Cystitis	2
Idiopathic abortion	5
Interstitial cell tumor	1
Kidney, nephrosis	1
Kidney, pyelonephritis	1
Membranous glomerulonephritis	1
Nephropathy (end stage renal disease)	1
Papilloma squamous	5
Seminoma	2
Testis neoplasm, interstitial cell	1
Transitional cell carcinoma	2
Urinary calculi, urolithiasis	1

CAPRINE

BODY AS A WHOLE	
Ascites	1
Corynebacterium pseudotuberculosis	1
Malnutrition	3
No diagnosis	1
No histologic diagnosis	1
Septicemia, bacterial, miscellaneous	1
Toxicosis copper	1
DIGESTIVE	
Abomasum abomasitis, mycotic	1
Bile duct carcinoma	1
Cryptosporidiosis	1
Enteritis, idiopathic	1
Enteritis, older bovine total cases	1
Enteritis, Johne's disease	5
Gastrointestinal parasitism	3
Hemonchosis acute abomasal hemorrhage	1
Hepatic lipidosis	1
Intestine enteritis, *Clostridium perfringens*	2
Intestine enteritis, *Clostridium perfringens* Type A Beta 2	1
Intestine enteritis, Coccidia	8
Intestine eneritis, *Escherichia coli*	2
Intestine enteritis, rotavirus	1
Intestine parasitism, nematodirus	1
Intestine parasitism, strongyles	2
Intestine parasitism, whipworms	1
Oral stomatitis	1
HEMIC AND LYMPHATIC	
Anemia	1
Lymph node lymphadenitis, caseous	1
MUSCULOSKELETAL	
Joint arthritis, *Streptococcus* sp.	1
RESPIRATORY	
Bronchopneumonia	1
Interstitial pneumonia	1
Lung pneumonia, *Arcanobacaterium pyogeness*	2
Lung pneumonia, *Mannheimia haemolytica*	7
Lung pneumonia, *Mycoplasma* sp.	1
Lung pneumonia, *Pasteurella multocida*	1

Lung pneumonia, *Pasteurella* sp.	1
UROGENITAL	
Abortion, *Campylobacter jejuni*	1
Abortion due to *Chlamydia psittaci*	8
Abortion due to *Coxiella*	2
Abortion, hepatitis	1
Abortion, placentitis	4
Abortion, pneumonia	2
Abortion, *Toxoplasma gondii*	2
Idiopathic abortion	8

CHINCHILLA

BODY AS A WHOLE	
Feline fatty liver syndrome	2
Septicemia, bacterial, miscellaneous	1
DIGESTIVE	
Gastric ulcer	1

COYOTE

BODY AS A WHOLE	
No diagnosis	1

DEER

BODY AS A WHOLE	
Abscess	2
Autolysis	1
Bluetongue	1
Copper deficiency	1
Emaciation	1
Epizootic hemorrhagic disease	3
Malignant catarrhal fever	1
No diagnosis	3
Normal tissue	1
Septicemia, *Arcanobacterium pyogenes*	1

DIGESTIVE

Coccidiosis	1
Enteritis colitis	1
Hepatitis	1
Intestine enteritis, *Clostridium perfringens*	4
Intestine enteritis, *Clostridium perfringes* Type A Beta 2	1
Intestine enteritis, *Clostridium perfringens* Type C	1
Intestine parasitism, cestodes	1
Intestine parasitism, strongyles	1
Intestine parasitism, whipworms	1
Rumen acidosis / grain overload	6
Rumen rumenitis	1

HEMIC AND LYMPHATIC

Lymphadenitis	1

INTEGUMENTARY

Papilloma	1

NERVOUS

Brain encephalomalacia, polio	2
Brain hemorrhage	1
Brain vasculitis	1
Parasitic meningitis/myelitis	1

RESPIRATORY

Bronchointerstitial pneumonia	1
Bronchopneumonia	2
Lung pneumonia, parasitic, metastrongylus	2
Lung pneumonia, parasitic, miscellaneous	1

UROGENITAL

Nephritis	1

ELK

BODY AS A WHOLE

Abscess	1
Peritonitis	1
Septicemia, *Escherichia coli*	1
Trauma	1

DIGESTIVE

Clostridium perfringens , intestine	1
Rumen rumenitis, mycotic	1

UROGENITAL

Kidney, nephrosis	1

EQUINE

BODY AS A WHOLE

Abscess	2
Emaciation	1
Hemorrhage	2
No diagnosis	5
Normal tissue	4
Toxicosis, zinc phosphide	1
West Nile virus infection	1
West Nile virus PCR positive	1

CARDIOVASCULAR

Blood vessels thrombosis	1
Myocardial necrosis	1

DIGESTIVE

Colon, impaction	1
Ehrlichial colitis (Potomac horse fever)	1
Enteritis colitis	2
Enteritis, idiopathic	2
Gastrointestinal intussusception	2
Gastrointestinal parasitism	3
Gingival hyperplasia	1
Hepatic lipidosis	1
Hepatitis	2
Intestinal torsion	2
Intestine enteritis, *Salmonella*	1
Intestine parasitism, strongyles	1
Liver bile duct hyperplasia	1
Liver hepatitis, necrotic	2
Typhlitis	1

HEMIC AND LYMPHATIC

Lymphadenitis, bacterial	1
Lymphadenopathy	1
Spleen splenitis	1

Strangles	3
INTEGUMENTARY	
Cellulitis	1
Dermal melanocytosis (melanoma)	1
Epidermal cyst	1
Fibrosarcoma	1
Melanoma	1
Neoplasm, sarcoid	2
Papilloma	1
Sarcoid	2
Sebaceous gland cyst	1
MUSCULOSKELETAL	
Arthritis	1
Myopathy	2
Osteopathy	1
NERVOUS	
Brain encephalomalacia, focal	2
RESPIRATORY	
Aspiration pneumonia	2
Bronchopneumonia	1
Lung pneumonia, *Pasteurella* sp.	1
Lung pneumonia, *Streptococcus equi*	1
Pneumonitis	1
Rhinitis	2
SPECIAL SENSES	
Eye neoplasm, squamous cell carcinoma	2
UROGENITAL	
Abortion of undetermined cause	1
Abortion, pneumonia	1
Bacterial abortion	1
Idiopathic abortion	11
Metritis	1
Urinary calculi, urolithiasis	1

