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Animal Health MATTERS Newsletter

Veterinary and Biomedical Sciences

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Animal Health MATTERS

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Animal Health MATTERS

March 2015



Latest Version of South Dakota “One Health” Meetings Explores Tuberculosis in Humans and Cattle

Russ Daly DVM, SDSU

Over 50 participants from human health and animal health organizations met in Sioux Falls on January 27 to hear from experts in tuberculosis – a disease that affects people as well as animals.

While infections due to *Mycobacterium tuberculosis* in the human population continue to decline in the US, over 9 million new cases of tuberculosis are diagnosed worldwide. Human infections with *Mycobacterium bovis*, the cause of tuberculosis in cattle, are also diagnosed in the US, with over 100 cases in 2013, the most recent reporting year. While many of these infections are obtained through consumption of unpasteurized dairy products in developing countries, the possibility of cattle-to-human or human-to-cattle transmission also exists.

Highlighting the potential for zoonotic tuberculosis transmission were presentations from Kirby Kruger, director of the North Dakota Department of Health’s Division of Disease Medical Services, and Dr. Susan Keller, North Dakota State Veterinarian. They described their work with a case involving transmission of *Mycobacterium bovis* from an employee at a dairy to cattle on that farm.

The meeting featured topics that alternated between human and animal aspects of tuberculosis. Drs. Earl Kemp, Jennifer Hsu, and Archana Chatterjee from the USD Sanford School of Medicine spoke on the biology and current forms of treatment of tuberculosis in human patients. Dr. Kathy Orloski, National Epidemiologist from USDA/APHIS’s Bovine Tuberculosis Eradication program, outlined current knowledge of the biology and present state of bovine tuberculosis in the US. Kristin Rounds, South Dakota’s Tuberculosis Control Coordinator, and Dr. Dustin Oedekoven, South Dakota State Veterinarian, discussed the epidemiology of human and animal tuberculosis in South Dakota.

The meeting was held on the campus of the USD Sanford School of Medicine in Sioux Falls. Participants included medical students viewing from a live feed at USD in Vermillion as



Dr. Dustin Oedekoven, South Dakota State Veterinarian, presents information on bovine tuberculosis regulatory efforts in South Dakota at the South Dakota One Health meeting held January 27, at the USD Sanford School of Medicine in Sioux Falls. (Photo: Eric Dalsieide, USD)

well as representatives from several different organizations, including the SD Department of Health, SD Department of Agriculture, Avera McKennan, SDSU, USDA, Great Plains Zoo, SD Animal Industry Board, and several veterinarians and physicians.

The meeting was the latest in a series of “One Health” meetings held in South Dakota, organized through SDSU, USD Sanford School of Medicine, the SD Department of Health, and the SD Animal Industry Board. Previous topics have included antibiotic resistance, animal contact in public settings, rabies, and Q Fever. ■

Director's Message

Jane Hennings, DVM, MS — Director ADRDL

I just want to let you know that the ADRDL has great people working in the laboratory. So, I am just going to “highlight” a few achievements and activities of some of the faculty and staff in the department who want to work for you.



This is not an exhaustive list! Some additional details are also stated throughout this “Animal Health Matters” publication.

First of all, I would like to thank those that participated in the new video that just went “on-line” on our website. See: www.sdstate.edu/vs/adrdl. The video has both former students and employees, those currently in the laboratory and several of you that use the laboratory. We are in the process of “updating” some of the information on the website, so if you have ideas for what you would like available there, please let me know. E-mails can be sent to:

Jane.Hennings@sdstate.edu.

Other important “happenings” in the department include: obtaining membership to the FDA “Geotraker” program for performing whole genome sequencing on food borne pathogens, particularly *Sal-*

monella. Dr. Joy Scaria, who started with us in September, is currently working on this program, and we are partners with the SD Department of Health on this project.

In addition, both Linda Fawcett and Tami Messenger from the Serology Section were able to give a presentation to the Livestock Exporter’s Meeting in February to provide them with information on “How to get the most out of your laboratory experience”. Export testing on cattle and swine are performed via the Serology and Molecular Diagnostic’s Sections, which are attentive to getting these tests done on time with accurate results.

