

**COLORADO STATE UNIVERSITY**  
VETERINARY DIAGNOSTIC LABORATORIES

**USER GUIDE**  
November, 2010

300 West Drake Fort Collins, CO 80523  
Phone (970) 297-1281 FAX (970) 297-0320  
[e-mail: dlab@colostate.edu](mailto:dlab@colostate.edu)  
[http: //www. dlab. colostate. edu](http://www.dlab.colostate.edu)

Hours 7:30 a. m. to 5:00 p.m. M-F

ROCKY FORD VETERINARY  
DIAGNOSTIC LABORATORY  
27847 Road 21  
Rocky Ford, CO 81067  
Phone (719) 254-6382  
FAX (719) 254-6055  
Hours 8:00-5:00 M-F

WESTERN SLOPE VETERINARY  
DIAGNOSTIC LABORATORY  
425 29 Road  
Grand Junction, CO 81504  
Phone (970) 243-0673  
FAX (970) 242-0003  
Hours 8:00-5:00 M-F

Fees Subject to Change without Notice

# TABLE OF CONTENTS

SECTION 1:	Introduction	3
	Staff	3
	Advisory Council	5
SECTION 2:	Guide to Services	6
SECTION 3:	Contacting the Laboratory	10
SECTION 4:	Submission Information	11
SECTION 5:	Fee policies	14
SECTION 6:	Results	15
SECTION 7:	Billing	15
SECTION 8:	Tests Schedule	17
	Avian Diagnostics	17
	Bacteriology	19
	Bacteriology/Serology	21
	Chemistry/Toxicology	25
	Clinical Pathology.	30
	Endocrinology	33
	Parasitology	35
	Pathology	38
	Specialized Infectious Disease	39
	Therapeutic Drug Monitoring	40
	Virology	41

# INTRODUCTION TO THE LABORATORY

The mission of Colorado State University Veterinary Diagnostic Laboratories is to provide timely, accurate and pertinent animal disease diagnostic services and educational outreach to veterinarians, animal industries and animal interests. As part of the University and College of Veterinary Medicine and Biomedical Sciences, the Diagnostic Laboratory will also strive to contribute to research through development of new approaches to disease identification, investigation and prevention and to contribute to the education of professional veterinary medical, graduate, undergraduate and post-doctoral students. The laboratory is accredited by the American Association of Veterinary Laboratory Diagnosticians and offers services in avian diagnostics, bacteriology, chemistry/toxicology, clinical pathology, endocrinology, immunology, parasitology, pathology, serology and virology.

## STAFF

### Fort Collins

	Barbara Powers, DVM, Ph.D., DACVP	Director
Office Staff	Jay Kammerzell Lisa Monzingo Elaine Andersen Nancy Ault Deborah Beard Deanna Bishop Connie Heighes Ivy Ho Hillary Johnson Tina Kane Helen Koh Katie Leber Mary Lindburg Dr. John Maulsby Michelle McHugh Jan Roberts Carrie Schmer Kim Speaker Deirdre Triplett Kaye Williams	Business Manager Office Manager Client Services Client Services Client Services Client Services Accountant Client Services Accounting Technician Client Services Computer Services Client Services Word Proc./Admin Asst. Case Coordinator Client Services Word Processing Computer Services Client Services Client Services Word Processing
Chemistry/Toxicology	Dwayne Hamar, Ph.D. Cathy Bedwell, M.S.	Section Head Chemist
Clinical Pathology	Linda Vap, DVM Paul Avery, DVM, Ph.D., DACVP Christine Olver, DVM, Ph.D., DACVP Mary Anna Thrall, DVM, Ph.D., DACVP Andrea Bohn, DVM, Ph.D., DACVP	Section Coordinator Clinical Pathologist Clin. Pathologist/Section Head Clinical Pathologist Clinical Pathologist
Endocrinology/Specialized Infectious Diseases/Therapeutic Drug Monitoring	Mike Lappin, DVM, Ph.D. Melissa Brewer Jennifer Hawley Arianne Miller	Section Head Research Associate Research Associate Research Associate
Microbiology/Virology/TSE/Avian Diagnostics/Foreign Animal Diseases	Doreene Hyatt, Ph.D. Hana Van Campen, DVM, Ph.D., DACVM	Head, Bacteriology Section Head, Virology Section