FELINE

BODY AS A WHOLE	
Abscess	2

Adenocarcinoma	1
Adenoma, undifferentiated	1
Emaciation	2
Ethylene glycol toxicosis	1
Fat steatitis	1
Feline rhinopneumonitis virus	1
Hamartoma	1
Histoplasmosis	1
Lipoma	1
No diagnosis	77
Normal tissue	1
Septicemia	1
Septicemia, *Francisella tularensis*	1
Toaxoplasmosis	1
DIGESTIVE	
Gastrointestinal parasitism	2
Giardiasis	4
Gingival hyperplasia	1
Gingivitis	2
Hepatitis likely toxic	1
Intestine enteritis, coccidia	1
Intestine enteritis, *E. coli*	1
Intestine enteritis, *E. coli* (AEEC)	1
Intestine enteritis, feline panleukopenia	4
Intestine enteritis, rotavirus	1
Oral stomatitis	1
HEMIC AND LYMPHATIC	
Hemobartonellosis	1
Lymphadenitis	1
Lymphosarcoma	2
INTEGUMENTARY	
Basal cell tumor	7
Cellulitis	2
Chronic hyperplastic dermatitis	1
Collagen hyperplasia	1
Dermatitis granulomatous	1
Dermatitis, flea bit (hypersensitivity)	1
Dermatitis, immune mediated	1
Dermatophytosis ringworm	3
Epidermal cyst	1
Fibrosarcoma	1
Mammary carcioma	2

Mammary carcinoma adenocarcinoma	3
Mast cell tumor	5
Meibomian gland adenoma	1
Myxoma	1
Neoplasm, sebaceous cell carcinoma	1
Panniculitis	2
Sebaceous gland hyperplasia	1
MUSCULOSKELETAL	
Bone osteodystrophy, rickets	1
NERVOUS	
Brain encephalitis, abscess	1
Brain encephalitis, non-suppurative	1
Brain meningitis, suppurative	3
Brain, meningoencephalitis	4
Rabies	2
RESPIRATORY	
Aspiration pneumonia	1
Bronchointerstitial pneumonia	1
Feline calicivirus	4
Lung pneumonia, bacterial, miscellaneous	2
Lung pneumonia, *Pasteurella multocida*	1
Lung pneumonia, *Pasteurella* sp.	1
Lung pneumonia, *Streptococcus* sp.	1
Pyothorax	1
Rhinitis	1
Sinus sinusitis	1
SPECIAL SENSES	
Ceruminous gland carcinoma	1
Cnjunctivitis	1
Otitis externa	4
UROGENITAL	
Cystitis	2
Glomerulonephritis	1
Granulosa cell tumor	1
Kidney renal dysplasia	1
Pyelonephritis	1

FERRET

BODY AS A WHOLE
- Canine distemper 1

RESPIRATORY
- Bronchopneumonia 1

NERVOUS
- Brain meningitis, suppurative 1
- Brain encephalitis, canine distemper 1

FISH

BODY AS A WHOLE
- Normal tissue 2

FOX

CARDIOVASCULAR
- Cardiomyopathy 1

GUINEA PIG

BODY AS A WHOLE
- Abscess 1
- Steatitis 1

INTEGUMENTARY
- Cellulitis 1

IGUANA

BODY AS A WHOLE
- Granulation tissue 1

LLAMA

BODY AS A WHOLE
- No diagnosis 1

UROGENITAL
- Idiopathaic abortion 2

MILK SAMPLE

BODY AS A WHOLE
- BVD virus PCR positive 1

MINK

BODY AS A WHOLE
- Canine distemper 1
- Fat steatitis 2
- No diagnosis 1
- Septicemia, *Escherichia coli* 1

INTEGUMENTARY
- Dermatitis, *Staphylococcus intermedius* 1
- Dermatitis, *Staphylococcus aureus* 1
- Dermatitis, *Staphylococcus* sp. 1

MUSCULOSKELETAL
- Muscle myopathy, nutritional 3
- Myopathy 1

RESPIRATORY
- Lung pleuritis 1
- Lung pneumonia, *Escherichia coli* 3

CARDIOVASCULAR
- Cardiomyopathy 1

UROGENITAL
- Cystitis 1
- Kidney, nephrosis 4

ENDOCRINE

Adrenocortical carcinoma	1
Kidney pyelonephritis	1

MOUNTAIN LION

BODY AS A WHOLE

Autolysis	1

MOUSE

BODY AS A WHOLE

Autolysis	1
Normal tissue	2

ENDOCRINE

Lymphosarcoma	1

UROGENITAL

Membranoproliferative glomerulonephritis	1

OVINE

BODY AS A WHOLE

Abscess	1
Anticoagulant type toxicosis	1
Autolysis	2
Copper deficiency	2
Copper higher than normal	2
Copper marginal	1
Corynebacterium pseudotuberculosis	1
No diagnosis	2
Peritonitis	2
Scrapie	23
Septicemia	1
Septicemia, bacterial, miscellaneous	1
Septicemia, *Mannheimia haemolytica*	1
Septicemia, *Salmonella*	1
Toxicosis copper	6
Toxicosis, miscellaneous	1

