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Veterinary and Biomedical Sciences

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2007

# South Dakota Animal Disease Research and Diagnostic Laboratory: Annual Report 2007

Animal Disease Research and Diagnostic Laboratory, South Dakota State University

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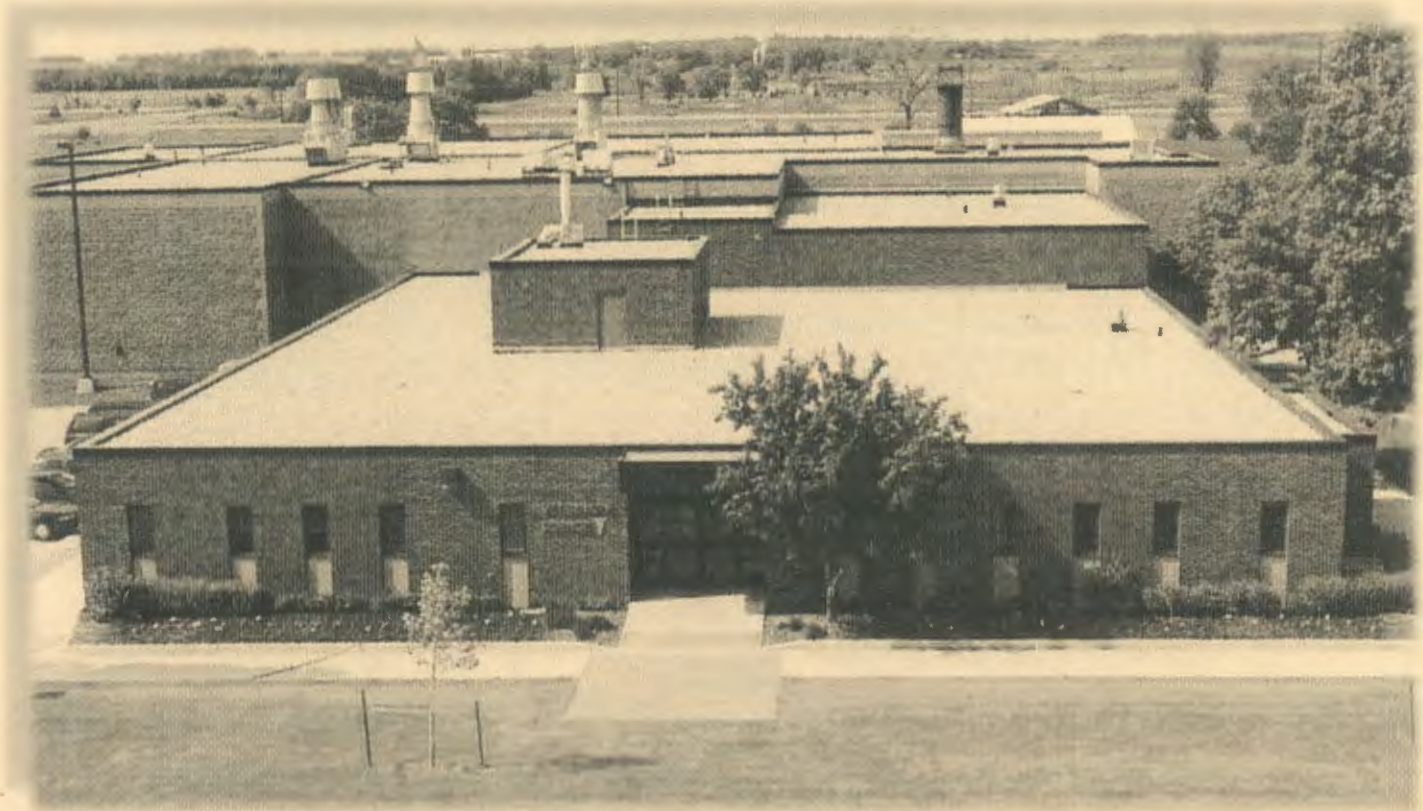
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**SOUTH DAKOTA**

# **ANIMAL DISEASE RESEARCH & DIAGNOSTIC LABORATORY**



## **ANNUAL REPORT 2007**

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# **SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY**

**FY 2007 Annual Report  
July 1, 2006 - June 30, 2007**

## **MISSION: VETERINARY SCIENCE DEPARTMENT**

To protect and improve the health of animals, the viability of the SD livestock industry, and the welfare of society through high quality diagnostic, 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 livestock industry, other animal owners, and society at large.

## **MISSION: RESEARCH**

To pursue basic and applied investigations that enhance the understanding of the induction of diseases in animals, to develop diagnostic methods for the detection of diseased animals, products for treatment or prevention of disease, and management protocols for the control of disease.

## **MISSION: VETERINARY EXTENSION**

To transfer information and provide educational opportunities to veterinarians, producers, county agents, and other interested individuals regarding animal health.

## **MISSION: TEACHING AND ADVISING**

Provide high quality animal health and biomedical science courses for the training of undergraduate Pre-veterinary and Animal Science students and graduate Veterinary Infectious Disease students. Effectively advise students in the Pre-veterinary curriculum.

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Annual Report—Fiscal Year 2007**

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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 lab serves all animal owners, but especially the food-animal industry via 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 third cooperative agreement grant with USDA in that regard. The grant provides funds for important operational and coordination activities of the NAHLN. This year the laboratory also received a significant equipment grant for molecular diagnostic equipment through the NAHLN.

The lab performed 426,569 test procedures in FY07 compared to 440,519 in FY06. Although down slightly this year, the workload is still nearly double what it was a decade ago. 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 483 rabies examinations during the past year. Our Food Safety section performed 981 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 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. Avian influenza Virus surveillance of both wild birds and domestic poultry continued for a second 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 1,189 animals in FY07.

The ADRDL continues to move forward in adapting new technology. The molecular diagnostic section added a pooled ear-notch PCR test for BVD virus this year. That test can significantly decrease the per animal test cost for carrier animal screening. The molecular group also maintains proficiency in Foot and Mouth Disease and Classical Swine Fever (CSF/Hog Cholera). The ADRDL received a grant this year 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 417 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.

In addition to diagnostics, 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 22 publications in refereed science journals and 82 other publications. In addition they made 99 professional and scientific presentations during FY07. This list demonstrates the department's strong commitment to generate new knowledge and our willingness to update the scientific 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. A high containment addition advocacy committee has been formed by our stakeholders and is active along with the ADRDL Advisory Committee. This is encouraging, because the need for high containment space in the ADRDL exists now and is rapidly growing. 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.



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

## DIAGNOSTIC HIGHLIGHTS – 2006

- 1) Value-Added Diagnostics for the Small Animal Practice: Clinical Pathology and Surgical Biopsy Services – David Knudsen, DVM, MS, DACLAM
- 2) Progress in Studying Enterotoxigenic *Escherichia coli* (ETEC)-Associated Porcine Post-Weaning Diarrhea (PWD) – Weiping Zhang, PhD and David Francis, PhD



## **Value-Added Diagnostics for the Small Animal Practice: Clinical Pathology and Surgical Biopsy Services**

David Knudsen DVM, MS, DACLAM  
Professor, Department of Veterinary Science  
Section Head, ADRDL Clinical Pathology  
South Dakota State University

Although South Dakota has traditionally been an agricultural, livestock intensive state, and will continue to be for the foreseeable future, there is also an increasing amount of interest in small animal practice. The state is slowly becoming more urbanized, with more clinics being restricted to small animal practice only, but even in rural areas the mixed animal practice is experiencing more small animal caseload as a result of societal changes and increased interest among the public in quality medical care for their pets. Also, there have been recent increases in the agricultural production of non-traditional species – fur, aquaculture, and others – in which antemortem diagnostic testing can play an important role.

The ADRDL Clinical Pathology Service has grown over the past several years to become a truly full-service resource for all sectors of veterinary practice in the state. Validated, high quality testing in hematology, clinical chemistry, cytology, fluid analysis, fecal testing, general parasitology, and endocrinology are offered and performed regularly in support of quality veterinary care throughout the region. Additionally, we have tried to address and anticipate many of the changes in case demographics and increasing case load in several ways.

One of the most frequently performed tests in our lab is the complete blood count, a panel of many hematologic tests that in most cases provides diagnostic insight into the animal's physiologic state. Our approach to blood counts has been automated cell counting coupled with manual examination of the blood smear. Using a laser-based hematology analyzer, the cell count numbers generated are accurate and timely, and can be carefully controlled through the performance of daily quality control procedures using both normal and abnormal controls. Even the best analyzers on the market, ours included, cannot be expected to be equally accurate over the diversity of species that we test on a daily basis. Our analyzer discriminates well in erythrocyte parameters between species, but machine generated white cell differential patterns are problematic; size and shape are not the only criteria looking at white cells, and there are significant species differences in nuclear morphology and cytoplasmic granulation that seem to be missed by automated analyzers. Microscopic examination of the blood smear gives us an opportunity to provide a correct white cell differential, as well as an examination of red cell morphology, platelet characterization, cell inclusions, and any atypical cells.

Clinical chemistry analysis for metabolites, electrolytes, and enzymes of interest is another traditional role for the clinical pathology lab. Our chemistry analyzer is an open-channel, wet reagent system that can be applied to a wide variety of species, samples, and

tests. All testing that is performed is stringently controlled for accuracy and specificity through the use of daily normal and abnormal controls as well as frequent calibration controls. As with hematology and other test methods, we also participate in quarterly proficiency testing provided by an outside service that compares our routine testing results with other laboratories across North America.

Most of our samples for clinical chemistry testing are from the acute patient, and our same-day testing has been of great value for the practitioner. In recent months, though, more veterinary clinics and hospitals across the region have been adding point-of-care (POC) chemistry analyzers to their practices. These analyzers are convenient and deliver almost immediate results, but can suffer from inaccuracies due to a lack of regular quality control, statistical calibration, and troubleshooting based on results tracking. Some practices have now begun to submit paired samples to our lab as a means of confirming or validating analytic results from their analyzer. In a sense, we are providing a reference laboratory service for the quality control of POC testing.

Another traditional area of interest in diagnostic testing for the clinical patient has been cytology and the analysis of fluids, such as urine, cavity transudates, and inflammatory exudates. Cytologic accessions to the lab sometimes require multiple staining methods to fully examine. If submission of the fluid itself is not possible, we ask that at least two air-dried, unstained smears (in addition to any stained smears) be submitted to maximize the diagnostic information and interpretation of the sample. In recent months we have also seen an increase in bone marrow cytology cases. Preparation of diagnostic smears for these cases can be challenging if not done routinely; please call our laboratory if you have any questions prior to sample collection.

We have also seen an increase in general parasitology and parasite identification in recent years. For small animal species, part of this increase is due to the recognition of emerging parasitic diseases in these species, such as enteric trichomoniasis in cats. We have also been increasingly asked to identify parasites from numerous wild animal and fish samples, not only in support of aquaculture and wildlife management, but also to answer diagnostic questions regarding potential zoonotic and "wildlife to pet" diseases, and to help with control measures through the determination of parasite life cycles. A large part of our parasitology caseload is coupled to fecal examination; depending on the host species, multiple antigen-capture fecal ELISA tests are also used in combination with bacterial culture and more traditional direct fecal examination by flotation.

In July 2007, the ADRDL instituted some changes to the Surgical Biopsy Service as part of our ongoing efforts to optimize diagnostic services. The most important change was that lab schedules were modified to ensure that a written diagnostic report will be faxed to the submitter within 24 hours of our receipt of the sample. This rapid biopsy report includes a morphologic diagnosis, or at least our initial impression of the lesion pending additional stains, and additional interpretation as indicated. After the case is finalized, we are also available for phone consultation during regular business hours at no additional charge.

Another change is that a team of veterinary pathologists rotate through the service, giving a high priority to expertise and shortened turn-around time. Each case is assigned to one team member, with challenging cases reviewed by all. Team members are Dr. David Zeman, Dr. Tanya Graham, and Dr. David Knudsen.

David Zeman DVM, PhD, DACVP is a veterinary graduate of Oklahoma State University and PhD graduate of Louisiana State University, where he also completed his veterinary pathology residency. He joined the ADRDL in 1986, and is now laboratory director. He was designated South Dakota veterinarian of the year in 2003 by the SDVMA, and laboratory diagnostician of the year in 2006 by the American Association of Veterinary Laboratory Diagnosticians (AAVLD). He particularly enjoys infectious disease investigations and tumor biopsies.

Tanya Graham DVM, DACVP graduated from Oklahoma State University in 1994, then completed her residency in veterinary pathology and joined the pathology faculty at Texas A&M University during her five year stay. She then worked as a diagnostic pathologist at the University of Pennsylvania for two years, and moved to the ADRDL in 2000. She is associate director of the laboratory, and section head of Histopathology and Immunohistochemistry. Currently, her interests beyond routine diagnostic pathology include avian pathology and regulatory diagnostic medicine.

David Knudsen DVM, MS, DACLAM is a 1982 graduate of Colorado State University and was in mixed animal practice for three years before completing residencies in veterinary pathology and laboratory animal medicine at University of Missouri – Columbia. After five years on staff at University of California – Davis, he was a private consultant in veterinary and comparative pathology for pharmaceutical and biotechnology companies before joining the ADRDL in 2002 as a diagnostic pathologist and section head for Clinical Pathology.

As in the past, a typical biopsy case accession includes processing and examination of up to 3 masses or samples from the same patient, up to 2 special stains as needed, written report plus phone consultation as needed, and return of the shipping container with fresh formalin, for a single case charge of \$20 plus a \$8 case generation fee. There is no additional charge for decalcification, but an additional day for processing is generally required. Biopsy shipping containers, which include a small jar of formalin and a slide mailer for cytologic samples, are available for a nominal initial fee.

Recent changes, expansion of services, and anticipating needs of the practitioner have all played a critical role in laboratory function for the ADRDL over the past year, and will continue to do so in the future. Together with other diagnostic sections of the ADRDL, the Clinical Pathology and Surgical Biopsy services continue to offer quality diagnostic testing for all sectors of the veterinary profession in South Dakota and the region.

## **Progress in studying enterotoxigenic *Escherichia coli* (ETEC)-associated porcine post-weaning diarrhea (PWD)**

Weiping Zhang, PhD and David Francis, PhD

Post-weaning diarrhea (PWD) caused by enterotoxigenic *Escherichia coli* (ETEC) is economically one of the most important diseases in the swine industry. Porcine PWD is characterized by severe diarrhea, dehydration, slow growth, weight loss, and death. It is estimated that ETEC-associated PWD disease can cause deaths of up to 5% of young pigs in a herd, and near \$100 million loss each year for swine producers in the U.S. alone. Yet, there are no commercial vaccines or effective treatments available to protect weaned pigs from PWD.

Key virulence factors in PWD are believed to be bacterial fimbriae and enterotoxins produced by ETEC strains. Bacterial fimbriae attach *E. coli* strains to the porcine small intestines and cause bacterial colonization. Then, the colonized *E. coli* strains secrete enterotoxins, mainly heat-labile (LT) and heat-stable (STa, STb) toxins, which stimulate fluid super-secretion and result in diarrhea. However, our recent studies indicated that pathogenesis of PWD could be more complicated and other virulence factors could also be involved in the disease, which makes it even more difficult to develop effective vaccines or treatments against PWD in pigs.

### **Virulence factors in ETEC-associated PWD**

Enterotoxigenic *E. coli* strains expressing K88 (F4), F18, K99, 987P and F41 fimbriae have been isolated from young pigs with diarrhea. K88, 987P, K99, or F41 fimbrial *E. coli* are typically associated with neonatal diarrhea, whereas K88 and F18 fimbrial strains are the dominant pathogens found in pigs with PWD. These *E. coli* strains produce one or more enterotoxins [LT, STa, STb; another toxin, Stx2e, is associated with porcine edema disease (ED)]. Our study on 304 *E. coli* strains isolated from pigs with PWD suggested that other virulence factors including enteroaggregative *E. coli* toxin 1 (EAST1), and non-fimbrial adhesins: adhesin involved in diffuse adherence (AIDA-I), porcine attaching and effacing-associated factor (paa) and *E. coli* attaching and effacing factor (EAE), could contribute to porcine PWD.

Prevalence of virulence factors associated with PWD: we found that fimbrial *E. coli* strains isolated from pigs with PWD express K88 (64.6%), F18 (34.3%), F41 (0.57%), K99 (0.57%), 987P (0%), LT (57.7%), STb (72.6%), STa (27.4%), Stx2e (17.4%), EAST1 (35%), AIDA-I (26.9%), paa (60%), and EAE (1.1%). These data indicate that K88 and F18, and LT and STb are still the dominant fimbriae and enterotoxins associated with PWD, respectively. However, it is noticeable that EAST1 is commonly associated with PWD, and the paa adhesin shows surprisingly high prevalence in PWD.

The most common pathotypes associated with PWD are K88/LT/STb (42.5%), K88/LT/STb/EAST1 (23.9%), and F18/STa/STb/Stx2e (31.7%).

## Virulence factors known to cause PWD

In an early classical study, Smith and Lingood found that an *E. coli* producing either K88 fimbria or LT toxin alone did not cause diarrhea in young pigs. Instead, an *E. coli* strain has to produce both fimbriae and toxin to be diarrheagenic. That does not suggest that an *E. coli* strain producing one of any fimbriae and one of any toxin is diarrheagenic. Identification of virulence determinants (i.e. the fimbria and the enterotoxin which are essential to cause PWD) becomes critical for understanding the disease and developing strategies to prevent or control this disease.

**Distribution of enterotoxin genes in fimbrial *E. coli* strains isolated from pigs with post-weaning diarrhea. \* indicates the total number of isolates contain the fimbrial gene.**

fimbria	no toxin	LT only	STb only	STa only	Stx2e only	EAST1 only	toxin genes							
							LT/STb	STa/STb	LT/STa/STb	LT/STb/EAST1	STa/STb/EAST1	STa/STb/Stx2e	LT/STa/STb/EAST1	Stx2e/STa/STb/EAST1
K88 (113)*	12	1	0	0	0	8	48	0	9	27	1	0	7	0
F18 (60)	15	1	1	0	0	5	2	2	1	2	0	19	1	5
F41 (1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0
K99 (1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0

To identify virulence determinants in PWD, we developed a study model using a model pathogen (a genetically engineered *E. coli* strain expressing only one fimbria and one enterotoxin of interest) and conducting animal challenge studies using gnotobiotic (germ free) piglets. We found an *E. coli* strain expressing K88ac fimbria and LT toxin causes severe diarrhea disease in all pigs, and a strain producing K88ac fimbria and STb causes disease in 60 – 70% of pigs. A strain expressing K88ac and STa toxin cause mild diarrhea in all pigs, but a strain expressing K88 fimbria alone does not cause any disease. Significance of EAST1 and STx2e currently are under investigation in our laboratory. This piglet model developed by us has great potential to study pathogenesis of human diarrhea and other enteric diseases.

## Vaccine development against PWD

Since nearly 70% of PWD cases are associated with the K88 *E. coli* strains and that LT, STa and STb play important role(s) in PWD, antigens from K88 fimbria, LT, STa and STb enterotoxins must be included as components for developing effective vaccines against PWD. Antigen from F18 fimbria may also be included in a vaccine since one third of *E. coli* strains isolated from pigs with PWD express F18 fimbria.

Our ongoing USDA-funded vaccine project using antigens from K88ac, LT and STb shows great potential. A vaccine developed from this study is able to protect pigs from K88 fimbrial ETEC strains. Currently, we are working on another study including STa as vaccine component, and seeking funds to complete this research project.

### **Future development in PWD pathogenesis and vaccines**

It is clear that antigens from F18 fimbria and perhaps EAST1 toxin need to be included as vaccine components because of their prevalence in *E. coli* strains associated with PWD. However, determination of their virulence significance in PWD will be the first step towards their application as antigens in vaccine development. Recognition of F18 fimbria to the host receptors and correlation between such recognition and clinical disease in hosts need to be further characterized. In addition, studying the virulence significance of non-fimbrial adhesins in PWD, especially paa, may help us to understand better the pathogenesis of PWD and develop strategies to prevent or control this disease.