	Kristy Pabilonia, DVM, DACVM	Head, Avian Diagnostics/ Foreign Animal Diseases
	Laurie Baeten	Resident
	Jeanette Bishop	Research Associate
	Denise Bolte	Microbiologist
	Monica Estay	Microbiologist
	Christina Gates	Microbiologist
	Cindy Hirota	Microbiologist
	Valerie Johnson	Resident
	Joseph McDowell	Lab Assistant
	Sarah Millonig	Program Assistant
	Leah Powers	Lab Assistant
	Mike Russell	Microbiologist
	Anita Schiebel	Microbiologist
	Katharine Slota	Program Assistant
	Gayle Thompson	Microbiologist
	Barbara Traut	Microbiologist
	Christina Weller	Microbiologist
	Kathi Wilson	Microbiologist
Parasitology	Lora Ballweber, DVM, M.S., dip EVPC	Parasitologist/Section Head
	Brandy Nagamine	Lab Technician
	Diana Sierra-Altaze	Research Associate
Pathology	Barbara Powers, DVM, Ph.D., DACVP	Pathologist/Director
	Tawfik Aboellail, BVSc, Ph.D., DACVP	Pathologist
	Colleen Duncan, DVM, MSc	Pathologist
	E.J. Ehrhart, DVM, Ph.D., DACVP	Pathologist
	Gary Mason, DVM, Ph.D., DACVP	Path./Section Head Necropsy
	Pat Schultheiss, DVM, Ph.D., DACVP	Pathologist
	Terry Spraker, DVM, Ph.D., DACVP	Pathologist
	Todd Bass	Histo Technologist
	Bruce Cummings	Research Associate
	Lee DeBuse	Lab Technician
	Grant Evans	Lab Technician
	Matthew Garber	Lab Technician
	Emma Groves	Lab Support
	Dennis Madden	Lab Coordinator
	Annie Nelson-Wensman	Lab Technician
	Erik Themm	Lab Technician
	Lisa Wolfe	Lab Support
	Dr. Deanna Dailey	Pathology Resident
	Dr. Clare Hoover	Pathology Resident
	Dr. Shannon Mcleland	Pathology Resident
	Dr. Alana Pavuk	Pathology Resident
	Dr. Brendan Podell	Pathology Resident
	Dr. Paula Schaffer	Pathology Resident
<b>Rocky Ford</b>	Jim Kennedy, DVM	Director
	Jennifer Boden	Lab Technician
	Carol Knudsen	Lab Assistant
	Laura Mendenhall	Client Services
	Dayla Pearl	Lab Technician
	Loxi Proctor	Lab Assistant
	Jane Carman Wharry	Microbiologist

**Grand Junction**

John Andrews, DVM, Ph.D.  
Donald Kitchen  
Fred Crippen  
Kim Hannafious  
Antonia Histia  
Cheryl Thomas

Director  
Director  
General Laborer  
Lab Technician  
Client Services  
Lab Technician

**ADVISORY COUNCIL**

*The Diagnostic Laboratory assembled a group of citizens concerned with the animal disease and monitoring to serve as liaisons between the laboratory and the community and to serve as a sounding board for diagnostic and administrative functions. The members include producers, veterinarians, and private citizens.*

