Welcome to the Fall 2012 issue of Diagnostic Veterinary Matters. In the last five issues we have shared with you the problems we are dealing with as a result of persistent steep state budget cuts in the face of rising operational costs. Unfortunately, these issues have continued to worsen as we have been recently notified to prepare for another 3% state budget cut in the current fiscal year. The diagnostic lab system financial situation is now in crisis. Below is a brief description of the current situation.

There are three primary sources of financial support for the Georgia Veterinary Diagnostic Laboratory System (GVDLS): contract with the Department of Agriculture (37%), fees for service (32%), and the University of Georgia (16%), chiefly through in-kind support. The remaining 15% is from a variety of sources, but primarily from the federal government in the form of grants and contracts. State funding of the GVDLS has historically been lean, essentially flat from 2001-09; however, the funding cuts have been severe since fiscal year (FY) 2009. State funding has been cut 4.1 – 9.4% annually since FY2009 in the face of a significant increase in the operating costs of the laboratories, especially the cost of biomedical supplies, utilities, and personnel expenses. In FY13 (factoring in the pending 3% cut), the GVDLS will receive less than three-quarters of the state funding it received in FY2008 - a decrease of more than $925,000!

The laboratories have adjusted to the declining state financial support by using a combination of process improvement/increased efficiency, technological improvements, reducing/outourcing services (including the closure of the toxicology sections at both labs and closure of the electron microscopy section at the Tifton lab), personnel reductions, maximizing synergies between laboratories and with the College of Veterinary Medicine, obtaining federal grants, expanding profitable services to the research and exotic animal/wildlife communities, postponement of equipment replacements, and selective user fee increases. Eight technical staff and five faculty positions have been left unfilled in the last six years.

GVDLS management believes it can maintain full services for both laboratories through FY2013 by not filling personnel vacancies, continuing to delay equipment purchases, instituting additional selective fee increases effective October 1, 2012 and other cost cutting activities, and exhausting all reserves at its disposal. However, the GVDLS will be forced to initiate consolidation of major service units and take steps to close one of its two laboratories as early as late FY2013 if chronic State underfunding of the GVDLS is not addressed in the FY2014 budget. The clinical pathology section in Tifton will likely be the first service section to be closed, with its services shifting to the larger clinical pathology laboratory in Athens. Both the Athens and Tifton labs serve as part of the National Animal Health Laboratory Network and loss of a laboratory will have a negative impact on animal disease surveillance and the State’s (and the Nation’s) ability to respond to animal disease outbreaks. The Georgia Department of Agriculture’s statutory obligation to prevent and control diseases in livestock will likewise be compromised if either of the two laboratories is closed. Livestock owners in parts of the state distant to the remaining laboratory will be forced to transport carcasses over long distances and will lose veterinary diagnosticians familiar with diseases and conditions specific to their region of the state.

To correct the financial crisis, we have proposed a combination of modest and selective fee increases in FY13, an increased state contract (from $2.8 to $3.3 million) in FY2014 and a bond issue of $2.9 million for equipment replacement in FY2015.

We also wish to announce that going forward the new editor of Diagnostic Veterinary Matters will be Dr. Marcia Ilha – a pathologist at the Tifton Laboratory. Drs. Hines and Saliki will continue as associate editors and Dr. Krimer will continue as the assistant editor of our newsletter. We want to thank you for your business and your loyalty to the UGA diagnostic laboratories, and look forward to continuing to provide you with high quality diagnostic services.
PERSONNEL HIGHLIGHTS

TIFTON VETERINARY DIAGNOSTIC AND INVESTIGATIONAL LABORATORY

- At the annual Staff Appreciation Luncheon, Diane Rousey received an award for 20 years of service. Michele Coarsey and Johnne Graves received awards for 15 years of service.
- Congratulations to Tammie T. Vann who received the 2012 Staff Appreciation Award, Service Technician category, from the UGA College of Veterinary Medicine. This award recognizes the contribution of staff who perform their job functions in an exemplary manner and who contribute to the College in a variety of ways that would be characterized collectively as good citizenship. Tammie is a certified medical technologist and has been a Clinical Pathology section employee at the TVDIL for 29 years.
- Drs. Rajeev and Hines received a 5-year $82,500 FDA grant in support of the Veterinary Response Network’s veterinary diagnostic program.
- Teresa Cook, TVDIL toxicology technician will be retiring effective 10/31/2012 after more than 22 years of service.
- Candice Jackson, Jill Johnson and Ashley Burroughs successfully completed the Avian Influenza, Swine Influenza and Newcastle Disease PCR proficiency tests.
- The Serology staff successfully completed the EIA laboratory AGID proficiency test, Bluetongue virus and Bovine Leukosis virus ELISA proficiency tests, and Brucellosis buffered plate antigen and card proficiency tests.
- Candice Jackson successfully completed the EIA individual AGID proficiency test.
- Jill Johnson successfully completed the Johne’s disease fecal culture proficiency test.
- The Bacteriology staff successfully completed the Vet-LRN Salmonella proficiency test.