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**FACULTY AND STAFF**  
**July 1, 2006 – June 30, 2007**

**ADMINISTRATION**

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Tanya Graham, DVM, Associate Professor, Diplomate ACVP, Associate Director

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Russell Daly, DVM, MS, Assistant Professor

**FOOD SAFETY**

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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

Traci Schroeder, BS, Laboratory Technician (6-21-07)

Joel Zebill, Laboratory Technician



### **MOLECULAR DIAGNOSTICS**

Jane Christopher-Hennings, DVM, MS, Associate Professor – Section Leader  
Matthew Dammen, BS, Senior Microbiologist  
Simon Althoff, BS, Microbiologist  
Travis Clement, BS, Microbiologist  
Rebecca Hewer, BS, Microbiologist  
Gina Steinlicht, BS, Microbiologist  
Shelleen Weeks, BS, Microbiologist

### **QUALITY CONTROL**

Rajesh Parmar, MS, Laboratory Quality Manager  
Shelleen Weeks, BS, Microbiologist, Assistant Quality Manager

### **RESEARCH**

David Francis, PhD, Professor, Research Coordinator  
Michael Hildreth, PhD, Professor  
Christopher Chase, DVM, PhD, Professor, Diplomate ACVM, Virology and Immunology  
Eric Nelson, PhD, Professor  
Jane Christopher-Hennings, DVM, MS, Associate Professor  
Alan Erickson, PhD, Professor  
Feng Li, PhD, Associate Professor  
Alan Young, PhD, Associate Professor  
Philip Hardwidge, PhD, Assistant Professor  
Radhey Kaushik, PhD, Assistant Professor  
Ying Fang, PhD, Assistant Research Professor  
Weiping Zhang, PhD, Assistant Research Professor  
Marie-Laure Sauer, PhD, Post Doctoral Fellow (11-15-06)  
Aaron Harmon, PhD, Post Doctoral Research Associate  
Yuejin Weng, PhD, Post Doctoral Research Associate  
Lyle Braun, MS, Senior Microbiologist  
Stacy Lindblom-Dries, BS, Microbiologist  
Collette Stacey-Oda, BS, Microbiologist  
Diane Baker, MS, Agriculture Research Manager Specialist  
Scott Kistler, BS, Livestock Superintendent (6-21-07)  
Dong He, MS, Bioimaging Research Associate  
Jun Lin, MS, Biochemistry Research Associate  
Mojun Zhao, MS, Researcher II  
Eric Brown, BS, Laboratory Technician  
Devan Schomp, BS, Laboratory Technician (9-29-06)  
Manal Mahmoud, DVM, MS, Visiting Scientist  
Katy Lloyd, International Exchange Research Student

### **TOXICOLOGY**

Regg Neiger, DVM, PhD, ADRDL Toxicology Coordinator  
Station Biochemistry Personnel

### **CHEMICAL SAFETY/BIO SAFETY**

Alan Erickson, PhD, Professor, Chemical Safety Officer  
Alan Young, PhD, Associate Professor, Safety Committee Chair

### **SEROLOGY**

Eric Nelson, PhD, Professor – Section Leader  
Linda Fawcett, BS, Senior Microbiologist  
Aaron Singrey, BS, MS, Senior Microbiologist  
Jeanine Dodson, BS, Microbiologist (5-21-07)  
Jennifer Lemon, BS, Microbiologist  
Craig Welbon, BS, Microbiologist  
Mary Thompson, BS, Research Assistant II

### **VIROLOGY**

Pam Leslie-Steen, MS, Assistant Professor – Section Leader  
Stacey Wessels, BS, Senior Microbiologist  
Jerri Rogers, BS, Microbiologist  
Cindy Appelt, BS, Laboratory Technician  
Christopher Chase, DVM, PhD, Professor  
Lyle Braun, MS, Senior Microbiologist

### **CLERICAL STAFF**

Rita Miller, Office Supervisor  
Gerri Murphy, Word Processor  
Evonne Freyberg, Secretary  
Margaret Janssen, Secretary  
Janice Kampmann, Secretary  
Nan Nesbit, Secretary  
Lori Huber, Staff Assistant (8-9-06)  
Kim Hyland, Staff Assistant

### **INFORMATION SYSTEMS**

Jon Greseth, Computer Support Analyst

### **HUMAN RESOURCES**

Russell Lokken, BS, MBA, Program Assistant II  
Susan Ust, Senior Secretary (12-28-06)  
Kelly Bakken, Senior Secretary  
Sandra Gustafson, Senior Claims Clerk

### **MAINTENANCE**

Jerry Anderson, Senior Building Maintenance Worker

### **NECROPSY**

Myron Olson, Laboratory Technician

### **ADJUNCT PROFESSORS**

David Benfield, PhD  
Richard Harland, DVM, MVS  
Sarah Patrick, PhD  
Carol Rinehart, PhD  
James Robl, PhD  
Raymond Rowland, 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  
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  
Marina Grigoryeva, Laboratory Technician (12-29-06)  
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  
Graduate Coordinator  
Bersabeh Tigabu, DVM, Graduate Research Assistant (2-21-07)  
Seung Yon Koh, MS, Graduate Research Assistant (2-21-07)  
Omot Abi, BS, Graduate Research Assistant  
JingJing Bao, MS, Graduate Research Assistant  
Brandon Berkenpas, BS, Graduate Research Assistant (12-21-06)  
Elizabeth Brown, BS, Graduate Research Assistant  
Frank Echtenkamp, BS, Graduate Research Assistant  
Annessa Furr, BS, Graduate Research Assistant  
Xaiofei Gao, MS, Graduate Research Assistant  
Anna Hermanson, BS, Graduate Research Assistant  
Amber Johnson, BS, Graduate Research Assistant  
Haixia Liu, MS, Graduate Research Assistant (5-25-07)  
Kristina Mateo, MS, Graduate Research Assistant  
Neerja Mishra, BS, Graduate Research Assistant (2-21-07)  
Kristen Rietsema, BS, Graduate Research Assistant  
Dan Wang, MS, Graduate Research Assistant  
Mackenzie Westby, BS, Graduate Research Assistant  
Wu Xun Lu, BS, Graduate Research Assistant

## **SOUTH DAKOTA**

### **ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY**

#### **AWARDS AND RECOGNITION**

**July 1, 2006 – June 30, 2007**

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

Bryan Gildemeister	10 years
Eddie Hamilton	10 years
Gina Steinlicht	10 years
Nancy Anderson	20 years
Evonne Freyberg	20 years
Sandy Gustafson	20 years
Terri VanErem	30 years
Shirley Mittan	40 years

**SOUTH DAKOTA  
ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY  
ADVISORY COMMITTEE**

**JULY 1, 2006 – JUNE 30, 2007**

**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**  
Tony Leif

**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  
Dayton Williams, DVM, President (2006-2007)  
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, 2006 – JUNE 30, 2007**

Mariecil Aguiar, Katie Bahr, Laura Balias, Molly Beckfeld, Nellie Benson, Stephanie Biddle, Karen Boegler, Brandon Boswell, Tiffany Bradley, Rachel Breen, Holly Bruns, Molly Brunsting, Catherine Coursen, John Cox, Ryan Fedeler, Christine Ferderer, Brandon Fishbach, Ashley Fleischhacker, James Francis, Julie Garry, Joy Gibbons, Lisa Goeden, Jamie Gosch, Ashley Grajczyk, Sherif Halawiesh, Nicole Hansen, Elizabeth Hanson, Joseph Hermerka, Veronika Holbeck, Susan Holler, Amy Hopf, Kelley Johnson, Kalahari Kastelic, Nicole Kreis, Tim Kruse, Megan Kuipers, Jeremy Lemire, Kristen Letcher, Brad Lindblom, Yun Luo, Erin McMahon, Jessica Mediger, Julie Mengenhausen, Kari Meyer, Michelle Monson, Travis Myers, BreAnn Neiger, Kristen Nelson, Gina Neu, Amanda Oppold, Camille Owens, Derek Peterson, Matt Poppens, Karen Prins, Becky Pullen, Lindsey Reister, Naomi Ries, Lori Rotert, Suzanne Roth, Margaret Rudolph, Nathan Runke, Anne Schafer, Tyler Schmidt, Amanda Schmig, Loni Schumacher, John Schwartz, Amber Seekamp, Courtney Shade, Charles Stangoehr, April Swartos, Lindsey Taschner, Michelle Temple, Dan Timblin, Douglas Timm, Amber VanHout.

**OLSON BIOCHEMISTRY LABORATORY**

**HOURLY ASSISTANTS**

Matthew Alford, Heidi Chilcoat, Kevin Combs, Christopher Couglin, Christina Fanning, Jared Hammon, Luke Holmoe, Sarah Jensen, Alycia Krcil, Rachel Lewis, Heather Licht, Amy Lippert, Andrea Lucas, Laura Mehlbrech, Ballie Nash, Jennifer Neal, Gonzalves Ntwali, Devan Otto, Paul Panitzke, Kacy Salter, Jaci Schreier, Joseph Small, Cory Smith, Derek Timm, Emily Winsel

**SOUTH DAKOTA**  
**LIST OF REPORTABLE AND QUARANTINABLE DISEASES**  
**JULY 2006**

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 <u>B.abortus</u> , <u>B. melitensis</u> ,* <u>B.suis</u> , and <u>B.ovis</u>	X	X
Brucellosis caused by <u>B.canis</u>	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 <u>Mycoplasma</u> sp)	X	
Contagious Caprine Pleuropneumonia*	X	X
Contagious Equine Metritis	X	X
Cryptosporidiosis	X	
Cysticercosis (metacestode stage of <u>Taenia saginata</u> or <u>Taenia solium</u> )	X	
Dermatophilosis	X	
Diphtheria ( <u>Corynebacterium diphtheriae</u> )	X	
Duck Viral Enteritis	X	
Duck Viral Hepatitis	X	
Enzootic Abortion in Ewes ( <u>Chlamydia</u> )	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 ( <i>Pasteurella multocida</i> )	X	
Fowl Pox	X	
Fowl Typhoid	X	X
Glanders	X	
Giardiasis	X	
Hemorrhagic Septicemia ( <i>Pasteurella multocida</i> )	X	
Herpesvirus of Salmonids	X	
Histoplasmosis	X	
Horse Mange ( <i>Sarcoptes</i> )	X	
Hydatid Disease ( <i>Echinococcus granulosus</i> or <i>Echinococcus multilocularis</i> )	X	
Infectious Bursal Disease	X	
Infectious Hematopoietic Necrosis	X	
Infectious Bovine Rhinotracheitis (IBR-IPV)	X	
Leishmaniasis	X	
Leptospirosis	X	
Listeriosis	X	
Lyme's Disease ( <i>Borrelia burgdorferi</i> )	X	
Malignant Catarrhal Fever	X	
Marek's Disease	X	
<i>Mycoplasma gallisepticum</i> (MG)	X	
<i>Mycoplasma synoviae</i> (MS)	X	
Newcastle Disease	X	X
Ovine Pulmonary Adenomatosis	X	
Paramyxovirus (2-9)	X	
Paratuberculosis (Johne's disease)	X	
Plague ( <i>Yersinia pestis</i> )	X	X
Potomac Horse Fever	X	
PRRS	X	
Pseudorabies	X	X
Pullorum Disease	X	X
Q-fever ( <i>Coxiella burnetii</i> )	X	
Rabies	X	X
Rocky Mountain Spotted Fever	X	
Salmonellosis ( <i>S. abortus ovis</i> )	X	
Salmonellosis ( <i>Salmonella enteritidis</i> )	X	
Salmonellosis ( <i>Salmonella</i> Newport MDR-Ampc)	X	
Salmonellosis ( <i>Salmonella typhimurium</i> )	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 ( <u>Francisella tularensis</u> )	X	
Vesicular Exanthema*	X	X
Vesicular Stomatitis*	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 Piroplasmiasis or Babesiosis,  
Babesia (Piroplasma) equi, B. caballi)  
 Glanders (Pseudomonas mallei)  
 Horse Pox  
 Japanese Encephalitis  
 Surra (Trypanosoma evansi)  
 Venezuelan Equine Encephalomyelitis (VEE)  
 Enterovirus Encephalomyelitis

**SOUTH DAKOTA**

**ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY**

**NATIONAL ANIMAL HEALTH REPORTING SYSTEM  
(NAHRS)**

**JULY 1, 2006 – JUNE 30, 2007**

**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 Horse Sickness  
African Swine Fever  
Classical Swine Fever (Hog Cholera)  
Highly Pathogenic Avian Influenza (Fowl Plague)  
Exotic Newcastle Disease

**OIE List B Diseases**

<u>Species</u>	<u>Disease</u>
All Species	Anthrax ( <i>Bacillus anthracis</i> )
All Species	Aujeszky's Disease (Pseudorabies)
All Species	Echinococcosis/Hydatidosis
All Species	Heartwater ( <i>Cowdria ruminantium</i> )
All Species	Leptospirosis
All Species	Q-Fever ( <i>Coxiella burnetti</i> )
All Species	Rabies
All Species	Paratuberculosis/Johne's Disease ( <i>Mycobacterium paratuberculosis</i> )
All Species	New and Old World Screwworm ( <i>Cochliomyia (Callitroga) hominivorax</i> , ( <i>Chrysomya) bezziana</i> )
All Species	Trichinellosis ( <i>Trichinella spiralis</i> )

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

\*Avian includes commercial poultry ONLY.

Caprine/Ovine	Scrapie
Caprine/Ovine	MAEDI-VISNA/Ovine Progressive Pneumonia
Equine	Contagious Equine Metritis ( <i>Taylorella equigenitalis</i> )
Equine	Dourine ( <i>Trypanosoma equiperdum</i> )
Equine	Epizootic Lymphaginitis ( <i>Histoplasma farciminosum</i> )
Equine	Equine Encephalomyelitis (Eastern (EEE) or Western (WEE))
Equine	Equine Infectious Anemia (EIA)
Equine	Equine Influenza (Virus Type A)
Equine	Equine Piroplasmiasis (Babesiosis, <i>Babesia (Piroplasma) equi, B. caballi</i> )
Equine	Equine Rhinopneumonitis (EHV-1 and EHV-4)
Equine	Glanders ( <i>Pseudomonas mallei</i> )
Equine	Horse Pox
Equine	Equine Viral Arteritis (EVA)
Equine	Japanese Encephalitis
Equine	Horse Mange
Equine	Surra ( <i>Trypanosoma evansi</i> )
Equine	Venezuelan Equine Encephalomyelitis (VEE)
Porcine	Atrophic Rhinitis of Swine ( <i>Bordetella bronchiseptica, Pasteurella multocida</i> )
Porcine	Porcine Cysticercosis ( <i>Cysticercus cellulosae</i> )
Porcine	Porcine Brucellosis ( <i>Brucella suis</i> )
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	<i>Oncorhynchus masou</i> Virus Disease

\*\*Aquaculture includes commercial food fish ONLY.

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**July 1, 2006 - June 30, 2007**

**ANALYSIS OF WORK LOAD**

Requests for Laboratory Assistance

<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>Total</u>
1,790	2,381	2,192	2,419	2,147	1,807	2,070	1,896	2,197	2,172	2,282	1,928	25,281

Laboratory Examinations

26,460	34,861	34,069	39,085	44,062	37,060	39,008	31,884	35,801	35,222	35,942	33,115	426,569
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**WORK LOAD COMPARISON WITH PRIOR YEARS**

Requests for Laboratory Assistance

<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>	<u>FY02</u>	<u>FY03</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	<u>FY07</u>
15,665	17,237	17,626	22,135	23,852	24,907	26,919	24,187	25,923	25,551	25,281

Laboratory Examinations

245,279	268,147	282,726	462,066	497,205	561,026	530,407	477,987	448,569	440,519	426,569
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**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Total Laboratory Procedures Conducted – FY07**

I.	Pathology		
A.	Necropsy Cases .....		1,802
II.	Clinical Pathology		
A.	Hematology		
1.	Complete Blood Count (CBC).....	850	
2.	Blood Count.....	106	
3.	Coombs .....	3	
4.	Hematocrits .....	6	
5.	Pre-surgical Evaluation.....	10	
6.	Retic Count .....	1	
B.	Urine and Fluids		
1.	Urinalysis .....	62	
2.	Cytology .....	93	
3.	Fluids Analysis.....	7	
4.	Rumen pH .....	9	
C.	Clinical Chemistry		
1.	Serum Chemistry Profiles		
a.	Dairy Management.....	87	
b.	Electrolyte (Anion Gap).....	3	
c.	Equine .....	205	
d.	Food Animal .....	510	
e.	Large Animal Pre-surgical.....	17	
f.	NSAIDS .....	20	
g.	Porcine .....	5	
h.	Renal .....	4	
i.	Ruminant.....	172	
j.	Small Animal .....	361	
k.	Small Animal Pre-surgical.....	258	
2.	Individual Tests		
a.	Acetest.....	1	
b.	Albumin .....	103	
c.	Alkaline Phosphorus .....	3	
d.	Alanine Transaminase (ALT) .....	4	
e.	Amylase .....	2	
f.	Aspartate Transamin .....	49	
g.	Beta Hydroxybutyrate.....	128	
h.	Bile Acid .....	19	
i.	Bilirubin, Direct.....	22	
j.	Bilirubin, Total.....	4	
k.	BUN .....	183	
l.	Calcium .....	132	

	m.	Chloride.....	30
	n.	Cholesterol.....	20
	o.	Creatinine.....	10
	p.	Gamma Glutamyl Transferase.....	28
	q.	Globulin.....	8
	r.	Glucose.....	36
	s.	Iron.....	3
	t.	Lactate Dehydrogen.....	1
	u.	Lipase.....	36
	v.	Magnesium.....	93
	w.	Non-esterified Fatty Acid (NEFA).....	91
	x.	Phosphate.....	121
	y.	Potassium.....	102
	z.	Protein, Total.....	21
	aa.	Sodium.....	22
D.		Parasitology	
	1.	Fecal Flotation.....	948
	2.	Fecal Sedimentation.....	26
	3.	Cryptosporidia Examination.....	817
	4.	Fecal Occult Blood.....	12
	5.	Hemoparasite Examination.....	3
	6.	<i>Tritrichomonas</i> Culture.....	3,220
E.		Immunology	
	1.	Bovine IgG Assay.....	77
	2.	Cortisol.....	3
	3.	Fecal ELISA	
	a.	Coronavirus.....	906
	b.	Rotavirus.....	867
	4.	Giardia.....	66
	5.	Parvovirus.....	50
	6.	Thyroid Hormone.....	471
	7.	Heartworm Antigen.....	25
	8.	Electron Microscopy.....	58
III.		Histopathology	
	A.	Histopathology	
	1.	Immunohistochemistry.....	3,377
	2.	Tissue Sections – H & E.....	19,611
	3.	Tissue Sections – Special Stains.....	344
		<b>Pathology Subtotal.....</b>	<b>36,144</b>
IV.		Microbiology	
	A.	Bacteriology	
	1.	Acid Fast Stain.....	2
	2.	Aerobic Culture.....	16,531
	3.	Anaerobic Culture.....	1,808
	4.	Antimicrobial Susceptibility Panels.....	1,862
	5.	Brucellosis Culture.....	14
	6.	<i>Campylobacter</i> Culture.....	323

7.	<i>Clostridium difficile</i> Toxin A/B II .....	30
8.	<i>Clostridium</i> Direct FA .....	13
9.	Darkfield Screen .....	168
10.	<i>Escherichia coli</i> Serotyping.....	498
11.	Giemsa Anthrax Screen .....	68
12.	Gram Stain .....	15
13.	Johne's Culture .....	479
14.	<i>Leptospira</i> FA .....	448
15.	Listeria Culture .....	39
16.	Milk Bulk Tank Culture.....	75
17.	Milk Sample Culture.....	376
18.	Mycology Culture .....	1,236
19.	<i>Mycoplasma</i> Culture .....	644
20.	<i>Mycoplasma</i> Milk Screen .....	53
21.	Non-specific Fluorescence Test.....	327
22.	<i>Salmonella</i> Serotyping.....	201
B.	Food Safety	
1.	<i>E. coli</i> Petrifilm.....	127
2.	<i>E. coli</i> 0157:H7 PCR.....	77
3.	Fast Antimicrobial Screen.....	43
4.	<i>Listeria monocytogenes</i> .....	66
5.	<i>Listeria</i> spp.....	109
6.	Modified Fast Antimicrobial Screen.....	47
7.	<i>Salmonella</i> BAX PCR.....	450
8.	<i>Salmonella</i> RTE.....	62
	<b>Microbiology Subtotal .....</b>	<b>26,191</b>
C.	Serology	
1.	Anaplasmosis	
	Card.....	18
	Competitive Enzyme-linked Immunoassay .....	2,040
	CF.....	161
2.	Avian Influenza	
	Agar Gel Immunodiffusion (AGID) .....	2,206
3.	Bluetongue	
	Agar Gel Immunodiffusion .....	4
	Enzyme-Linked Immunoassay (ELISA).....	807
4.	Bovine Leukosis Virus	
	AGID.....	9
	ELISA .....	11,270
5.	Bovine Respiratory Syncytial Virus	
	SN .....	712
6.	Bovine Viral Diarrhea Virus	
	Antigen Capture ELISA (Serum).....	266
	ELISA (Ear Notch) .....	21,070