**DIAGNOSTIC LABORATORY ADVISORY COMMITTEE MEMBERS**

Dr. Joan Bowen	5036 ECR 60	Wellington, CO 80549
Mr. Norm Brown	8167 NCR 11	Wellington, CO 80549
Dr. Bob Davies	6060 Broadway	Denver, CO 80216
Mr. Terry Fankhauser	8833 Ralston Road	Arvada, CO 80002
Dr. Mike Gotchey	1878 Lincoln Avenue	Steamboat Springs, CO
Dr. Marv Hamann	183 Domingo Drive	Pueblo West, CO 81007
Mr. Ed Hansen	4554 CR 74E	Livermore, CO 80636
Dr. Dean Hendrickson	VTH Director	Fort Collins, CO 80523
Dr. Ron Kollers	1336 W. Elizabeth	Fort Collins, CO 80521
Dr. Elizabeth Lawaczeck	CO Dept. of Public Health & Environment	Denver, CO 80216
Dr. Paul Lunn	VTH/Dept of Clinical Sciences	Fort Collins, CO 80523
Dr. Larry Mackey	PO Box 336204	Greeley, CO 80632
Dr. Leesa McCue	P.O. Box 388	Limon, CO 80828
Dr. Keith Roehr	Colo. Dept. of Ag	Denver, CO 80215
Dr. Del Miles	5626 W. 19th St., Suite A	Greeley, CO 80634
Dr. Mike Miller	317 W. Prospect	Fort Collins, CO 80526
Dr. Roger Perkins	755 Parfet, Suite 136	Lakewood, CO 80215
Mr. Kenny Rogers	5151 CR 34	Yuma, CO 80759
Dr. Steve Wheeler	3550 South Jason Street	Englewood, CO 80110
Dr. Lou Swanson	CSU Extension	Fort Collins, CO 80523

## GUIDE TO SERVICES

*This section contains information about areas of service offered and suggestions about how to handle submissions. It will provide information on the official tests, and it will explain the capabilities of the laboratory sections.*

The Diagnostic Laboratory is composed of closely integrated sections, each playing a vital role to provide you with complete and timely results. For any information regarding laboratory results or information concerning the following sections, please call 970-297-1281, or visit us on the worldwide web at: <http://www.dlab.colostate.edu>. The most current updates are on the website.

**“Accessions submitted to the CSU-VDL, including carcasses, tissues and agents isolated from samples, become the property of the CSU-VDL unless other arrangements are made in writing prior to or at the time of submission.”**

### CLIENT SERVICES SECTION

The client services section of the Diagnostic Laboratory serves as a vital link in the communication between the various sections of the laboratory and you--our client. This section is responsible for accessioning and routing samples, data entry of cases, billing and general reception for clients, both in person and over the phone. We send and track samples referred to other laboratories. The staff of the client services section helps with any and all of the following--prices, sample requirements or appropriateness, reporting of results, shipping options, expected result times, referral tests. We also handle requests for any supplies needed such as our User's Guide, forms, histopathology mailers, federal express air bills, media, and others.

Jay Kammerzell is the business manager. Lisa Monzingo is the office manager. Carrie Schmer and Helen Koh are our computer service employees. Connie Heighes and Hillary Johnson handle accounting and other financial matters. The front office is staffed by Tina Kane, Katie Leber, Deirdre Triplett and Michelle McHugh. Nancy Ault, Kim Speaker, Deanna Bishop, Ivy Ho and Deborah Beard handle sample submissions in our sample entry area. Mary Lindburg, Elaine Andersen, Jan Roberts and Kaye Williams handle transcription of dictated pathology cases. Dr. John Maulsby is the case coordinator who can advise on further diagnostic strategies and food animal management/treatment options.

### PATHOLOGY SECTION

The pathology section is comprised of a necropsy service and a biopsy/histopathology service. Eight pathologists rotate on-duty through the services and frequently consult with each other regarding cases. Information regarding treatment options is available from the clinicians at the Veterinary Teaching Hospital (VTH). Pathologists are board certified and members of the American College of Veterinary Pathologists. These pathologists are: Drs. Barb Powers, Terry Spraker, Pat Schultheiss, Gary Mason, E.J. Ehrhart, Tawfik Aboellail and Colleen Duncan.