ATHENS VETERINARY DIAGNOSTIC LABORATORY

1. Pam Currin retired on 8/17/2012 after 29 years of service. We welcome Laura Griffiths as the new Virology/Serology Lab Manager.
2. Beverly Arnold retired after 8 years of service. We welcome Michelle Norris as our new Quality Manager.
3. Dr. Doris Miller has been selected to receive one of four competitive scholarships offered by the University of Florida-based Maples Center for Forensic Medicine. These scholarships were made possible by a grant from the American Society for the Prevention of Cruelty to Animals (ASPCA).
4. Drs. Sanchez (AVDL) and Rajeev (TVDIL) received a competitive renewal of a $60,000 FDA grant to study salmonella in pet animals in Georgia.
5. Drs. Sanchez and Saliki received a 5-year $82,500 FDA grant in support of the Veterinary Response Network’s veterinary diagnostic program.
6. Dr. Sanchez received a 5-year $212,480 NIH training grant to fund the Georgia Veterinary Scholars program which she directs at the college.
8. Laura Griffiths completed Coggins testing training at NVSL, passed the EIA proficiency test and is now authorized by the USDA to run and report Coggins.
10. The Serology staff successfully completed the 2012 Coggins, bluetongue, and bovine leukemia proficiency tests.

What’s New in Athens?

Reminder: The silver box outside the front door of our building is meant for dropping off samples after hours or just before hours. With the exception of formalin-fixed tissues, samples should not be dropped off between 5 pm Friday and 5 pm Sunday. When using this box please be sure that all of your samples and paperwork are together in a plastic bag. This not only keeps the samples and forms from getting separated, but also prevents papers from getting damaged by ice packs left by other clients. If you are using an ice pack, remember to wrap it separately.

New tests:
- We now offer the Idexx 4Dx SNAP test for canine anaplasmosis, heartworm disease, ehrlichiosis, and Lyme disease. Although this test kit can be run in-clinic, due to volume discounts and limited shelf life, our unit costs are much less. Send us your dog samples for diagnosis or yearly screening and save money. The cost per test is $25 and can be performed on serum, plasma and anticoagulated whole blood.
- New PCR tests for Trypanosoma cruzi, Cytauxzoon felis, and Pan-Paramyxovirus (all paramyxoviruses including PI-3 and BRSV) are available at a cost of $35/test.
ANAPLASMOSIS
Sue E. Turnquist DVM, MS, PhD, DACVP (TVDIL)

The mild 2012 winter and spring and summer’s hot weather and rain set up a perfect storm for vector-borne diseases in livestock. With larger than average populations of ticks, biting flies and mosquitoes in most areas of south Georgia, outbreaks of anaplasmosis are possible. Anaplasmosis is an infectious disease of cattle that causes destruction of red blood cells (RBCs) resulting in potentially fatal anemia. The Tifton lab is beginning to see cases of anaplasmosis in Georgia cattle herds.

There are four stages of anaplasmosis including incubation, developmental, convalescent and carrier stages. The incubation stage begins with the initial infection and continues until one percent of the cow’s RBCs are infected. Anaplasma reproduce in the blood during the incubation phase – essentially flying under the radar and avoiding the innate immune system. The developmental stage is when the clinical signs typically appear. The body finally recognizes the hemoparasite and destroys it along with the associated red blood cells. Clinical signs appear once enough RBCs have been destroyed to result in anemia. Initially, affected cows have an elevated body temperature and milk production will decrease or cease in lactating animals. As the anemia progresses, affected cows may appear weak or lag behind the rest of the herd. Pallor of the skin (teats, muzzle, nose) or mucous membranes may be noted. In the later stages the animals may show excitement and aggressive behavior or become recumbent and unable to rise. Handling affected cattle with clinical signs of anemia may result in respiratory distress and/or death and is generally not recommended.

Cattle that survive the development stage enter the convalescent stage. During this stage, affected cattle lose weight, abort calves, and eventually recover which may take several months. This stage is characterized by increases in red blood cell and hemoglobin levels and high peripheral leukocyte counts. Cattle that survive natural infection without benefit of treatment become reservoirs and enter the carrier stage. These animals are lifelong carriers and will generally not exhibit any clinical signs associated with Anaplasma infection. These animals may serve as a source of infection for future outbreaks.

At necropsy, affected animals that die during the developmental stage may be pale or slightly icteric. The blood will be thin and watery (like cherry Kool-Aid®), and the lungs will be pale. The right heart is generally flaccid. The gall bladder may be distended, and the spleen is diffusely enlarged and may be meaty and bulge on cut surface. There are no typical histologic lesions, but major organs (lung, liver, spleen, liver, kidney, heart and intestine) can be submitted in formalin to rule out other disease processes. If the carcass is fresh, blood smears are helpful in making a diagnosis. The organisms can also be observed in impression smears made from the spleen. Body cavity fluids (thoracic, pericardial or abdominal fluid) or blood from the heart (right ventricle) can be tested for anaplasmosis with a c-ELISA assay.