7.	Bovine Viral Diarrhea Virus I	
	SN .....	1,680
8.	Bovine Viral Diarrhea Virus II	
	SN .....	1,598
9.	<i>Brucella</i>	
	BAPA.....	2,838
	Card.....	3,182
	CF.....	624
	Plate.....	1,636
	Rivanol.....	43
	Tube .....	679
10.	<i>Brucella</i> – Canine	
	Rapid Slide Agglutination Test (RSAT).....	324
11.	<i>Brucella ovis</i>	
	ELISA .....	2,176
12.	Caprine Arthritis Encephalitis.....	263
13.	Chronic Wasting Disease (BioRad ELISA).....	2,543
14.	Epizootic Hemorrhagic Disease	
	AGID.....	12
15.	Equine Infectious Anemia	
	AGID.....	201
	ELISA .....	3,170
16.	Feline Immunodeficiency Virus	
	ELISA .....	40
17.	Feline Infectious Peritonitis	
	ELISA .....	30
18.	Feline Leukemia Virus	
	ELISA .....	44
19.	Infectious Bovine Rhinotracheitis	
	SN .....	1,109
20.	<i>Leptospira</i>	
	<i>bratislava</i> .....	1,062
	<i>canicola</i> .....	1,062
	<i>grippotyphosa</i> .....	1,062
	<i>hardjo</i> .....	1,062
	<i>icterohaemorrhagiae</i> .....	1,062
	<i>pomona</i> .....	1,062
21.	<i>Mycoplasma hyopneumoniae</i>	
	ELISA .....	4,337
22.	<i>Neospora</i>	
	ELISA .....	854
23.	Ovine Progressive Pneumonia	
	AGID.....	689
24.	Parainfluenza-3	
	SN .....	688
25.	Paratuberculosis (Johne's)	
	ELISA .....	77,267

26.	Porcine Parvovirus	
	HI .....	228
27.	Porcine Respiratory and Reproductive Syndrome	
	ELISA .....	112,888
	Fluorescent Focus Neutralization (FFN) .....	995
	IFA (US Strain).....	6,766
	IFA (Euro Strain) .....	3,085
28.	Pseudorabies	
	gB ELISA.....	4,197
	Latex Agglutination .....	442
29.	Pseudorabies Differential Test	
	G1 ELISA .....	115
30.	Swine Influenza Virus	
	H1N1.....	3,522
	H3N2.....	3,522
	H1N1 ELISA .....	159
	H3N2 ELISA .....	159
	H1N1 Pfizer Strain .....	363
31.	Toxin A IgA (ELISA).....	156
32.	Toxin A IgG (ELISA).....	
	<b>Serology Subtotal .....</b>	<b>287,556</b>

D. Virology

1.	Bovine	
a.	Bovine Respiratory Syncytial Virus ELISA .....	25
b.	Bovine Respiratory Syncytial Virus FA .....	614
c.	Bovine Viral Diarrhea Virus ELISA.....	2,478
d.	Bovine Viral Diarrhea Virus FA.....	1,762
e.	Coronavirus FA.....	573
f.	Herpes Infectious Bovine Rhinotracheitis VI.....	2
g.	Infectious Bovine Rhinotracheitis Virus FA.....	1,134
h.	Parainfluenza-3 Virus FA .....	30
i.	Rotavirus FA.....	558
j.	Virus Isolation.....	2,170
2.	Canine	
a.	Adenovirus FA.....	12
b.	Coronavirus FA.....	24
c.	Distemper Virus FA.....	38
d.	Herpesvirus FA.....	13
e.	Parvovirus FA .....	39
f.	Virus Isolation.....	13
3.	Equine	
a.	Herpesvirus FA .....	23
b.	Virus Isolation.....	20

4.	Feline	
a.	Feline Infectious Peritonitis FA .....	2
b.	Feline Panleukopenia Virus FA .....	11
c.	Feline Toxoplasma IFA .....	1
d.	Viral Rhinotracheitis .....	4
e.	Virus Isolation.....	7
5.	Ovine	
a.	Border Disease Virus FA .....	102
b.	Coronavirus FA.....	25
c.	Parainfluenza-3 Virus FA .....	42
d.	Respiratory Syncytial Virus FA.....	43
e.	Rotavirus FA.....	30
f.	<i>Toxoplasma</i> IFA.....	98
g.	Virus Isolation.....	39
6.	Porcine	
a.	Circovirus II FA .....	352
b.	Parvovirus FA .....	5
c.	Porcine Reproductive & Respiratory Syndrome Virus FA..	572
d.	Porcine Reproductive & Respiratory Syndrome Virus VI ..	463
e.	Pseudorabies FA .....	14
f.	Rotavirus FA .....	252
g.	Swine Influenza Virus Directigen.....	40
h.	Swine Influenza Virus FA .....	515
i.	Transmissible Gastroenteritis Virus FA.....	270
j.	Virus Isolation.....	214
7.	Wild/Other Animal	
a.	Bovine Viral Diarrhea Virus FA.....	53
b.	Coronavirus FA.....	6
c.	Distemper Virus FA.....	16
d.	Infectious Bovine Rhinotracheitis Virus FA.....	14
e.	Panleukopenia FA.....	1
e.	Parainfluenza-3 Virus FA .....	1
f.	Respiratory Syncytial Virus FA.....	12
g.	Rotavirus FA.....	6
h.	Virus Isolation.....	62
8.	Rabies .....	483
	<b>Virology Subtotal .....</b>	<b>13,283</b>

V.	Molecular Diagnostics	
1.	Avian Influenza.....	1,494
2.	BLV.....	298
3.	BVD .....	994
4.	Circovirus.....	2,127
5.	Circovirus Sequencing.....	50
6.	Classical Swine Fever .....	14
7.	<i>Clostridium</i> Genotype.....	92
8.	<i>Escherichia coli</i> .....	526
9.	Johne's .....	2,015

	10.	<i>Lawsonia intracellularis</i> .....	35
	11.	<i>Mycoplasma bovis</i> .....	20
	12.	<i>Mycoplasma hyopneumoniae</i> .....	340
	13.	PRRS .....	42,675
	14.	PRRS Sequencing .....	509
	15.	<i>Tritrichomonas foetus</i> .....	5
		<b>Molecular Diagnostics Subtotal .....</b>	<b>51,194</b>
VI.		<b>Prion Contract Testing</b>	
	1.	Prion CWD and Scrapie .....	1,189
		<b>Contract Testing Subtotal .....</b>	<b>1,189</b>
VII.		<b>Analytical Chemistry</b>	
		Diagnostic (feed, water, and animal specimens)	
	1.	Total Analyses .....	10,115
	2.	Total Samples .....	897
		<b>Toxicology Subtotal .....</b>	<b>11,012</b>
VIII.		<b>Summary of Laboratory Procedures</b>	
	A.	Pathology .....	36,144
	B.	Microbiology .....	26,191
	C.	Serology .....	287,556
	D.	Virology .....	13,283
	E.	Molecular Diagnostics .....	51,194
	F.	Prion Contract Testing .....	1,190
	G.	Toxicology/Chemistry .....	11,012
		<b>Total Laboratory Procedures .....</b>	<b>426,569</b>

**SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY  
IN VITRO ANTIMICROBIAL DRUG SENSITIVITY TESTS  
JULY 1, 2006 – JUNE 30, 2007**

**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

	<i>Bordetella avium</i>			<i>Enterococcus sp.</i>			<i>Escherichia coli</i>			Gram-Negative Bacteria		
	S	M	R	S	M	R	S	M	R	S	M	R
Amoxicillin	3	1	2	1	0	0	19	0	24	0	0	2
Ceftiofur	2	2	2	1	0	0	41	1	1	1	0	1
Clindamycin	0	0	6	0	0	1	0	0	43	0	0	2
Enrofloxin	5	1	0	1	0	0	42	0	1	2	0	0
Erythromycin	0	2	4	0	1	0	0	0	43	0	0	2
Florfenicol	2	0	4	0	1	0	12	25	6	0	1	1
Gentamycin	6	0	0	0	1	0	22	4	17	1	0	1
Neomycin	5	0	1	0	0	1	30	0	13	2	0	0
Novobiocin	2	0	4	1	0	0	0	0	43	0	0	2
Oxytetracycline	5	0	1	1	0	0	5	0	38	1	0	1
Penicillin	0	0	6	1	0	0	0	0	43	0	0	2
Spectinomycin	2	1	3	0	0	1	4	19	20	0	0	2
Streptomycin	2	0	4	0	0	1	16	0	27	1	0	1
Sulphadimethoxine	3	0	3	0	0	1	11	0	32	0	0	2
Sulphathiazole	0	3	3	0	0	1	0	11	32	0	1	1
Tetracycline	5	0	1	1	0	0	5	0	38	1	0	1
Trimethoprim / Sulphamethoxazole	3	0	3	1	0	0	42	0	1	1	0	1
Tylosin Tartrate	N/A			N/A			N/A			N/A		

AVIAN IN VITRO SENSITIVITY TESTS CON'T)

	<i>Haemophilus</i> sp.			Hemolytic <i>Escherichia coli</i>			<i>Klebsiella pneumoniae</i>			<i>Klebsiella</i> sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Amoxicillin	2	0	0	1	0	0	0	0	4	0	0	3
Ceftiofur	1	0	1	1	0	0	3	1	0	3	0	0
Clindamycin	1	0	1	0	0	1	0	0	4	0	0	3
Enrofloxin	1	1	0	1	0	0	4	0	0	3	0	0
Erythromycin	1	1	0	0	0	1	0	0	4	0	0	3
Florfenicol	2	0	0	0	1	0	0	3	1	1	2	0
Gentamycin	2	0	0	1	0	0	1	0	3	3	0	0
Neomycin	2	0	0	1	0	0	2	0	2	3	0	0
Novobiocin	2	0	0	0	0	1	0	0	4	0	0	3
Oxytetracycline	0	0	2	1	0	0	0	0	4	0	0	3
Penicillin	0	0	2	0	0	1	0	0	4	0	0	3
Spectinomycin	0	1	1	0	0	1	0	0	4	1	2	0
Streptomycin	2	0	0	1	0	0	0	0	4	2	0	1
Sulphadimethoxine	2	0	0	0	0	1	0	0	4	3	0	0
Sulphathiazole	0	2	0	0	0	1	0	0	4	0	3	0
Tetracycline	0	0	2	1	0	0	0	0	4	0	0	3
Trimethoprim / Sulphamethoxazole	2	0	0	1	0	0	2	0	2	3	0	0
Tylosin Tartrate	N/A			N/A			N/A			N/A		

AVIAN IN VITRO SENSITIVITY TESTS (CON'T)

	<i>Ornithobacterium rhinotrachealis</i>			<i>Pasteurella multocida</i>			<i>Pasteurella sp.</i>			<i>Pseudomonas aeruginosa</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Amoxicillin	2	0	0	4	0	0	8	0	0	0	0	3
Ceftiofur	2	0	0	4	0	0	8	0	0	0	0	3
Clindamycin	2	0	0	0	0	4	0	0	8	0	0	3
Enrofloxin	0	0	2	4	0	0	8	0	0	1	1	1
Erythromycin	2	0	0	0	4	0	0	6	2	0	0	3
Florfenicol	2	0	0	4	0	0	8	0	0	0	0	3
Gentamycin	2	0	0	4	0	0	8	0	0	3	0	0
Neomycin	2	0	0	4	0	0	7	0	1	3	0	0
Novobiocin	2	0	0	3	0	1	2	0	6	0	0	3
Oxytetracycline	2	0	0	3	0	1	1	0	7	0	0	3
Penicillin	0	0	2	3	0	1	2	0	6	0	0	3
Spectinomycin	0	1	1	0	4	0	0	8	0	0	0	3
Streptomycin	2	0	0	3	0	1	7	0	1	0	0	3
Sulphadimethoxine	0	0	2	4	0	0	5	0	3	0	0	3
Sulphathiazole	0	1	1	0	4	0	0	5	3	0	1	2
Tetracycline	2	0	0	3	0	1	1	1	6	0	0	3
Trimethoprim / Sulphamethoxazole	1	0	1	3	0	0	7	0	1	0	0	3
Tylosin Tartrate	N/A			0	0	2	N/A			N/A		

AVIAN IN VITRO SENSITIVITY TESTS (CON'T)

	<i>Salmonella</i> sp.			<i>Staphylococcus</i> coagulase -		
	S	M	R	S	M	R
Amoxicillin	6	0	4	1	0	0
Ceftiofur	10	0	0	1	0	0
Clindamycin	0	0	10	0	1	0
Enrofloxin	10	0	0	0	1	0
Erythromycin	0	0	10	1	0	0
Florfenicol	7	2	1	1	0	0
Gentamycin	9	1	0	1	0	0
Neomycin	7	0	3	1	0	0
Novobiocin	0	0	10	1	0	0
Oxytetracycline	6	0	4	1	0	0
Penicillin	0	0	10	1	0	0
Spectinomycin	0	6	4	0	0	1
Streptomycin	6	0	4	1	0	0
Sulphadimethoxine	3	0	7	1	0	0
Sulphathiazole	0	6	4	0	1	0
Tetracycline	6	0	4	1	0	0
Trimethoprim / Sulphamethoxazole	10	0	0	1	0	0
Tylosin Tartrate	N/A			N/A		



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**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

	<i>Acinetobacter</i> sp.			<i>Actinobacillus</i> sp.			<i>Bacillus cereus</i>			<i>Bacillus</i> sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	0	1	1	0	0	1	3	1	0
Ceftiofur	0	0	1	2	0	0	0	0	1	3	0	1
Chlortetracycline	1	0	0	2	0	0	1	0	0	3	0	1
Clindamycin	0	0	1	0	0	2	1	0	0	2	1	1
Danofloxacin	1	0	0	2	0	0	1	0	0	3	0	1
Enrofloxin	1	0	0	2	0	0	1	0	0	4	0	0
Erythromycin	N/A			N/A			N/A			1	0	0
Florfenicol	0	0	1	2	0	0	1	0	0	4	0	0
Gentamycin	1	0	0	2	0	0	1	0	0	3	0	1
Neomycin	1	0	0	0	0	2	1	0	0	3	0	1
Oxytetracycline	1	0	0	0	0	2	1	0	0	3	0	1
Penicillin	0	0	1	0	0	2	0	0	1	3	0	1
Spectinomycin	0	0	1	0	2	0	0	0	1	3	0	1
Sulphachlorpyridazine	N/A			N/A			N/A			1	0	0
Sulphadimethoxine	1	0	0	0	0	2	1	0	0	3	0	1
Sulphathiazole	N/A			N/A			N/A			0	1	0
Tiamulin	0	0	1	0	0	2	0	0	1	1	0	3
Tilmicosin	0	0	1	0	2	0	1	0	0	3	0	1
Trimethoprim / Sulphamethoxazole	1	0	0	2	0	0	1	0	0	4	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)**

	<i>Branhamella ovis</i>			<i>Campylobacter jejuni</i>			<i>Corynebacterium sp.</i>			<i>Enterococcus sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	29	0	1	2	0	0	5	1	0	43	0	1
Ceftiofur	30	0	0	0	0	2	6	0	0	30	0	14
Chlortetracycline	30	0	0	1	0	1	2	3	1	5	9	30
Clindamycin	0	28	2	2	0	0	4	0	2	29	2	13
Danofloxacin	30	0	0	2	0	0	2	0	4	1	0	43
Enrofloxin	30	0	0	2	0	0	2	3	1	12	23	9
Erythromycin	9	11	0	N/A			0	0	1	14	0	2
Florfenicol	29	0	1	2	0	0	6	0	0	38	4	2
Gentamycin	30	0	0	2	0	0	6	0	0	26	16	2
Neomycin	30	0	0	2	0	0	6	0	0	20	0	24
Oxytetracycline	30	0	0	1	0	1	1	2	3	4	6	34
Penicillin	20	0	10	0	0	2	4	0	2	43	0	1
Spectinomycin	0	25	5	2	0	0	0	1	5	0	2	42
Sulphachlorpyridazine	20	0	0	N/A			0	0	1	0	0	16
Sulphadimethoxine	26	0	4	1	0	1	1	0	5	1	0	43
Sulphathiazole	0	16	4	N/A			0	0	1	0	0	16
Tiamulin	30	0	0	2	0	0	6	0	0	32	0	12
Tilmicosin	28	1	1	2	0	0	3	0	3	35	4	5
Trimethoprim / Sulphamethoxazole	29	0	1	1	0	1	5	0	1	43	0	1
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)

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	<i>Escherichia coli</i>			<i>Escherichia coli</i> --K99			<i>Escherichia ferguson</i>			Gram-Negative Bacteria		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	58	0	61	1	0	9	3	0	1	3	0	0
Ceftiofur	94	3	22	2	0	8	3	0	1	3	0	0
Chlortetracycline	31	2	86	0	0	10	2	0	2	3	0	0
Clindamycin	0	0	119	0	0	10	0	0	4	0	0	3
Danofloxacin	108	0	11	10	0	0	4	0	0	3	0	0
Enrofloxacin	108	2	9	10	0	0	4	0	0	3	0	0
Erythromycin	N/A			0	0	2	0	0	4	0	0	3
Florfenicol	8	66	45	0	3	7	3	1	0	0	3	0
Gentamycin	94	1	24	4	2	4	4	0	0	3	0	0
Neomycin	70	0	49	1	0	9	3	0	1	3	0	0
Oxytetracycline	30	0	89	0	0	10	2	0	2	3	0	0
Penicillin	0	0	119	0	0	10	0	0	4	0	0	3
Spectinomycin	0	77	42	0	2	8	1	1	2	0	3	0
Sulphachlorpyridazine	3	0	31	1	0	1	1	0	3	2	0	1
Sulphadimethoxine	29	0	90	0	0	10	0	0	4	1	0	2
Sulphathiazole	0	3	31	0	0	2	0	0	4	0	1	2
Tiamulin	0	0	119	0	0	10	0	0	4	0	0	3
Tilmicosin	0	0	119	0	0	10	0	0	4	0	0	3
Trimethoprim / Sulphamethoxazole	82	0	37	1	0	9	4	0	0	3	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)**

	Gram-Positive Bacteria			Hemolytic <i>Escherichia coli</i>			<i>Histophilus somni</i>			<i>Klebsiella oxytoca</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	17	0	2	87	0	1	0	0	1
Ceftiofur	1	0	0	18	0	1	87	0	1	1	0	0
Chlortetracycline	0	0	1	9	3	7	85	3	0	0	0	1
Clindamycin	1	0	0	0	0	19	44	35	9	0	0	1
Danofloxacin	0	0	1	18	0	1	80	0	8	1	0	0
Enrofloxacin	0	1	0	19	0	0	79	6	3	1	0	0
Erythromycin	N/A			0	0	8	33	9	6	N/A		
Florfenicol	1	0	0	5	11	3	86	2	0	1	0	0
Gentamycin	1	0	0	18	1	0	41	14	33	1	0	0
Neomycin	1	0	0	17	0	2	9	0	79	0	0	1
Oxytetracycline	0	0	1	9	0	10	50	12	26	0	0	1
Penicillin	1	0	0	0	0	19	85	2	1	0	0	1
Spectinomycin	0	0	1	0	16	3	65	1	22	0	1	0
Sulphachlorpyridazine	N/A			3	0	5	38	0	18	N/A		
Sulphadimethoxine	0	0	1	11	0	8	27	0	61	1	0	0
Sulphathiazole	N/A			0	3	5	8	0	40	N/A		
Tiamulin	1	0	0	0	0	19	88	0	0	0	0	1
Tilmicosin	1	0	0	0	0	19	87	0	1	0	0	1
Trimethoprim / Sulphamethoxazole	1	0	0	19	0	0	87	0	1	1	0	0
Tulathromycin	N/A			N/A			39	0	1	N/A		
Tylosin Tartrate	N/A			N/A			48	27	13	N/A		

BOVINE IN VITRO SENSITIVITY TEST (CON'T)

