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Animal Health MATTERS Newsletter

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Animal Health MATTERS

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Animal Health MATTERS

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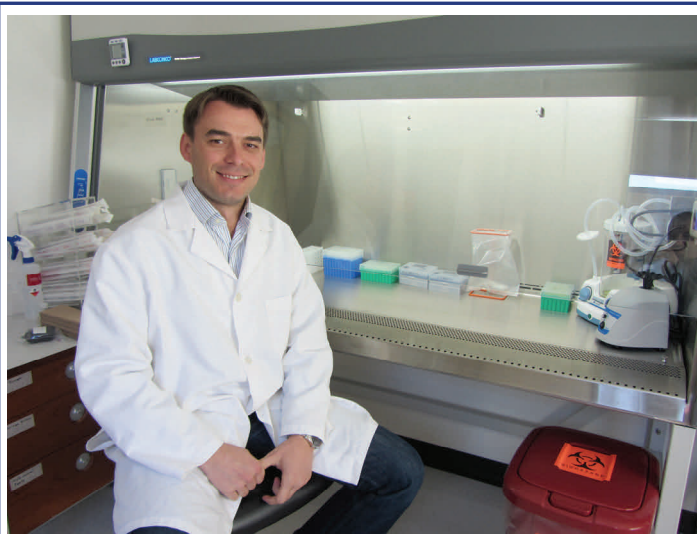


New Diagnostic/Research Faculty Bring Talents to SDSU

Russ Daly, DVM, Extension Veterinarian

Dr. Diego Diel

Using a Common Virus as a New Way to Deliver Vaccines



Dr. Diego Diel, Assistant Professor, SDSU Veterinary and Biomedical Sciences Department, in his new lab space in the former Olson Biochemistry Lab.

The allure of working with animals while growing up on his parents' and grandparents' farms has led Dr. Diego Diel to a career that seeks to keep such animals healthy and productive.

Dr. Diel is among the most recent additions to the faculty at the SDSU Veterinary and Biomedical Sciences Department. He began his position as Assistant Professor on August 22, 2014. Dr. Diel has responsibilities in viral research as well as diagnostic test development and service.

A native of Santo Cristo (population 15,000), in the southern Brazilian state of Rio Grande do Sul, Dr. Diel's interest in animals was fostered at an early age through work on his parents' and grandparents' farms. His father still runs a 2,000-head swine finishing facility back home. The Brazilian swine industry is slowly growing. This growth is aided by the fact that the national herd does not have to contend with Porcine Reproductive and Respiratory Syndrome (PRRS) nor Porcine Epidemic Diarrhea Virus (PEDV). This growing industry is changing in much the same way as US swine production has,

Diel (Continued on page 2)

Dr. Joy Scaria

Using genomics to better understand *Clostridium* and foodborne pathogens

A young man garners a keen interest in biology growing up on his family's farm. That's a common backstory for many SDSU students. It's also the backstory for Dr. Joy Scaria, one of the newest faculty members in the SDSU Veterinary and Biomedical Sciences Department. The type of farm and his path through microbiology are quite different than most, though.

A rubber tree plantation in Kerala, in extreme southern India (think the same climate as Florida), holds Dr. Scaria's roots. His family still runs the farm, where latex is collected from trees twice a week and treated with acid to yield sheets of rubber for sale. Dr. Scaria is one of four academically-inclined siblings (one has a PhD in high energy physics, another in mathematics).

After undergraduate work close to home, Joy obtained his Master's degree in genetics at the University of Madras, and a PhD degree in applied microbiology at the Birla Institute of Technology and Science in Pirla, India. His experiences there shaped his future direction. Birla was known for its engineering expertise, and Joy's friendships with engineers exposed him to computer science and eventually the interface between computa-

Scaria (Continued on page 7)



Joy Scaria, PhD, pictured next to the department's newest piece of equipment, the MiSeq next generation sequencing machine.

Director's Message: "One Health" and the Importance of Training the Next Generation of Scientists...

Jane Hennings, DVM, MS — Director ADRDL

I am sure most of you have heard of "One Health", which is the study of the interactions between humans, animals and the environment that contribute to health or disease (<http://onehealthinitiative.com/>). "One Health" issues are diverse, but typically involve zoonosis (with a broad definition of "shared risk of disease") and could include such issues as bacterial, viral and parasitic infections, biothreats, vector-borne infections, antimicrobial resistance, food safety, interventions (eg. vaccine and therapeutics, sanitation, surveillance vector control) and global health. Additionally, "One Health" can include the "comparative medicine/translational medicine" studies such as the study of cancer and cardiovascular disease, environmental hazards expo-



sure, joint and skeletal diseases and metabolic diseases in both animals and humans, along with the human-animal bond.