#### Necropsy Service

The necropsy service provides diagnostic pathology support for all users, including the VTH, who have animals that die or are euthanized. Another important function is training veterinary students and pathology residents in diagnostic pathology. The section head of necropsy is Gary Mason. The necropsy laboratory is staffed by Dennis Madden, Erik Themm, Lee DeBuse, Lisa Wolfe and Emma Groves.

We perform necropsies daily, including weekends. Non-VTH cases should be submitted through the client services section of the Diagnostic Laboratory or, on weekends/holidays, through the emergency desk of the VTH. The necropsy service for VTH cases is concentrated in the morning in order to provide maximal teaching value for the students. Pathologists are on call throughout the weekend for emergencies.

For all cases, we report gross findings within 36 hours of the necropsy by telephone, fax or e. mail. For non-VTH cases, we telephone, e. mail or fax updates as laboratory findings become available. A final report is usually generated within two weeks. For VTH cases, which involves both the resident-in-training and the supervising pathologist, the final report is available within three weeks.

#### Biopsy and Histopathology Service

This section provides diagnostic service for evaluation of biopsy specimens from live animals as well as histopathology analysis of tissues sent in from field necropsies. This may include submissions for histopathology in conjunction with bacteriology, virology, parasitology, and/or toxicology and include interpretation of the results by the coordinating pathologist. The section head is Dr. Barb Powers. Lee DeBuse, Lisa Wolfe and Emma Groves assist in processing samples. The histopathology laboratory processes samples for the Diagnostic Laboratory as well as for research needs for the college. The laboratory is supervised by Todd Bass and histotechnicians are Matthew Garber, Grant Evans, Annie Nelson-Wensman and Research Associate Bruce Cummings. A wide variety of special stains, including immunohistochemical staining are available.

Federal Express and UPS can provide overnight delivery that will pick-up specimens at your hospital and provide next-day delivery. We also have a local courier service. We provide fixative-filled containers and pre-labeled mailers for your convenience. Tissue specimens arriving at the laboratory by 3 p.m. are processed overnight and slides are ready for

interpretation by the pathologist on duty after 12:00 p.m. the following day. We fax, e. mail or phone preliminary biopsy results usually within 24 hours followed by a hard copy by mail. If you need results as soon as possible, please do not hesitate to call. Cases with ancillary testing (microbiology/toxicology, and others) take longer but preliminary histopathology results are available within 24 to 48 hours. Consultation with the original pathologist is always available as is review of difficult cases by a second pathologist.

### **BACTERIOLOGY AND FOOD SAFETY SECTION**

The bacteriology section is responsible for isolating and identifying bacterial and fungal pathogens from a variety of specimens including tissues, feces, and urine. Specimens may be taken at necropsy or from live animals. We test bacterial pathogens isolated from clinical specimens for susceptibility to a panel of antibiotics, specific for companion animals or food animals to provide information useful in treating the disease. We also perform immunological assays for measuring immunoglobulin levels and for detecting antibodies in patient serum specific for bacterial and fungal pathogens.

The bacteriology section is composed of a dynamic team of individuals; Dr. Doreene Hyatt (section head), Gayle Thompson, Cindy Hirota, Barbara Traut, Denise Bolte, and Mike Russell. all work together to identify pathogens and report results, develop new methods, and assure quality results.

We process bacterial and fungal specimens in the afternoon of the day of receipt. Aerobic bacteria usually require two to four days for identification and antibiotic susceptibility testing, while anaerobic cultures usually require four to seven days for completion of identification. Certain bacterial and fungal pathogens may take longer to grow and identify. We e. mail or fax results of identification and antibiotic susceptibility tests upon completion with a hard copy by mail.