Several faculty and staff including Dr. Eric Nelson, Dr. Chris Chase and Travis Clement gave presentations on PEDv and PDCoV diagnostics and gut mucosal immunity at the American Association of Swine Veterinarian’s Meeting this month. Several diagnostic tests were developed at our laboratory for the swine enteric coronaviruses and are now licensed to various national and international companies including a PEDv/TGE/PDCoV real-time PCR, an indirect ELISA, a multiplexing serologic assay called a “fluorescent multiplex immunoassay” and monoclonal antibodies to PEDV and PDCoV (which are used for immunohistochemistry, for verification of virus isolation and for the serological “fluorescent focus neutraliza-

tion” test).

Research Associates Seema Das, MS and Laura Ruesch, MS have been performing testing on milk via culture techniques and using the “MALDI TOF” instrumentation. They are putting together information on this milk testing that can currently be performed at the ADRDL. This printed information will be presented this month at the Central Plains Dairy Expo in Sioux Falls. In January, Dr. Russ Daly organized a South Dakota “One Health” meeting focusing on tuberculosis in people and animals. This meeting was attended by MDs, veterinarians and other medical professionals to present perspectives on this infectious disease.

As I thought of this year, I was encouraged to think that we “have the right people on the bus” as stated in the book “Good to Great” by Jim Collins, (if you think of the bus as your company, institution, school, etc.). He states, “if people board the bus principally because of all the other great people on the bus, you’ll be much faster and smarter in responding to changing conditions. Second, if you have the right people on your bus, you don’t need to worry about motivating them.” I can honestly state that there are some great people on this laboratory “bus”, and we hope you will let us know how we can use this expertise to meet your needs. ■

Bailey Herd Health Conference Covers Connection Between Facilities and Animal Health

Russ Daly, DVM, SDSU

Over 50 veterinarians were on hand at the annual James Bailey Herd Health Conference on the SDSU campus, Saturday, February 14. A wide variety of speakers covered aspects of cattle housing and facility design. Topics included air quality, animal health in a variety of feedlot configurations, ventilation, and automated calf feeding units.

The featured speaker, Dr. Kip Lukasiewicz, from Production Animal Consultants in St. Paul, Nebraska, focused on the pros and cons of different cattle handling facility designs. Veterinarians in attendance learned about cattle behavior relative to their movement through “Bud Boxes” and curved alley configurations. Dr. Kevin Janni and Jim Salfer from the University of Minnesota

later turned the meeting focus to raising dairy calves. The proper design and management of calf barn ventilation systems as well as automated milk feeders was detailed. Veterinarians also heard from SDSU Extension Environmental Quality Engineer Dr. Erin Cortus on air quality in monoslope cattle buildings, as well as Dr. Reid McDaniel, SDSU Extension Feedlot Specialist, and Heidi Carroll, SDSU Extension Livestock Stewardship Associate. McDaniel and Carroll spoke on health parameters among three different feedlot configurations at SDSU’s Opportunities Farm.

Veterinarians also were updated on the status of SDSU’s new Cow-Calf and Swine Unit projects, as well as an update from the Veterinary and Biomedical Sci-



Dr. Kip Lukasiewicz, St. Paul, Nebraska, presents information on cattle behavior through handling facilities at the 2015 James Bailey Herd Health Conference held at SDSU in Brookings.

ences Department. Special guests were Dr. Jim Bailey, 91, retired SDSU Extension Veterinarian, and his wife Roberta. ■

Essential Behind the Scenes Work: Accounting and Human Resources Staff at the VBS and ADRDL

Russ Daly DVM, SDSU

The Veterinary and Biomedical Sciences Department is a unique entity on the SDSU campus. As with any other department at South Dakota's largest university, it carries out the traditional missions of research, teaching, and outreach. But the department distinguishes itself from others at SDSU as the home for the state's Animal Disease Research and Diagnostic Laboratory, a multi-million dollar service entity. A staff of over 100 faculty, scientists, staff, and students carries out the work of the lab and the department every day, in addition to research, teaching and outreach functions. Keeping the administrative wheels greased for these people to do their jobs requires a significant amount of support.

Keeping those widely varied and critical activities running in the background is a team of two individuals that oversee the important accounting, purchasing, accounts payable and human resource tasks that need to occur to keep accounts receivable coming in, the employees paid, and the supplies and inventory stocked on the shelves.