DIGESTIVE	
Abomasum abomasitis, *Clostridium* sp.	1
Abomasum abomasitis, mycotic	1
Atrophic enteritis	1
Clostridium perfringens Type D	2
Enteritis, idiopathic	2
Enteritis, rotavirus	1
Feces, rotavirus	1
Gastrointestinal parasitism	5
Hemonchosis, acute abomasal hemorrhage	1
Hepatic lipidosis	1
Intestine enteritis, *Clostridium perfringens*	3
Intestine entertis, coccidia	10
Intestine enteritis, *Escherichia coli*	1
Intestine enteritis, *Salmonella*	1
Intestine parasitism, cestodes	1
Intestine parasitism, nematodirus	2
Intestine parasitism, strongyles	4
Intestine perforation	1
Rumen acidosis / grain overload	3
HEMIC AND LYMPHATIC	
Anemia	1
Lymphosarcoma	1
INTEGUMENTARY	
Dermatitis, *Staphylococcus aureus*	1
Fibroma	1
Panniculitis	1
MUSCULOSKELETAL	
Bone osteodystropy, rickets	1
NERVOUS	
Bacterial encephalitis, suppurative	1
Brain encephalomalcia, polio	1
Brain meningitis, suppurative	3
Brain, meningoencephalitis	1
Listeria monocytogenes encephalitis	1
RESPIRATORY	
Bacterial pneumonia	1
Bronchointerstitial pneumonia	4
Bronchopneumonia	2

Interstitial pneumonia	2
Lung pneumonia, abscess	1
Lung pneumonia, *Histophilus somni*	1
Lung pneumonia, *Mannheimia haemolytica*	8
Lung pneumonia, *Mycoplasma* sp.	2
Lung pneumonia, *Pasteurella multocida*	3
Meconium aspiration syndrome	1
Nasal carcinoma	1
Pneumonitis	1
SPECIAL SENSES	
Ear otitis interna	1
UROGENITAL	
Abortion, *Arcanobacterium pyogenes*	2
Abortion, *Campylobacter jejuni*	16
Abortion due to *Campylobacter*	2
Abortion due to *Chlamydia psittaci*	16
Abortion due to *Listeria monocytogenes*	1
Abortion with congenital anomaly	1
Abortion, Border disease virus	2
Abortion, Cache Valley virus	1
Abortion, goiter	
Abortion, hepatitis	1
Abortion, placentitis	10
Abortion, pneumonia	2
Abortion, *Toxoplasma gondii*	7
Bacterial abortion	2
Idiopathic abortion	6
Kidney, nephrosis	1
Kidney renal dysplasia	1
Uterus pyometra	1
Vas deferens	1

PORCINE

BODY AS A WHOLE	
Abscess	2
Autolysis	2
Circovirus identified -- no disease	208
Copper deficiency	1
Copper marginal	1
Erysipelas	3
Hemorrhage	2

Iron deficiency	1
No diagnosis	23
No histologic diagnosis	1
Normal tissue	13
Omphalitis (navel ill)	1
PCV2 dermatitis nephropathy syndrome	5
PCV2 disease multi-systemic	34
Peritonitis	8
Polyserositis	8
Polyserositis (*Haemophilus parasuis* Glasser's)	5
Polyserositis, *Streptococcus suis*	1
PRRS infection	3
Septicemia	6
Septicemia, *Actinobacillus suis*	1
Septicemia, *Arcanobacterium pyogenes*	6
Septicemia, bacterial, miscellaneous	4
Septicemia, *Erysipelothrix rhusiopathiae*	1
Septicemia, *Salmonella*	22
Septicemia, *Streptococcus suis*	2
Septicemic *Pasteurella multocida*	2
Serositis	1
Starvation / inanition	2
Virus isolation PRRS	24

CARDIOVASCULAR

Bacterial pericarditis	5
Heart anomaly	1
Heart cardiomyopathy, nutritional	1
Heart endocarditis, *Streptococcus suis*	1
Heart endocarditis, valvular	1
Mulberry heart disease	1
Myocardial necrosis	2
Myocarditis	1

DIGESTIVE

Atrophic enteritis	3
Bacterial enteritis	8
Clostridium perfringens, intestine	6
Colitis	13
Colitis, *Clostridium difficille*	4
Cryptosporidiosis	3
Enteritis colitis	10
Enteritis due to TGE	7
Enteritis, idiopathic	12
Enteritis, nursing total cases	78

Enteritis, weaned total cases	94
Gastric ulcer	8
Gastritis	2
Hepatitis	4
Hepatitis likely toxic	1
Hepatopathy	1
Hepatosis dietetica	1
Intestinal edema	1
Intestinal torsion	7
Intestine enteritis, calicivirus	1
Intestine enteritis, *Clostridium perfringens*	18
Intestine enteritis, *Clostridium perfringens* Type A	2
Intestine enteritis, *Clostridium perfringens* Type A Beta 2	13
Intestine enteritis, *Clostridium perfringens* Type C	1
Intestine enteritis, coccidia	7
Intestine enteritis, *Escherichia coli*	79
Intestine enteritis, *Escherichia coli* (AEEC)	5
Intestine enteritis, hemorrhagic bowel syndrome	2
Intestine enteritis, necrotic	2
Intestine enteritis, porcine proliferative	3
Intestine enteritis, rotavirus	48
Intestine enteritis, *Salmonella*	31
Intestine enteritis, typhlitis	1
Intestine enteritis, viral, miscellaneous	3
Liver hepatitis, parasitic	1
Mesenteric torsion	1
PCV2 disease enteritis	6
HEMIC AND LYMPHATIC	
Anemia	2
Lymphadenitis	2
Lymphadenopathy	1
Spleen splenitis	1
Splenitis	1
Tonsillitis	1
INTEGUMENTARY	
Cellulitis	2
Dermatitis, *Staphylococcus aureus*	1
Dermatitis, *Staphylococcus hyicus*	3
Dermatitis, poxvirus	1
Dermatitis, non-specific	3
Exudative epidermitis, greasy pig disease	2

MUSCULOSKELETAL

Arthritis	2
Bone osteodystrophy, rickets	2
Joint arthritis, *Arcanobacterium pyogenes*	3
Joint arthritis, *Haemophilus parasuis*	1
Joint arthritis, *Staphylococcus* sp.	2
Joint arthritis, *Streptococcus* sp.	1
Muscle myositis, *Clostridium*	1
Myopathy, monensin toxicity	1
Osteochondrosis	1

NERVOUS

Brain encephalomalacia, multifocal	1
Brain meningitis, *Arcanobacterium pyogenes*	3
Brain meningitis, *Escherichia coli*	1
Brain meningitis, non-suppurative	2
Brain meningitis, *Streptococcus suis*	15
Brain meningitis, suppurative	3
Meningitis	5