At the Veterinary and Biomedical Sciences Department/Animal Disease Research and Diagnostic laboratory (ADRDL), we deal with "one health" issues on a daily basis. We also train graduate and undergraduate students by providing "hands on" training that can contribute to workforce development in dealing with health and disease, whether it is found in people or animals. For example, we have students working and/or observing in various sections of the department including virology, bacteriology, molecular diagnostics, histopathology, clinical pathology, serology, pathology (necropsy), parasitology and food safety. The techniques used in these laboratories are performed in various human hospitals, clinics and laboratories, so the work experience is beneficial whether students go into human or veterinary medicine. The classes that we teach in the department are also relevant for students study-

ing human or animal health, including anatomy, physiology, cell biology or infectious diseases.

Currently, "one health" training is important due to the advent of emerging infectious diseases in humans and in animals, such as porcine epidemic diarrhea virus (PEDv), which affects pigs and just arrived in the United States in May 2013, or the ebola virus which has infected people, and just arrived in the United States in 2014. The same questions are asked for both emerging diseases.

How did it get started?

How did it get here?

How do you "contain" it?

How do you identify infected individuals?

How do you prevent it? (vaccine, antiviral or other?)

It is critically important to train the next generation of scientists (whether they go into human or animal medicine) to answer these important questions, since infectious diseases continue to appear. ■

Diel

(Continued from page 1)
with consolidation into larger fully integrated "systems".

Diego's animal interests led him to begin veterinary school after his graduation from high school. He attended the Federal University of Santa Maria, which was about four hours away from home. Veterinary school in Brazil is a 5-1/2 year program, with the first two years' study in basic sciences and the rest in clinical courses in the veterinary teaching hospital. Santa Maria, one of 105 veterinary schools in Brazil, boasted 55 students per class, the majority of which (80-85%) had food animal interests.

Dr. Diel had every intention to serve the swine industry as a vet after graduation, but instead received an offer from one of his professors to begin a Master's program. His research there focused on Bovine Herpesvirus-5 (BHV-5), which is a significant problem in Brazil, resulting in neurologic illness in cattle.

From there, PhD coursework and

post-doctoral research followed. Dr. Diel's PhD research brought him to the US, where he worked with Dr. Dan Rock at the University of Illinois, to determine the virulence determinants of Orf, or Contagious Ecthyma, in small ruminants. It's this knowledge and experience that he is currently using to better characterize what viral proteins interact with the immune system to cause infection. That understanding will help Dr. Diel create vaccines that use the Orf virus as a vector, or carrier, of other important viral antigens. In the midst of this research, Dr. Diel spent two years at USDA's Southeast Poultry Research Laboratory in Georgia.

During his stint at Illinois, Dr. Diel had the chance to visit SDSU through a collaboration with the VBSD's Dr. Alan Young. "I was very impressed with the department and the diagnostic laboratory during that visit," said Dr. Diel. When the new faculty position was advertised, he already had a favorable viewpoint of

the work that could be done here. "There is great infrastructure in place for meaningful research here. The ADRDL has the latest in equipment, and there are very good animal facilities in which to do research."

Dr. Diel's work will cross between research and diagnostics, and he expects to play a leadership role in viral diagnostics at the ADRDL. In addition to his work with vaccine development, he will spend a great deal of time working on a scourge facing US swine producers: PEDV. Dr. Diel has projects in the pipeline that will help us further understand how this virus causes disease, with the eventual hope that more effective interventions can be developed.

Diego has settled into Brookings with his wife, Camila, who holds a Master's degree in US law and is working as a patent coordinator with South Dakota Innovation Partners, and their 2-1/2 year old son, Bernardo. ■

Summary of BVDV-PI Testing at SDSU ADRDL

Russ Daly, DVM, Extension Veterinarian

Animals persistently infected with Bovine Viral Diarrhea Virus (BVDV) are considered the reservoir for BVDV within the cattle population. Within individual herds, identifying these persistently infected (BVDV-PI) animals through individual animal testing has allowed for the removal of these animals or for the prevention of BVDV-PI animals from entering the herd, making testing a valuable procedure for maintaining cattle health.