### **VIROLOGY AND MOLECULAR DIAGNOSTICS SECTION**

The virology section is responsible for analysis of specimens to obtain evidence of viral infection. Specimens from live animals may include nasal or ocular secretions, feces, and blood or tissue(s) from a suspected viral lesion. In addition, we test serum (paired, when possible) for the presence of antibodies to a panel of viruses for a retrospective diagnosis. Success in diagnosis often is better using specimens from live animals. However, we frequently perform tests on samples taken at necropsy. Dr. Hana Van Campen (section head) supervises the virology section. Anita Schiebel, Monica Estay, and Christina Gates and Jeanette Bishop comprise the technical staff. The section offers diagnostic testing for the major viruses of cattle, horses, pigs, dogs, and cats, and selected testing for viruses of sheep, goats, wildlife, and llamas. The staff work together to perform the most appropriate diagnostic tests. These may include isolation of virus (VI); detection of viruses using fluorescent antibody (FA), polymerase chain reaction (PCR), ELISA, immunohistochemistry and serology. Several of these analyses including FA, PCR, and ELISA are performed as rapid tests with short turnaround time. We make every attempt to provide reports with useful interpretations relevant to individual case history. We transmit reports to submitters by telephone, fax, or e. mail as soon as they are completed followed by a hard copy by mail. For case consultation, the technical staff are available by telephone.

### **CHEMISTRY/TOXICOLOGY SECTION**

The chemistry/toxicology section is comprised of Dr. Dwayne Hamar (section head) and Cathy L. Bedwell (chemist). This section provides a variety of chemical analyses to aid in the diagnosis of an animal's nutritional status. Trace- and macro-mineral analyses are available from biological tissues such as blood, serum, bone, kidney, and liver, as well as feeds, mineral supplements, water, and forages. We analyze small liver biopsies for most trace- and macro-nutrients. Copper, selenium, and vitamins A and E analyses are the most requested nutritional tests.

Several chemical tests for diagnosing toxicoses are available. Analyses often requested include strychnine, arsenic, nitrate, mercury, lead, and acetyl cholinesterase. We perform these tests on biological tissues, vomitus or stomach contents, feeds, and suspected baits. Other available tests include canine serum bromide analysis and qualitative analysis of bladder calculi.

We provide interpretive diagnostic information with every analysis. With cases involving wild or exotic animals where little nutritional research has been published, we give diagnostic information from other species for comparison. Dr. Hamar or Ms. Bedwell are always available to discuss with you the data and possible interpretations.

### **PARASITOLOGY SECTION**

The parasitology section is responsible for the detection and identification of external and internal parasites from a variety of domestic and wild animal species. Specimens may include skin scrapings, feces, blood, aspirates, and tissues. We also perform immunological assays for detecting antibodies in patient blood for specific parasitic organisms. Specimens may be from live animals or from samples collected at necropsy. Dr. Lora Ballweber is the section head, Brandy Nagamine is the lab technician and Diana Sierra-Alzate is the research associate. The lab is responsible for analyzing samples, reporting results, developing new methods, conducting research and assuring quality results. Diagnostic tests include routine parasitological examinations as well as more specialized tests, such as PCR and immunofluorescent assays. Turnaround time is test dependent, but usually results are available within 24 hours of sample receipt. We transmit results by fax, e. mail or telephone as soon as they are completed. For case consultation, Dr. Ballweber is available by phone.

## **AVIAN DIAGNOSTICS**

The Avian Diagnostics section provides diagnostic testing services to veterinarians and owners of commercial poultry flocks, small poultry and waterfowl flocks, upland game bird facilities and pet birds. This section houses the Colorado Avian Disease Surveillance Program and the State Agency for the National Poultry Improvement Plan (the Colorado Poultry Health Board). Dr. Kristy Pabilonia supervises the Avian Diagnostics section. The section is comprised of one laboratory technician (Christina Weller) two Program Assistants (Sarah Millonig and Katharine Slota) and numerous veterinary students that assist with field-based sample collection and testing programs. Dr. Kristy Pabilonia or Christina Weller are always available to provide consultation services or answer any questions you may have.