RESPIRATORY

Bronchointerstitial pneumonia	8
Bronchopneumonia	14
Inclusion body rhinitis	2
Interstitial pneumonia	8
Lung, alveolar pneumonia	1
Lung hemorrhage	1
Lung pleuritis	6
Lung pneumonia, *Actinobacillus pleuropneumoniae*	5
Lung pneumonia, *Actinobacillus suis*	10
Lung pneumonia, *Arcanobacterium pyogenes*	24
Lung pneumonia, bacterial, miscellaneous	4
Lung pneumonia, BALT	1
Lung pneumonia, *Bordetella* sp.	41
Lung pneumonia, *Haemophilus parasuis*	75
Lung pneumonia, *Mycoplasma hyopneumoniae*	51
Lung pneumonia, *Pasteurella multocida*	99
Lung pneumonia, PRRS	99
Lung pneumonia, *Salmonella* sp.	11
Lung pneumonia, *Streptococcus* sp.	2
Lung pneumonia, *Streptococcus suis*	89
Lung pneumonia, swine influenza virus	11
Lung pulmonary, atelectasis	1
Lung pulmonary, congestion	1
Nasal isolation, *Bordetella* sp.	1

Nasal isolation, *Haemophilus parasuis*	1
Nasal isolation, *Pasteurella multocida*	1
PCV2 disease pneumonia	46
Pleuritis	1
Rhinitis	5
SPECIAL SENSES	
Otitis externa	2
UROGENITAL	
Abortion associated with PRRS	6
Abortion, placentitis	3
Abortion, pneumonia	1
Bacterial abortion	3
Chronic tubulointerstitial nephritis	1
Cystitis	1
Glomerulonephritis	1
Idiopathic abortion	34
Nephritis	5
PRRS virus positive by PCR	85
Renal infaraction	1
Vagina, vaginitis, bacterial, miscellaneous	1
Vas deferens	2

PRAIRIE DOG

BODY AS A WHOLE	
Toxicosis, zinc phosphide	1

RABBIT

BODY AS A WHOLE	
Hemorrhage	1
Normal tissue	1
Septicemia, *Escherichia coli*	1
Septicemia, *Francisella tularensis*	1
Trauma	1
MUSCULOSKELETAL	
Vertebrae fracture	1
RESPIRATORY	
Lung edema	1

RACCOON

BODY AS A WHOLE		
	No diagnosis	8
	Trauma	1
RESPIRATORY		
	Interstitial pneumonia	1
DIGESTIVE		
	Intestine parasitism, ascarids	1
NERVOUS		
	Brain encephalitis, canine distemper	4
	Brain encephalitis, non-suppurative	1
	Brain encephalitis, viral, miscellaneous	1
	Brain, meningoencephalitis	1

RAT

INTEGUMENTARY		
	Neoplasm, squamous cell carcinoma	1

REPTILE

INTEGUMENTARY		
	Squamous cell carcinoma -- ocular	1
RESPIRATORY		
	Bronchopneumonia	1
DIGESTIVE		
	Gastric carcinoma	1
	Hepatitis lipidosis	1

SKUNK

BODY AS A WHOLE		
	No diagnosis	2

NERVOUS

Rabies	13

SQUIRREL

DIGESTIVE

Coccidiosis	1

NERVOUS

Brain encephalitis, protozoal, miscellaneous	1

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Thiex, N., and R. Larson. Oxytetracycline in animal feed, fish feed, and animal remedy products, liquid chromatography with fluorescence detection: Collaborative study. Feed Safety International Conference, Namur, Belgium (abstract 25).

Thiex, N. Reference methods for distillers grains. AOAC International Annual Meeting and Exposition Final Program (abstract P-813).

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Young, A. Update on the South Dakota Center for Infectious Disease Research and Vaccinology. Proceedings, SD Veterinary Medical Association:75.

Zeman, D.H. Failure of passive transfer and weak calf syndrome in beef calves: A case report from spring of 2007. Proceedings, SD Veterinary Medical Association:71.

Zeman, D.H. Biopsy service changes at the ADRDL – effective July 1, 2007. Animal Health Matters 10(2):2.

Zeman, D.H. Classical swine fever surveillance (hog cholera) at the SDSU ADRDL. Animal Health Matters 10(2):1-2.

Zeman, D.H. High containment facility needs of the ADRDL: An update. Animal Health Matters 10(2):1.

Zeman, D.H. Specimens in...results out. Animal Health Matters 10(1):1.

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Zeman, D.H., and J. Poindexter-Runge. Hardware disease associated with steel belted tires used as hay feeding stations: A new source of hardware for an old disease. Proceedings, SD Veterinary Medical Association:73-74.

Zhang, W. Research spotlight at SDSU Veterinary Science Department. Animal Health Matters 10(3):6-7.

Zhang, W., and D. H. Francis. Development of a gnotobiotic pig model for studying pathogenesis of enterotoxigenic *Escherichia coli* diarrhea. Joint Conference US/Japan Cooperative Medical Science Program—Cholera and Other Bacterial Enteric Infections:295.

Zhang, W., and D. Francis. Seeking answers for post-weaning diarrhea. The National Hog Farmer, December 17.

Zhao, M., D. Robertson, D.H. Francis, and W. Zhang. Toxicity reduction in mutant porcine STa toxins and chimeric STa proteins. Conference of Research Workers in Animal Diseases (abstract 69P).

PRESENTATIONS—2007

CHASE, CHRISTOPHER

1) Immunology 101: Immune response. What does it take to make vaccine take? Missouri Veterinary Medical Association, Lake Ozark, MO, January 19.
2) Applied immunology. Merial Swine Advisory Board, San Antonio, TX, January 26.
3) Vaccinology and the value of properly adjuvanted inactivated vaccine. Novartis Cow/Calf Symposium, San Antonio, TX, March 9; Sioux Falls, SD, April 27; Sedona, AZ, June 1;
4) Infectious bovine rhinotracheitis (IBR) and its impact on reproductive performance. Novartis Cow/Calf Symposium, San Antonio, TX, March 10; Nashville, TN, March 17; Sioux Falls, SD, April 28; Sedona, AZ, June 2; Niagra Falls, NY, June 30; Wisconsin Dells, WI, September 29.
5) Vaccinology and the value of properly adjuvanted inactivated vaccine. Novartis Cow/Calf Symposium, Nashville, TN, March 16.
6) Improving reproductive efficiency: Prevention of infectious bovine rhinotracheitis (IBR). Central Plains Dairy Expo, Sioux Falls, SD, March 21.