Russell Lokken, BS, MBA, holds the title of Budget and Administration Coordinator. He oversees the accounting, purchasing, and human resources func-

tions of the VBS Department as well as the ADRDL. Russell has 35 years' experience with SDSU, the past 18 of which have been with the department and ADRDL. Prior to that, he held positions on campus with the Department of Finance and Budget in the Cashier's office, as well as with campus stores and the print facility. A native of White, he holds an accounting degree from Mankato State University and an MBA from the University of South Dakota.

Bridget Skeels, BS, Accountant, has been with the department since January 2015 (see "New Hires" below). Bridget is responsible for invoicing and management of timekeeping and leave balances, research and analytics using Excel. She provides business office functions for the permanent faculty and staff, as well as the many student and hourly workers employed



Accounting and Human Resources personnel (L-R:) Russell Lokken, Budget and Administration Coordinator and Bridget Skeels, Accountant.

throughout the year. Bridget brings with her a deep understanding of indexes and analytics, providing the department leadership with meaningful data that can be used to make the right decisions about the use of department resources. ■

New Hires at South Dakota ADRDL

Bridget Skeels began work in the Accounting/HR department in January 2015. Bridget comes to the Veterinary and Biomedical Sciences Department with a great deal of university



experience under her belt. She previously spent two years on the staff of the SDSU Office of Continuing Education and International Affairs, having worked in accounting in the Academic Affairs office prior to that. In addition, Bridget worked for the University of Wisconsin-Stout in Menominee, Wisconsin, after her graduation from there with a management degree.

Bridget is a native of Kirksville, Mis-

souri and lives in Elkton with her husband Steve, who is on the staff of Bel Brands in Brookings, and two children, Bryan and Ashley. While serving the staff and clients of the ADRDL and department, Bridget is finishing up on MBA degrees in finance and accounting through Colorado Technical University, which she will complete this November.

Zach Lau also began work at the ADRDL in January 2015. Zach's duties at the lab revolve around the receiving office, where he processes incoming samples for distribution to the various laboratory sections. Entering and tracking sample information are important parts of his duties. Zach will also spend time filling in on the necropsy floor, assisting

pathologists with data entry and the distribution of samples to the appropriate laboratory sections. His ability to fill in when

needed in the Molecular Diagnostics section is also an asset to the ADRDL.

Zach graduated from SDSU in 2013 with a degree in Wildlife and Fisheries. His prior experience included time as a biologist on the staff of a local fish hatchery. He spent his childhood years growing up in Maryland, but moved to Jasper, Minnesota, during high school and graduated from Garretson High School. ■



Dairy Animal and Product Testing Services at the ADRDL

The ADRDL has a long history of serving the region's dairy producers since its inception in 1887. Dairy farming, manufacturing, and lab technology have all changed dramatically since then. One major example illustrating the leaps and bounds technology has taken is the recent addition of the MALDI-TOF MS

MASTITIS / ANIMAL HEALTH TESTING		Sample received	Samples tested
Milk Testing for Mastitis	Identifies any microorganism found in milk sample including <i>Strep. agalactiae</i> , <i>Staph. aureus</i> , <i>E.coli</i> , yeast, other <i>Staphylococcus</i> species and other <i>Streptococcus</i> species, <i>Trueperella pyogenes</i> and any other bacteria present in high numbers.	Monday - Friday	Monday - Saturday
Mycoplasma Milk Screening	Checks for presence of <i>Mycoplasma</i> species in individual cow milk or bulk tank. For specific <i>Mycoplasma bovis</i> identification, PCR tests can be requested.	Monday - Friday	Monday - Friday
Bulk Tank Testing	Enumerates major categories of bacteria in bulk tank milk, including <i>Strep agalactiae</i> , <i>Staph. aureus</i> , Coliforms, Non-ag Streps, coagulase negative <i>Staph</i> , and other bacteria in high numbers.	Monday - Friday	Monday - Thursday
Antibiotic Susceptibility	Determines whether bacteria is susceptible or resistant to commonly used antibiotics. The antibiotics tested include: ampicillin, ceftiofur, cephalothin, oxacillin, erythromycin, novobiocin, penicillin G, pen-novo, pirlimycin, streptomycin, and tetracycline.	Monday - Friday	Monday - Friday
Environmental Samples	Checks for presence of <i>Salmonella</i> , <i>E.coli</i> or other bacteria in high numbers from different types of environmental samples such as bedding, water, milk replacers, feed, and laboratory isolates.	Monday - Friday	Monday - Friday
Rapid Testing for Antibiotics in Milk	Can be performed on request by a client or for research purposes. Drugs detected include beta lactams, flunixin, streptomycin, neomycin/streptomycin, chloramphenicol, fluoroquinolones, sulfonamides, tetracycline, macrolides, and aflatoxin.	Monday - Friday	Monday - Friday
PRODUCT SAFETY TESTING			
Aerobic Plate Count	Indicates levels of microorganisms in product.	Monday - Friday	Monday - Wednesday
<i>E.coli</i>/Coliform Count	Quantitative analysis for the presence of <i>Escherichia coli</i> Biotype 1 and coliforms.	Monday - Friday	Monday - Wednesday
Pathogen Testing	Qualitative, validated testing for low levels of pathogens (<i>Escherichia coli</i> O157:H7, Shiga toxin-producing <i>E. coli</i> , <i>Campylobacter</i> , <i>Listeria monocytogenes</i> , Genus <i>Listeria</i>)	Monday - Friday	Varies by test, contact lab