Several different methods are available for BVDV testing at the SDSU ADRDL, the most popular of which are the individual ear notch ELISA and the pooled PCR test. For ELISA testing, the individual ear notch is suspended in saline solution at the lab, agitated, and an antigen-capture ELISA procedure performed on the fluid. The pooled PCR procedure also utilizes individual ear notches, which are also suspended in saline solution and agitated. Aliquots of

fluid from each sample are then pooled and subjected to PCR for BVDV. If positive pools are identified, then individual antigen-capture ELISAs are performed on the samples that comprised the pool. Currently, the pooled PCR test is the most widely requested BVDV-PI test at SDSU.

To confirm true BVDV-PI status, a follow-up sample from the positive animal is recommended to be collected roughly 4-6 weeks later. If ear notches were used in the initial diagnosis, a blood sample is recommended for follow-up confirmation, for either virus isolation or PCR, to differentiate animals that are transiently infected from BVDV-PI animals.

The results below reflect testing performed on cases submitted to the SDSU ADRDL. Almost assuredly they do not represent infection rates in the cattle population in general, as submissions reflect many different scenarios: testing within

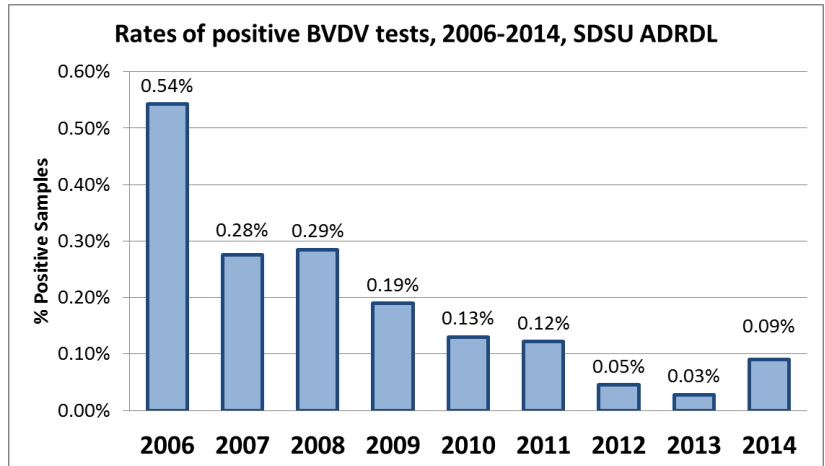
known-BVDV-positive herds, screening incoming purchased animals, etc.

Total numbers of samples tested for BVDV have rebounded over the past two years. Notably, numbers of samples submitted per case has more than doubled over the past 9 years, from 25 samples per case in 2006 to 58 in 2014. Positive sample rates have declined in recent years as well. However, BVDV infections continue to affect cow-calf, feedlot, and dairy operations in South Dakota and the region, and BVDV-PI testing remains an essential part of control.

An updated “BVDV Diagnostics at SDSU ADRDL” document can be found on the Veterinary Extension website at www.sdstate.edu/vs/extension (click on “Beef Cattle Issues” or “Dairy Animal Issues”). The document includes suggestions for which tests to run in which situations, along with detailed information about each test. ■

PCR Pooling of Ear Notches for BVD: Change in Price and Pool Size

The ADRDL has changed their procedures for PCR pooling of ear notches. Beginning in July, 2014, the lab will now create pools of up to 20 samples at a charge of \$25 per pool. In the past, pools of up to 50 were run at a cost of \$60 per pool. The PCR test has always performed extremely well with the larger pools. However, using smaller pools means less expense when positive pools are detected and the notches within the pool need to be tested via antigen-capture ELISA individually. Please call the lab at 605-688-5171 if you have any questions.



FY 2014 BVD Summary

Test	No. cases	No. Samples	No. positives	No. positive cases	Positive sample rate	Positive case rate
Ear Notch ELISA	171	4,941	10	7	0.20%	4.09%
Pooled PCR + ELISA to ID individuals*	256	24,800	20	12	0.08%	4.69%
Immunohistochemistry	16	271	2	1	0.74%	6.25%
Serum ACE	168	5,513	0	0	0.00%	0.00%
TOTALS, FY 2014	611	35,525	32	20	0.09%	3.27%
TOTALS FY 2006-14	8,243	296,361	624	398	0.21%	4.83%

* Pooled PCR with ELISA to ID individuals: This row includes numbers of individual ear notches tested using the pooled PCR procedure plus the ELISA tests necessary to identify individual BVDV-positive animals within the pool.