7) Advancements in challenge models and label claims for a commercial BVD vaccine. Boehringer Ingelheim Vetmedica conference call, May 2; May 3; May 4; May 8; May 9; May 10; and May 11.
8) Neonatal immunology. Novartis Animal Health Canada, Nanton, AL, June 12; Sherwood Park, AL, June 13; Saskatoon, SK, June 14; and Onanole, MB, June 15.
9) Dynamics of colostrum production. Novartis Animal Health Canada, Nanton, AL, June 12; Sherwood Park, AL, June 13; Saskatoon, SK, June 14; and Onanole, MB, June 15.
10) Valuable difference of a properly inactivated and adjuvanted vaccine. Novartis Dairy Symposium, Niagara Falls, NY, June 29; and Wisconsin Dells, WI, September 29.
11) The science of passive immunity. Novartis Scours Prevention Symposium, Snowbird, UT, August 3; Kansas City, MO, August 24; and Wisconsin Dells, WI, September 29.
12) Considerations for BVD and IBR vaccinations pre-calving. Novartis Scours Prevention Symposium, Snowbird, UT, August 4.
13) Vaccination considerations for pregnant cows. Novartis Scours Prevention Symposium, Kansas City, MO, August 25.
14) Innate immune response in bovine respiratory disease. Schering-Plough Animal Health, Hermiston, OR, September 12.
15) Primary immune response to vaccines (Part 1 and 2). Central Veterinary Conference, Kansas City, MO, September 15.
16) Diagnosing BVDV. Central Veterinary Conference, Kansas City, MO, September 15.
17) BVDV epidemiology: What do we understand about wildlife and chronic shedding? Central Veterinary Conference, Kansas City, MO, September 15.
18) Vaccinating in the face of outbreak: Why does it provide protection. Central Veterinary Conference, Kansas City, MO, September 15.
19) Bovine viral vaccines: Developing an effective program. Central Veterinary Conference, Kansas City, MO, September 15.
20) Pandemic infections: When does fact meet fiction? Central Veterinary Conference, Kansas City, MO, September 16.
21) IBR and BVDV: What effects immunosuppression? Central Veterinary Conference, Kansas City, MO, September 16.
22) When is the right time to vaccinate dairy cows? Central Veterinary Conference, Kansas City, MO, September 16.
23) Review/refresher, with emphasis on vaccinology. American Association of Bovine Practitioners, Vancouver, BC, Canada, September 20.
24) Porcine circovirus 2, Porcine Respiratory and Reproductive Syndrome Virus (PRRSV) and Porcine Respiratory Disease Complex. Yunnan Provincial Feed Association, Qujing, Yannan Province, China, November 12-13; Guizhou Provincial Feed Association, Guiyang, Guizhou Province, China, November 16-17; and Yunnan Provincial Feed Association, Nanning, Guangxi Province, China, November 18-19.

25) Immunology of the lung roundtable. Bovine Veterinarian/Schering Plough, Denver, CO, November 29.

DALY, RUSS

MEDIA

1) Health aspects of raising natural beef. WNAX radio, Yankton, SD, January 4.
2) Control of infectious reproductive diseases. River Valley Cooperative website interview, January 30.
3) Health aspects of raising natural beef. Today's Ag, February 2; and SDSU Ag Extension radio, February 2.
4) Calf health at calving time. Tri-State Neighbor, February 26.
5) Grass tetany. Northern Ag Network radio, April 18.
6) Anthrax prevention; West Nile and equine vaccinations. Today's Ag, April 27.
7) Anthrax. River Valley Cooperative website, May 2.
8) Large animal veterinarian shortage. Today's Ag, June 8.
9) Swine circovirus. WNAX radio, Yankton, June 13.
10) Calf health. Successful Farming, July 5.
11) Heat stress. KWAT Ag Hour, Watertown, July 24; KYNT radio, Yankton, July 24; SDSU Ag Communications, July 24; KELO-TV July 25; and WNAX radio, Yankton, July 26.
12) *E. coli* and disease transmission at fairs and petting zoos; heat stress. Today's Ag, July 25; and SDSU Ag Extension radio, July 25.
13) Anthrax and heat stress. Today's Ag, July 27.
14) Rabies, World Rabies Day. SDSU Ag Communications, September 5.
15) Bull tail necrosis. Bowdle Pioneer, October 5.
16) Pet plant toxicities. Canby News, November 26.

PRESENTATIONS

1) Proper use of animal health products, vaccination programs, and proper use. Annie's Project group meeting, Timber Lake, SD, January 8.
2) Pork quality assurance training. SD Pork Producers, Sioux Falls, SD, January 11; Brookings, SD, May 21.
3) Infectious reproductive diseases: The role of biosecurity. Ranchers' Workshop, Highmore, SD, January 16.
4) Health mandates of a "natural" production system—matching cattle to markets II: A "natural" approach meeting, Brookings, SD, January 17.
5) Reproductive health: Breeding soundness and disease prevention. Bull Selection Workshop, Ft. Pierre, SD, January 22; Faith, SD, January 25; Mobridge, SD, January 26.
6) Drylotting beef cows: Animal health considerations. Drylot Alternatives meeting, Aberdeen, SD, January 12; Huron, SD, February 12; Herried, SD, February 16; Watertown, SD, February 22; Sisseton, SD, February 22; and Gettysburg, SD, March 22.
7) Infectious diseases in the cow/calf herd: The role of biosecurity. Pfizer Leader's Edge Mid-winter Seminar, Brookings, SD, February 15.

