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Animal Health MATTERS

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South Dakota State University

SDSU Veterinary Science Department • Animal Disease Research & Diagnostic Laboratory

Animal Health MATTERS

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Head/Director's Message

David H. Zeman, DVM, PhD

Specimens in…. Results out.

Counting my years as a pathology resident, I will have been in the business of diagnostic veterinary medicine for 25 years this spring. There have of course been many changes in diagnostic medicine, as with all professions and with other aspects of life. One thing that hasn't changed much at the diagnostic lab is that specimens come in, the diagnosticians do their work, and the results go back out to the field where they hopefully help veterinarians and animal owners safeguard animal health. There are however some important changes relative to how specimens come in and how results go out.

Specimens in: Society, government regulators and the shipping industry are increasingly concerned that we ship specimens in a safe manner. The impetus behind this is simple… we do not want potentially dangerous pathogens escaping from your diagnostic shipping containers where they might cause unintended illness in people or animals that might come in contact with them. Fortunately, this is an extremely rare event, but the concern remains and is perhaps heightened in this era of high public awareness of terrible diseases such as anthrax, TB, HIV, Mad Cow, *E. coli* and *Salmonellosis.* As of January 1, 2007, regulations again tightened relative to shipping and we have been getting the word out to assist our clients and encourage them to use proper packaging and shipping procedures when sending samples to the lab; if for no other reason than to at least protect your clinics and others from possible liability situations should some unforeseen event ever happen.

Results out: Letters and telephone calls were the norm for this process 25 years ago, but then that wonderful invention called the FAX came to diagnostic medicine. It's of course still used today as a convenient way to communicate sometimes complex written material in an efficient way and to save a few days of mail time. However, the glory days of the FAX appear to be dimming. Since each case generates numerous individual pieces of information (results), it has always been cumbersome to get this flow of information to the client quickly without bombarding them with 10 or 20 pieces of FAX paper during office hours. However, internet access to results has solved this and allows the customer to receive results on *their timetable*, day or night or weekends or holidays… in real time relative to test completion. As soon as a diagnostician verifies a test result in our computer, it is accessible to our clients. The ADRDL has nearly 400 of our customers set up with passwords that allows them to do exactly that… real time/anytime test results. We hope you are taking advantage of that opportunity and the advantages it can bring as you manage animal health issues.

Specimens in…results out, but as always thanks for your business, it is a pleasure to work alongside you to improve animal health.

Diagnostic News - SDSU ADRDL

BVD Tests Available at SDSU ADRDL:

New Antigen-capture test for serum is now available

R. Daly, SDSU Extension Veterinarian

Bovine viral diarrhea (BVD) continues to play a significant role in the health status of our region's beef and dairy herds. Diagnostic tests for BVD continue to evolve, presenting practitioners with more tools than ever before for diagnosis of BVD-PI (persistently infected) animals. The following is an updated list of the current tests available at SDSU's ADRDL. Practitioners are encouraged to consult the ADRDL Users Guide at **http://vetsci.sdstate.edu/DiagnosticLab/index.htm** for more detailed information. These items are arranged in the same manner as they are found on the new ADRDL submission form.

A. Under "Serology":

1. BVD Ear Notch ACE (Antigen-Capture ELISA).
(Detects BVD virus in ear-notches)

This is the popular "ear-notch" test that identifies individual BVD-PI animals. The test involves agitating a fresh ear notch in saline (which is added at the lab) to elute antigen from the hair follicles. The fluid is then used in a microwell plate as for other ELISA tests.
Sample needed: Ear notch, 1 cm x 1 cm from animal. Put notch in individual round-bottomed tube, leave dry (do not add saline, etc), ship on ice. Samples may be frozen if they will not be submitted immediately.
Setup and reporting: Test results are available on the same day the test is set up. Tests are batched together and run at least every 2-3 days.
Cost = $4.00

2. BVD Serum ACE (Antigen-capture ELISA)
<<NEW>> (Detects BVD virus in serum)

This is the latest test to come online at the ADRDL. Essentially, a serum sample (instead of an ear notch) is used in the same antigen-capture ELISA test as is used for the ear notches. This test would be used in much the same manner as the BVD outgrowth ELISA (see below): when serum samples are obtained for additional testing beyond BVD-PI.