The Clinical Pathology Section at SDSU's ADRDL

Russ Daly DVM, SDSU

Although it is housed in the smallest laboratory of all the ADRDL sections, the Clinical Pathology section performs large numbers of tests on clinical specimens such as whole blood, serum, and fecal samples. Blood cell counts, serum chemistry panels, and parasitology exams are the most common examples of tests requested by veterinarians from across the region. Most tests feature one day turnaround times, which, when coupled with 24 hour VADDS access to results over the internet, are a valuable alternative to in-house analyzers for many veterinary clinics across the region.

Of the serum chemistry tests performed by the Clinical Pathology section, most practitioners take advantage of the panels put together for small animals, ruminants, and horses. A dairy management panel that includes beta-hydroxybutyrate (BHB) and non-esterified fatty acids (NEFA) is also popular, and helps veterinarians in the diagnosis of subclinical ketosis and pre-calving energy balance. Complete blood counts (CBC) are also a popular request on a variety of species, and are performed on the Cell-Dyn 3500 analyzer in the lab.

On a test-by-test basis, parasitology exams outnumber either chemistry or hematology analysis in the Clinical Pathology section. Fecal floatation tests for internal parasites, microscopic examinations for *Cryptosporidium*, and examination of culture pouches for *Tritrichomonas* are commonly performed, with case numbers varying depending on the time of year. Fecal ELISA testing for rotavirus and coronavirus on calf fecal samples is also a responsibility of the Clinical Pathology lab, and is a common request during calving season. The lab also has the capability to examine and identify ectoparasites, questionable or "pseudo" parasites, as well as water examination for cyanobacteria (blue-green algae).

The Clinical Pathology lab is continually looking for ways to offer practitioners and diagnosticians more testing options. Another service that's provided to



ADRDL Clinical Pathology Section (L-R): Julie Colby, Bench Manager; Dr. David Knudsen, Section Leader, and Karen Belau, Laboratory Technician. Not pictured: Alex Martineau and Eileen Zhang, student workers.

a number of clinics is parallel testing of hematology or serum chemistry panels between SDSU's calibrated and validated analyzers and point-of-care analyzers operated by the referring practice. This parallel testing can provide another level of quality control for point-of-care testing, as well as the additional peace of mind of regular proficiency testing for point-of-care personnel.

The Clinical Pathology section is staffed by Dr. Dave Knudsen as section leader, Julie Colby as medical lab technologist and bench manager, and laboratory technician Karen Belau. There are also currently two undergraduate pre-veterinary students that work in the lab.

Section Leader: David Knudsen DVM, MS, DACLAM is Professor of Vet-

erinary Science at SDSU and a pathologist and case coordinator for the ADRDL. He has been section leader of the Clinical Pathology laboratory since 2002. A native of southern Colorado, he was in mixed animal practice in Montana and Colorado following his graduation from vet school at Colorado State University in 1982. He then entered a residency for both Veterinary Pathology and Laboratory Animal Medicine at the University of Missouri and became board certified in Laboratory Animal Medicine in 1989. Subsequently he founded and directed the UC Davis Comparative Pathology Laboratory, a service lab for clinical and anatomic pathology of research animals, for several years. Prior to coming to SDSU, Dr. Knudsen was a patholo-

gy consultant in the northern Pacific Coast region for a variety of pharmaceutical, biotechnology, and animal research organizations.

Dr. Knudsen's specific duties in the Clinical Pathology section include interpretation of cytology accessions, parasite identification, and review of laboratory results on a case-by-case basis, in addition to his duties as a pathologist and case coordinator for the ADRDL pathology service. He teaches graduate level pathology and developmental biology courses and advises pre-veterinary students here at SDSU. In his spare time he enjoys playing brass instrumental music, and skiing.

Bench Manager: Julie Colby BS, MLT, HT completed training in medical

laboratory technology and histotechnology in 1988, and is certified with the American Society of Clinical Pathology (ASCP). She also received her B.S. in Liberal Studies in 2002 from SDSU. Julie's first position at SDSU was in the ADRDL histology section from 1989 to 1998. She began work in the clinical pathology lab in June 2013. She is responsible for hiring and training student workers, performing the wide range of tests offered by the section, and operating, maintaining, and calibrating the various analyzers in use in the section. Julie's job provides her with plenty of variety and with satisfaction in watching the students she has hired develop skills.