EASTERN EQUINE ENCEPHALITIS AND WEST NILE VIRUS IN HORSES
Sree Rajeev, DVM, PhD, DACVM (TVDIL)

The Tifton Veterinary Diagnostic and Investigational Laboratory (TVDIL) has diagnosed a total of 8 cases of eastern equine encephalitis (EEE) and 4 cases of West Nile virus (WNV) in horses this summer. EEE and WNV are mosquito-borne viral disease prevalent in eastern United States which cause serious disease in horses, man and birds. These diseases are the most serious mosquito-borne diseases currently in the United States. Clinical signs in horses include fever, anorexia, depression, hyperexcitability, blindness, ataxia, recumbency convulsions and death. The TVDIL tests serum samples from live animals using IgM ELISA and a hemagglutination inhibition (HI) tests for diagnosis in live animals. From dead animals PCR, histopathology and virus isolation on brain is recommended. Mosquito control and vaccination of horses is highly recommended to prevent these usually fatal diseases. For more information on human infections visit http://www.cdc.gov/ncidod/dvbid/arbor/
The Georgia Veterinary Diagnostic Laboratories

The Georgia Veterinary Diagnostic Laboratory System (GVDLS) is composed of two world class laboratories, the Athens Veterinary Diagnostic Laboratory (AVDL) and the Tifton Veterinary Diagnostic and Investigational Laboratory (TVDIL). The GVDLS is administered by the University of Georgia, College of Veterinary Medicine (UGA-CVM) through a contract between the Georgia Department of Agriculture and the UGA Board of Regents. The two laboratories, which occupy two buildings (one in Athens and one in Tifton) with a total of 53,500 sq. ft of laboratory space, are fully accredited by the American Association of Veterinary Laboratory Diagnosticians and are members of the National Animal Health Laboratory network (NAHLN).

The core mission of the two laboratories is to “render diagnostic services relative to the control, diagnosis, treatment, prevention and eradication of diseases for all domestic animals including cattle, sheep, goats, swine, equine, poultry, turkey, fowl, dogs, cats, and any wildlife or zoo animals” in the state of Georgia. Within the UGA-CVM, in addition to providing diagnostic services, the faculty and staff of the laboratories are also engaged in activities that support the research and teaching missions of the University.
FACULTY AND STAFF

The faculty and staff of the GVDLS are highly educated, dedicated and motivated individuals who work as a team to provide the highest quality of service possible to our clients. Currently, the two laboratories employ 14 faculty and 55 staff. The faculty hold appointments of either Assistant, Associate or Full Professor in the departments of Pathology or Infectious Diseases at the UGA-CVM. The vast majority of our faculty are veterinarians, with PhD degrees in their area of expertise and/or are board certified in either the American College of Veterinary Pathologists or the American College of Veterinary Microbiologists. Individual pathologists have areas of specialization that include renal pathology, dermatopathology, reproductive pathology, laboratory animal pathology, and wildlife diseases. Virtually all of the technical staff at both laboratories hold either AS or BS degrees, and several also hold MS degrees. In addition, several of our technical staff are also certified animal health technicians, certified histotechnicians or certified medical technologists. The faculty and staff of the GVDLS are committed to providing our clients with the most accurate and expedient test results possible.

QUALITY

Both laboratories are fully accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), the gold standard for quality of veterinary diagnostic laboratories. Accreditation by AAVLD involves a rigorous on-site audit and evaluation of all aspects of the laboratory operation every 5 years. The AAVLD has adopted standards based on the International Organization of Standards (ISO) 17205 document as their guide to essential requirements for laboratory accreditation.

Both laboratories maintain an on-going quality management program that assures adequate troubleshooting and continuous improvement in the quality of test results. All diagnostic testing is performed using standardized test methods which are crucial to the accurate diagnosis of animal diseases. Test methods are continuously reviewed by our faculty and staff to ensure that our laboratories can provide clients with the most effective testing available. Employees are given internal and external opportunities for training and our highly-skilled laboratory technicians participate regularly in nationally recognized proficiency testing programs. All critical laboratory equipment is frequently checked by trained and experienced personnel to ensure peak performance.

The diagnostic laboratories are committed to providing our clients with timely and accurate test results. We realize that production and maintenance of healthy animals in trading nations worldwide is dependent upon the accurate diagnosis and reporting of animal diseases. We understand the importance of our role in the keeping of happy, healthy companion animals. Therefore, a robust quality management program is essential to providing our clients with the trusted information they need to ensure the well-being of all animals.
in the United States that offers PCR testing of amphibian samples for Eastern Equine Encephalitis virus, Western Equine Encephalitis virus and St. Louis Encephalitis virus. In addition, the TVDIL is one of the few suggested as a potential cause of Crohn's Disease in humans. The TVDIL also performs all of the GVDLS animal testing for West Nile virus, research on Johne's disease (ruminant paratuberculosis), a chronic insidious intestinal disease that affects all types of ruminants and has been (most notably morbilliviruses that have been linked to several recent mass mortality events). The TVDIL is a regional center for diagnostics and laboratory animal diagnostic program and are the only laboratory that offers diagnostic services for several marine mammal infectious diseases several laboratory animal and marine mammal diagnostic tests. We are only the second veterinary laboratory nationwide to offer a full-service laboratory animal diagnostic program and are the only laboratory that offers diagnostic services for several marine mammal infectious diseases (most notably morbilliviruses that have been linked to several recent mass mortality events). The TVDIL is a regional center for diagnostics and research on Johne's disease (ruminant paratuberculosis), a chronic insidious intestinal disease that affects all types of ruminants and has been suggested as a potential cause of Crohn's Disease in humans. The TVDIL also performs all of the GVDLS animal testing for West Nile virus, Eastern Equine Encephalitis virus, Western Equine Encephalitis virus and St. Louis Encephalitis virus. In addition, the TVDIL is one of the few laboratories in the United States that offers PCR testing of amphibian samples for Ranavirus and chytrid fungus, both of which are important causes of mortality in amphibians.