8) Calving problems: Effects on the cow and calf. Crossroads Veterinary Clinic Producer's meeting, Bowdle, SD, February 26.
9) Health aspects of the older horse. North American Riding for the Handicapped Association Regional Conference, Brandon, SD, March 10.
10) Bovine viral diarrhea. 4-State Ruminant Backgrounding Program In-Service Training, Rapid City, SD, April 20; Corn, Cattle, and Energy Conference, Dickinson, ND, August 23; and Rapid City, SD, November 27.
11) SDSU Diagnostic Lab Update. Schering-Plough Animal Health Spring Veterinarians meeting, Sioux Falls, SD, April 25; and Watertown, SD, April 26.
12) Animal health in the feedlot. Land O'Lakes Feedlot Short Course, Brookings, SD, June 19.
13) Organic beef production: Animal health aspects. Organic Farming Workshop, Norris, SD, July 10.
14) Current animal health topics. SD Cattlemen's Association Pre-DakotaFest Mixer, Mitchell, SD, August 22.
15) Control of infectious reproductive diseases and vaccination timing in beef herds. Applied Reproductive Strategies in Beef Cattle, Billings, MT, September 11.
16) Animal health products: Vaccines and antibiotics. Women in Agriculture Regional Conference, Spearfish, SD, September 14.
17) A *Salmonella newport* outbreak in beef cows associated with BVDV-PI animals. American Association of Bovine Practitioners Convention, Vancouver, BC, Canada, September 21; American Association of Veterinary Laboratory Diagnosticians/United States Animal Health Association Conference, Reno, NV, October 20.
18) Health concepts for today's beef herds. Annie's Project Group, Union Center, SD, October 1.
19) Health programs for reducing morbidity. Corn, Cattle, and Energy Conference, Rapid City, SD, November 27.
20) Mycoplasmosis in the feedlot. Feedlot Extension Program, Parker, SD, December 6.
21) Beef quality assurance certification training. Bowdle, SD, December 13.

FANG, YING

1) Reverse genetics in PRRSV. Presented at four major animal disease research and diagnostic laboratories in China (Shanghai Veterinary Research Institute; China Agricultural University; Veterinary Medicine Institute of Guangdong Academy of Agricultural Sciences; and Fujian Academy of Agricultural Sciences), China.
2) The non-structural protein 2 of PRRSV: Implication of viral replication and pathogenesis. International PRRSV Symposium, Chicago, IL.
3) Nuclear localization of Nidovirus proteins: Implication in viral pathogenesis. Faculty seminar, Ag/Bio College, SDSU, Brookings, SD.
4) Diagnostics: New tools and challenges. American Association of Swine Veterinarians Workshop, Orlando, FL.

HARDWIDGE, PHILIP

1) Heat-labile enterotoxin enhances ETEC colonization of intestinal epithelial cells. American Society for Microbiology, Biodefense and Emerging Diseases, Washington, DC, February.
2) A global killer: How and why we study how EHEC causes diarrhea. Buena Vista University, Storm Lake, IA, May.
3) Molecular armaments of EHEC and ETEC. University of Texas Health Center, Tyler, TX, June.
4) Proteomic profiling of T2S proteins for ETEC vaccine development. Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, September.
5) Diarrheagenic *E. coli*. Brookings Health System, Brookings, SD, November.
6) Bacterial enterotoxins promote host colonization. U.S./Japan Joint Panel meeting on Cholera and Other Bacterial Enteric Infections, Austin, TX, December.

HOLLER, LARRY

1) Submission of samples for diagnosis of abortion. Diagnostic Laboratory Update, SDSU, Brookings, SD, January.
2) GM1 gangliosidosis, Parkinson's, and Mad Cows. Northwest Iowa Sheep Producers, Primghar, IA, January 4.
3) Lambing time workshop. Spencer, IA, January 20.
4) Sheep production medicine. Hartley, IA, January 26.
5) Diagnosis of small ruminant abortions. Midwest Veterinary Conference, Columbus, OH, February.
6) Zoonotic diseases and sheep production. Midwest Veterinary Conference Columbus, OH, February.
7) Sheep production medicine. Midwest Veterinary Conference, Columbus, OH, February.
8) Ovine GM1 gangliosidosis. Midwest Veterinary Conference, Columbus, OH, February.
9) Gross diagnosis of neonatal lamb mortalities. Brookings County Sheep Forum, December 12.
10) Improving feeder lamb health. SDSGA Convention, Lead, SD, September 29.

MISKIMINS, DALE

1) Pregnancy toxemia in beef heifers. SDVMA annual meeting, Sioux Falls, SD, August 13-15.
2) Tracheal edema in a feedlot steer. SDVMA annual meeting, Sioux Falls, SD, August 13-15.
3) Sarcina-associated abomasitis in dairy calves. SDVMA annual meeting, Sioux Falls, SD, August 13-15.

NEIGER, REGG

1) Viral hemorrhage septicemia. Dakota Black Goose facility, Lake Preston, SD, March 21.

PILLATZKI, ANGELA

1) Pillatzki, A.E. Fatal thymic hemorrhage in a dog. SDVMA annual meeting, Sioux Falls, SD, August.
2) Pillatzki, A.E. Potomac horse fever. SDVMA annual meeting, Sioux Falls, SD, August.

THIEX, NANCY

1) Collaborative evaluation and development of recommended methods for distillers grains. Distillers Grains Technology Council Symposium, Louisville, KY, May.

ZEMAN, DAVID

1) Failure of passive transfer and weak calf syndrome in beef calves: A case report from spring of 2007. SDVMA annual meeting, Sioux Falls, SD, August.
2) Hardware disease associated with steel belted tires used as hay feeding stations: A new source of hardware for an old disease. SDVMA annual meeting, Sioux Falls, SD, August.