Laboratory Technician: Karen Belau has 24 years of experience at the ADRDL

working in a variety of roles. Karen currently divides her time between fixed tissue preparation, processing reproductive failure cases, parasitology examinations, and work with hematology and chemistry analyzers. She has attended SDSU for biology and microbiology coursework, and holds a degree in Veterinary Office Management from Pipestone Vocational School.

Student Workers: Pre-veterinary student workers in the Clinical Pathology section include Alex Martineau, a third year student from New Hampshire, and Eileen Zhang, a second year student from Vancouver, British Columbia. ■

Governor Daugaard Pays Visit to the ADRDL

Governor Dennis Daugaard and First Lady Linda Daugaard were treated to a special tour of SDSU's Animal Disease Research and Diagnostic Laboratory on October 3, 2014. Governor and Mrs. Daugaard were accompanied by a group of state representatives and officials on the tour. During the visit, the group visited each of the various sections of the ADRDL, visited with lab personnel, and observed routine testing procedures.

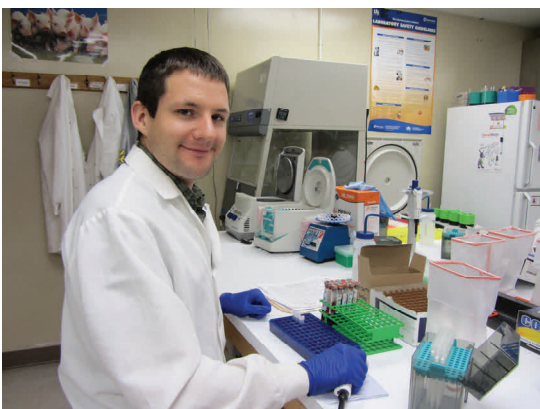
Department faculty members briefed the group on several important topics while they toured the facility, including the importance of the ADRDL in detecting emerging animal diseases, the strong link between diagnostic work and research, and lab roles in protecting the food supply and public health. The governor and his group also heard of the need for increased space for diagnostics, including Biosafety Level 3 space, critical for the state's response to foreign animal disease outbreaks as well as certain endemic diseases present here already.

In addition to Governor and Mrs. Daugaard, other participants on the tour included South Dakota Secretary of Agriculture Lucas Lentsch, Ag Policy Director Nathan Sanderson, Mark DeGroot from the Governor's office, State Veterinarian Dustin Oedekoven, South Dakota Board of Regents President Dean Krogman, State Senator Larry Tiedemann, State Representatives Spencer Hawley and Scott Munsterman, SDSU President David Chicoine, and SDSU College of Agriculture and Biological Sciences Dean Barry Dunn. ■



Dr. Jane Hennings, ADRDL Director (L), explains the functions of the Molecular Diagnostics Section to (L-R) South Dakota First Lady Linda Daugaard, Governor Dennis Daugaard, Nathan Sanderson, Secretary of Agriculture Lucas Lentsch, State Representative Spencer Hawley, Dean Barry Dunn, and Board of Regents President Dean Krogman on their visit to the ADRDL, October 3, 2014.

Pieces and Parts



New Hire: Dana Rausch, Molecular Diagnostics

Dana Rausch, MS, is new to the ADRDL's Molecular Diagnostics section. Dana had been working as temporary help in the section since June, 2014, and was hired to a permanent position as Senior Microbiologist in October, 2014. Dana completed his Master's degree in Biology in 2011 at SDSU, working with *E. coli* vaccine development. A native of Dell Rapids, he graduated from SDSU with a Biology degree in 2007. ■



Serology Staff Member Aids Custer State Park Bison Testing Efforts

Linda Fawcett, Senior Microbiologist in the ADRDL Serology section, traveled to Custer State Park to help Game, Fish and Parks staff and private veterinarians test the park's bison herd this past October. Linda worked closely with Drs. Sheila Lindsay, Dustin Brown, and Cayla Brown of Fall River Veterinary Clinic in processing blood samples taken while working the animals. "In all, there were 113 calves six months of age or less, and 117 older animals ranging from yearlings to an 18-year-old. "Animals were bled for brucellosis testing and were also tuberculosis tested. "In the past, the group had experienced problems with samples getting hung up in the mail or frozen on their way to the lab. This year, I was able to spin down the blood samples right away and transport them back to SDSU, where testing went off without a hitch," said Linda. This testing is in preparation for the annual Custer State Park Buffalo Auction to be held in November, where some of the herd will be sold to the highest bidder. ■



Larry Holler Serves as SDSU Faculty Senate President

This academic year, a Veterinary and Biomedical Sciences Department faculty member holds the reins of the SDSU Faculty Senate. Dr. Larry Holler was elected to the Faculty Senate Vice President post during 2013-2014, and ascended to the presidency this year. As president, he presides over senate meetings and determines meeting agendas in conjunction with other officers. As president, Dr. Holler represents the SDSU faculty in official matters of the University, South Dakota Board of Regents, and public events and meetings.