In recognition of veterinarians’ need for timely results, the laboratories have recently developed and deployed approximately 100 nucleic acid (DNA or RNA) based tests including polymerase chain reaction (PCR) and in-situ hybridization for many bacterial, fungal, and virus pathogens. Many of these tests are offered as convenient syndrome-based panels and have a 24-hour turn-around time. The AVDL has also developed and deployed several laboratory animal and marine mammal diagnostic tests. We are only the second veterinary laboratory nationwide to offer a full-service laboratory animal diagnostic program and are the only laboratory that offers diagnostic services for several marine mammal infectious diseases (most notably morbilliviruses that have been linked to several recent mass mortality events). The TVDIL is a regional center for diagnostics and research on Johne's disease (ruminant paratuberculosis), a chronic insidious intestinal disease that affects all types of ruminants and has been suggested as a potential cause of Crohn's Disease in humans. The TVDIL also performs all of the GVDLS animal testing for West Nile virus, Eastern Equine Encephalitis virus, Western Equine Encephalitis virus and St. Louis Encephalitis virus. In addition, the TVDIL is one of the few laboratories in the United States that offers PCR testing of amphibian samples for Ranavirus and chytrid fungus, both of which are important causes of mortality in amphibians.

While providing routine diagnostic services to veterinary practitioners, our diagnostic laboratories play a major role in passive disease surveillance, essentially serving as “sentinels” for emerging and re-emerging diseases of importance to animal health and public health. Some infectious disease examples of this sentinel role in public health are our monitoring of methicillin resistant staphylococci (MRS) epidemiology as well that of Salmonella in both small and large animal populations. Other examples are leptospirosis, brucellosis, and rabies which may infect multiple species of animals and can be easily transmitted to humans.

THE MELAMINE STORY

The surveillance role of the laboratories is not limited to infectious diseases. For example, in 2007, a large outbreak of toxic renal failure due to the ingestion of melamine/cyanuric acid-containing pet foods occurred in dogs and cats from North America. Based on findings from animals and tissues submitted to the University of Georgia Athens Veterinary Diagnostic Laboratory from Georgia practitioners and confirmed as having melamine/cyanuric acid-associated renal failure, Dr. Cathy Brown and other pathologists from the Athens laboratory published the first scientific report detailing the features of this toxicosis. In addition, this scientific report established a link between the 2007 pet food associated nephrotoxicosis and a similar outbreak of renal failure occurring in Asia in 2004, when an estimated 6,000 dogs developed nephrotoxic renal failure. The toxic compounds in these outbreaks were present in wheat gluten, rice protein, and corn gluten imported from China and used as pet food ingredients. It is now generally accepted that melamine was intentionally added by suppliers in China to falsely elevate the measured protein content and, hence, the monetary value of these products. In 2008, a similar outbreak of toxic renal disease occurred in an estimated 300,000 infants in China following the deliberate contamination of infant formula with melamine. Information gained by veterinary scientists in their investigations of pet food-associated melamine renal toxicity was used extensively by the human medical community in their treatment of renal disease in children due to consumption of melamine-contaminated infant formula.

In addition, the surveillance mission of the GVDLS laboratories is enhanced through our participation in state and federal government sponsored active surveillance programs. The major program diseases include: bovine spongiform encephalopathy (BSE; mad cow disease), scrapie, bird flu, swine flu and swine pseudorabies. Mad cow disease was first detected in the US in December 2003 and a surveillance program was established in 2004. The AVDL is currently one of only six national laboratories that conduct routine surveillance testing for BSE. AVDL participation in this program resulted in the detection of the last known US case of mad cow disease in March 2006. Surveillance testing for bird and swine flu is conducted at both labs under a fee-for-service contract with the USDA.
Dr. Sree Rajeev's primary research area at the TVDIL is on the diagnosis and prevention of leptospirosis in animals and humans. Leptospirosis is a major problem in the cattle industry due to its effect on reproductive performance. This is one of the top concerns for dairy producers as *Leptospira* infection is insidious and can cause cumulative economic loss to the industry. In other domestic animals and humans, leptospirosis can be a life threatening disease. In humans leptospirosis is an under-recognized, neglected and life threatening zoonotic disease with major global health impact. It has emerged as a major slum health problem in developing countries where one billion of the world’s population lives. Dr. Rajeev has completed one project on “Leptospira infection and its role in infertility in dairy cows” and is working on another project on “Isolation and characterization of *Leptospira* strains infecting cattle” both funded by Southeastern Milk check off group. The long range goals of Dr. Rajeev’s research are to develop strategies for early and accurate diagnosis of both human and animal leptospirosis, develop a suitable animal model for testing vaccines, and to develop preventive strategies so that complications, mortality and economic loss due to leptospirosis can be minimized.