Maternal antibodies may interfere with testing, so this test is useful only on older calves (over 4 to 6 months old), or pre-colostral serum samples. As with the outgrowth ELISA, it's possible that the test may pick up animals that have been vaccinated within the past 3 weeks with a modified live BVD vaccine.
Sample needed: Serum, separated and removed from the clot.
Setup and reporting: Test results are available on the same day the test is set up. Tests are batched together and run at least every 2-3 days.
Cost = $4.00

3. BVD Type I, BVD Type II. (Detects antibodies to BVD)

These are the standard serology tests for detecting antibodies against BVD Types I or II. Virus neutralization is used. In most cases, paired samples, or extremely high titers (>1:4196) are necessary to indicate active infection. This testing does not diagnose persistently infected animals, although most PI animals would be expected to have very low or negative antibody titers.
Sample needed: Serum, separated and removed from the clot.
Setup and reporting: Setup once a week on Mondays and read out on Fridays.
Cost = $4.50 for each type.

B. Under "Molecular Diagnostics/PCR"

1. BVD Ear Notch (Fresh) – pooled or individual
(Detects BVD virus in ear notches)

This test uses a sample similar to that of the "ear notch ELISA" test described above, but instead of the fluid being used in a serologic test, it is submitted for PCR (polymerase chain reaction) testing. This procedure is an extremely sensitive method of detecting the presence of viral nucleic acid.

Because of this sensitivity, a pooling procedure can be used, in which a maximum of 50 samples can be submitted, and the fluid obtained is pooled and submitted for PCR analysis. If a pool tests positive, the individual samples that comprised the pool are submitted for "ear notch ELISA" to determine which individuals are BVD-PI. Alternatively, individual ear notches could also be submitted for PCR analysis.
Sample needed: Ear notch, 1 cm x 1 cm from animal. Put notch in individual round-bottomed tube, leave dry (do not add saline, etc), ship on ice. Samples may be frozen if they will not be submitted immediately.
Setup and reporting: Setup once a week on Wednesdays and read out the same day.
Cost = $60 per pool or individual sample.

2. BVD Serum or Whole Blood – pooled or individual
(Detects BVD virus in blood or serum)

This test utilizes PCR technology to detect viral particles in serum or whole blood samples. Samples may be pooled: a maximum of 10 samples per pool for serum, and 20 samples per pool for whole blood.
Sample needed: Whole blood or serum sample.
Setup and reporting: Setup once a week on Wednesdays and read out the same day.
Cost = $25 per pool or individual sample.

3. BVD Milk (Detects BVD virus in milk)

This is an economical test for screening herds with potential persistently infected animals. PCR technology is utilized to detect viral nucleic acid in a bulk or string milk sample.
Sample needed: Milk, 50 ml, not frozen or spoiled.
Setup and reporting: Setup once a week on Wednesdays and read out the same day.
Cost = $25

C. Under "Virology/FA"

1. Serum BVD Outgrowth ELISA (Detects BVD virus in serum)

This test uses bovine cell lines in plates similar but a little larger than serology microwell plates. The cell lines enhance the growth of the virus (virus isolation), which is then detected by immunologic staining.

Printed three times a year by the Veterinary Science Department, South Dakota State University, David Zeman, Head/Director, VSD/ADRDL. South Dakota State University, South Dakota counties, and USDA cooperating. SDSU adheres to AA/EEO guidelines in offering educational programs and services.