As an ADRDL pathologist with a primarily service appointment, Dr. Holler brings a different perspective to University governance compared to other faculty members who may have mainly teaching or research appointments. "I consider my role as mainly a facilitator for discussions among the faculty members. Some of the major issues we are dealing with now focus on general education requirements, student retention, and faculty review procedures."

The Faculty Senate consists of 33 senators elected by their peers from each of the different colleges comprising the university. They develop and disseminate ideas for University improvement, communicate with the SDSU administration, and help form University policy. Dr. Holler is in his sixth year of serving SDSU as a senator, and will continue serving the Faculty Senate on their executive committee as past president next year. ■



Scaria

(Continued from page 1)
tional skills and microbiology.

These talents came with Dr. Scaria to Cornell University, where his post-doctoral work applied the technology of next-generation sequencing to analyzing why certain food-borne pathogens such as Salmonella and Shiga-toxin producing *E. coli* (STEC) cause illness. Next-generation sequencing goes way beyond the typical ways of identifying organisms. By fully laying out the nucleic acid fingerprint of a pathogen, it can identify small differences in nucleic acids that could lead to big differences in how that germ infects a person or animal, or becomes resistant to antibiotics.

Later work focused on a germ that is all too familiar to swine producers as well as human physicians: *Clostridium difficile*, or “C. diff”. This bacteria is implicated in baby pig diarrhea as well as human cases of diarrhea, particularly in people receiving antibiotic treatments for other illnesses. Most strains of C. diff have their own preferences for the hosts they like to infect, and it’s some of these

differences that Dr. Scaria continues to chase down.

Pigs are important in the study of C. diff not simply because it is a significant illness in that species; pigs can serve as a great model for studying the human disease. Dr. Scaria will use the gnotobiotic (germ-free) pig facilities here at SDSU to further this work.

On the genomics side of his work, the future is very exciting. SDSU’s ADRDL has installed a “MiSeq” next generation sequencing machine that will prove very prominent in Dr. Scaria’s work, as well as in investigations of diagnostic samples that come into the lab. One of Dr Scaria’s goals as he becomes established at SDSU is to apply these cutting-edge tools to improve animal health and food safety by tracking outbreaks of these illnesses. “Globalization has changed the evolutionary pressures of bacteria,” according to Dr. Scaria. “Bacteria can come from anywhere nowadays, and this complicates our ability to track outbreaks, such as those related to foodborne sources.” Besides tracking outbreaks, this technology

has real benefits to South Dakota farmers and livestock producers working on today’s global platform, by ensuring and validating that their products are free from potential contamination.

The position at SDSU appealed to Dr. Scaria for several reasons. “Because I have an interest in infectious disease research, the connection between the diagnostic lab and the research program is important and not something you find everywhere. We definitely have this at SDSU. Instead of having to work on samples from other sources, we can study what comes through the door at the diagnostic lab.” The strong expertise and facilities that support gnotobiotic pig work, as well as the strong bench skills of ADRDL staff, along with their connection to what’s happening on the farm, were other strong selling points for SDSU.

Dr. Scaria lives in Brookings with his wife Deepthi, an agricultural economist, and their two sons, Alex, 6, and Tony, 1.

Continuing Education Events

November 13-14

Swine Disease for Practitioners Conference

Scheman Building, Iowa State University, Ames, IA

<http://www.extension.iastate.edu/registration/events/conferences/swine/index.html>

December 4-6

Academy of Veterinary Consultants Winter Meeting

Embassy Suites Kansas City International Airport, Kansas City, MO

<http://www.avc-beef.org>

December 4-6

Wyoming Veterinary Medical Association Winter Meeting

Casper, WY

<http://www.wyvma.org/>

December 6-10

American Association of Equine Practitioners Annual Convention

Salt Palace Convention Center, Salt Lake City, UT

<http://www.aep.org/info/annual-convention-318>

February 13-14, 2015

James Bailey Herd Health Conference and ADRDL Update

SDSU Campus, Brookings, SD

<http://www.sdvmed.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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