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	<i>Klebsiella pneumoniae</i>			<i>Mannheimia haemolytica</i>			<i>Micrococcus sp.</i>			<i>Moraxella bovis</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	3	114	1	18	1	0	0	15	0	0
Ceftiofur	3	0	0	132	1	0	1	0	0	15	0	0
Chlortetracycline	1	0	2	123	8	2	1	0	0	15	0	0
Clindamycin	0	0	3	0	0	133	1	0	0	1	13	1
Danofloxacin	3	0	0	121	0	12	1	0	0	15	0	0
Enrofloxacin	3	0	0	122	9	2	1	0	0	15	0	0
Erythromycin	N/A			0	62	6	N/A			11	0	0
Florfenicol	1	1	1	127	1	5	1	0	0	15	0	0
Gentamycin	2	0	1	126	0	7	1	0	0	15	0	0
Neomycin	2	0	1	101	0	32	1	0	0	15	0	0
Oxytetracycline	1	0	2	92	17	24	1	0	0	15	0	0
Penicillin	0	0	3	61	53	19	0	0	1	0	0	15
Spectinomycin	0	2	1	115	1	17	N/A			15	0	0
Sulphachlorpyridazine	N/A			68	0	0	N/A			11	0	0
Sulphadimethoxine	1	0	2	90	0	43	1	0	0	14	0	1
Sulphathiazole	N/A			44	0	24	N/A			0	9	2
Tiamulin	0	0	3	39	0	94	1	0	0	15	0	0
Tilmicosin	0	0	3	116	10	7	1	0	0	15	0	0
Trimethoprim / Sulphamethoxazole	2	0	1	66	65	2	1	0	0	14	0	1
Tulathromycin	N/A			62	0	3	N/A			N/A		
Tylosin Tartrate	N/A			0	0	133	N/A			N/A		

**BOVINE IN VITRO SENSITIVITY TEST (CON'T.)**

	<i>Moraxella sp.</i>			<i>Pasteurella multocida</i>			<i>Pasteurella trehalosi</i>			<i>Pasteurella sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	119	0	0	1	0	1	17	1	2
Ceftiofur	1	0	0	118	0	1	2	0	0	20	0	0
Chlortetracycline	1	0	0	114	4	1	1	1	0	13	5	2
Clindamycin	0	1	0	0	1	118	0	1	1	0	1	19
Danofloxacin	1	0	0	109	0	10	2	0	0	15	0	5
Enrofloxin	1	0	0	118	0	1	2	0	0	15	1	4
Erythromycin	N/A			1	52	12	N/A			1	1	0
Florfenicol	1	0	0	107	5	7	2	0	0	16	1	3
Gentamycin	1	0	0	103	8	8	2	0	0	17	0	3
Neomycin	1	0	0	60	0	59	1	0	1	13	0	7
Oxytetracycline	1	0	0	81	2	36	0	0	2	9	0	11
Penicillin	0	0	1	100	0	19	0	0	2	3	0	17
Spectinomycin	1	0	0	15	69	35	0	0	2	2	14	4
Sulphachlorpyridazine	N/A			45	0	20	N/A			2	0	0
Sulphadimethoxine	1	0	0	47	0	72	2	0	0	17	0	3
Sulphathiazole	N/A			0	19	46	N/A			0	2	0
Tiamulin	1	0	0	25	0	94	2	0	0	11	0	9
Tilmicosin	1	0	0	97	1	21	2	0	0	13	1	6
Trimethoprim / Sulphamethoxazole	1	0	0	115	0	4	1	0	1	16	0	4
Tulathromycin	N/A			52	0	2	N/A			N/A		
Tylosin Tartrate	N/A			0	1	58	N/A			N/A		

**BOVINE IN VITRO SENSITIVITY TEST (CON'T.)**

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	<i>Proteus</i> sp.			<i>Pseudomonas aëruginosa</i>			<i>Pseudomonas</i> sp.			<i>Salmonella</i> sp.		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	5	0	1	0	0	5	2	0	2	35	0	70
Ceftiofur	6	0	0	0	0	5	4	0	0	51	0	54
Chlortetracycline	0	0	6	0	0	5	2	1	1	26	1	78
Clindamycin	0	0	6	0	0	5	0	1	3	0	0	105
Danofloxacin	6	0	0	4	0	1	2	0	2	101	0	4
Enrofloxin	6	0	0	4	1	0	2	0	2	104	1	0
Erythromycin	0	0	5	0	0	2	0	1	0	0	0	58
Florfenicol	0	5	1	0	0	5	1	1	2	8	31	66
Gentamycin	5	0	1	5	0	0	4	0	0	94	4	7
Neomycin	5	0	1	5	0	0	2	0	2	56	0	49
Oxytetracycline	0	0	6	0	0	5	1	0	3	26	0	79
Penicillin	0	0	6	0	0	5	1	0	3	0	0	105
Spectinomycin	0	0	6	0	0	5	1	1	2	0	26	79
Sulphachlorpyridazine	0	0	5	1	0	1	0	0	1	15	0	43
Sulphadimethoxine	1	0	5	0	0	5	1	0	3	9	0	96
Sulphathiazole	0	0	5	0	1	1	0	0	1	0	8	50
Tiamulin	0	0	6	0	0	5	1	0	3	0	0	105
Tilmicosin	0	0	6	0	0	5	2	1	1	0	0	105
Trimethoprim / Sulphamethoxazole	6	0	0	1	0	4	2	0	2	91	0	14
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.)**

	<i>Staphylococcus aureus</i>			<i>Staphylococcus coagulase -</i>			<i>Staphylococcus coagulase +</i>			<i>Streptococcus sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	3	4	0	0	2	0	2	4	0	0
Ceftiofur	4	0	0	4	0	0	4	0	0	4	0	0
Chlortetracycline	1	0	3	2	0	2	1	0	3	0	1	3
Clindamycin	1	0	3	3	1	0	2	0	2	4	0	0
Danofloxacin	1	0	3	2	0	2	2	0	2	0	0	4
Enrofloxin	1	0	3	3	1	0	2	0	2	1	2	1
Erythromycin	1	0	0	N/A	1	0	1	0	0	N/A	0	0
Florfenicol	1	2	1	2	2	0	1	3	0	4	0	0
Gentamycin	1	2	1	3	1	0	2	1	1	1	3	0
Neomycin	3	0	1	4	0	0	3	0	1	1	0	3
Oxytetracycline	1	0	3	1	0	3	1	0	3	0	0	4
Penicillin	0	0	3	4	0	0	2	0	2	4	0	0
Spectinomycin	0	0	4	0	1	3	0	0	4	0	2	2
Sulphachlorpyridazine	1	0	0	N/A	1	0	1	0	0	N/A	0	4
Sulphadimethoxine	4	0	0	4	0	0	4	0	0	0	0	0
Sulphathiazole	0	1	0	N/A	0	1	0	1	0	N/A	0	0
Tiamulin	1	0	3	2	0	2	2	0	2	4	0	0
Tilmicosin	1	0	3	3	1	0	2	0	2	4	0	0
Trimethoprim / Sulphamethoxazole	4	0	0	4	0	0	4	0	0	4	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.)**

	<i>Yersinia pestis</i>		
	S	M	R
Ampicillin	1	0	0
Ceftiofur	1	0	0
Chlortetracycline	1	0	0
Clindamycin	0	0	1
Danofloxacin	1	0	0
Enrofloxin	1	0	0
Erythromycin	N/A		
Florfenicol	1	0	0
Gentamycin	1	0	0
Neomycin	1	0	0
Oxytetracycline	1	0	0
Penicillin	0	0	1
Spectinomycin	1	0	0
Sulphachlorpyridazine	N/A		
Sulphadimethoxine	1	0	0
Sulphathiazole	N/A		
Tiamulin	0	0	1
Tilmicosin	0	0	1
Trimethoprim / Sulphamethoxazole	1	0	0
Tulathromycin	N/A		
Tylosin Tartrate	0	0	1

**SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY**  
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**JULY 1, 2006 – JUNE 30, 2007**

**MILK SAMPLES**

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	<i>Enterococcus sp.</i>			Environmental <i>Streptococcus</i>			<i>Escherichia coli</i>			Gram-Positive Bacteria		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	10	0	0	11	0	0	0	0	1
Ceftiofur	1	0	0	10	0	0	11	0	0	0	0	1
Cephalothin	1	0	0	10	0	0	11	0	0	0	0	1
Erythromycin	1	0	0	8	0	2	0	0	11	0	0	1
Oxacillin	1	0	0	10	0	0	0	0	11	0	0	1
Penicillin	1	0	0	9	1	0	0	0	11	0	0	1
Penicillin / Novobiocinova	1	0	0	10	0	0	0	0	11	1	0	0
Pirlimycin	1	0	0	7	0	3	0	0	11	0	0	1
Sulphadimethoxine	0	0	1	1	0	9	11	0	0	1	0	0
Tetracycline	1	0	0	7	0	3	10	0	1	1	0	0

	Hemolytic <i>Escherichia coli</i>			<i>Klebsiella pneumoniae</i>			<i>Pseudomonas sp.</i>			<i>Salmonella sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	4	0	0	0	0	1	0	0	1	1	0	0
Ceftiofur	4	0	0	1	0	0	0	0	1	1	0	0
Cephalothin	4	0	0	1	0	0	0	0	1	1	0	0
Erythromycin	0	0	4	0	0	1	0	0	1	0	0	1
Oxacillin	0	0	4	0	0	1	0	0	1	0	0	1
Penicillin	0	0	4	0	0	1	0	0	1	0	0	1
Penicillin / Novobiocinova	0	0	4	0	0	1	0	0	1	0	0	1
Pirlimycin	0	0	4	0	0	1	0	0	1	0	0	1
Sulphadimethoxine	3	0	1	1	0	0	0	0	1	0	0	1
Tetracycline	1	1	2	1	0	0	1	0	0	1	0	0

MILK SAMPLES IN VITRO SENSITIVITY TESTS (CON'T)

	<i>Serratia marcescens</i>			<i>Staphylococcus coagulase -</i>			<i>Staphylococcus coagulase +</i>			<i>Staphylococcus sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	0	1	9	0	1	10	0	1	1	0	0
Ceftiofur	1	0	0	10	0	0	11	0	0	1	0	0
Cephalothin	0	0	1	10	0	0	11	0	0	1	0	0
Erythromycin	0	0	1	4	0	6	5	0	6	1	0	0
Oxacillin	0	0	1	10	0	0	11	0	0	1	0	0
Penicillin	0	0	1	8	0	2	9	0	2	1	0	0
Penicillin / Novobiocinova	0	0	1	10	0	0	11	0	0	1	0	0
Pirlimycin	0	0	1	4	0	6	5	0	6	1	0	0
Sulphadimethoxine	0	0	1	9	0	1	10	0	1	1	0	0
Tetracycline	0	0	1	9	0	1	11	0	0	1	0	0

**SOUTH DAKOTA ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY**  
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**OVINE**

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	<i>Campylobacter foetus ssp. foetus</i>			<i>Campylobacter jejuni</i>			<i>Escherichia coli</i>			Hemolytic <i>Escherichia coli</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	4	0	0	6	0	0	3	0	1	1	0	0
Ceftiofur	0	0	4	0	0	6	4	0	0	1	0	0
Chlortetracycline	2	0	2	0	0	6	0	0	4	0	0	1
Clindamycin	2	1	1	6	0	0	0	0	4	0	0	1
Danofloxacin	1	0	3	6	0	0	4	0	0	1	0	0
Enrofloxin	2	1	1	6	0	0	4	0	0	1	0	0
Erythromycin	N/A			N/A			N/A			N/A		
Florfenicol	3	1	0	6	0	0	0	3	1	0	0	1
Gentamycin	4	0	0	6	0	0	4	0	0	1	0	0
Neomycin	4	0	0	6	0	0	4	0	0	1	0	0
Oxytetracycline	2	0	2	0	0	6	0	0	4	0	0	1
Penicillin	4	0	0	0	0	6	0	0	4	0	0	1
Spectinomycin	3	1	0	6	0	0	0	3	1	0	1	0
Sulphachlorpyridazine	N/A			N/A			N/A			N/A		
Sulphadimethoxine	0	0	4	1	0	5	2	0	2	0	0	1
Sulphathiazole	N/A			N/A			N/A			N/A		
Tiamulin	0	0	4	6	0	0	0	0	4	0	0	1
Tilmicosin	4	0	0	6	0	0	0	0	4	0	0	1
Trimethoprim / Sulphamethoxazole	1	0	3	1	0	5	4	0	0	1	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)

	<i>Mannheimia haemolytica</i>			<i>Pantoea sp.</i>			<i>Pasteurella multocida</i>			<i>Pseudomonas sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	12	0	1	1	0	0	6	0	0	1	0	0
Ceftiofur	13	0	0	1	0	0	6	0	0	1	0	0
Chlortetracycline	11	0	2	1	0	0	6	0	0	1	0	0
Clindamycin	0	0	13	0	0	1	0	0	6	0	0	1
Danofloxacin	13	0	0	1	0	0	6	0	0	1	0	0
Enrofloxacin	13	0	0	1	0	0	6	0	0	1	0	0
Erythromycin	0	8	0	N/A			0	4	0	N/A		
Florfenicol	13	0	0	1	0	0	6	0	0	0	0	1
Gentamycin	13	0	0	1	0	0	6	0	0	1	0	0
Neomycin	13	0	0	1	0	0	6	0	0	1	0	0
Oxytetracycline	11	0	2	1	0	0	6	0	0	1	0	0
Penicillin	3	9	1	0	0	1	6	0	0	0	0	1
Spectinomycin	13	0	0	0	1	0	0	4	2	1	0	0
Sulphachlorpyridazine	7	0	1	N/A			3	0	1	N/A		
Sulphadimethoxine	9	0	4	0	0	1	4	0	2	1	0	0
Sulphathiazole	4	0	4	N/A			0	2	2	N/A		
Tiamulin	11	0	2	0	0	1	0	0	6	1	0	0
Tilmicosin	13	0	0	0	0	1	6	0	0	1	0	0
Trimethoprim / Sulphamethoxazole	8	5	0	1	0	0	6	0	0	1	0	0
Tulathromycin	5	0	0	N/A			2	0	0	N/A		
Tylosin Tartrate	0	0	13	N/A			0	0	2	N/A		

OVINE IN VITRO SENSITIVITY TESTS (CON'T)

	<i>Salmonella</i> sp.			<i>Staphylococcus</i> coagulase +			<i>Yersinia enterocolitica</i>		
	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	4	0	0	1	0	0	1
Ceftiofur	4	0	1	1	0	0	1	0	0
Chlortetracycline	0	0	5	1	0	0	1	0	0
Clindamycin	0	0	5	1	0	0	0	0	1
Danofloxin	5	0	0	1	0	0	1	0	0
Enrofloxin	5	0	0	1	0	0	1	0	0
Erythromycin	0	0	5	N/A			N/A		
Florfenicol	1	1	3	1	0	0	1	0	0
Gentamycin	5	0	0	1	0	0	1	0	0
Neomycin	2	0	3	1	0	0	1	0	0
Oxytetracycline	0	0	5	1	0	0	1	0	0
Penicillin	0	0	5	0	0	1	0	0	1
Spectinomycin	0	1	4	0	0	1	1	0	0
49 Sulphachlorpyridazine	0	0	5	N/A			N/A		
Sulphadimethoxine	0	0	5	1	0	0	0	0	1
Sulphathiazole	0	0	5	N/A			N/A		
Tiamulin	0	0	5	1	0	0	0	0	1
Tilmicosin	0	0	5	1	0	0	0	0	1
Trimethoprim / Sulphamethoxazole	5	0	0	1	0	0	1	0	0
Tulathromycin	N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A		

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**PORCINE**

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	<i>Actinobacillus pleuropneumoniae</i>			<i>Actinobacillus suis</i>			<i>Actinobacillus sp.</i>			Beta <i>Streptococcus sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	11	0	5	26	0	3	4	0	2	3	0	0
Ceftiofur	15	0	1	29	0	0	6	0	0	3	0	0
Chlortetracycline	5	5	6	28	1	0	2	2	2	0	1	2
Clindamycin	0	8	8	0	0	29	0	0	6	2	0	1
Danofloxacin	15	0	1	29	0	0	6	0	0	1	0	2
Enrofloxacin	16	0	0	29	0	0	6	0	0	3	0	0
Erythromycin	0	7	0	0	9	0	0	1	0	N/A		
Florfenicol	16	0	0	29	0	0	6	0	0	3	0	0
Gentamycin	2	8	6	29	0	0	6	0	0	2	1	0
Neomycin	0	0	16	24	0	5	5	0	1	1	0	2
Oxytetracycline	1	0	15	11	0	18	1	0	5	0	0	3
Penicillin	2	9	5	1	0	28	1	0	5	3	0	0
Spectinomycin	8	8	0	0	19	10	0	5	1	2	1	0
Sulphachlorpyridazine	7	0	0	9	0	0	1	0	0	1	0	1
Sulphadimethoxine	9	0	7	26	0	3	3	0	3	2	0	1
Sulphathiazole	4	0	3	0	8	1	0	1	0	0	1	1
Tiamulin	14	0	2	4	0	25	2	0	4	2	0	1
Tilmicosin	16	0	0	27	2	0	3	1	2	2	0	1
Trimethoprim / Sulphamethoxazole	7	9	0	29	0	0	6	0	0	3	0	0
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	0	0	16	N/A			N/A			N/A		

**PORCINE IN VITRO SENSITIVITY TESTS CON'T)**

	<i>Bordetella bronchiseptica</i>			<i>Enterococcus faecalis</i>			<i>Enterococcus sp.</i>			<i>Erysipelothrix rhusiopathiae</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	30	14	3	1	0	0	2	0	0	2	0	0
Ceftiofur	1	0	46	0	0	1	0	0	2	2	0	0
Chlortetracycline	47	0	0	1	0	0	1	0	1	0	0	2
Clindamycin	0	0	47	0	0	1	0	0	2	2	0	0
Danofloxacin	11	0	36	0	0	1	0	0	2	2	0	0
Enrofloxin	47	0	0	1	0	0	1	1	0	2	0	0
Erythromycin	0	10	7	N/A			N/A			N/A		
Florfenicol	41	6	0	1	0	0	0	2	0	0	2	0
Gentamycin	47	0	0	0	0	1	0	0	2	0	0	2
Neomycin	47	0	0	0	0	1	0	0	2	0	0	2
Oxytetracycline	47	0	0	0	1	0	0	1	1	0	0	2
Penicillin	0	0	47	1	0	0	2	0	0	2	0	0
Spectinomycin	0	0	47	0	0	1	0	0	2	2	0	0
Sulphachlorpyridazine	3	0	14	N/A			N/A			N/A		
Sulphadimethoxine	4	0	43	0	0	1	0	0	2	1	0	1
Sulphathiazole	0	3	14	N/A			N/A			N/A		
Tiamulin	0	0	47	0	0	1	0	0	2	1	0	1
Tilmicosin	19	24	4	0	1	0	0	1	1	2	0	0
Trimethoprim / Sulphamethoxazole	36	0	11	1	0	0	2	0	0	0	0	2
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)

	<i>Escherichia coli</i>			Gram-Negative Bacteria			<i>Haemophilus parvus</i>			Hemolytic <i>Escherichia coli</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	30	1	43	1	0	4	47	1	3	16	0	45
Ceftiofur	48	3	23	4	0	1	50	0	1	38	3	20
Chlortetracycline	4	0	70	0	0	5	48	0	3	3	3	55
Clindamycin	0	0	74	0	0	5	3	25	23	0	0	61
Danofloxacin	73	0	1	5	0	0	50	0	1	60	0	1
Enrofloxacin	74	0	0	5	0	0	51	0	0	61	0	0
Erythromycin	0	0	29	N/A	0	0	6	21	0	0	0	27
Florfenicol	6	36	32	0	4	1	51	0	0	8	24	29
Gentamycin	47	10	17	5	0	0	47	4	0	36	11	14
Neomycin	41	0	33	4	0	1	42	0	9	26	0	35
Oxytetracycline	4	0	70	0	0	5	46	0	5	3	0	58
Penicillin	0	0	74	0	0	5	8	0	43	0	0	61
Spectinomycin	3	35	36	0	3	2	46	4	1	0	19	42
Sulphachloropyridazine	17	0	12	N/A	0	5	25	0	2	3	0	24
Sulphadimethoxine	26	0	48	0	0	5	31	0	20	6	0	55
Sulphathiazole	0	12	17	N/A	0	5	0	13	14	0	1	26
Tiamulin	0	0	74	0	0	5	42	0	9	0	0	61
Tilmicosin	0	0	74	0	0	5	48	0	3	0	0	61
Trimethoprim / Sulphamethoxazole	62	0	12	3	0	2	50	0	1	39	0	22
Tulathromycin	N/A	0		N/A			N/A			N/A		
Tylosin Tartrate	0	0	2	N/A	0		N/A	0		N/A	0	