810 printed at a cost of .43 each

Maternal antibodies may interfere with testing, so this test is useful only on older calves (over 6 months). Acute infections are only very rarely detected with this method, but the test may pick up animals that have been vaccinated within the past 3 weeks with a modified live BVD vaccine.
Sample needed: Serum, spun off and separated from the clot. Hemolysis may interfere with test results. Submit chilled, or frozen if the sample needs to be held longer than two days.
Setup and Reporting: Test is set up once a week on Fridays, before 10 AM. Results are read the following Wednesday.
Cost = $6.00

2. Respiratory Tissues
3. Enteric Tissues (Both detect BVD virus in tissues)

These items refer to virus isolation for BVD specifically requested on submitted tissues. Virus isolation would not distinguish a persistently-infected animal from an acutely-infected animal.

D. Under "Immunohistochemistry (IHC)"

1. BVD Ear-Notch (Formalin fixed) (Detects BVD virus in ear notches)

This test involves histologic examination of a formalin-fixed ear notch after processing and treatment with a BVD-specific immunohistochemical stain.
Sample needed: Ear notch in buffered formalin, in individual tubes. Specimens stored in formalin for over 5 days may result in false negatives.
Setup and Reporting: Samples are set up all days of the week. Significant time is necessary for tissue processing and interpretation by a pathologist. Test results are available in 10-14 days.
Cost = $ 4.00

2. BVD (Intestine) (Detects BVD virus in intestinal tissue)

Refers to immunohistochemistry for BVD specifically requested on submitted intestine.

The Scoop On Scoops…

Tanya Graham, SDSU

We have received several brainstems that have been traumatized or that do not contain the obex region necessary for CWD / Scrapie testing. Obviously it's best not to let the brain freeze but in South Dakota in the winter, that may be impossible! The easiest and least traumatic way to remove the obex region is via the scoop method. **We have both the small (sheep and deer) and large (cattle and adult elk) scoops available at no charge.** Just let us know and we'll send you a set the next time we return one of your shipping boxes.

A pictorial review of obex removal is available online at **http://www.aphis.usda.gov/vs/nvsl/BSE/procedure_manual.pdf**

The following written instructions on obex removal using the scoop method are from *BioRad's Brain Stem Sampling Procedure in the Slaughterhouse:*

Place the head flat on the table, resting on the forehead and nose. The spoon can be easily inserted thru the foramen magnum, underneath the dura mater, with the convexity of the spoon facing downwards.

By advancing anteriorly in the axis of the medulla oblongata, the anterior lip of the spoon sections the base of the cerebellum, isolating the cerebellar peduncles (anterior, middle, and posterior).

The roots of the cranial nerves are sectioned by rotating the spoon from left to right and from right to left.

(If you have trouble severing the cranial nerves, hold the dura covering the brain stem with forceps and slide curved scissors into the foramen magnum to cut the cranial nerves before using the scoop.)

Top Ten Tips for Submissions to the Olson Biochemistry Lab

R. Daly, N. Thiex, SDSU

1. Submit **lots of water**. For water analysis, one liter is ideal.

2. Save those **empty pop** (or drinking water) **bottles**. They're good for sending in water samples (but you'll have to use more than one to get a liter, usually). They are readily available and they come with screw caps. Rinse out the inside (three times) with some of the water you're sampling, fill, and screw shut. Note: if you're sampling water for pesticides, you need to use a glass container—pesticides will want to stick to the plastic inside.

3. Prussic acid **isn't** a problem in corn. Sorghum, sudangrass, milo, cane, and flax are the plants to be concerned with.

4. **Chopping** the sample will **release** prussic acid. If you really want accurate HCN levels, submit whole plants.

5. A **handful of hair**. When taking hair samples for selenium analysis (e.g. in horses), you need to get a lot (get the clippers out). A cupful of hair will be about right. The hair needs to come from the flank area—not the mane or tail. Mane or tail hair doesn't turn over as frequently as hair from the flank, and won't represent the most recent selenium status of the animal.