RESEARCH PROJECTS

Animal Health

AH-024 Unique mechanisms of B cell subset development and function in domestic animals—Young, Nelson, Daniel (October 2004-September 2009)

AH-157 Bovine viral diarrhea virus infections in cattle: An emphasis on pathogenesis and diagnostics—Chase, Daly, Graham, Holler (October 2006-September 2011)

AH-161 Identification of antibacterial, antiadhesive and antidiarrheal compounds from native plants—Francis (October 2006-September 2011)

Experiment Station

G-200 Acquisition of the BioPlex Suspension Array System for multiplex assay development in swine research—Christopher-Hennings, Fang, Sauer, Wang, Sutton, Chase, Nelson (September 2007-August 2008)

G-224 Development of a vaccine for protecting weaned pigs from enterotoxigenic *Escherichia coli*—Francis, Young (October 2004-September 2009)

H-044 Role of intestinal epithelial cells in mucosal immunity of domestic animals—Kaushik, Nil (October 2004-September 2009)

H-174 Development of avian metapneumovirus binding and entry assays and determination of suitable cell lines for receptor discovery—Li (October 2006-September 2008)

H-177 Quantification of enterotoxin-mediated enhancement of bacterial adherence to intestinal epithelial cells—Hardwidge, Francis (October 2006-September 2008)

H-180 *In vivo* evaluation of genetic markers in the Nsp2 region of porcine reproductive and respiratory syndrome virus—Fang (October 2006-September 2008)

H-203 Influenza A virus RNA polymerase complex assembly—Li (July 2007-June 2010)

H-209 Discovery and characterization of novel ETEC antigens for human vaccine development—Hardwidge (August 2007-September 2009)

H-213 Parasite issues in South Dakota Beef Production—Hildreth, Epperson (October 2003-September 2008)

H-232 Mechanisms of immune tolerance and BVDV persistence in sheep—Young, Chase (October 2007-September 2009)

H-244 Analysis of pesticides and related compounds—Matthees (October 2004-September 2009)

R-159 An integrated approach to the control of bovine respiratory diseases (NC-1027)—Chase, Daly (October 2006-September 2011)

R-194 Porcine reproductive and respiratory syndrome: Methods for the integrated control, prevention and elimination of PRRS in U.S. swine herds (NC-229)—Christopher-Hennings, Nelson, Fang (October 2004-September 2009)

R-235 Domestic surveillance, diagnosis, and therapy of transmissible spongiform encephalopathies—Young, Graham (October 2005-September 2010)

R-362 Enteric diseases of swine and cattle: Prevention, control and food safety (NC-1007)—Francis, Nelson, Young (October 2002-September 2007)

S-376 Survey of infectious, toxicologic, and nutritional diseases of livestock—Diagnostic Laboratory (July 1986-September 2009)

S-996 Analytical Services—Olson Biochemistry Laboratory (Ongoing Project)

National Pork Board

- Development of a non-antibiotic selection vector for developing a live vaccine against ETEC-associated porcine post-weaning diarrhea (PWD) —Zhang, Francis (September 2007-December 2008)
- Elimination of PRRSV from semen: On farm mechanical and antiviral methods—Christopher-Hennings, Fang, Nelson (October 2007-October 2008)
- Characterization of genetic markers in the Nsp2 region of PRRSV: Implications for future recombinant marker vaccine development—Fang, Nelson, Christopher-Hennings, Knudsen (December 2006-December 2008)
- Porcine circovirus associated disease induced immune dysfunction—Hesse, Rowland, Thacker, Fang, Wyatt (December 2007-November 2008)
- Strategy to include STa antigen for eveloping vaccines against post-weaning diarrhea disease—Zhang, Fang, Francis (July 2007-June 2008)

Schering-Plough Animal Health

- Comparison of the distribution of vaccine antigen in tissues of calves following vaccination—Chase, Holler (December 2006-June 2008)

USDA/APHIS/Veterinary Services

- Classical Swine Fever Surveillance—Zeman, Christopher-Hennings, Graham, ADRDL/VS Molecular Diagnostic Section (April 2007-May 2008)
- Foot and mouth laboratory equipment—Zeman, Christopher-Hennings, Graham (September 2007-July 2008)

USDA/CSREES

- Avian influenza preparedness and response team—Cassel, Graham, Brashier, Daly, Kightlinger, King, Tablante, Zimmerman (June 2007-June 2009)

USDA/CSREES, Four State Ruminant Consortium

- Extension, outreach, and research programs for beef cattle producers and backgrounders in the 4-state area—Maddock, Daly, Wright, Lardy, Petry, Stamm, Paterson, Cantalupo, Paisley (October 2006-June 2008)

USDA/CSREES/NRI CAP (JDIP)

- Development of an *in vitro* bovine small intestine epithelial cell culture model for studying the pathogenesis of Johne's disease—Kaushik, Sreevatsan, Christopher-Hennings (April 2007-April 2009)

USDA/CSREES/National Animal Health Lab Network

- Zeman, Graham (July 2007-June 2008)

USDA/Food Safety and Inspection Service

- Food Emergency Response Network: Enhancement of laboratory testing capability at the SDSU ADRDL—Ruesch, Zeman (September 2007-August 2008)

USDA/National Research Initiative

- A model for Chronic Wasting Disease in Muntjac deer—Young, Bessen, Richt, Knudsen (August 2007-August 2009)
- Genetic marker development in the Nsp2 region of a European-like PRRSV: Implications for future recombinant marker vaccine development—Fang (September 2005-August 2008)
- The role of PRRSV non-structural proteins 1 and 2 in host immunity—Fang, Lunney, Young, Nelson, Christopher-Hennings (January 2008-December 2010)

USDA/National Research Initiative, PRRS Integrated Program

- Characterization of PRRSV minor glycoproteins for use in a second-generation vaccine—Faaberg, Nelson, Lopez, Yoo (December 2004-December 2007)
- PRRSV surveillance, elimination and immunity in boars and boar semen—Christopher-Hennings, Munoz-Zanzi, Loskutoff, Lunney, Nelson (April 2006-December 2007)
- Production of monoclonal antibodies against the PRRSV non-structural proteins—Fang, Murtaugh, Nelson (October 2005-January 2008)
- The role of PRRSV non-structural protein 2 in viral replication—Fang, Guan, Rowland (June 2006-January 2008)