(matrix-assisted laser desorption ionization time-of-flight Mass Spectrometry) instrument to the ADRDL’s bacteriology section. MALDI-TOF technology means that bacteria (aerobic or anaerobic) and fungal samples can be rapidly identified. This has dramatically shortened turnaround time for clients.

The chart below outlines the available ADRDL services that specifically support the area’s expanding dairy industry. Call the ADRDL at 605-688-5171 for more information about these services.

Price	Turnaround time	Ideal specimen	Shipping sample
\$7.00	3-4 days	2 ml milk	Sterile tube with ice packs
\$12.00	8-10 days	2 ml milk	Sterile tube with ice packs
\$28.00	3-4 days	6 ml milk (minimum) collected on 3-5 consecutive days	Sterile tube with ice packs. Freeze samples immediately after collection. Samples must remain cold, preferably frozen.
\$15.00* (One sensitivity is free with milk testing request) *price correction	2-3 days	2 ml milk or Pure culture	Sterile tube or plate with growth with ice packs.
\$25.00-\$100 (depending on the type of sample and test)	2-4 days	Water, feed, culture plate	with ice packs
Depends on the test	6 days	6 ml milk	with ice packs
\$15	48 hours after test initiation	10ml milk	with ice packs
\$15	48 hours after test initiation	10ml milk	with ice packs
Varies by test, contact lab	Varies by test, contact lab	25ml milk	with ice packs

Video Production Highlights ADRDL Value to Animals and Citizens

A new video production emphasizes the role that South Dakota's Animal Disease Research and Diagnostic Laboratory plays in animal and public health for the state and region.

Titled, "South Dakota ADRDL: Answering Questions that Keep Animals and People Healthy," the production features testimonials from Dr. Monte Fuhrman, Sioux Nation Ag Center, Sioux Falls; Dr. Dustin Oedekoven, South Dakota State Veterinarian; Dr. Angela Pillatzki, ADRDL; and Dr. Lon Kightlinger, South Dakota State Epidemiologist. These individuals speak on how the ADRDL helps them answer critical diagnostic questions for veterinary clients, regulatory agencies, and public health officials of the state and region.

In addition, the video features Debra Thomas, Brookings Health System, and graduate student Kyle Hain. The role of the ADRDL in training the next generation of veterinarians and laboratory scientists is stressed through their stories.

The video was produced through the efforts of Yeager Media Center at SDSU, with special thanks to Bruce Anderson and Lowell Haag. View the clip at <http://youtu.be/ArU9VaB6l4w>

Bovine Respiratory Coronavirus Testing

Dale Miskimins and Diego Diel

Bovine coronaviruses can cause neonatal diarrhea, winter dysentery in adult animals, respiratory infection and diarrhea in feedlot cattle. The ADRDL has recently added testing for **bovine respiratory coronavirus**. PCR testing is set-up weekly on Monday (typically reported on Tuesday) on deep nasal swabs, tracheobronchial wash fluid, and lung. Samples with low Ct PCR values (acute cases) may be suitable for additional virus isolation attempts. Dr. Diego Diel's laboratory is performing virus isolation examination using HRT (human rectal tumor) cells. We hope to learn more about the respiratory and enteric coronavirus strains circulating in the upper Great Plains. Contact the laboratory at 605-688-5171 for additional information.