**PORCINE IN VITRO SENSITIVITY TESTS (CON'T)**

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	<i>Mannheimia haemolytica</i>			<i>Pasteurella multocida</i>			<i>Pasteurella sp.</i>			<i>Pseudomonas aeruginosa</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	2	159	0	1	2	0	0	0	0	1
Ceftiofur	3	0	0	160	0	0	2	0	0	0	0	1
Chlortetracycline	3	0	0	154	4	2	2	0	0	0	0	1
Clindamycin	0	0	3	0	0	160	0	0	2	0	0	1
Danofloxin	3	0	0	159	0	1	2	0	0	0	0	1
Enrofloxin	3	0	0	160	0	0	2	0	0	1	0	0
Erythromycin	0	3	0	0	80	1	N/A			N/A		
Florfenicol	3	0	0	160	0	0	2	0	0	0	0	1
Gentamycin	3	0	0	158	2	0	2	0	0	1	0	0
Neomycin	2	0	1	152	0	8	1	0	1	1	0	0
Oxytetracycline	0	1	2	124	6	30	2	0	0	0	0	1
Penicillin	0	2	1	151	0	9	1	0	1	0	0	1
Spectinomycin	0	1	2	0	127	33	0	2	0	0	0	1
Sulphachlorpyridazine	3	0	0	60	0	21	N/A			N/A		
Sulphadimethoxine	2	0	1	108	0	52	1	0	1	0	0	1
Sulphathiazole	2	0	1	0	44	37	N/A			N/A		
Tiamulin	1	0	2	9	0	151	1	0	1	0	0	1
Tilmicosin	3	0	0	143	15	2	1	0	1	0	0	1
Trimethoprim / Sulphamethoxazole	3	0	0	160	0	0	2	0	0	0	0	1
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	0	0	3	1	3	78	N/A			N/A		

**PORCINE IN VITRO SENSITIVITY TESTS (CON'T)**

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	<i>Pseudomonas sp.</i>			<i>Salmonella sp.</i>			<i>Staphylococcus aureus</i>			<i>Staphylococcus coagulase -</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	0	1	0	30	0	35	N/A			2	0	1
Ceftiofur	0	0	1	50	0	15	1	0	0	3	0	0
Chlortetracycline	1	0	0	9	0	56	0	0	1	1	0	2
Clindamycin	0	0	1	0	0	65	0	0	1	2	0	1
Danofloxin	0	0	1	65	0	0	1	0	0	3	0	0
Enrofloxin	0	0	1	65	0	0	1	0	0	3	0	0
Erythromycin	N/A			0	0	32	N/A			1	0	0
Florfenicol	0	0	1	20	24	21	0	1	0	0	3	0
Gentamycin	0	0	1	53	4	8	1	0	0	3	0	0
Neomycin	0	0	1	49	0	16	1	0	0	3	0	0
Oxytetracycline	1	0	0	9	0	56	0	0	1	1	0	2
Penicillin	0	0	1	0	0	65	N/A			1	0	2
Spectinomycin	0	0	1	0	22	43	0	0	1	3	0	0
Sulphachlorpyridazine	N/A			6	0	26	N/A			0	0	1
Sulphadimethoxine	0	0	1	3	0	62	1	0	0	1	0	2
Sulphathiazole	N/A			0	5	27	N/A			0	0	1
Tiamulin	0	0	1	0	0	65	1	0	0	1	0	2
Tilmicosin	0	0	1	0	0	65	0	0	1	1	1	1
Trimethoprim / Sulphamethoxazole	0	0	1	54	0	11	1	0	0	3	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)**

	<i>Staphylococcus epidermidis</i>			<i>Staphylococcus hyicus</i>			<i>Streptococcus suis</i>			<i>Streptococcus sp.</i>		
	S	M	R	S	M	R	S	M	R	S	M	R
Ampicillin	1	0	0	2	0	0	176	5	1	3	1	0
Ceftiofur	1	0	0	2	0	0	179	1	2	4	0	0
Chlortetracycline	0	0	1	0	0	2	14	26	142	1	0	3
Clindamycin	0	0	1	0	0	2	45	5	132	0	0	4
Danofloxin	1	0	0	2	0	0	105	0	77	2	0	2
Enrofloxin	1	0	0	2	0	0	179	1	2	3	1	0
Erythromycin	0	0	1	N/A			24	5	57	0	0	2
Florfenicol	1	0	0	2	0	0	180	0	2	4	0	0
Gentamycin	1	0	0	2	0	0	180	1	1	3	0	1
Neomycin	1	0	0	2	0	0	130	0	52	2	0	2
Oxytetracycline	0	0	1	0	0	2	12	8	162	1	0	3
Penicillin	1	0	0	1	0	1	156	20	6	1	2	1
Spectinomycin	0	0	1	0	0	2	90	77	15	2	0	2
Sulphachlorpyridazine	1	0	0	N/A			41	0	45	0	0	2
Sulphadimethoxine	1	0	0	2	0	0	87	0	95	1	0	3
Sulphathiazole	0	1	0	N/A			0	39	47	0	0	2
Tiamulin	0	0	1	1	0	1	154	0	28	2	0	2
Tilmicosin	1	0	0	0	0	2	50	0	132	0	0	4
Trimethoprim / Sulphamethoxazole	1	0	0	2	0	0	180	0	2	3	0	1
Tulathromycin	N/A			N/A			N/A			N/A		
Tylosin Tartrate	N/A			N/A			N/A			N/A		

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**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Salmonella Isolations  
July 1, 2006 - June 30, 2007**

	<u>Total</u>	<u>Bovine</u>	<u>Porcine</u>	<u>Canine</u>	<u>Caprine</u>	<u>Equine</u>	<u>Ovine</u>	<u>Wildlife/ Zoo</u>	<u>Meat Insp.</u>	<u>Water</u>	<u>Avian Misc.</u>	<u>Chicken</u>	<u>Pheasant</u>	<u>Turkey</u>
agona	57	50	4	1								1		1
anatum	4	4												
braenderup	1	1												
brandenburg	1													1
cerro	1	1												
cholersuis kunzendorf	96		96											
derby	55		55											
dublin	221	218	1					2						
4,5,12:i:-	2	1								1				
fresno	1	1												
give	2	2												
hadar	1													1
havana	2		1											1
heidelberg	4		2		1							1		
indiana	1												1	
infantis	8		6								1	1		
johannesburg	3		2									1		
kentucky	1											1		
kiambu	1												1	
krefeld	1		1											
london	1		1											
mbandaka	1	1												
meleagridis	3	2							1					
montevideo	6	6												
muenchen	2	2												
muenster	2	1												1
newport	255	23	4			224	1			1				2
ohio	3		1				1					1		

**SALMONELLA ISOLATIONS (continued)**

	<u>Total</u>	<u>Bovine</u>	<u>Porcine</u>	<u>Canine</u>	<u>Caprine</u>	<u>Equine</u>	<u>Ovine</u>	<u>Wildlife/ Zoo</u>	<u>Meat Insp.</u>	<u>Water</u>	<u>Avian Misc.</u>	<u>Chicken</u>	<u>Pheasant</u>	<u>Turkey</u>
reading	3	1	1				1							
senftenberg	2	1									1			
thompson	57	1	56											
typhimurium	18	13	4						1					
typhimurium copenhagen	20	11	5				3				1			
uganda	45	37	8											
worthington	2		2											
<b>TOTAL</b>	<b>883</b>	<b>377</b>	<b>250</b>	<b>1</b>	<b>1</b>	<b>224</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>2</b>	<b>7</b>

NOTE: A blank field indicates a zero amount.

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Serology**

**July 1, 2006 - June 30, 2007**

<u>Disease</u>	<u>Positive</u>	<u>Negative</u>	<u>Other*</u>	<u>Total</u>
<b>Anaplasmosis</b>				
Card	0	18	0	18
Competative Enzyme-Linked Immunoassay	70	1,969	1	2,040
CF	0	161	0	161
<b>Avian Influenza</b>				
Agar Gel Immunodiffusion (AGID)	7	2,195	4	2,206
<b>Bluetongue</b>				
Agar Gel Immunodiffusion (AGID)	4	0	0	4
Enzyme-Linked Immunoassay (ELISA)	39	768	0	807
<b>Bovine Leukosis Virus</b>				
AGID	3	6	0	9
ELISA	1,788	9,473	9	11,270
<b>Bovine Respiratory Syncytial Virus</b>				
SN	610	94	8	712
<b>Bovine Viral Diarrhea Virus</b>				
Antigen Capture ELISA (Serum)	1	264	1	266
ELISA (Ear Notch)	120	20,931	19	21,070
<b>Bovine Viral Diarrhea Virus I</b>				
SN	1,323	352	5	1,680
<b>Bovine Viral Diarrhea Virus II</b>				
SN	1,333	241	24	1,598

<i>Brucella</i>				
BAPA	5	2,820	13	2,838
Card	4	3,168	10	3,182
CF	2	618	4	624
Plate	2	1,626	8	1,636
Rivanol	0	43	0	43
Tube	0	679	0	679
<i>Brucella - Canine</i>				
Rapid Slide Agglutination Test (RSAT)	1	323	0	324
<i>Brucella ovis</i>				
ELISA	6	2,170		2,176
Caprine Arthritis Encephalitis	145	118	0	263
Chronic Wasting Disease (BioRad ELISA)				
Epizootic Hemorrhagic Disease				
AGID	5	7	0	12
Equine Infectious Anemia				
AGID	0	199	2	201
ELISA	0	3,167	3	3,170
Feline Immunodeficiency Virus				
ELISA	1	39	0	40
Feline Infectious Peritonitis				
ELISA	19	11	0	30
Feline Leukemia Virus				
ELISA	5	35	0	40
Infectious Bovine Rhinotracheitis				
SN	902	202	5	1,109



<i>Leptospira</i>				
<i>bratislava</i>	97	962	3	1,062
<i>canicola</i>	75	984	3	1,062
<i>grippotyphosa</i>	85	973	3	1,061
<i>hardjo</i>	98	960	4	1,062
<i>icterohemorrhagiae</i>	178	881	3	1,062
<i>pomona</i>	96	963	3	1,062
Lyme Disease				
ELISA				
<i>Mycoplasma hyopneumoniae</i>				
ELISA	757	3,578	2	4,337
<i>Neospora</i>				
ELISA	75	778	1	854
Ovine Progressive Pneumonia				
AGID	76	613	0	689
ELISA				
Parainfluenza-3				
SN	665	16	7	688
Paratuberculosis (Johne's)				
ELISA	6,643	70,518	106	77,267
Porcine Parvovirus				
HI	214	9	5	228
Porcine Respiratory and Reproductive Syndrome				
ELISA	6,762	105,994	132	112,888
Fluorescent Focus Neutralization (FFN)	663	331	1	995
IFA (U.S. Strain)	231	6,511	24	6,766
IFA (Euro Strain)	106	2,968	11	3,085
Pseudorabies				
ELISA				
g B ELISA	5	4,183	9	4,197
Latex Agglutination	1	441	0	442

Pseudorabies Differential Test				
G1 ELISA	0	115	0	115
Swine Influenza Virus				
H1N1	868	2,646	8	3,522
H3N2	1,167	2,331	24	3,522
H1N1 ELISA	64	94	1	159
H3N2 ELISA	69	89	1	159
H1N1 Pfizer Strain	302	19	42	363
Toxin A IgA (ELISA)	0	0	156	156
West Nile Virus (IgM)				
<b>TOTAL</b>	<b>25,692</b>	<b>258,654</b>	<b>665</b>	<b>285,011</b>

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Rabies Examinations**

**July 1, 2006 - June 30, 2007**

	Positive		Negative		<u>Untestable</u>	<u>Total Specimens</u>
	<u>Human Exposure</u>	<u>No Human Exposure</u>	<u>Human Exposure</u>	<u>No Human Exposure</u>		
Bat	0	2	45	25	6	78
Beaver	0	0	0	0	1	1
Bovine	0	1	17	42	8	68
Canine	1	0	65	23	1	90
Coyote	0	0	1	1	2	4
Deer	0	0	0	7	0	7
Equine	0	0	3	3	2	8
Feline	1	0	90	21	1	113
Ferret	0	0	0	1	0	1
Fox	0	0	1	3	0	4
Gerbil	0	0	1	0	0	1
Goat	0	0	0	1	2	3
Gopher	0	0	1	0	1	2
Kangaroo	0	0	0	1	0	1
Mink	0	0	1	1	0	2
Mouse	0	0	3	0	0	3
Muskrat	0	0	1	0	0	1
Opossum	0	0	2	5	1	8
Ovine	0	0	2	4	1	7
Rabbit	0	0	1	0	0	1
Raccoon	0	0	8	23	2	33
Rat	0	0	1	0	0	1
Skunk	2	12	1	20	5	40
Squirrel	0	0	2	1	0	3
Woodchuck	0	0	0	3	0	3
Total	4	15	246	185	33	483

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Positive Rabies Cases**

**July 1, 2006 - June 30, 2007**

	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>Total</u>
Bat	0	1	1	0	0	0	0	0	0	0	0	0	2
Bovine	1	0	0	0	0	0	0	0	0	0	0	0	1
Canine	0	1	0	0	0	0	0	0	0	0	0	0	1
Feline	0	0	0	1	0	0	0	0	0	0	0	0	1
Skunk	2	1	2	0	2	1	0	0	1	2	2	1	14
TOTAL	3	3	3	1	2	1	0	0	1	2	2	1	19

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Molecular Diagnostics**

**July 1, 2006 - June 30, 2007**

**BOVINE**

<u>Disease</u>	<u>Positive</u>	<u>Negative</u>	<u>Other</u>	<u>Total</u>
Bovine Leukosis Virus	8	290	0	298
Bovine Viral Diarrhea Virus				
Whole Blood/Serum/Milk	8	466	0	474
Ear Notch	31	489	0	520
<i>Mycobacterium paratuberculosis</i> (Johne's)	152	1,827	4	1,983
<i>Mycoplasma bovis</i>	16	4	0	20
<i>Trichostrongylus axei</i>	4	1	0	5

**PORCINE**

<u>Disease</u>	<u>Positive</u>	<u>Negative</u>	<u>Other</u>	<u>Total</u>
Classic Swine Fever	0	14	0	14
Circovirus				
Type 1	4	40	0	44
Type 2	1,547	523	13	2,083
<i>Lawsonia intracellularis</i>	12	23	0	35
<i>Mycoplasma hyopneumoniae</i>	93	247	0	340
Porcine Respiratory and Reproductive Syndrome (PRRS)				
US				
Semen/Tissue	178	1,625	0	1,803
Serum	612	5,763	4	6,379
Lelystad				
Semen/Tissue	1	46	0	47
Serum	80	3,571	5	3,656
Multiplex				
Semen/Tissue	238	5,699	6	5,943
Serum	2,210	22,617	20	24,847

**OTHER SPECIES**

<u>Disease</u>	<u>Positive</u>	<u>Negative</u>	<u>Other</u>	<u>Total</u>
<i>Mycobacterium paratuberculosis</i> (Johne's)				
Deer	0	2	0	2
Elk	0	1	0	1
Feed	2	1	0	3
Milk	12	6	0	18
Ovine	1	2	0	3
Wildlife	0	5	0	5

	<u>Positive</u>	<u>Negative</u>	<u>Other</u>	<u>Total</u>
<b>AVIAN</b>				
<u>Disease</u>				
Avian Influenza Screen	186	938	0	1,124
Avian Influenza H5	9	176	0	185
Avian Influenza H7	0	185	0	185

**South Dakota  
Animal Disease Research and Diagnostic Laboratory**

**Molecular Diagnostic-Clostridium Genotyping**

**July 1, 2006 - June 30, 2007**

<u>Species</u>	<u>Genotype A</u>	<u>Genotype A/ Beta 2 Toxin</u>	<u>Genotype C</u>	<u>Genotype C/ Beta 2 Toxin</u>	<u>Genotype D</u>	<u>Genotype E/ Beta 2 Toxin/ Enterotoxin</u>
BOVINE	334	155	1	1	0	35
CAPRINE	1	0	0	0	0	0
OVINE	59	6	0	0	1	0
PORCINE	49	212	0	0	0	0
WILD/OTHER ANIMAL	1	1	0	0	0	0
TOTAL	444	374	1	1	1	35

## **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, 2006 - June 30, 2007

TOTAL

## AVIAN, MISCELLANEOUS

### BODY AS A WHOLE

Amyloidosis	1
Avian, tuberculosis, <i>Mycobacterium</i>	1
Dehydration	1
Exotic Newcastle disease virus	1
Malnutrition	6
No diagnosis	3
Peritonitis	2
Poxvirus infection	1
Salt toxicosis	1
Septicemia	5
Septicemia, <i>Escherichia coli</i>	2
Septicemia, <i>Salmonella</i>	1
Trauma	1
West Nile virus infection	1

### CARDIOVASCULAR

Bacterial pericarditis	1
Myocarditis	1

### DIGESTIVE

Avian, proventriculitis	1
Avian, ventriculitis	1
Bacterial enteritis	1
<i>Clostridium perfringens</i> /intestine	1
Coccidiosis	2
Gastrointestinal parasitism	2
Hepatic lipidosis	1
Hepatitis	3
Hepatitis likely toxic	1
Intestine parasitism, cestodes	1
Liver hepatitis, necrotic	1

### HEMIC AND LYMPHATIC

Blood parasite, Leucocytozoon	1
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AVIAN MISCELLANEOUS (continued)

INTEGUMENTARY

Adenitis (sweat gland)	1
Fibropapilloma	1
Fibrosarcoma	1
Skin, xanthoma	1
	1

MUSCULOSKELETAL

Fractured bone	1
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RESPIRATORY

Airsacculitis	1
Aspiration pneumonia	1
Avian influenza viral infection	1
Avian influenza virus PCR positive	3
Bacterial pneumonia	1
Bronchitis	1
Lung edema	1
Lung pneumonia, <i>Aspergillus</i>	1
Lung pneumonia, bacterial, miscellaneous	
Lung pneumonia, <i>Bordella</i> sp.	1
Lung pneumonia, mycotic	1
Lung pneumonia, <i>Pasteurella</i> sp.	2
Sinus sinusitis	2

UROGENITAL

Chronic tubulointerstitial nephritis	1
Salpingitis, inflammation of oviduct	1

CHICKEN

BODY AS A WHOLE

Avian, tuberculosis, <i>Mycobacterium</i>	1
Malnutrition	1
No diagnosis	3
Peritonitis	3
Septicemia, <i>Escherichia coli</i>	4
Septicemic, <i>Pasteurella multocida</i>	1
Toxicosis, zinc phosphide	1

CARDIOVASCULAR

Bacterial pericarditis	1
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CHICKEN (continued)

DIGESTIVE

Bacterial enteritis	1
Coccidiosis	1
Intestine enteritis, necrotic	1

HEMIC AND LYMPHATIC

Lymphoproliferative, Marek's, herpes	1
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MUSCULOSKELETAL

Bone osteodystrophy, rickets	6
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RESPIRATORY

Bacterial pneumonia	1
Bronchopneumonia	2
Tracheitis	1
Tracheitis, laryngotracheitis virus	1
Viral pneumonia	1

UROGENITAL

Membranous glomerulonephritis	1
Salpingitis, inflammation of oviduct	2

PHEASANT

BODY AS A WHOLE

Adenovirus	1
Malnutrition	4
No diagnosis	6
Peritonitis	2
Septicemia, <i>Escherichia coli</i>	3
Septicemia, <i>Salmonella</i>	1
Septicemic <i>Pasteurella multocida</i>	1

DIGESTIVE

Coccidiosis	2
Feces, rotavirus (EM)	1
Gastrointestinal parasitism	1
Intestine enteritis, rotavirus	1
Intestine enteritis, <i>Salmonella</i>	1

RESPIRATORY

Bronchopneumonia	1
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PHEASANT (continued)

Sinus sinusitis	1
Sinusitis, <i>Mycoplasma</i>	1

**TURKEY**

BODY AS A WHOLE

No diagnosis	1
Normal tissue	1
Septicemia, <i>Erysipelothrix rhusiopathiae</i>	1
Septicemia, <i>Escherichia coli</i>	10
Septicemia, <i>Salmonella</i>	4
Septicemic <i>Pasteurella multocida</i>	2

CARDIOVASCULAR

Heart, round heart syndrome	1
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DIGESTIVE

<i>Clostridium perfringens</i> / intestine	1
Coccidiosis	1
Enteritis colitis	1
Intestine enteritis, adenovirus	1
Intestine enteritis, <i>Clostridium perfringens</i>	1
Intestine enteritis, rotavirus	1
Intestine enteritis, <i>Salmonella</i>	2
Intestine enteritis, viral, miscellaneous	1
Pharyngitis	1