6. A **clean** handful of hair. The hair sample needs to be clean and not caked with mud. This ensures that selenium in the hair, and not in the mud, is measured.

Holiday hours:

May 28 – Memorial Day
July 4 – Independence Day

7. **Get enough serum** for a mineral screen. 4.0 ml of serum is ideal. That means that you may need to collect 10-12 ml of whole blood.

8. **Hemolysis** will affect your mineral (and vitamin) screen. It will cause selenium and iron analyses to be falsely high. The most effective way to avoid hemolysis is to do a timely job of spinning down the sample and pouring it off before shipping (even when using serum separator tubes).

9. Send **lots of liver** when requesting mineral screens. Over 20 grams if available.

10. **Freeze** that tube. When requesting serum Vitamin E or A analysis, the sample (serum, not whole blood) should be clear, immediately frozen, and kept frozen until it's analyzed.

New DOT Shipping Regulations in Effect

R. Parmar, Quality Systems Manager, ADRDL

As of January 1st, 2007, new Department of Transportation regulations regarding shipment of diagnostic specimens are in effect. These regulations affect shipment of Category B substances* (e.g. **Diagnostic Specimens)** to the ADRDL.

Effective January 1st, 2007, diagnostic specimen(s) shipped to the ADRDL should have triple layer packaging (refer to the instructions provided with the shipping container).

There are also new regulations regarding labeling of the outer container. The label "Diagnostic Specimen" is no longer in compliance. Now the outer container must be labeled "Biological Substance, Category B" with the number "UN 3373". Many of you may have noticed that the ADRDL has already implemented this change as of November 1st, 2006. The ADRDL shipping boxes returned to you are labeled correctly. If you have any other ADRDL shipping containers without this new label (Biological Substance, Category B & UN 3373 number), please contact the lab at 605-688-5171 and labels will be provided.

It is the shipper's responsibility to make sure that the diagnostic specimens, being shipped to the ADRDL, are packaged according to current shipping rules and regulations. We endeavor to assist our clients with these transitions. Thank you.

**According to 49 CFR 173.199(e), Category B substance is defined as an infectious substance that is not in a form generally capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals when exposure to it occurs. This includes Category B infectious substances transported for diagnostic or investigational purposes.*

Note: An animal sample (including, but not limited to, secreta, excreta, blood and its components, tissue and tissue fluids, and body parts) being transported for routine testing not related to the diagnosis of an infectious disease, such as testing to monitor kidney or liver function, or for tests for diagnosis of non-infectious diseases, such as cancer biopsies, and for which there is a low probability the sample is infectious do not require Biological Substance, Category B & UN 3373" label.

These regulations imply that the most serum samples sent for clinical pathology testing would be exempt from these requirements. However, adhering to the above guidelines helps ensure that samples arrive at the ADRDL in the best condition possible.

For specific information on packaging diagnostic specimens, please refer to the information at: http://vetsci.sdstate.edu/DiagnosticLab/index.htm. A flier containing this information is also included in the ADRDL shipment boxes that are returned to you.

Further information about the regulations can be found at: http://hazmat.dot.gov.

Research News - SDSU Veterinary Science Department

Research Spotlight: Dr. Philip Hardwidge

Dr. Philip Hardwidge joined the Veterinary Science Department faculty in 2005, following a post-doctoral fellowship with Brett Finlay at the University of British Columbia in Vancouver. He received his Ph.D. in Biomedical Sciences from the Mayo Clinic in Rochester, MN in 2002, and holds a B.S. in Microbiology from the University of Illinois.

Dr. Hardwidge's laboratory focuses on understanding the molecular virulence mechanisms of bacteria that cause diarrheal disease, using three types of *Escherichia coli* (*E. coli)* as model systems. *E. coli* is a bacterium commonly found in the gut of humans and other warm-blooded animals. While most *E. coli* are harmless, some cause severe disease, including:

1. Enteropathogenic *E. coli* (EPEC): the leading cause of bacterial-mediated diarrhea in children and a major endemic health threat in the developing world.
2. Enterohemorrhagic *E. coli* (EHEC): a cause of food borne illness through contamination of beef and vegetable products and causes a fatal pediatric kidney disease for which there is no effective treatment or prophylaxis.