Several of the TVDIL faculty led by Dr. Murray E. Hines II have two ongoing research projects on Johne’s Disease totaling approximately $600,000.00 in research funds obtained from the Johne’s Disease Integrated Project (JDIP) and branches of the US Department of Agriculture (USDA-NIFA and USDA-APHIS). Johne’s Disease is caused by the bacterium *Mycobacterium avium subsp. paratuberculosis* (MAP) and causes a chronic insidious intestinal disease of all ruminant species with no effective treatment currently available. Current Johne’s disease diagnostic tests and vaccines lack sufficient efficacy, and improved diagnostic tests and vaccines are badly needed. One project involves the creation of a large well-characterized sample archive from dairy cattle containing both samples from confirmed infected and non-infected dairy cattle. This large sample archive will be used to compare currently available commercial and new experimental diagnostic tests including ELISA serological tests, multiple fecal culture methods and multiple PCR tests to determine the best and most economical tests for the diagnosis of Johne’s disease in cattle. The second larger project is a two year Johne’s disease vaccine efficacy study which is a part of a larger three phase project. Phases I and II of this larger project performed at other institutions involved the evaluation of over 20 experimental Johne’s vaccines in a cell based system (Phase I) and in mice (Phase II) to determine the better performing vaccines in those systems. The TVDIL is performing the Phase III study where the 5 best performing experimental vaccines from Phases I and II will be evaluated in a goat challenge model. Goats and cattle are both commonly infected with MAP, but the smaller size and faster course of the disease in goats makes them the preferred animal model for Johne’s disease vaccine and challenge studies. In this study, groups of goats will be vaccinated with the experimental and control vaccines, then later challenged with a wild-type strain of MAP and followed for up to 14 months using a wide variety of diagnostic tests, cultures and specimen evaluation to determine which vaccine(s) are best able to prevent or reduce the incidence and severity of Johne’s Disease, and the associated economic losses to producers.

Dr. Susan Sanchez is involved in the monitoring and epidemiological observation of methicillin resistant *Staphylococcus aureus* (MRSA) in animals and how it relates to human health. This bacteria is a growing problem in people and other animals. MRSA in the US has shifted in the past 8 years from being an infrequent hospital-acquired infection to an infection that is now spreading through the community, being routinely encountered at gymsnasiums and schools, disproportionately affecting our young, elderly, and the financially disadvantaged. Most interestingly, our investigations have shown that this increase in MRSA among people in Georgia was mirrored by an increase in MRSA in its animal population. Identifying differences beyond known virulence factors will allow better estimation of the evolutionary and epidemiological history of these strains, and may also uncover new virulence factors that act specifically in non-human hosts. *Salmonella* accounts for an estimated 1.4 million illnesses, resulting in 16,000 hospitalizations, and 582 deaths in the United States each year. The incidence of salmonellosis within the U.S. differs from state to state and within each state. These differences cannot be explained entirely by differences in population density, cultural/ethnic customs, or food-distribution networks. These regional differences in disease incidence are also reflected in *Salmonella* serovar distribution. We do not know or understand what might explain this geographic scattering of *Salmonella* infection in the US part of the answer lies in identifying alternate reservoirs, such as pets. A better understanding of the transmission dynamics of *Salmonella* in pets will help us understand the role of these unique companions, in the distribution dynamics of *Salmonella* and human illnesses.
Dr. Sheela Ramamoorthy at the TVDIL has funded research projects to develop improved diagnostics and vaccines for swine respiratory diseases. Porcine circovirus2 (PCV2) is an economically important swine disease. She has made important contributions to understanding the molecular pathogenesis and development of updated vaccines against PCV2 which are in the process of being commercialized. Current efforts are focused on addressing an urgent producer need for a vaccine that can differentiate between vaccinated and infected animals. Dr. Ramamoorthy has recently developed an advanced multiplex technology for the simultaneous detection of antibodies to more than one swine pathogen, resulting in higher testing efficiency and cost-saving. The 2009 pandemic H1N1 (pH1N1) virus (swine influenza) had a major impact on the swine industry health care systems and all over the world. Currently, only PCR based methods are available for the detection of the virus. Using sophisticated differential epitope analysis techniques, we are in the process of developing user-friendly and less expensive serological methods for the specific detection and differentiation of the pH1N1 virus from other circulating H1 influenza viruses.