Dr. Hennings Named to AAVLD Executive Board

Dr. Jane Christopher-Hennings, ADRDL Director and VBS Department Head, was recently named to the Executive Board for the American Association of Veterinary Laboratory Diagnosticians (AAVLD). She will serve the board as the representative for the North Central Region. The AAVLD promotes continuous improvement and public awareness of veterinary diagnostic laboratories through education, communication, peer-reviewed publication, collaboration, outreach, and laboratory accreditation.

Equine Well-Being Survey: Please Respond!

Heidi Carroll, SDSU Livestock Stewardship Extension Associate

What is the current level of care being offered to animals in South Dakota? What perceptions about animal well-being exist in South Dakota? What educational resources are you looking for to learn more about animal well-being and on-farm care? Are you curious to know the answers? So are we.

The SDSU Extension team is conducting a survey to investigate these questions. The goal of the survey is to gain understanding about the current perceptions of animal well-being in South Dakota. The survey emphasis is on horses, however additional livestock species may be added in the future.

Who should complete the survey? Anyone of any age who participates in horse events, owns or manages horses, works in the horse industry, or simply enjoys being a spectator of horse events. All responses will remain confidential.

How to complete the survey? The survey can be completed online at <http://equinewell-beingsd.questionpro.com>. Follow the directions and when all questions are complete, click sub-

mit. If you are uncomfortable completing the survey online, a paper version with return envelope can be mailed to you by simply contacting Heidi Carroll.

For more information: Please contact Heidi Carroll, SDSU Livestock Stewardship Extension Associate, at 605-688-6623 or heidi.carroll@sdstate.edu.

Nelson Presented with SDSU Faculty Award

Dr. Eric Nelson, Professor and Assistant VBS Department Head, was honored at SDSU's annual Celebration of Faculty Excellence banquet held February 17 on the SDSU campus.

Dr. Nelson received the 2015 **Pat and Jo Cannon Intellectual Property Commercialization award**. This award is presented to faculty members whose inventions have potential for regional economic development and successful commercialization through a technology transfer process with industry partners.

Will Aylor, Assistant Vice President, stated, "Dr. Nelson's discovery, isolation, diagnosis, and prevention of infectious agents in animal health are renowned in South Dakota and throughout the world. His prolific work continues with 17 invention disclosures and 15 commercially licensed technologies to companies ranging from world leaders in animal health to local start-ups in the last 6 years alone. Dr. Nelson is able to anticipate areas of need as new animal diseases emerge leading to sponsored research and technologies with a built-in commercial interest. He is an invaluable asset to the students and other researchers who have been taught by him, SDSU, and animal health around the world."

In all, SDSU honored 19 different faculty members for their accomplishments and contributions to the university, state, and beyond.

New Graduate Students

Two new graduate students have started working with Dr. Diego Diel to begin the Spring 2015 semester:

Kyle Hain. Kyle obtained his B.A. in Biology at SDSU in December 2014. He will be working with porcine coronaviruses, aiming to understand the mechanisms underlying their interactions with the host and disease pathogenesis.

Lok Raj Joshi. Lok obtained his Bachelor of Veterinary Science and Animal Husbandry at the Institute of Agriculture and Animal Science (IAAS), Tribhuvan University, Rampur, Chitwan, Nepal, in 2013. He will be working on viral vaccine delivery vectors for use in livestock species.

Soft Tissue Sarcomas in Dogs

Angela Pillatzki, DVM, MS, DACVP

Cutaneous and subcutaneous soft tissue sarcomas (STS) are mesenchymal neoplasms which originate from soft connective tissues. They most often occur in middle-aged to older, medium- to large-breed dogs. In general, STS are slow growing, locally invasive and have a low to moderate metastatic rate. As a group, these neoplasms share similar biological features such as: they most often occur on the trunk and limbs; grossly they frequently appear well-demarcated, but microscopically they often have a pseudocapsule and poorly defined margins; they infiltrate adjacent tissues along fascial planes; and local recurrence is more common with conservative excision.