3. Enterotoxigenic *E. coli* (ETEC): the leading cause of traveler's diarrhea and a major endemic health threat in underdeveloped nations, especially among children.

These strains are transmitted by food or water contaminated with animal or human feces. Each strain produces special toxin(s) that stimulate the secretion of excess fluid in the intestine, causing diarrhea.

Despite the great need, there are neither effective vaccines available, nor do we fully understand the mechanisms by which these organisms cause disease. Below, we highlight several of Dr. Hardwidge's ongoing research projects that are designed to: 1) understand how *E. coli* causes disease; and 2) to guide development of novel therapeutic strategies.

1. How *E. coli* (through expressing "effector proteins") changes the proteins expressed by intestinal cells. Dr. Hardwidge, while working with Dr. Brett Finlay at the University of British Columbia, published the first large-scale proteomic analysis of a human cellular response to a pathogen wherein he showed that the movement of *E. coli* "effector proteins" (molecules that bind proteins and activate or inhibit that protein's action) into intestinal cells resulted in significant changes to the proteins expressed by the intestinal cells. These data are now being used to understand better the interplay of bacterial effectors and the host. Several interesting projects are ongoing based on this work:

Dr. Hardwidge's group has demonstrated that an EHEC effector protein "down regulates" a protein called NOD2, which regulates the inflammatory response to the bacteria. Also being studied is how effectors, by changing the activity of ion channels, may play a role in *E. coli* diarrhea. Dr. Hardwidge's group and others also have evidence of an effector protein (EspG) that may alter host cell division through disruption of their microtubule structure.

Study of these effector proteins and how they alter intestinal cells has wide-ranging implications for therapy and prevention of disease caused by *E. coli*.

2. Novel *E. coli* virulence factors. The factors that make EPEC and EHEC virulent, and the mechanisms by which they cause disease have not been completely characterized, and our current knowledge is insufficient to explain the pathogenesis of disease caused by these agents.

Until recently, it was believed that a single location ("pathogenicity island") on the *E. coli* chromosome was responsible for encoding almost every virulence factor. However, numerous new pathogenicity islands and secreted proteins have recently been discovered. Very little is known about these newly discovered proteins and the genes that encode them.

His group, in collaboration with Dr. Brett Finlay and Dr. Mark Wickham, has discovered that a newly-characterized EHEC effector protein (NleF) is responsible for disrupting the host response to EHEC because it interacts with the exocyst, a protein complex that directs secretory vesicles to distinct sites on the intestinal cell plasma membrane. He is also looking at NleF's action on host secretion of factors that stimulate inflammation. Understanding the full range of *E. coli*'s virulence factors is crucial in developing therapeutic and preventive strategies.

3. The role of enterotoxins in enhancing bacterial colonization. Dr. Hardwidge's lab, in collaboration with Dr. David Francis at SDSU, is testing the hypothesis that bacterial enterotoxins precondition the host intestinal epithelium for bacterial colonization. ETEC strains that secrete the heat-labile enterotoxin (LT) bind porcine intestinal epithelial cells with higher affinity than do LT-negative strains. He has also shown that the ability of EHEC to adhere to host cells correlates with Shiga toxin expression. Preconditioning of the host cell by diffusible enterotoxin may play a significant role in enhancing the ability of enteric bacteria to adhere to the host, a crucial step in the pathogenesis of these infections.

4. Virulence factor discovery and vaccine development. To discover new ETEC vaccine candidates, a mass spectrometry-based 'reverse-vaccinology' approach to identify the outer membrane proteins of ETEC will be used, in collaboration with Dr. Leonard Foster at the University of British Columbia. The genes encoding these proteins will then be cloned, used for protein expression, and used to immunize animals. Serum from those immunized animals will be used to test for protection against ETEC in gnotobiotic piglet and mouse models of ETEC disease. This represents a novel method in discovering effective preventive measures against ETEC.