Dr. Moges Woldemeskel's research at the TVDIL focuses on the role of mast cells in tumor angiogenesis and gastrointestinal (GIT) infection in domestic animals. His work mainly focuses on tumor angiogenesis, progression and invasion mediated by mast cells. Furthermore, the research also strives to determine the role of mast cells in gastrointestinal inflammation. The results of his investigation to date have shown that mast cells are associated with angiogenesis in canine cutaneous hemangioma, hemangiosarcoma, mammary adenoma and adenocarcinoma, and suggests that mast cells play an important role in neovascularization and tumor progression in these neoplasms. Additionally, an important role played by mast cells in GIT inflammation in dogs has been documented. Dr. Woldemeskel's study is delineating the significance of mast cells in correlation with increased risk of metastasis and prognosis of associated neoplasms and their role in GIT inflammation, to ultimately develop treatment and control strategies which would target mast cells, their enzymes and associated cytokines.

Dr. Marcia Ilha with the assistance of other TVDIL faculty studied the occurrence of Bovine viral diarrhea virus (BVDV) in white-tailed deer (WTD) in the state of Georgia. Bovine Viral Diarrhea is a subclinical to fatal viral disease that causes marked economic losses to the cattle industry. Experimental studies indicated that BVDV can be transferred back-and-forth between cattle and WTD and amongst WTD. Surveys for BVDV in other states have showed extremely low prevalences of natural infection in WTD (less than 1%). From September to December of 2010, 367 samples of ear from hunter-harvested free ranging WTD from 37 counties in Georgia were tested for BVDV. Four samples resulted in suspect samples by either the antigen ELISA test (3 samples) or RT-PCR test (1 sample). However, none of these samples were positive in both tests and in other tests used (virus isolation and IHC). Even though a few of the samples resulted in suspect for BVDV, the presence of the virus within this deer population could not be further confirmed. Although the results of this preliminary study may not support the hypothesis that WTD could be a potential reservoir for BVDV in the state of Georgia, low prevalence of this disease in WTD in Georgia is still a possibility.

Dr. Blas-Machado’s research at AVDL involves Bovine enterovirus (BEV), a picornavirus which consists of small (18–30 nm), non-enveloped viruses with an icosahedral capsid that encloses a single copy of positive-sense RNA genome. Bovine enterovirus is in the genus Enterovirus, along with poliovirus, human enterovirus, coxsackieviruses, swine vesicular disease virus, echovirus 11, and others. Despite the large volume of information available on other enteroviruses, very little documentation exists on the pathogenesis of BEV infections in cattle or on its prevalence in North America. Several case reports in the 1950s and 1970s document the isolation of BEV from feces and various tissues from apparently healthy animals or from animals with clinical signs that ranged from mild to moderate diarrhea to reproductive disease. However, these older reports are difficult to interpret as they relied solely on serological assays or had identified more than one infectious agent. Recently, in the first report of BEV in more than 20 years, BEV-1 was isolated from a 2 year-old pregnant Aberdeen Angus in Oklahoma, USA, with fatal enteric disease. Faculty members at the Athens Veterinary Diagnostic Laboratory conducting research on this virus isolate have recently published a report about BEV-1. This manuscript described the lesions associated with infection in animals experimentally infected with BEV-1 and postulated about its pathogenesis in cattle. Obtaining knowledge about the susceptibility of cattle to challenge, the pathology associated with infection, and the prevalence of BEV-1 infection in herds would be essential to the understanding of infection and disease in cattle.
Dr. Paula Krimer developed and characterized a canine model of Lyme disease for an international pharmaceutical company. Lyme disease is a tick-borne disease that incidentally affects both dogs and humans. The disease is caused by *Borrelia burgdorferi*, a small gram-negative spirochete bacterium that is transmitted by Ixodes ticks. The comprehensive study required the participation of all aspects of the AVDL services, from pathology to PCR to culture and clinical pathology, and resulted in two published research papers, including a paper on neuroborreliosis. This research model continues to be used in the development of vaccines to prevent canine Lyme disease.

Dr. Ellis of the AVDL participates in collaborative research projects whose goal is to elucidate the infection dynamics and potential reservoirs of *Trypanosoma cruzi*, which can cause a potentially fatal myocarditis in domestic animals and is the cause of Chagas disease in humans. Better understanding of the ecology of this disease could lead to better methods of prevention and control. In addition, Dr. Ellis provides pathological support for research projects involving the genetics of mammary and intestinal cancers in dogs. It is hoped that better characterization of these diseases on a molecular or genetic level will help to identify early events in carcinogenesis and/or targets for therapeutic intervention.

Dr. Saliki at the AVDL recently completed a Merial-sponsored study on canine parvovirus (CPV). In recent years, a new sub-type of CPV (type 2c) has arisen and become prevalent in many states. The goal of the project was to study the epidemiology of CPV-2c and to characterize the subtypes of CPV in current circulation with a view to identifying a type 2c virus that could serve as a candidate for the next generation of CPV vaccines. Indeed, given the rapid evolution of the virus, with new subtypes continuing to emerge, it is essential that CPV vaccine formulations are efficacious against prevalent CPV subtypes. The project identified a novel mutation in the newly emerged CPV-2c and also generated two virus strains that are potential candidates for future CPV vaccines.