INTEGUMENTARY

Cellulitis	1
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MUSCULOSKELETAL

Bone osteodystrophy, rickets	1
Joint arthritis, bacterial, miscellaneous	1
Joint arthritis, <i>Mycoplasma</i> sp.	1
Myositis	1

RESPIRATORY

Bacterial pneumonia	3
Bronchopneumonia	6
Interstitial pneumonia	1
Lung pneumonia, <i>Bordetella</i> sp.	2
Lung pneumonia, <i>Escherichia coli</i>	1

TURKEY (continued)

Lung pneumonia, mycotic	1
Lung pneumonia, <i>Pasteurella multocida</i>	1
Lung pneumonia, <i>Salmonella</i> sp.	1
Pneumonia, <i>Ornithobacterium rhinotracheale</i>	6

**BAT**

BODY AS A WHOLE	
No diagnosis	33
NERVOUS	
Rabies	2

**BISON (AMERICAN)**

BODY AS A WHOLE	
Copper deficiency	1
Malignant catarrhal fever	2
No diagnosis	1
Normal tissue	1
DIGESTIVE	
Coccidiosis	2
Gastrointestinal parasitism	3
Hepatitis likely toxic	1
Intestine parasitism, whipworms	1
Liver abscess	1
Rumen rumenitis	1
INTEGUMENTARY	
Bacterial dermatitis	1
RESPIRATORY	
Bronchointerstitial pneumonia	1
Bronchopneumonia	1
Interstitial pneumonia	2
Lung pneumonia, abscess	1
Lung pneumonia, <i>Arcanobacterium pyogenes</i>	1
Lung pneumonia, <i>Histophilus somni</i>	1
Lung pneumonia, <i>Mannheimia haemolytica</i>	2

BISON (continued)

Lung pneumonia, <i>Mycoplasma</i> sp.	1
Lung pneumonia, parasitic, dictyocaulus	1
Lung pneumonia, <i>Pasteurella multocida</i>	1

UROGENITAL

Prepuce bacteriological examination	2
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**BOVINE**

BODY AS A WHOLE

Abscess	1
Anaphylaxis (type 1 hypersensitivity)	1
Anthrax	4
Autolysis	15
BVD infection	6
BVD Type II	1
BVD virus infection (virus isolation)	37
BVD virus PCR positive	16
Copper deficiency	15
Copper higher than normal	5
Copper marginal	3
Emaciation	2
Failure passive transfer	5
Fat serous atrophy	1
Fat steatitis	1
Hemorrhage	4
Herpesvirus DN599 infection virus isolation	10
Hypocalcemia	3
Hypomagnesemia	3
Infectious bovine rhinotracheitis virus isolation	1
Lead toxicosis	13
Lipoma	1
Listeria septicemia	1
<i>Mycoplasma</i> sp. isolation	15
Nitrate/nitrite toxicosis	1
No diagnosis	124
No histologic diagnosis	1
Normal tissue	56
Omphalitis (navel ill)	7
Peritonitis	16
Polyserositis	1
Pregnancy toxemia (ketosis)	1

## BOVINE (continued)

Salmonellosis	3
Selenium higher than normal	1
Selenium toxicosis	1
Septicemia	11
Septicemia, <i>Arcanobacterium pyogenes</i>	12
Septicemia, bacterial, miscellaneous	12
Septicemia, <i>Escherichia coli</i>	7
Septicemia, <i>Histophilus somni</i>	3
Septicemia, <i>Mannheimia haemolytica</i>	3
Septicemia, mycotic	1
Septicemia, <i>Salmonella</i>	36
Septicemic <i>Pasteurella multocida</i>	4
Serositis	1
Starvation/inanition	3
Sudden death	7
Tetanus	1
Toxicosis, ammonia	1
Toxicosis, copper	2
Trauma	7
Trauma related to predator / scavenger attack	1
Zinc higher than normal	4
CARDIOVASCULAR	
Bacterial pericarditis	4
Edema	1
Heart anomaly	2
Heart cardiomyopathy, nutritional	1
Heart endocarditis, <i>Arcanobacterium pyogenes</i>	1
Myocardial necrosis	2
Myocarditis	10
Right-sided congestive heart failure	1
Vasculitis	1
CHEMISTRY	
Water, toxic levels of sulfate	1
DIGESTIVE	
Abomasum abomasitis	15
Abomasum abomasitis, BVD	2
Abomasum abomastitis, <i>Clostridium</i> sp.	15
Abomasum dilatation	4
Abomasum displacement	6
Abomasum perforation	5

## BOVINE (continued)

Abomasum rupture	4
Abomasum ulceration	4
Atrophic enteritis	4
Bacterial enteritis	28
Bovine fatty liver syndrome	2
<i>Clostridium perfringens</i> / feces	1
<i>Clostridium perfringens</i> / intestine	8
Coccidiosis	29
Colitis	1
Cryptosporidiosis	122
Enteritis colitis	2
Enteritis due to BVD	11
Enteritis, idiopathic	145
Enteritis, Johne's disease	112
Enteritis, young calf total cases	469
Esophagitis	2
Feces, rotavirus (EM)	11
Gastrointestinal parasitism	1
Hepatic lipidosis	8
Hepatitis	8
Hepatitis likely toxic	1
Intestine enteritis, <i>Clostridium perfringens</i>	54
Intestine enteritis, <i>Clostridium perfringens</i> Type A	3
Intestine enteritis, <i>Clostridium perfringens</i> Type A Beta 2	10
Intestine enteritis, <i>Clostridium perfringens</i> Type C	3
Intestine enteritis, coccidia	21
Intestine enteritis, coronavirus	100
Intestine enteritis, <i>Escherichia coli</i>	16
Intestine enteritis, <i>Escherichia coli</i> (AEEC)	8
Intestine enteritis, granulomatous	1
Intestine enteritis, rotavirus	150
Intestine enteritis, <i>Salmonella</i>	49
Intestine enteritis, viral, miscellaneous	2
Intestine enteritis, necrotic	2
Intestine hemorrhage	1
Intestine, jejunal hemorrhagic syndrome	6
Intestine parasitism, nematodirus	3
Intestine parasitism, strongyles	6
Liver abscess	3
Liver hepatitis, necrotic	8
Liver hepatitis, parasitic	1
Liver parasitism, trematode	1
Liver passive congestion	1



BOVINE (continued)

Lymphocytic plasmacytic enteritis	1
Mesenteric torsion	1
Omasitis	1
Oral stomatitis	1
Parasitic colitis ( <i>Trichuris</i> )	1
Reticulum reticulitis, traumatic	9
Rumen acidosis / grain overload	2
Rumen rumenitis	8
Rumen rumenitis, mycotic	2
Rumen tympany, bloat	9
Typhilitis	1
HEMIC AND LYMPHATIC	
Anaplasmosis	1
Lymphadenitis	3
Lymphadenopathy	2
Lymphangiosarcoma	1
Lymphosarcoma	12
Neoplasm, lymphosarcoma abomasum	1
Spleen rupture	2
INTEGUMENTARY	
Bacterial dermatitis	3
Cellulitis	7
Dermatitis, parasitic, lice	1
Dermatopathy congenital	1
Mastitis	8
Mastitis ( <i>Staphylococcus aureus</i> )	15
Milk sample mastitis, bulk tank	14
Milk sample mastitis, clinical	38
Milk sample mastitis, subclinical	6
MUSCULOSKELETAL	
Arthritis	3
Clostridial myositis, blackleg	1
Fractured bone	1
Joint arthritis, <i>Arcanobacterium pyogenes</i>	1
Joint arthritis, <i>Mycoplasma bovis</i>	1
Joint arthritis, <i>Mycoplasma</i> sp.	3
Joint, coxofemoral luxation	1
Muscle myopathy, nutritional	2
Muscle myositis, <i>Clostridium</i> (ME)	2
Myopathy	1

## BOVINE (continued)

Myositis	6
Osteosarcoma	1
NERVOUS	
Brain encephalitis, bacterial, miscellaneous	5
Brain encephalitis, <i>Histophilus somni</i>	2
Brain encephalitis, non-suppurative	1
Brain encephalitis, suppurative	1
Brain encephalomalacia, polio	10
Brain encephalopathy	3
Brain meningitis, <i>Arcanobacterium pyogenes</i>	1
Brain meningitis, <i>Escherichia coli</i>	1
Brain meningitis, suppurative	5
Brain, meningoencephalitis	4
<i>Listeria monocytogenes</i> encephalitis	3
Meningitis	2
Rabies	1
RESPIRATORY	
Aspiration pneumonia	8
Bronchitis	3
Bronchointestinal pneumonia	36
Bronchopneumonia	45
Granulomatous pneumonia	1
Interstitial pneumonia	31
Lung, alveolar pneumonia	1
Lung edema	5
Lung hemorrhage	1
Lung pleuritis	4
Lung pneumonia, abscess	5
Lung pneumonia, acute atypical interstitial	12
Lung pneumonia, <i>Arcanobacterium pyogenes</i>	48
Lung pneumonia, bacterial, miscellaneous	11
Lung pneumonia, BRSV	39
Lung pneumonia, BVD virus	18
Lung pneumonia, embolic bacterial	2
Lung pneumonia, foreign body aspiration	4
Lung pneumonia, <i>Histophilus somni</i>	74
Lung pneumonia, IBR virus	4
Lung pneumonia, <i>Mannheimia haemolytica</i>	110
Lung pneumonia, <i>Mycoplasma hyopneumoniae</i>	2
Lung pneumonia, <i>Mycoplasma</i> sp.	160
Lung pneumonia, mycotic	2

## BOVINE (continued)

Lung pneumonia, <i>Pasteurella multocida</i>	104
Lung pneumonia, <i>Salmonella</i> sp.	8
Lung pneumonia, parasitic, dictyocaulus	1
Lung pneumonia, <i>Pasteurella</i> sp.	6
Lung pulmonary, atelectasis	3
Lung pulmonary, congestion	3
Lung pulmonary, emphysema	4
Meconium aspiration syndrome	13
Pleuritis	2
Pneumonia, <i>Mycoplasma bovis</i>	8
Pneumonitis	2
Tracheitis	2
SPECIAL SENSES	
Eye, <i>Branhamella</i> isolated	1
Eye keratoconjunctivitis, <i>Moraxella</i>	19
Eye neoplasm, squamous cell carcinoma	1
Otitis externa	1
Otitis media	5
Otitis, <i>Mycoplasma</i>	5
UROGENITAL	
Abortion, <i>Arcanobacterium pyogenes</i>	22
Abortion associated with <i>Neospora</i> -like organism	4
Abortion, <i>Brucella</i> sp.	1
Abortion due to BVD	2
Abortion due to <i>Campylobacter</i>	2
Abortion, <i>Campylobacter jejuni</i>	1
Abortion due to <i>Chlamydia psittaci</i>	4
Abortion due to IBR	10
Abortion due to <i>Listeria monocytogenes</i>	2
Abortion, hepatitis	5
Abortion, myocarditis	10
Abortion, <i>Pasteurella multocida</i>	1
Abortion placentitis	67
Abortion, pneumonia	19
Abortion, <i>Salmonella</i> sp.	1
Abortion with congenital anomaly	2
Bacterial abortion	8
Chronic tubulointerstitial nephritis	2
Cystitis	4
Endometritis, bacterial	5
Idiopathic abortion	195

BOVINE (continued)

Kidney pyelonephritis	3
Kidney renal dysplasia	1
Metritis	10
Milk <i>Mycoplasma</i> sp. isolated	6
Mycotic abortion	11
Nephritis	11
Nephrosis, idiopathic	1
Prepuce bacteriological examination	510
Pyelonephritis	1
Rupture of the urinary bladder	1
Urinary calculi, urolithiasis	2
Uterine torsion	1
Vagina bacteriologic examination	7
Vas deferens	2

CANINE

BODY AS A WHOLE

Abscess	2
Adenocarcinoma	2
Anaplastic (undifferentiated) carcinoma	1
Autolysis	1
Blastomycosis	4
Ethylene glycol toxicosis	4
Granulation tissue	1
Hamartoma	1
Hemorrhage	2
Histoplasmosis	2
Inflammatory mass	4
Leiomyoma	1
Leiomyosarcoma	1
Lipoma	26
Liposarcoma	1
<i>Mycoplasma</i> sp. isolation	1
No diagnosis	48
Normal tissue	9
Organophosphate toxicosis	1
Polyp	1
Septicemia, bacterial, miscellaneous	1
Septicemia, <i>Escherichia coli</i>	3

CANINE (continued)

Spindle cell tumor	1
Starvation / inanition	3
Trauma	2
<b>CARDIOVASCULAR</b>	
Blood vessels vasculitis	2
Congenital, patent ductus arteriosus	1
Heart endocardiosis, valvular	1
Heart failure, congestive	1
Myocardial necrosis	1
Myocarditis	1
Vasculitis	1
<b>DIGESTIVE</b>	
Acanthomatous epulis	3
Ameloblastoma	1
Bacterial enteritis	2
Cholangitis	1
<i>Clostridium perfringens</i> / intestine	1
Enteritis, idiopathic	11
Epulis	10
Gastric carcinoma	1
Gastric torsion	2
Gastrointestinal parasitism	2
Giardiasis	11
Gingival hyperplasia	2
Gingivitis	1
Glossitis	1
Hepatic glycogenosis	1
Hepatic lipidosis	5
Hepatitis	1
Intestinal torsion	1
Intestine enteritis, coccidia	1
Intestine enteritis, coronavirus	1
Intestine enteritis, <i>Escherichia coli</i>	6
Intestine enteritis, parvovirus	4
Intestine enteritis, <i>Salmonella</i>	1
Mesenteric torsion	1
Oral neoplasm, melanoma	1
Oral neoplasm, squamous cell carcinoma	1
Parvovirus enteritis	12
Salivary gland sialadenitis	2
Salivary gland sialoceles	1

## ENDOCRINE

Thyroid carcinoma	1
Thyroid, lymphocytic thyroiditis	1
Thyroid neoplasm, carcinoma	1

## HEMIC AND LYMPHATIC

Bone marrow neoplasm, myeloproliferative	1
Hemangioma	5
Hemangiopericytoma	13
Hemangiosarcoma	3
Hematoma	1
Hemobartonellosis	1
Hyperplastic lymph node	1
Lymphadenitis	2
Lymphosarcoma	8
Plasma cell neoplasm, plasmacytoma	3
Spleen splenosis	1
Strangles	1
Thymus, hemorrhage	1

## INTEGUMENTARY

Adenitis (sweat gland)	1
Bacterial dermatitis	1
Basal cell carcinoma	1
Basal cell tumor	3
Calcinosis circumscripta	1
Cellulitis	7
Chronic hyperplastic dermatitis	4
Cystic mammary gland ducts	1
Dermal fibrosis (collagen nevus)	5
Dermal hair follicle cyst	8
Dermatitis, focal	11
Dermatitis granulomatous	5
Dermatitis, immune mediated	1
Dermatitis, lick granuloma	3
Dermatitis, mycotic (fungal)	1
Dermatitis, non-specific	6
Dermatitis, parasitic, demodex	1
Dermatitis, scar	2
Dermatophy congenital	1
Dermatophytosis ringworm	5
Discoid lupus erythematosus	1
Endocrine dermatopathy	3

CANINE (continued)

Epidermal cyst	15
Fibroma	3
Fibrosarcoma	2
Focal adnexal dysplasia	3
Folliculitis	2
Foreign body granuloma	4
Granuloma	1
Histiocytoma	39
Keratoacanthoma	1
Malignant fibrous histiocytoma	1
Malignant melanoma	9
Mammary adenoma	5
Mammary carcinoma	2
Mammary carcinoma adenocarcinoma	8
Mammary gland neolasm, malignant mixed	2
Mammary, hyperplasia	2
Mast cell tumor	5
Mast cell tumor, grade I, well differentiated	20
Mast cell tumor, grade II, differentiated	15
Mast cell tumor, grade III, poorly differentiated	5
Melanoma	10
Mixed mammary tumor	10
Mixed mammary tumor - malignant	2
Myxoma	1
Myxosarcoma	1
Neoplasm, cutaneous lymphoma	4
Neoplasm, intracutaneous Cornif epithelium	2
Neoplasm, neuroendocrine (Merkel)	1
Neoplasm, papilloma	2
Neoplasm, perianal gland adenoma	20
Neoplasm, perianal gland carcinoma	2
Neoplasm, pilomatrixoma	4
Neoplasm, sarcoma (undifferentiated)	1
Neoplasm, sebaceous gland adenoma	8
Neoplasm, squamous cell carcinoma	4
Neoplasm, trichoblastoma	2
Neoplasm, trichoepithelioma	11
Panniculitis	12
Pilomatrixoma	3
Pyogranuloma	1
Sebaceous gland hyperplasia	6
Sebaceous gland inflammation	1

Sweat gland adenoma	1
Sweat gland cyst	4
<b>MUSCULOSKELETAL</b>	
Chondroma	2
Chondrosarcoma	2
Fractured bone	1
Joint arthritis, bacterial, miscellaneous	1
Osteosarcoma	4
Synovia neoplasm, synoviosarcoma	1
<b>NERVOUS</b>	
Brain encephalitis, canine distemper	2
Brain encephalitis, non-suppurative	1
Brain meningitis, suppurative	1
Brain, meningoencephalitis	1
Hydrocephalus	2
Nerve neoplasm, Schwannoma	7
Rabies	1
<b>RESPIRATORY</b>	
Aspiration pneumonia	1
Bacterial pneumonia	1
Intestinal pneumonia	2
Lung edema	1
Lung hemorrhage	1
Lung pneumonia, <i>Bordetella</i> sp.	1
Lung pneumonia, <i>Escherichia coli</i>	3
Lung pneumonia, mycotic	1
Lung pneumonia, <i>Pasteurella multocida</i>	1
Lung pneumonia, <i>Streptococcus</i> sp.	2
Lung pulmonary, atelectasis	1
Nasal carcinoma	1
Rhinitis	2
Sinus sinusitis	1
<b>SPECIAL SENSES</b>	
Ear otitis interna	2
Eye neoplasm, melanoma	1
Otitis externa	7
	1
<b>UROGENITAL</b>	
Abortion, hepatitis	1



## CANINE (continued)

Abortion, placentitis	1
Chronic tubulointerstitial nephritis	2
Cystitis	3
Glomerulonephritis	2
Granulosa cell tumor	2
Idiopathic abortion	2
Interstitial cell tumor	1
Kidney, nephrosis	1
Papilloma squamous	1
Seminoma	2
Sertoli cell tumor	2
Testis neoplasm, interstitial cell	2
Transitional cell carcinoma	3
Transmissible venereal tumor	1
Vagina vaginitis	1

## CAPRINE

### BODY AS A WHOLE

Autolysis	1
Copper deficiency	3
Iron deficiency	1
Malnutrition	1
No diagnosis	6
Normal tissue	1

### CARDIOVASCULAR

Myocardial necrosis	1
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### DIGESTIVE

Bacterial enteritis	1
Coccidiosis	6
Cryptosporidiosis	1
Eosinophilic enteritis	1
Gastrointestinal parasitism	2
Glossitis	1
Intestine enteritis, <i>Clostridium perfringens</i>	1
Intestine enteritis, Coccidia	1
Intestine enteritis, <i>Salmonella</i>	1
Intestine parasitism, strongyles	3
Parasitic enteritis	2

CAPRINE (continued)

HEMIC AND LYMPHATIC

Anemia	1
Lymph node lymphadenitis, caseous	1

INTEGUMENTARY

Cellulitis	1
Chronic hyperplastic dermatitis	1
Dermatitis, focal	1
Milk sample mastitis, clinical	1
Parakeratosis zinc deficiency	1

NERVOUS

Brain encephalitis, non-suppurative	1
Brain meningitis, suppurative	1
<i>Listeria monocytogenes</i> encephalitis	1

RESPIRATORY

Lung pneumonia, <i>Actinobacillus lignieres</i>	1
Lung pneumonia, <i>Arcanobacterium pyogeness</i>	2
Lung pneumonia, <i>Mannheimia haemolytica</i>	7
Lung pneumonia, <i>Mycoplasma</i> sp.	2
Lung pneumonia, <i>Pasteurella multocida</i>	4

SPECIAL SENSES

Eye keratoconjunctivitis, <i>Moraxella</i>	1
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UROGENITAL