Tumors comprising the STS group include peripheral nerve sheath tumor (not originating from the brachial plexus), fibrosarcoma (excluding oral tumors), myxosarcoma, liposarcoma, perivascular wall tumors, malignant mesenchymoma and undifferentiated sarcoma. Tissue of origin can be difficult to determine at the light microscopic level with routine H&E staining because the individual tumor types share similar cellular characteristics, cellular patterns and cellular matrix. Expression of cellular markers as measured by immunohistochemistry (IHC) is often shared among the individual tumor types, so a panel of IHC cell markers may be required to determine the tissue origin of an individual tumor.

Regardless of tissue of origin and anatomic location, studies have shown that STS histologic grades are a strong predictor of recurrence and to a lesser extent, rate of metastasis. The grading scheme for STS takes into account tissue differentiation, mitotic index and extent of necrosis. When considering the completeness of surgical excision, "complete margins" are defined as a minimum distance of 3-5mm between the surgically-created tissue edge and neoplastic cells. "Close margins" are defined as a distance of less than 3mm between the surgically-created tissue edge and neoplastic cells or the surgical edge does not contain normal tissue beyond the pseudocapsule.

In general, prognostic traits for each STS grade are as follows:

Grade I tumors

- Recurrence is rare with complete margins; and recurrence is infrequent with close margins
- Metastasis is rare

Grade II tumors

- Recurrence is rare with complete margins; and recurrence is intermediate with close margins
 - Rate of recurrence is increased and tumor-free interval is shorter with close margins compared with Grade I tumors
- Metastasis is rare to infrequent

Grade III tumors

- Recurrence is rare to infrequent with complete margins; and recurrence is likely with close margins
- Greatest metastatic potential of all grades
- Least common tumor grade
- Typically most infiltrative and difficult to achieve complete margins

It is important to remember, however, that tumor grade may not have a pro-

found effect on patient survival because both primary and metastatic STS tend to be slow growing. Patients with STS are often older and other age-dependent diseases may have a greater impact on their survival. Although tumor location can impact the success of complete excision, it may not significantly impact a patient's quality of life. Patient survival and quality of life, in addition to STS tumor grade, should be considered when contemplating treatment options for this type of tumor.

References:

- Dennis M, McSporran K, Bacon N, Schulman F, Foster R and Powers B: Prognostic factors for cutaneous and subcutaneous soft tissue sarcomas in dogs. *Vet Pathol* 48: 73-84, 2011.
- Ehrhart N: Soft-tissue sarcomas in dogs: a review. *J Am Anim Hosp Assoc* 41:241-246, 2005.
- McSporran K: Histologic grade predicts recurrence for marginally excised canine subcutaneous soft tissue sarcomas. *Vet Pathol* 46:928-933, 2009. ■

Continuing Education Events

April 9-11 — Academy of Veterinary Consultants Spring Meeting
Embassy Suites Hotel and Conference Center, Norman, OK;
<http://www.avc-beef.org>

June 4-5 — SDVMA Summer Meeting
Ramkota Inn & Convention Center, Pierre, SD; www.sdvmetmed.org

June 15-17 — Nebraska VMA Summer Meeting
Valentine, NE; <http://www.nvma.org/>

June 21-23 — Montana VMA Summer Meeting
Big Sky Resort, Big Sky, MT; www.mtvma.org

June 21-24 — Wyoming VMA Summer Meeting
Holiday Inn, Sheridan, WY; <http://www.wyvma.org/>

August 9-12 —
South Dakota Veterinary Medical Association Annual Meeting
Ramkota Inn, Sioux Falls, SD; www.sdvmetmed.org

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Animal Health MATTERS

The SDSU Veterinary and Biomedical Sciences Department conducts research, teaching, professional service, and extension service to South Dakota and the surrounding region. An entity within the SDSU Veterinary and Biomedical Sciences Department, the South Dakota Animal Disease Research and Diagnostic Laboratory is a full-service, all-species diagnostic laboratory accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD). The AAVLD accreditation program complies with international expectations for quality diagnostic services under the guidance of the World Organization for Animal Health (the OIE). The ADRDL collaborates with the USDA National Veterinary Services Laboratory on many federal disease monitoring and eradication programs and is a member of the National Animal Health Laboratory Network. For information regarding the laboratory's Quality System, contact Rajesh Parmar – ADRDL Quality Manager, at 605 688 4309.

Editor: Russ Daly, DVM

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