5. Susceptibility of human ETEC to porcine epithelial cell proteins. Dr. Hardwidge's lab has recently discovered that most human ETEC isolates are highly susceptible to an unidentified protein found in the extracellular fluid of porcine epithelial cell cultures. They are testing the hypothesis that this antimicrobial factor is a member of the -defensin family of antimicrobial peptides. This work may permit the development of new therapies specific to ETEC infections in people.

6. Biochemical strategies of bacterial enterotoxin export. The molecular mechanisms underlying how the heat-labile enterotoxin (LT) is exported during infection are poorly understood. ETEC produce outer membrane vesicles (OMVs) containing LT that are taken into host cells, yet how OMV production, and incorporation of LT into OMVs, are regulated is unknown. Dr. Hardwidge's lab has identified a specific domain in an ETEC protein known as LeoA that is important to LT export and may influence OMV formation. They have also discovered that LeoA plays a significant role in the export of protein subunits that comprise bacterial flagella, a finding of significant implications towards understanding how ETEC interacts with the host immune system.

Extension News - SDSU ADRDL

Methicillin-resistant *Staphylococcus aureus* Colonization in Veterinary Personnel

Methicillin-resistant *Staphylococcus aureus* (MRSA) was isolated from nares of 27/417 (6.5%) attendees at an international veterinary conference: 23/345 (7.0%) veterinarians, 4/34 (12.0%) technicians, and 0/38 others. Colonization was more common for large-animal (15/96, 15.6%) than small-animal personnel (12/271, 4.4%) or those with no animal patient contact (0/50) ($p<0.001$). Large-animal practice was the only variable significantly associated with colonization (odds ratio 2.9; 95% confidence interval 1.2–6.6). Pulsed-field gel electrophoresis identified 2 predominant clones with similar distribution among veterinarians as previously reported for horses and companion animals. Canadian epidemic MRSA-2 (CMRSA) was isolated from 11 small-animal and 2 large-animal personnel from the United States (n = 12) and Germany (n = 1). In contrast, CMRSA-5 was isolated exclusively from large-animal personnel ($p<0.001$) in the United States (n = 10), United Kingdom (n = 2), and Denmark (n = 1). MRSA colonization may be an occupational risk for veterinary professionals.

Hanselman BA, Kruth SA, Rousseau J, Low DE, Willey BM, McGeer A, et al. Methicillin-resistant *Staphylococcus aureus* colonization in veterinary personnel. Emerg Infect Dis [serial on the Internet]. 2006 Dec [Feb. 23, 2007]. Available from http://www.cdc.gov/ncidod/EID/vol12no12/06-0231.htm

Multidrug-Resistant *Salmonella enterica* Serotype Typhimurium Associated with Pet Rodents

Background: An estimated 1.4 million *salmonella* infections occur annually in the United States. The majority of these infections are foodborne, but many are acquired by contact with animals. In August 2004, isolates of *Salmonella enterica* serotype Typhimurium, which were indistinguishable from one another by pulsed-field gel electrophoresis (PFGE), were obtained from eight hamsters from a Minnesota pet distributor. We conducted an investigation to determine whether human cases of *salmonella* could be linked to this rodent-borne strain.

Methods: To identify cases of human infection with *S. enterica* serotype Typhimurium potentially related to pet rodents, we reviewed *Salmonella* PFGE patterns submitted to the National Molecular Subtyping Network for Foodborne Disease Surveillance. Patients with isolates matching the hamster strain were interviewed about exposure to pet rodents. Implicated rodents were traced to pet stores, distributors, and breeders.