Abortion, <i>Campylobacter jejuni</i>	2
Abortion due to <i>Chlamydia psittaci</i>	8
Abortion due to <i>Coxiella</i>	1
Abortion due to <i>Listeria monocytogenes</i>	1
Abortion, goiter	1
Abortion, placentitis	4
Abortion, <i>Toxoplasma gondii</i>	4
Bacterial abortion	1
Idiopathic abortion	11
Uterus metritis, <i>Clostridium perfringens</i>	1

COYOTE

BODY AS A WHOLE

No diagnosis	2
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## DEER

### BODY AS A WHOLE

Abscess	2
Malnutrition	1
No diagnosis	7
Polyserositis	1
Septicemia, <i>Arcanobacterium pyogenes</i>	1
Toxicosis, sodium ion / water deprivation	1

### CARDIOVASCULAR

Blood vessels vasculitis	1
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### DIGESTIVE

Abomasum abomastitis, <i>Clostridium</i> sp.	1
Bacterial enteritis	2
Hair ball	1
Intestine enteritis, <i>Clostridium perfringens</i>	1
Intestine enteritis, <i>Clostridium perfringens</i> A Beta 2	1
Rumen acidosis / grain overload	2
Rumen rumenitis	1

### ENDOCRINE

Adrenal, cortex hypertrophy	1
Pituitary adenoma	1

### INTEGUMENTARY

Dermatitis, parasitic, demodex	1
Endocrine dermatopathy	1

### MUSCULOSKELETAL

Myopathy	1
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### NERVOUS

Brain encephalitis, abscess	1
Brain encephalitis, non-suppurative	2
Brain encephalitis, polio	2
Brain meningitis, <i>Arcanobacterium pyogenes</i>	2

### RESPIRATORY

Laryngitis	1
Lung pneumonia, <i>Arcanobacterium pyogenes</i>	3
Lung pneumonia, <i>Mycoplasma</i> sp.	1

DEER (continued)

Lung pneumonia, parasitic, miscellaneous	2
Pleuritis	1

UROGENITAL

Chronic tubulointerstitial nephritis	1
Metritis	1

**ELK**

RESPIRATORY

Lung pneumonia, <i>Actinobacterium pyogenes</i>	1
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UROGENITAL

Abortion, pneumonia	1
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**EQUINE**

BODY AS A WHOLE

Actinobacillosis	1
Adenocarcinoma	1
Autolysis	1
Copper marginal	1
<i>Corynebacterium pseudotuberculosis</i>	1
No diagnosis	5
Normal tissue	2
Peritonitis	1
Polyp, inflammatory	1
Septicemia, <i>Actinobacillus equuli</i>	1
Septicemia, <i>Salmonella</i>	1
Septicemia, <i>Streptococcus</i> sp.	1
Toxicosis, miscellaneous	1
Toxicosis, zine phosphide	2

DIGESTIVE

Colitis	1
Colon, impaction	1
Ehrlichial colitis (Potomac horse fever)	1
Enteritis, idiopathic	5
Gastrointestinal intussusception	1
Gastrointestinal parasitism	1

Glossitis	1
Hepatitis likely toxic	1
Hepatopathy	2
Idiopathic colitis (colitis X)	1
Intestine displacement	1
Intestine enteritis, bacterial, miscellaneous	3
Intestine enteritis, <i>Clostridium perfringens</i>	1
Intestine enteritis, necrotic	1
Intestine enteritis, <i>Salmonella</i>	1
Intestine parasitism, strongyles	2
Mesenteric torsion	1
Typhlitis	1
HEMIC AND LYMPHATIC	
Hemangioma	1
Lymphosarcoma	1
INTEGUMENTARY	
Chronic hyperplastic dermatitis	1
Dermatophytosis ringworm	1
Fibroma	1
Melanoma	1
Neoplasm, sarcoid	4
Neoplasm, squamous cell carcinoma	1
MUSCULOSKELETAL	
Arthritis	1
Fractured bone	1
NERVOUS	
Brain encephalopathy	1
RESPIRATORY	
Guttural pouch empyema	1
Lung pneumonia, <i>Rhodococcus equi</i>	2
Lung pneumonia, <i>Streptococcus equi</i>	2
Rhinitis	1
UROGENITAL	
Abortion, pneumonia	1
Bacterial abortion	2
Idiopathic abortion	4
Kidney nephrosis	1

Kidney pyelonephritis	1
Pyelonephritis	1
Squamous cell carcinoma, penile	1

**FELINE**

## BODY AS A WHOLE

Adenocarcinoma	1
Emaciation	1
Ethylene glycol toxicosis	1
Giant cell tumor, soft parts	1
Histoplasmosis	1
Lipoma	2
No diagnosis	47
Normal tissue	1
Septicemia	2
Septicemia, <i>Escherichia coli</i>	1
Septicemia, <i>Francisella tularensis</i>	4
Septicemia, <i>Streptococcus</i> sp.	1

## CARDIOVASCULAR

Acute heart failure	1
Congenital, patent ductus arteriosus	1
Heart cardiomyopathy, nutritional	1

## DIGESTIVE

Bacterial enteritis	2
Enteritis, idiopathic	5
Feline infectious peritonitis	5
Giardiasis	2
Hepatitis likely toxic	1
Intestine enteritis, <i>E. coli</i>	1
Intestine enteritis, <i>E. coli</i> (AEEC)	1
Intestine parasitism, ascarids	1
Lymphocytic plasmacytic enteritis	2
Oral neoplasm, squamous cell carcinoma	2
Oral stomatitis	1
Parasitic enteritis	2
Parvovirus enteritis	5

HEMIC AND LYMPHATIC

Hemangioma	1
Lymphosarcoma	5
Thymus, hemorrhage	1

INTEGUMENTARY

Alopecia	1
Basal cell tumor	3
Cellulitis	2
Chronic hyperplastic dermatitis	1
Dermal fibrosis (collagen nevus)	1
Dermatitis, focal	2
Dermatitis, immune mediated	1
Dermatitis, non-specific	1
Dermatophytosis ringworm	7
Eosinophilic plaque	1
Fibroma	2
Fibrosarcoma	3
Fibrosarcoma, feline, vaccine induced	1
Mammary carcinoma	2
Mast cell tumor	2
Mast cell tumor, grade 1, well differentiated	1
Neoplasm, carcinoma (undifferentiated)	1
Neoplasm, sebaceous gland adenoma	2
Neoplasm, sweat gland adenoma	1
Neoplasm, trichoblastoma	1

MUSCULOSKELETAL

Myositis	1
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NERVOUS

Brain encephalitis, non-suppurative	3
Brain encephalitis, protozoal, miscellaneous	1
Brain encephalitis, suppurative	1
Brain encephalopathy	1
Brain meningitis, suppurative	1
Nerve neoplasm, Schwannoma	2
Rabies	1

RESPIRATORY

Lung edema	1
Lung pneumonia, <i>Bordella</i> sp.	1
Lung pneumonia, feline rhinotracheitis	

FELINE (continued)

Lung pneumonia, <i>Pasteurella multocida</i>	1
Pleural cavity pyothorax	1

SPECIAL SENSES

Ceruminous gland carcinoma	1
Otitis externa	1

UROGENITAL

Kidney nephrosis	2
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**FOX**

DIGESTIVE

Gastrointestinal parasitism	1
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HEMIC AND LYMPHATIC

Hemangiosarcoma	1
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**GOPHER**

BODY AS A WHOLE

No diagnosis	1
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**MINK**

BODY AS A WHOLE

No diagnosis	1
Septicemia, <i>Escherichia coli</i>	1

INTEGUMENTARY

Dermatitis, <i>Staphylococcus intermedius</i>	1
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**MUSKRAT**

BODY AS A WHOLE

No diagnosis	1
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## OPOSSUM

### BODY AS A WHOLE

No diagnosis 1

## OVINE

### BODY AS A WHOLE

Ascites 1  
Copper deficiency 2  
Copper higher than normal 1  
Copper marginal 1  
Hypocalcemia 2  
Hypomagnesemia 1  
Malnutrition 1  
No diagnosis 9  
Normal tissue 3  
Sarcocystosis 2  
Sudden death 1  
Toxicosis copper 5  
Trauma 1

### CARDIOVASCULAR

Heart endocarditis, valvular 1  
Myocardial necrosis 2  
Myocarditis 1

### DIGESTIVE

Abomasum abomasitis, *Clostridium* sp. 1  
Abomasum abomasitis, mycotic 1  
Abomasum ulceration 1  
Bacterial enteritis 2  
Carbohydrate overload, acute 1  
*Clostridium perfringens* / intestine 2  
*Clostridium perfringens* Type D 1  
Colitis 1  
Colitis, *Clostridium difficile* 1  
Enteritis, idiopathic 1  
Enteritis, Johne's disease 1  
Eosinophilic enteritis 1  
Gastrointestinal parasitism 6  
Glossitis 1

OVINE (continued)

Hepatitis	1
Intestinal adenocarcinoma	1
Intestine enteritis, <i>Clostridium perfringens</i>	5
Intestine enteritis, <i>Clostridium perfringens</i> Type A, Beta 2	1
Intestine enteritis, coccidia	9
Intestine enteritis, <i>Escherichia coli</i>	1
Intestine enteritis, rotavirus	2
Intestine enteritis, <i>Salmonella</i>	4
Intestine hemorrhage	1
Intestine parasitism, cestodes	1
Intestine parasitism, strongyles	1
Liver hepatitis, necrotic	1
Mesenteric torsion	1
Rumen acidosis / grain overload	1
Rumen, tympany, bloat	1
HEMIC AND LYMPHATIC	
Lymph node lymphadenitis, caseous	1
Lymphosarcoma	1
INTEGUMENTARY	
Mastitis ( <i>Staphylococcus aureus</i> )	1
Milk sample mastitis, clinical	2
MUSCULOSKELETAL	
Muscle myopathy, nutritional	1
Myopathy	2
NERVOUS	
Bacterial encephalitis	1
Brain encephalitis, non-suppurative	1
Brain encephalomalcia, polio	2
Brain, scrapie	23
Brain, meningoencephalitis	1
<i>Listeria monocytogenes</i> encephalitis	2
RESPIRATORY	
Bacterial pneumonia	1
Bronchopneumonia	4
Interstitial pneumonia	4
Lung edema	2
Lung pleuritis	2
Lung pneumonia, <i>Arcanobacterium pyogenes</i>	1

Ovine (continued)

Lung pneumonia, embolic bacterial	1
Lung pneumonia, <i>Mannheimia haemolytica</i>	9
Lung pneumonia, <i>Mycoplasma</i> sp.	3
Lung pneumonia, <i>Pasteurella multocida</i>	3
Lung pulmonary congestion	1

UROGENITAL

Abortion, <i>Arcanobacterium pyogenes</i>	2
Abortion, <i>Bacillus</i> sp.	1
Abortion, <i>Campylobacter fetus intestinalis</i>	1
Abortion, <i>Campylobacter jejuni</i>	7
Abortion due to <i>Campylobacter</i>	3
Abortion due to <i>Chlamydia psittaci</i>	15
Abortion due to <i>Coxiella</i>	1
Abortion, hepatitis	1
Abortion, <i>Mannheimia haemolytica</i>	1
Abortion, myocarditis	1
Abortion, placentitis	4
Abortion, pneumonia	1
Abortion, <i>Salmonella</i> sp.	1
Abortion, <i>Toxoplasma gondii</i>	8
Bacterial abortion	3
Dystocia	1
Idiopathic abortion	14
Kidney, nephrosis	1
Metritis	1
Vas deferens	1

**PORCINE**

BODY AS A WHOLE

Abscess	2
Autolysis	2
Circovirus	473
Copper deficiency	1
Copper marginal	1
Edema disease	1
Enterovirus infection (virus isolation)	2
Heat prostration	1
Hemorrhage	5
No diagnosis	26
Normal tissue	10

PORCINE (continued)

Peritonitis	5
Polyserositis	7
Polyserositis ( <i>Haemophilus parasuis</i> Glasser's)	3
Polyserositis, <i>Streptococcus suis</i>	2
Septicemia	6
Septicemia, <i>Actinobacillus suis</i>	2
Septicemia, <i>Arcanobacterium pyogenes</i>	7
Septicemia, bacterial, miscellaneous	2
Septicemia, <i>Erysipelothrix rhusiopathiae</i>	3
Septicemia, <i>Escherichia coli</i>	2
Septicemia, <i>Haemophilus parasuis</i>	1
Septicemia, <i>Mannheimia haemolytica</i>	1
Septicemia, <i>Salmonella</i>	23
Septicemia, <i>Streptococcus suis</i>	2
Septicemia, <i>Pasteurella multocida</i>	2
Trauma	1
Virus isolation PRRS	21

CARDIOVASCULAR

Bacterial pericarditis	6
Heart endocarditis, <i>Erysipelothrix</i>	2
Heart endocarditis, <i>Streptococcus suis</i>	2
Heart endocarditis, valvular	1
Heart, epicarditis	2
Mulberry heart disease	4
Myocardial necrosis	1
Myocarditis	1

DIGESTIVE

Atrophic enteritis	4
Bacterial enteritis	5
Colitis	17
Colitis, <i>Clostridium difficile</i>	4
Enteritis due to TGE	1
Enteritis, idiopathic	18
Enteritis, nursing total cases	80
Enteritis, weaned total cases	91
Gastric torsion	1
Gastric ulcer	8
Gastritis	1
Hepatitis	3
Intestinal accident	4
Intestinal torsion	4

PORCINE (continued)

Intestine enteritis, <i>Clostridium perfringens</i>	26
Intestine enteritis, <i>Clostridium perfringens</i> Type A	1
Intestine enteritis, <i>Clostridium perfringens</i> Type A Beta 2	7
Intestine enteritis, coccidia	7
Intestine enteritis, enterovirus	1
Intestine enteritis, <i>Escherichia coli</i>	67
Intestine enteritis, <i>Escherichia coli</i> (AEEC)	4
Intestine enteritis, porcine proliferative	14
Intestine enteritis, rotavirus	29
Intestine enteritis, <i>Salmonella</i>	38
Intestine enteritis, viral, miscellaneous	10
Intestine parasitism, whipworms	1
Liver hepatitis, necrotic	1
Liver hepatitis, parasitic	1
Mesenteric torsion	3
HEMIC AND LYMPHATIC	
Anemia	2
Anemia, iron deficiency	1
Blood parasite, <i>Mycoplasma haemosuis</i>	1
Icterus	1
Lymphadenitis	1
Lymphadenitis, bacterial	1
Lymphadenopathy	1
Spleen infarction	1
Spleen splenitis	3
INTEGUMENTARY	
Dermatitis, <i>Staphylococcus hyicus</i>	2
Dermatitis, <i>Staphylococcus</i> sp.	1
Dermatitis, diffuse	1
Dermatitis, non-specific	2
Dermatitis, parasitic, mites	1
Exudative epidermitis, greasy pig disease	1
MUSCULOSKELETAL	
Arthritis	3
Fractured bone	1
Hernia inguinal	1
Joint arthritis, <i>Arcanobacterium pyogenes</i>	5
Joint arthritis, suppurative	1
Myositis	1

PORCINE (continued)

Osteochondrosis	1
Synovitis	1
NERVOUS	
Brain encephalitis, enterovirus	1
Brain encephalitis, <i>Streptococcus suis</i>	2
Brain encephalitis, viral, miscellaneous	2
Brain meningitis, <i>Arcanobacterium pyogenes</i>	1
Brain meningitis, <i>Haemophilus parasuis</i>	2
Brain meningitis, non-suppurative	1
Brain meningitis, <i>Streptococcus suis</i>	17
Brain meningitis, suppurative	4
RESPIRATORY	
Atrophic rhinitis	1
Bronchointerstitial pneumonia	9
Bronchopneumonia	22
Inclusion body rhinitis	1
Interstitial pneumonia	15
Lung pneumonia, <i>Actinobacillus pleuropneumoniae</i>	15
Lung pneumonia, <i>Actinobacillus suis</i>	23
Lung pneumonia, <i>Arcanobacterium pyogenes</i>	40
Lung pneumonia, bacterial, miscellaneous	4
Lung pneumonia, <i>Bordetella</i> sp.	42
Lung pneumonia, <i>Haemophilus parasuis</i>	57
Lung pneumonia, <i>Mycoplasma hyopneumoniae</i>	83
Lung pneumonia, parasitic, ascaris	2
Lung pneumonia, <i>Pasteurella multocida</i>	146
Lung pneumonia, PRRS	151
Lung pneumonia, <i>Salmonella</i> sp.	7
Lung pneumonia, <i>Streptococcus</i> sp.	3
Lung pneumonia, <i>Streptococcus suis</i>	131
Lung pneumonia, swine influenza virus	12
Nasal ELISA, SIV	2
Nasal isolation, <i>Pasteurella multocida</i>	1
Pleuritis	2
Rhinitis	2
UROGENITAL	
Abortion, associated with PRRS	3
Abortion, pneumonia	4
Bacterial abortion	5
Chronic tubulointerstitial nephritis	3

PORCINE (continued)

Cystitis	1
Glomerulonephritis	1
Idiopathic abortion	22
Metritis	1
Nephritis	7
Nephropathy	1
Orchitis	1
Prepuce bacteriological examination	1
PRRS virus positive by PCR	89
Vas deferens	2

**RABBIT**

BODY AS A WHOLE	
No diagnosis	1

**RACCOON**

BODY AS A WHOLE	
No diagnosis	10

NERVOUS	
Brain encephalitis, protozoal, miscellaneous	2
Brain encephalitis, canine distemper	6
Brain meningitis, non-suppurative	1
Brain, meningoencephalitis	1
Meningitis	1

**REPTILE**

BODY AS A WHOLE	
Malnutrition	1
No diagnosis	2
Septicemia	1
Steatitis	1

DIGESTIVE	
Cryptosporidiosis	1
Gastritis	1
Intestine enteritis, <i>Salmonella</i>	1

REPTILE (continued)

INTEGUMENTARY

Contact dermatitis 1

RESPIRATORY

Interstitial pneumonia 1

UROGENITAL

Nephritis 1

**SKUNK**

NERVOUS

Rabies 14

**WILDLIFE / ZOO**

BODY AS A WHOLE

Abscess 1

Actinobacillosis 1

Hemorrhage 1

Malnutrition 1

No diagnosis 7

Normal tissue 5

Peritonitis 1

Septicemia 2

Septicemia, bacterial, miscellaneous 1

Septicemia, *Escherichia coli* 3

Septicemia, *Francisella tularensis* 1

Trauma 1

CARDIOVASCULAR

Blood vessel vasculitis 1

Heart anomaly 1

DIGESTIVE

Abomasum ulceration 1

Cholangitis 1

Gastrointestinal parasitism 1

Gingivitis 1

Hepatitis 1

Intestine enteritis, coccidia 2



Intestine parasitism, ascarids	1
Intestine parasitism, cestodes	1
HEMIC AND LYMPHATIC	
Bone marrow neoplasm, myeloproliferative	1
Hemangioma	1
INTEGUMENTARY	
Cellulitis	1
Fibrosarcoma	2
Mammary carcinoma	1
Mastitis	1
MUSCULOSKELETAL	
Nutritional myopathy	1
Vertebrae fracture	1
NERVOUS	
Brain encephalitis, bacterial, miscellaneous	1
Brain meningitis, non-suppurative	1
Brain meningitis, suppurative	2
RESPIRATORY	
Bronchopneumonia	2
Chlamydia psittaci, respiratory chlamydia	1
Interstitial pneumonia	1
Lung pleuritis	1
Lung pneumonia, bacterial, miscellaneous	5
Lung pneumonia, <i>Pasteurella multocida</i>	2
Lung pneumonia, <i>Escherichia coli</i>	2
Lung pneumonia, parasitic, metastrongylus	2
Parasitic pneumonia	1
SPECIAL SENSES	
Conjunctivitis	1
UROGENITAL	
Abortion, <i>Salmonella</i> sp.	1
Chronic tubulointerstitial nephritis	1
Idiopathic abortion	3
Interstitial cell tumor	1

Kidney, nephrosis	2
Membranoproliferative glomerulonephritis	1
Nephropathy (end stage renal disease)	1

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## **PRESENTATIONS—2006**

### **CHASE, CHRISTOPHER**

- 1) BVDV Update. Veterinary Diagnostic Update, Brookings, SD, January 9.
- 2) Bovine immunology. Roundtable, Intervet, Scottsdale, AZ, January 24.
- 3) Cutting edge immunology and wildlife's role in BVD biosecurity. Pfizer Animal Health Midwinter Veterinarian Retreat, Deadwood, SD, February 2.
- 4) Virulent BVDV Type II challenge of BVDV naïve and BVDV maternal antibody positive neonatal calves vaccinated at 3.5 months of age with pyramid FP5. Wyeth Animal Health Continuing Education Seminar, Winnipeg, MB, Canada, February 11; Brooks, AB, Canada, February 27; Calgary, AB, Canada, February 27; Red Deer, AB, Canada, February 28; Edmonton, AB, Canada, February 28; Lloydminster, AB, Canada, March 1; Saskatoon SK, Canada, March 1; and Moose Jaw, SK, Canada, March 2; Guelph ONT Canada August 22; Ottawa ONT Canada, August 23; and Drummondville QUB, Canada, August 24.
- 5) What impact do circulating antibodies have with your cattle during processing? Fort Dodge Animal Health Feedlot Success 2006 Seminar, Omaha, NE, March 17.
- 6) Circulating antibodies: how do your clients overcome them? Fort Dodge Animal Health Feedlot Success 2006 Seminar, Omaha, NE, March 17.
- 7) How does BVDV affect your herd? Carroll County Cattlemen, Manning IA, April 4.
- 8) Developing the primary immune system. Southwest Iowa Veterinary Medical Association, Osceola, IA, April 5.
- 9) BVD testing in cattle and why deer are serving as a reservoir host. Southwest Iowa Veterinary Medical Association, Osceola, IA, April 5.
- 10) BVD genetic diversity. Schering-Plough Animal Health, Fort Wayne, IN,

- April 22.
- 11) BVD AgTele panel. Schering-Plough Animal Health, April, 26.
  - 12) Circulating antibodies: how do your clients overcome them? Fort Dodge Animal Health 2006 Dairy Leaders, Oregon, OH, May 4.
  - 13) New developments in vaccine development. Faculty of Veterinary Medicine, Zagazig University, Zagazig, Egypt, May 13.
  - 14) Bovine Respiratory Disease. Faculty of Veterinary Medicine, Cairo University, Giza, Egypt, May 17.
  - 15) BVD roundtable. Schering-Plough Animal Health, Omaha, NE, May 30.
  - 16) Immunology 101: The primary immune response. Nebraska Veterinary Medical Association Summer Meeting, Hastings, NE, June 22.
  - 17) Immunology of BVDV. Schering-Plough Animal Health, Deadwood, SD, July 7.
  - 18) The primary immune response. Veterinary Focus meeting, Bloomington MN, July 21.
  - 19) Overcoming maternal interference and BVDV diagnostics. Nelson Tradeshow, Sioux Falls, SD, July 25.
  - 20) The maternal antibody dilemma, BVD pool testing and managing your way through BVD. 1<sup>st</sup> Annual Beef Production Seminar, Chamberlain, SD, August 3.
  - 21) Avian influenza: is it a threat? Brookings Health System Medical Staff Conference, Brookings, SD, September 13.
  - 22) The primary immune response and non-cytopathic BVD. Northeast Wisconsin Veterinarians, Green Bay, WI, November 1.
  - 23) Avian influenza: hazard or hype? Brookings County Regional Pandemic Taskforce, Brookings SD, November 9; and College of Nursing Seminar, South Dakota State University, Brookings, SD, November 30.