National Institute of Health, NIAID

- Developing a piglet model to study human ETEC-associated diarrhea—Zhang, Francis (July 2007-June 2009)
- Emerging virulence factors in *E. coli* 0157:H7 pathogenesis—Hardwidge, Finlay (June 2007-May 2009)
- Germinal center function in prion disease—Young, Bartz, Richt (April 2007-March 2009)
- Mechanism of action of the HIV-1 maturation inhibitor PA-457—Li, Hardwidge (May 2007-April 2009)

NIAID/Rocky Mountain Regional Center of Excellence, Biodefense and Emerging Infectious Diseases Research

- A novel assay for viral assembly inhibitors—Li (May 2007-April 2008)

National Science Foundation

- Role of peyers patches in neonatal development—Butler, Francis (July 2007-August 2010)

Chronix Biomedical/South Dakota EPSCoR

- Circulating nucleic acids derived from follicular dendritic cells as a diagnostic marker for scrapie pathogenesis—Young, Urnovitch, Richt (January 2008-December 2008)

Egyptian and Educational and Cultural Bureau

- Training grant for Egyptian scientists—Chase (July 2000-December 2007)

Novartis Animal Health

- Chimeric PRRSV vaccines development based on a US Type 1 PRRSV full-length cDNA infectious clone—Fang (October 2006-December 2009)

- Comparison of the immune response between a pair of NCP and CP bovine viral diarrhea virus (BVDV) type 1 isolates—Chase, Young, Ridpath, NADC, Rural Technologies, Inc. (July 2005-July 2008)
- Determination of the cell mediated immune response in animals vaccinated with Virashield 6—Chase, Young, Rural Technologies, Inc. (March 2007-December 2007)

Pfizer Animal Health, Inc.

- Summer pneumonia in beef calves—Daly, Smith, Seeger, Stokka, Groteluschen (April 2008-April 2009)

South Dakota Board of Regents

- Center for Infectious Disease Research and Vaccinology—Francis (August 2004-June 2009)

South Dakota Department of Health, Centers for Disease Control

- South Dakota West Nile virus surveillance and epidemiological project: Mosquito survey—Hildreth (2001-2009)

South Dakota Governor's 2010 Initiative Research Centers Program/Center for Infectious Disease Research and Vaccinology/SDSU

- A porcine model for enterotoxigenic *E. coli* strains afflicting humans—Hardwidge, Francis (July 2005-June 2008)
- Characterization of ETEC surface antigens that invoke a protective immune response—Hardwidge (August 2007-August 2008)
- Developing a platform using K88 fimbriae to express a LT epitope antigen—Zhang, Francis (January 2008-June 2008)

South Dakota Poultry Industries Association

- Poultry education and travel—Zeman, Graham (2007-2008)

South Dakota State University/ Bentley Undergraduate Award

- Mechanism of the enterohemorrhagic *E. coli* EspR1 and N1eH1 proteins—Hardwidge (September 2007-April 2008)

COURSE OFFERINGS—DEPARTMENT OF VETERINARY SCIENCE

VET 103	Introduction to Veterinary Medicine, 1 cr. (Hamilton)
VET 223	Anatomy and Physiology of Domestic Animals, 4 cr. (Erickson)
VET 403/503	Animal Diseases and Their Control, 3 cr. (Daly)
VET 424/524	Medical and Veterinary Virology, 3 cr. (Wang, Chase)
VET 491/591	Independent Study, 1-3 cr. (Veterinary Science Faculty)
VET 492/592	Topics, 1-3 cr. (Veterinary Science Faculty)
VET 493	Workshop, 1-4 cr. (Veterinary Science Faculty)
VET 494	Internship, 1-12 cr. (Veterinary Science Faculty)
VET 494-S01	Internship—Vet Anatomy II, 3 cr. (Erickson)
VET 494-S02	Internship—Vet Microbiology, 1 cr. (Chase
VET 496	Field Experience, 1-12 cr. (Veterinary Science Faculty)
VET 497	Cooperative Education, 1-12 cr. (Veterinary Science Faculty)
VET 498	Undergraduate Research/Scholarship, 1-4 cr. (Veterinary Science Faculty)
VET 592	Tp—Immunology, 3 cr. (Chase)
VET 623	Advanced Mammalian Physiology, 5 cr. (Erickson)
VET 788	Master's Research Problems, 2-3 cr. (Veterinary Science Faculty)
VET 791	Independent Study, 1-4 cr. (Veterinary Science Faculty)
VET 792	Tp—Immunology,3 cr. (Chase)
VET 792-S02	Tp—Molecular Diagnostics/PCR, 3 cr. (Christopher-Hennings)
VET 792-S03	Tp—Faculty Seminar, 1 cr. (Hardwidge)
VET 792-S04	Tp—Advanced Immunology, 2 cr. (Chase)
VET 792-S04	Tp—Monoclonal Antibody Production, 1cr. (Fang)
VET 792-S05	Tp—Scientific Writing, 2 cr. (Young)

VET 792-S06	Tp—Flow Cytometry, 1 cr. (Young)
VET 793	Workshop, 1-4 cr. (Veterinary Science Faculty)
MICR 424	Medical and Veterinary Virology, 3 cr. (Wang, Chase)
MICR 439	Medical and Veterinary Immunology, 3 cr. (Kaushik, Young, Chase)
MICR 440L	Infectious Disease Lab, 3 cr. (Braun)
MICR 492	Tp—Immunology, 3 cr. (Chase)
MICR 592	Tp—Medical and Veterinary Immunology, 3 cr. (Kaushik, Young, Chase)
BIOS 662	Advanced Molecular and Cellular Biology, 6 cr. (Chase)
BIOS 663	Advanced Concepts Infectious Disease, 6 cr. (Young, Chase)
BIOS 798	Thesis—Veterinary Science, 1-7 cr. (Veterinary Science Faculty)
BIOS 898D	Dissertation—PhD, Bio/Micro, 1-7 cr. (Veterinary Science Faculty)
BIOS 898D	Dissertation—PhD, Veterinary Science, 1-7 cr. (Veterinary Science Faculty)
ZOOL 423/523	Advanced Mammalian Physiology, 4 cr. (Erickson)