Results: We identified matching *S. enterica* serotype Typhimurium isolates from 28 patients in whom the onset of illness occurred between December 2003 and September 2004. Of 22 patients (or in the case of children, their parents) interviewed, 13 patients (59%) in 10 states reported exposure to pet hamsters, mice, or rats, and 2 (9%) had secondary infections. The median age of the 15 patients with primary or secondary rodent exposure was 16 years, and 6 patients (40%) were hospitalized. Thirteen associated pet stores supplied by seven distributors were identified in 10 states. No single source of the rodents was identified. The outbreak strain of *S. enterica* serotype Typhimurium was cultured from a patient's pet mouse and from seven hamsters from pet stores. Closely related *S. enterica* serotype Typhimurium isolates were cultured from rodent cages and reusable transport containers at a pet distributor. Human, rodent, and environmental isolates were resistant to ampicillin, chloramphenicol, streptomycin, sulfisoxazole, and tetracycline.

Conclusions: Pet rodents probably are an underrecognized source of human *salmonella* infection.

Swanson SJ, Snider C, Braden CR, Boxrud D, Wünschmann A, Rudroff JA, Lockett J, Smith KE. Multidrug-Resistant *Salmonella enterica* Serotype Typhimurium Associated with Pet Rodents, N Engl J Med. 2007 Jan 4;356(1):21-8.,

Pieces and Parts

- **Distance MPH Degree Program**. The University of Iowa, College of Public Health, in collaboration with the Iowa State University College of Veterinary Medicine, will offer a distance-learning Master of Public Health (M.P.H.) program for practicing veterinarians beginning June 2007. The degree program will utilize distance-learning (online) courses in conjunction with short on-campus institutes during the summer.

  The program was developed in response to recent national and world events calling for public health preparedness in areas where public health and veterinary medicine overlap, including zoonotic diseases, food security and foodborne diseases, bioterrorism, and environmental health. The distance-learning MPH will play a crucial role in meeting these needs.

A degree in veterinary medicine from an accredited U.S. college of veterinary medicine is a prerequisite for the program. For more information about the distance-learning MPH program, go to www.public-health.uiowa.edu/mph/about/professional_programs/mph_vets.html

- **Extension Publication Spotlight:**
  1. Feeding Natural Cattle (ExEx 2056). An overview of considerations to make when feeding calves for "natural" programs. The publication highlights purchasing and marketing "natural" cattle, cost of gain using rations without antibiotics or ionophores, and adjustment of diets for "natural" programs.
  2. Hiring and Managing Spanish-Speaking Employees (ExEx 4034). With an emphasis on dairy operations, this publication covers hiring, training, language issues, standard operating procedures, and using the team concept.

These publications, among many others, are available for free at: http://agbiopubs.sdstate.edu/.

Viral Hemorrhagic Septicemia – Emerging Fish Disease

R. Daly, SDSU

Viral hemorrhagic septicemia (VHS) virus--a serious pathogen of fresh- and saltwater fish--is emerging as a significant disease in the Great Lakes region. Specifically, VHS has been found in the waters and tributaries of Lake St. Clair, Lake Erie, Lake Ontario, and the St. Lawrence River.

In the past, VHS was thought to be a concern only in Europe, for trout and a few other freshwater fish raised commercially. The recent outbreak in the Great Lakes region appears to be a new strain of the virus, and is responsible for die-offs in many freshwater species. At least 37 susceptible species have been identified, including: black crappie, bluegill, brown trout, channel catfish, largemouth and smallmouth bass, muskellunge, rainbow trout, walleye, and white and yellow perch, among many others. (A complete listing of susceptible species can be found at: http://www.aphis.usda.gov/vs/aqua/)

How VHS was transferred to the Great Lakes is not known. The disease transmits easily between fish of all ages. Mortality is highest at low water temperatures between 37 and 54 degrees Fahrenheit. Some fish will show no external signs while others show signs that include bulging eyes, bloated abdomens, inactive or overactive behavior, and hemorrhage in the eyes, skin, gills, and at the base of the fins. Infected fish may also have lesions that look like those caused by other fish diseases, so diagnostic evaluation is necessary. No human health risks related to this virus have been identified.