#### **CHRISTOPHER-HENNINGS, JANE**

- 1) Porcine Reproductive and Respiratory Syndrome Virus: Room for research in the immunology of the boar (male) reproductive tract. American Association of Veterinary Immunologist / American College of Veterinary Microbiologists in association with the Conference for Research Workers in Animal Disease, Chicago, IL, December 2.
- 2) Boar stud issues: PRRSV diagnostics for boar studs and methodology of SDSU PRRSV PCR. American Association of Swine Veterinarians, Kansas City, MO, March 4.

#### **DALY, RUSS**

##### **MEDIA**

- 1) Tuberculosis in Minnesota. Today's Ag, February 16.
- 2) Equine Herpesvirus infections. SDSU Ag Extension Radio Update, March 3; Today's Ag, March 13; and Tri-State Neighbor, March 30.
- 3) Cold weather conditions and calves. SDSU Ag Communications news release, March 20.

- 4) Anthrax prevention. SDSU Ag Communications, April 26; Argus Leader interview, April 27; Angus Journal, May 9; WNAX radio interview, June 29; and SDSU Ag Extension radio update, June 30.
- 5) Emerging swine diseases (PCVAD, PRRS). Today's Ag, May 4.
- 6) Swine circovirus infection. SDSU Ag Extension radio update, May 16.
- 7) Dust pneumonia in calves on pasture. Today's Ag, May 24.
- 8) Drought issues panel discussion. Today's Ag, June 2.
- 9) Anthrax awareness. SDSU Ag Communications news release, June 27.
- 10) Heat stress in feedlot calves. WNAX radio interview, July 17.
- 11) Anthrax infection and prevention. Today's Ag, July 21.
- 12) Biosecurity concerns when buying cattle. WNAX radio interview, July 26; and Today's Ag, August 25.
- 13) AIP and grass tetany. SDSU Ag Communications, September 11.
- 14) Process verified programs available to SD cattle producers. Today's Ag, October 27; SDSU Ag Extension radio update, October 27.
- 15) Antibiotic resistance: role of animal health treatments. Today's Ag, November 17; River Valley Cooperative website interview, November 20.

#### **PRESENTATIONS**

- 1) Reduction of calf scours using the Sandhills calving system. Calving Clinic, Presho, January 4; Calving Clinic, Wall, SD, January 4.
- 2) Current animal health concerns: BVD and trichomoniasis. Calving Workshop, Union Center, January 5; and Beef Day, Buffalo, SD, January 6.
- 3) Computer-based tools for epidemiology. SDSU Diagnostic Lab Update, Brookings, SD, January 9.
- 4) Calving time preparations. Calving Workshop, Freeman, January 11.
- 5) Pork Quality Assurance training. SD Pork Producers annual meeting, Sioux Falls, SD, January 13.
- 6) Use of vaccination in calf scours prevention/trichomoniasis/calving time preparations. Calving Workshop, Redfield, SD, January 17.
- 7) Reduction of calf scours using the Sandhills calving system/Use of vaccination in calf scours prevention. Ranchers' Workshop, Miller, SD, January 17.
- 8) Trichomoniasis in the Northern Plains. Bull Selection Workshop, Mitchell, SD, January 19; and Winner, SD, January 19.
- 9) Current animal health concerns: BVD, trichomoniasis, and tuberculosis. Ranchers' Appreciation Day, Mobridge, SD, February 3.
- 10) Using biosecurity to prevent reproductive disease. Ranchers' Workshop, Gettysburg, SD, February 8.
- 11) Tuberculosis in cattle. Watertown Farm Show, Watertown, SD, February 10.
- 12) Veterinary Extension at SDSU. SDVMA District 2 meeting, Faulkton, SD, February 23.
- 13) Springtime vaccinations for cows and calves. Cow/Calf Workshop, Frederick, SD, March 8.
- 14) Extension veterinarians: their role in disease investigation and public health. Foodborne and Diarrheal Diseases Branch, Centers for Disease Control and Prevention, Atlanta, GA, March 31.

- 15) Avian influenza. Conference call presentation for Extension Educators, SDSU, Brookings, SD, May 10.
- 16) Youth Pork Quality Assurance. V-Tel for SD Extension Livestock Educators, SDSU, Brookings, SD, May 13.
- 17) A future as a veterinarian. 4-H Teen Leadership Conference, SDSU, Brookings, SD, June 7.
- 18) Current swine health issues. American Soybean Association delegation from China, SDSU, Brookings, SD, June 14.
- 19) Transmissible spongiform encephalopathies: current understanding. US State Department delegation from Japan, Rapid City via V-Tel, June 16.
- 20) Attitudes toward veterinary medicine: a survey of undergraduates. SDVMA annual meeting, Sioux Falls, SD, August 14.
- 21) Swine disease eradication: role of management and biosecurity. US Grains Association delegation from China, SDSU, Brookings, SD, September 21.
- 22) Use of biological risk management tools in teaching undergraduates. Faculty representative and Extension Veterinarian breakfast, American Association of Bovine Practitioners, St. Paul, MN, September 22.
- 23) Animal disease biosecurity: keeping your herd and family safe. Women in Agriculture Conference, Spearfish, SD, September 30.
- 24) Control of infectious reproductive diseases and timing of vaccination in beef cattle herds. Applied Reproductive Strategies in Beef Cattle Symposium, Rapid City, SD, October 3.
- 25) Country of origin labeling: impact on animal and public health. SD Governor's Task Force on Country of Origin Labeling, Pierre, SD, October 6.
- 26) Food safety and public health aspects of hunting wild game. Hunter Safety Planning meeting for Extension Educators, Sioux Falls, SD, October 10; and Web Conference for Extension Educators, SDSU, Brookings, SD, October 14.
- 27) Veterinary Extension in South Dakota. American Association of Extension Veterinarians annual meeting, Minneapolis, MN, October 16.
- 28) Process verified programs available to SD cattle producers. SD Cooperative Extension Service Annual Conference, Livestock Breakout Session, Brookings, SD, October 18.
- 29) Bovine Viral Diarrhea. SDSU Animal and Range Sciences Beef Group, SDSU, Brookings, SD, November 17.
- 30) Drylotting beef cows: animal health considerations. Drylot Management meeting, Mitchell, SD, November 30; and Beresford, SD, November 30<sup>th</sup>.
- 31) Attitudes toward veterinary medicine: a survey of undergraduates. SDSU/Pfizer Informal Beef Group, SDSU, Brookings, SD, December 19.

#### **FANG, YING**

- 1) Antibody response to PRRSV Nsp2 cysteine protease. International PRRSV Symposium, Chicago, IL.
- 2) Reverse genetics in PRRSV. Faculty seminar, Ag/Bio College, SDSU, Brookings, SD.

- 3) Emergence of European-like PRRSV in North America. Veterinary Medicine Institute of Guangdong Academy of Agriculture Sciences, Guangzhou, Guangdong, P.R. China.

#### **GRAHAM, TANYA**

- 1) H5N1 Avian Influenza and wild bird surveillance: specimen collection wet lab. ADRDL, SDSU, Brookings, SD, May 2.
- 2) Transmission of high path Avian Influenza H5N1: animals to animals and animals to people. Pandemic Influenza update. Information for Health Care Professionals, Brookings Hospital, Brookings, SD, May 5; Brookings County Pandemic Preparedness Cooperative Committee, Swiftel Center, Brookings, SD, May 11; Moody County Update, Flandreau, SD, June 29; Dakota Provisions Turkey Processing Plant, SDSU ADRDL, July 27; and SD Osteopathic Association annual meeting, Pierre, SD, December 2.
- 3) Update: Transmission of high path Avian Influenza H5N1. Seminar series lecture, SDSU College of Ag/Bio Sciences, September 15.
- 4) Avian Influenza and hunting. Today's Ag, September 22.
- 5) Necropsy night. SDSU Pre-veterinary Club meeting, Brookings, SD, October 5.
- 6) Avian Influenza and backyard poultry operations. SDSU Ag Communications, Brookings, SD, November 9; and Today's Ag, November 17.

#### **HARDWIDGE, PHILIP**

- 1) 2010 Center report. Yankton, SD, July 6.
- 2) Flushing out the host intestinal response to diarrheagenic *E. coli* virulence proteins. Life Science Seminar Series, SDSU, Brookings, SD, September 6; and Loyola University, Chicago, IL, September 6.
- 3) Proteomic analysis of the intestinal epithelial cell response to enteropathogenic *E. coli*. American Society for Microbiology, October 6.

#### **HOLLER, LARRY**

- 1) Submission of samples for diagnosis of abortion. Diagnostic Laboratory Update, SDSU, Brookings, SD, January 9.
- 2) Utilizing the Diagnostic Lab. Minnesota Lamb and Wool Producers Annual Conference, Minnesota West Technical College, Pipestone, MN, December 1-2.
- 3) Abortion diseases and diagnostics in small ruminants. Minnesota Veterinary Medical Association's annual meeting, Duluth, MN, February 23.
- 4) Sheep feedlot medicine: a diagnostic challenge. Minnesota Veterinary Medical Association's annual meeting, Duluth, MN, February 23.
- 5) Sheep producers can manage three major causes of abortion. Tri-State Neighbor, March; and The Prairie Star Livestock, March.

#### **KNUDSEN, DAVID**

- 1) Swine viral disease in Europe: current medical and diagnostic practice. SDVMA annual meeting, Sioux Falls, SD, August 15.

**MISKIMINS, DALE**

- 1) Bovine respiratory diseases. Diagnostic Lab Update, SDSU, Brookings, SD, January 9.
- 2) *Clostridium perfringens* A/E infections in cattle. Herd Health Conference, Brookings, SD, February 18.
- 3) Transport tetany in feeder lambs. SDVMA annual meeting, Sioux Falls, SD, August 15.
- 4) Relationship of copper, selenium, and zinc to bovine respiratory disease. Beef Group, Brookings, SD, December 19.

**NEIGER, REGG**

- 1) Toxicology and VADDS sessions at ADRDL. Diagnostic Lab Update, SDSU, Brookings, SD, January 9.
- 2) Porcine circovirus. SDVMA annual meeting, Sioux Falls, SD, August 15.

**PILLATZKI, ANGELA**

- 1) Diagnosis of central nervous system disease. Diagnostic Lab Update, SDSU, Brookings, SD, January 9.

**THIEX, NANCY**

- 1) Current and developing analytic methods available to researchers at SDSU. SDSU Informal Beef Group, Brookings, SD, December 19.

**ZEMAN, DAVID**

- 1) Porcine circovirus-associated disease: North American perspective. National Veterinary Research and Quarantine Services, Federal Government of Korea, Anyang, Korea, October 23.
- 2) Quality system management in veterinary diagnostic laboratories. Provincial Laboratories Seminar Series. National Veterinary Research and Quarantine Services, Federal Government of Korea, Kangwon Province, Korea, October 25.



## **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)
- AH-241 Antimicrobial sensitivity and characterization of *Campylobacter* spp. isolates from ovine abortions and comparison to other *Campylobacter*—Epperson, Holler (October 2001-September 2006)
- AH-271 Evaluation of anti-diarrhea substances in pigs—Francis (October 2001-September 2006)
- AH-341 Controlling bovine viral diarrhea virus (BVDV): Improving methods for diagnosis and understanding mechanisms of pathogenesis—Chase, Graham (October 2001-September 2006)

### **Experiment Station**

- G-075 Genetic marker development in the Nsp2 region of a European-like PRRSV: Implications for future recombinant marker vaccine development—Fang (September 2005-August 2008)
- G-125 Third International Rushmore Conference on Enteric Disease: Strategies in the prevention of enteric disease and dissemination of food-borne pathogens—Francis (October 2005-September 2006)
- G-224 Development of a vaccine for protecting weaned pigs from enterotoxigenic *Escherichia coli*—Francis, Young (October 2004-September 2008)
- H-044 Role of intestinal epithelial cells in mucosal immunity of domestic animals—Kaushik (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 2009)
- H-177 Quantification of enterotoxin-mediated enhancement of bacterial adherence to intestinal epithelial cells—Hardwidge, Francis (October 2006-September 2009)
- H-180 *In vivo* evaluation of genetic markers in the Nsp2 region of porcine reproductive and respiratory syndrome virus—Fang (October 2006-September 2009)
- H-213 Parasite issues in South Dakota Beef Production—Hildreth, Epperson (October 2003-September 2008)
- H-241 Antimicrobial sensitivity and characterization of *Campylobacter*—Epperson, Holler (October 2001-September 2006)
- H-244 Analysis of pesticides and related compounds—Matthees (October 2004-September 2009)
- H-251 Description, impact, and risk factors associated with lung lesions in lambs—Daniel, Holler, Held (October 2001-September 2006)

- R-084 A collaborative initiative for domestic surveillance, diagnosis, and therapy of transmissible spongiform encephalopathies—Young, Graham (February 2004-September 2005)
- R-159 An integrated approach to the control of bovine respiratory diseases—Chase, Daly (October 2006-September 2011)
- R-171 Evolving pathogens, targeted sequences, and strategies for control of bovine respiratory disease—Chase, Epperson (October 2001-September 2006)
- R-194 Porcine reproductive and respiratory syndrome: Methods for the integrated control, prevention and elimination of PRRS in U.S. swine herds—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—Thiex (Ongoing Project)

**National Pork Board**

- Accurate ELISA test development for PRRSV serology: Evaluation of cysteine protease domains of Nsp2 as potential diagnostic targets—Fang, Benfield, Rowland, Christopher-Hennings, Nelson (August 2005-August 2006)
- Implementation of PRRSV database-Renewal—Faaberg, Christopher-Hennings, Collins, Retzel (2006)
- *In vivo* evaluation of genetic markers in the Nsp2 region of PRRSV: Implications for future recombinant marker vaccine development—Fang, Nelson, Christopher-Hennings, Knudsen (January 2007-January 2008)
- Prevention of PRRS by antibody administration—Harris, Erdman, Strohhahn, Platt, Plagemann, Osorio, Nelson (August 2005-August 2006)

**Schering-Plough Animal Health**

- Comparison of the distribution of three BVDV vaccine antigens in tissues of calves following vaccination—Chase, Holler, Broderson, University of Nebraska, Rural Technologies, Inc. (January 2007-July 2007)

**USDA CREES, 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-July 2008)

**USDA Food Safety and Inspection Service**

- Food emergency response network: Enhancement of laboratory testing capability for microbiological threat agents at the SDSU/ADRDL—Ruesch, Zeman, Francis (September 2005-August 2006)

### **USDA Food Safety and Inspection Service/FERN Grant**

- Microbiology—Zeman, Ruesch (2006)

### **USDA/JDIP CAP**

- 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 2008)

### **USDA National Animal Health Lab Network**

- Zeman (June 2005-July 2006)

### **USDA National Research Initiative, Competitive Grants Program**

- Influence of enterotoxins on virulence and colonization of the porcine intestine by *Escherichia coli*—Moxley, Francis (October 2004-September 2006)

### **USDA National Research Initiative, PRRS Integrated Program**

- Integrated control and elimination of porcine reproductive and respiratory syndrome virus (PRRSV) in the U.S.—Consortium project of approximately 11 participating universities (March 2004-December 2007)
- Characterization of PRRSV minor glycoproteins for use in a second-generation vaccine—Faaberg, Nelson, Lopez, Yoo (January 2005-July 2007)
- Management of PRRS persistence: Identification of persistently-infected swine—Rowland, Zimmerman, Evans, Nelson, Christopher-Hennings, Benfield (December 2004-July 2006)
- PRRSV surveillance, elimination and immunity in boars and boar semen—Christopher-Hennings, Munoz-Zanzi, Loskutoff, Lunney, Nelson (April 2006-May 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**

- Emerging virulence factors in *E. coli* 0157:H7 pathogenesis—Hardwidge, Finlay (June 2007-May 2009)
- Germinal center function in prion disease—Young, Bartz (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**

- Development of a novel assay for influenza A virus assembly inhibitors—Li (May 2007-April 2008)

### **National Science Foundation**

- Role of Peyers patches in neonatal development—Butler, Francis (2007)

### **Egyptian and Educational and Cultural Bureau**

- Training grant for Egyptian scientists—Chase (July 2000-August 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. (January 2007-September 2007)
- Determination of the cell mediated immune response in animals vaccinated with Virashield 6—Chase, Young, Rural Technologies, Inc. (March 2007-December 2007)

### **Pfizer, Inc.**

- Surveillance of trichostrongyle nematodes in cattle herds in the Northern Plains by multiplex PCR as a tool to evaluate emerging resistance of macrocyclic lactones—Hildreth (June 2006-June 2007)

### **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 (2006-2007)

### **South Dakota Governor's 2010 Initiative**

- A porcine model for enterotoxigenic *E. coli* strains afflicting humans—Hardwidge (July 2005-June 2007)

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

- Influenza and metapneumovirus—Li (July 2005-June 2007)

### **South Dakota Poultry Industries Association**

- Poultry education and travel—Zeman (2006-2007)

### **South Dakota State University, Research Support Fund**

- Treatment and prevention of postweaning colibacillosis using soybean products—Erickson, Lin (April 2006-March 2007)

## 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	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 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	Topics, 1-3 cr. (Veterinary Science Faculty)
VET 792	Tp—Faculty Seminar, 1 cr. (Young)
VET 792	Tp—Immunology, 3 cr. (Chase)
VET 792	Tp—Molecular Diagnostics/PCR, 3 cr. (Christopher-Hennings)
VET 792	Tp—Monoclonal Antibody Production, 1 cr. (Fang)
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 663 Advanced Concepts Infectious Disease, 6 cr. (Young)
- 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)

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