A UNIQUE, SYNERGISTIC RELATIONSHIP WITH THE COLLEGE OF VETERINARY MEDICINE AND UGA

The relationship of the two diagnostic laboratories with the CVM is more than just administrative. Few state veterinary diagnostic laboratories in the United States share a relationship with a veterinary school and a major land grant university as close as the one we have in Georgia. The synergies related to this relationship are numerous. For example, the AVDL shares necropsy facilities, faculty and support laboratories with the CVM. This sharing of resources significantly lowers the cost of operations by reducing redundancies in facilities and staffing. It also provides DVM students, graduate students and pathology residents training by a greater variety of pathologists and exposure to a wider variety and larger number of animal species and disease conditions than they would have at most other veterinary colleges. At the AVDL, pathologists are directly involved in the training of anatomic pathology residents on the necropsy floor. They also serve the teaching mission of the CVM as instructors in anatomic and clinical pathology graduate courses, by active participation in seminar courses and journal clubs, and by organizing microscopic rounds on specific topics for pathology residents as well as other veterinary specialties such as dermatopathology and ocular pathology. The TVDIL serves as a base of operations for the CVM in South Georgia. A production animal veterinarian assigned to the laboratory works with clinical rotations of DVM students interested in large animal/production medicine and the laboratory has bunking facilities to support these rotations. Pathology residents, graduate students and DVM students profit from the experience and mentoring provided by the veterinary pathologists assigned to the two diagnostic labs, greatly enhancing the teaching mission of the CVM. The Diagnostic laboratories benefit from the sharing of resources with the CVM and the access to the in-depth expertise and cutting edge technology within the CVM and UGA.

CHALLENGES

Historically, the two veterinary diagnostic laboratories were fully funded by the State of Georgia through a legislative line item in the Department of Agriculture’s budget. However, state financial difficulties in the early 90s led to the institution of user fees to supplement operational budget shortfalls. The current economic crisis has resulted in drastic budget cuts totaling 21.5% in the last 3 fiscal years. These cuts, which exceed the state’s average cut, coupled with the steady increase in the cost of laboratory supplies and equipment, have resulted in some service reductions and risk compromising the ability of the laboratories to continue playing their vital role in animal disease surveillance and contributing to the economic well-being and public health in Georgia. These budget reductions notwithstanding, the laboratories continue to offer a wide variety of services and continue generating timely and reliable test results, thanks to a highly trained cadre of workers, coupled with increased efficiency of operations.
Two cases of mushroom toxicosis recently have been diagnosed at the TVDIL. The first case involved a 2 year-old mixed breed dog that died following a brief course of vomiting and bloody diarrhea. The second case involved a 12 week-old Labrador Retriever puppy with a history of vomiting with death occurring within 24 hours of the onset of clinical signs. The submitting veterinarian noted that the owners had seen the puppy eat a mushroom. Both dogs had submassive to massive hepatic necrosis which is very typical for mushroom poisoning.

The recent hot weather and rain have produced optimal growing conditions for mushrooms. There are a number of different toxic species of mushrooms, but Amanita mushrooms are most commonly associated with fatal mushroom poisoning in humans and dogs. Amanita species account for 95% of the mushroom-related fatalities in humans, and *Amanita phalloides*, the death cap mushroom, is responsible for >50% of the human fatalities and most of the dog fatalities. These mushrooms produce cyclopeptides including amatoxins, phallotoxins and virotoxins.

Cyclopeptide poisoning has three distinct phases:

1. The initial phase which lasts around 24 hours is centered on the GI tract and is characterized by profuse bloody diarrhea, vomiting, abdominal pain, dehydration, electrolyte abnormalities, hyperthermia, tachycardia and hyperglycemia.
2. Phase 2 or the latent phase lasts 12 to 24 hours and the serum alanine transaminase (ALT) and aspartate transaminase (AST) begin to rise. The dog may appear to recover during this phase.
3. The often terminal phase 3 occurs 3 to 4 days after ingestion and is considered the hepatorenal phase. This phase is characterized by severe hepatic dysfunction, severe renal failure, cerebral edema, icterus, elevated serum hepatic enzymes, hypoglycemia, coagulopathies, hemorrhage, azotemia, metabolic acidosis and sepsis. Hepatic encephalopathy and coma can also occur.
Sparganosis is an infection of tissues by second stage larvae (spargana or plerocercoid) of pseudophyllidean tapeworms. Sparganosis due to pseudophyllidean cestodes such as Sparganum spp. (e.g. Sparganum proliferum) and Spirometra spp. (e.g. Spirometra mansonioides, Spirometra erinaceieuropaei) can occur in body cavities or in tissues of intermediate and paratenic hosts. Sparganum proliferum is phylogenetically identified as a new species in the order pseudophyllidea. The life cycle and the definitive host of Sparganum proliferum is unknown but believed to be similar to that of Spirometra spp. The definite hosts of Spirometra spp. are carnivores, and the eggs are shed in feces. The eggs embryonate in the environment, hatch in water and release coracidia. Coracidia are ingested by intermediate hosts, copepod crustaceans (Cyclops spp.), and develop into procercoids. Second intermediate hosts including fish, reptiles, and amphibians ingest infected copepods and acquire procercoid larvae. Procercoids develop into plerocercoids in the second intermediate hosts. Predators of the second intermediate hosts are infected by the plerocercoids. Plerocercoidosis/sparganosis develops after ingesting procercoids or plerocercoids with contaminated water or infected intermediate hosts. Humans and other mammals including apes, pigs, dogs, and cats can serve as paratenic or second intermediate hosts and develop sparganosis.