Sport fishermen and recreational boaters have been asked to adhere to good biosecurity practices while fishing or boating in waters where VHS has been found. Equipment, boats, and trailers should be thoroughly cleaned before use elsewhere. Fish should not be transferred from one body of water to another.

Federal order on movement of live fish: October 2006

In October 2006, the USDA's Animal and Plant Health Inspection Service (APHIS) issued an emergency order prohibiting the importation of 37 species of live fish from two Canadian provinces (Ontario and Quebec) and the interstate movement of the same species from the eight states (IL, IN, MI, MN, NY, OH, PA, and WI) surrounding the Great Lakes.

In November 2006, the order was amended to permit the movement of those susceptible species if certain requirements are met. Under certain circumstances, live fish from those areas can still be transported interstate for slaughter purposes or transported to research or diagnostic laboratories. Live fish transported for any other purposes can move interstate only with documentation that the fish have tested negative for VHS. Aquaculture farmers are required to have either an accredited veterinarian, or certified American Fisheries Society Fish Health Inspector, perform the health inspection and collection of samples for shipment to diagnostic laboratories.

States not included in the Federal Order (including South Dakota) can continue to move live VHS-susceptible fish species without restriction. In addition, fish originating in States not included in the Federal order can transit the affected Great Lakes States without oversight.

More information about VHS, and the APHIS Federal Order, can be obtained at the website referenced at the end of this article.

Veterinarians interested in obtaining training in fish necropsy and inspection can do so during the following short course:

Aquaculture Fish Necropsy and Inspection Techniques Short Course
Saturday, March 17, 2007, 9:00 am to 5:00 pm
Ohio Department of Agriculture Animal Disease and Diagnostic Lab, Reynoldsburg, OH (near Columbus)

Objective of the Course: This one-day short course will teach veterinarians proper techniques of fish necropsy, tissue sample collection and preparation for diagnostic testing, to meet new USDA/APHIS regulations for the interstate transportation of fish species.

The course will be led by Dr. Andy Goodwin, Chief Fish Pathologist, University of Arkansas-Pine Bluff, and current President of the American Fisheries Society Fish Health Chapter.
Registration Cost: $40 per person, limited to the first 40 paid registrants
Phone: 1-800-282-1955 for more information

Reference: http://www.aphis.usda.gov/vs/aqua/

SOUTH DAKOTA STATE UNIVERSITY

Animal Health MATTERS

SDSU Veterinary Science Department
Animal Disease Research & Diagnostic Laboratory

Box 2175- North Campus Drive
Brookings, SD 57007-1396

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Permit 24

The SDSU Veterinary Science Department conducts research, teaching, professional service, and extension service to South Dakota and the surrounding region. Entities within the department include the South Dakota Animal Disease Research and Diagnostic Laboratory, the Olson Biochemistry Laboratory, and the Center for Infectious Disease Research and Vaccinology.

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 monitor 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.

Phone: (605) 688-5171 · Fax: (605) 688-6003 · Website: http://vetsci.sdstate.edu

Calendar of Events

March 3-5 – American Association of Feline Practitioners Winter Conference, InterContinental Hotel, Miami, FL
http://www.aafponline.org/2007Winter/index.htm

March 3-6 – American Association of Swine Veterinarians Annual Meeting, Doubletree Hotel Universal Orlando, Orlando, FL
http://www.aasv.org/annmtg/

March 29-31 – Academy of Veterinary Consultants Spring Conference, Marriott Hotel, Oklahoma City, OK
http://www.avc-beef.org/agenda.htm

June 3-5 – SDVMA Summer Meeting
Ramkota Convention Center, Pierre, SD
Phone: (605) 688-6649; http://www.sdvetmed.org

August 12-15 – SDVMA Annual Meeting
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