Figures A & B: Sparganosis in the subcutaneous tissue of adult female domestic short hair cat from South Georgia. Abundant sections of cestode larvae (arrows, Figures A and B) with associated severe diffuse pyogranulomatous panniculitis (INF, Figure B).

Sparganosis has a worldwide distribution. The majority of cases in humans have been reported from Japan, Korea, China and Southeast Asia, but a few cases have been reported from the southern United States in broad areas of Atlantic and Gulf states. Sparganosis in Asia and Americas are attributed to Spirometra erinaceieuropaei and Spirometra mansonioides, respectively. Human infection may occur through various ways including drinking untreated contaminated water containing larvae or first intermediate hosts, ingesting raw or inadequately cooked flesh of infected secondary intermediate hosts or paratenic hosts (frogs, snakes, and game such as feral swine) and applying flesh of an infected intermediate host as a poultice to a wound, which is most commonly practiced in the Orient. After ingestion, the larvae penetrate the intestine wall and disperse in the body. A direct infection of open wounds or mucous membranes with plerocercoids has been described in humans. Hunters and other individuals who use wild animals for private and commercial meat production, and veterinary professionals could be exposed to sparganosis.

**Diagnosis, Treatment and Control**

Grossly, sparganosis usually appears as slowly growing migratory subcutaneous nodules in the tissues of infected intermediate and paratenic hosts. The parasite can be found anywhere in the body including central nervous system. Due to lack of distinct morphologic features, spargana must be fed to a definitive host before the parasite can be definitively identified. Sparganosis is usually diagnosed following surgical removal of the worms from infected tissues. The infection may also be diagnosed by the presence of eosinophilia or identification of the parasite in tissue specimens from excisional biopsies. Microscopically, extensive pyogranulomatous and eosinophilic dermatitis, and panniculitis with abundant intralesional cestode larvae would be observed in biopsy specimens. In humans, if excisional biopsy is not feasible to remove and identify the parasite, an anti-sparganum ELISA test could be used for diagnosis. MRI imaging is the most valuable method of detection of human cerebral sparganosis.

Knowledge of the epidemiology of the disease and the cultural practices in a given area is important to determine appropriate control measures to avoid infection. In humans, history of exposure to infected animals, drinking contaminated water, and handling or consumption of flesh of infected secondary intermediate hosts or paratenic hosts with a clinical history of a painful, migratory, subcutaneous nodule would suggest possible sparganosis. As preventive measures drinking water should be properly boiled or filtered and animal flesh must be sufficiently cooked before consumption. The practice of applying a poultice made from infected tissues of intermediate hosts should be avoided. Currently there is no effective treatment of sparganosis. Complete removal of the granulomas together with the cestode larvae is the treatment of choice.
Dr. Doris M. Miller

Doris M. Miller is a Board Certified Veterinary Pathologist, Professor of Veterinary Pathology, and Associate Director of State Government Relations at the University of Georgia College of Veterinary Medicine. She received her DVM and PhD degrees from the UGA and served as Director of the AVDL from 1989 to 2007. Her interests include forensic and reproductive pathology. She has taught a variety of courses to undergraduate, veterinary, and graduate students including creating the UGA Human/Animal Bond program in 1984. Dr. Miller initiated and continues to teach an elective Veterinary Forensic Pathology course to sophomore vet students, only the second such course offered in the United States. She works closely with local and state crime scene and animal cruelty investigators, veterinarians, and law enforcement agents. Dr. Miller serves as a liaison to improve communication and enhance the relationship between the College, veterinarians and organizations such as the Department of Agriculture, the GVMA and CVM Alumni Association.

Dr. Sue E. Turnquist

Dr. Sue E. Turnquist is an anatomic pathologist at the TVDIL and an Associate Professor in the Department of Pathology. In addition to her DVM degree from Louisiana State University (LSU), she completed a food animal residency program and a Master’s Degree in Epidemiology from LSU, and earned a PhD in Veterinary Pathology from the University of Missouri. She has an extensive background in food animal medicine and is especially interested in infectious diseases of livestock and small ruminant diseases. Sue spent nearly 15 years at the University of Missouri (UM) Veterinary Medical Diagnostic Laboratory as the oncologic pathologist for the UM Teaching Hospital. As an epidemiologist, she developed an elective class at UM that provided students with experience in field investigations involving a variety of species and situations. In her leisure time, Sue enjoys running, quilting, gardening and training agility competition skills with her dogs, Jesse, an Australian Shepherd, and Petey, a Border Collie.