## **FOREIGN ANIMAL DISEASES/ZOONOSES**

The Colorado State University Veterinary Diagnostic Laboratory is a core member of the National Animal Health Laboratory Network (see NAHLN section) and the Laboratory Response Network. We provide testing services for foreign animal diseases and zoonotic diseases, including foot and mouth disease (FMD), avian influenza (AI), exotic Newcastle disease (END), bovine spongiform encephalopathy (BSE), chronic wasting disease (CWD), scrapie, classical swine fever (CSF), vesicular stomatitis (VS), Francisella tularensis (Tularemia) and Coxiella burnetii (Q Fever). Some of these test requests must be coordinated by USDA and/or the state veterinarian. More than five laboratory technicians are involved in annual proficiency testing on NAHLN/LRN official diagnostic testing protocols.

## **CLINICAL PATHOLOGY SECTION**

The clinical pathology section provides complete clinical pathology services to any user, including users outside of the VTH. This should be especially convenient for those of you submitting samples to other sections of the Laboratory and will allow us to provide more complete interpretation of disease processes. The section head is Dr. Christine Olver and the section coordinator is Dr. Linda Vap. Clinical pathologists that rotate on duty are Drs. Paul Avery and Andrea Bohn. Dr. Terry Campbell provides expertise in evaluation of exotic animal samples. The clinical pathology section provides routine clinical pathology analyses such as CBC, small, large, and exotic animal chemistry panels, urinalysis, cytologic interpretations of tissue smears or aspirates, bone marrow analysis, body fluid analysis, and other specialized analyses. We provide normal values with your results and our equipment is routinely checked for quality control to ensure accurate results. Blood submitted for CBC should not be over 30 hours old (use our Federal Express pick-up service) and serum for chemistry panels should be separated from the blood clot prior to shipment. Slides for cytology are best submitted unfixed and unstained with care not to allow them to be exposed to formalin fumes. Samples from outside the VTH should be submitted to the Diagnostic Laboratory during regular hours, or to the VTH front desk at nights, weekends and holidays. We phone or fax results as soon as they are available, with a hard copy to follow by mail. We are readily available to discuss any results with you.

## **TSE SECTION**

We specialize in diagnostics for Transmissible Spongiform Encephalopathies, including Chronic Wasting Disease (CWD), Bovine Spongiform Encephalopathy (BSE) and Scrapie. ELISA for CWD and BSE, and IHC for CWD and Scrapie are performed. Kathi Wilson is the lead worker/coordinator of the TSE section. Others contributing to this area are Terry Spraker, Barbara Powers, Leah Powers, Bruce Cummings and Elaine Andersen. The BSE and scrapie testing are USDA programs and submissions must be USDA approved. CWD testing is in conjunction with the Colorado Division of Wildlife, Colorado Dept. of Agriculture or USDA.

## **ENDOCRINOLOGY & THERAPEUTIC DRUG MONITORING SECTION**

Dr. Michael Lappin DVM, PhD of the Veterinary Teaching Hospital supervises this section. Tests offered are Total T4, endogenous TSH, cortisol, ACTH stimulation, endogenous ACTH, insulin, phenobarbital, and digoxin. These tests performed on a chemiluminescent immunoanalyzer (IMMULITE). These tests are ran daily with results out the same day it is received.

## **SPECIALIZED INFECTIOUS DISEASE TESTS**

Dr. Michael Lappin DVM, PhD of the Veterinary Teaching Hospital supervises this section as well.

### Serology:

We offer *Toxoplasma gondii* testing IgM and IgG antibody testing in serum, CSF and aqueous humor. Dr. M. Lappin developed this test himself, to help diagnosis acute or chronic *T.gondii* infections in dogs or cats. This test is ran every Tuesday and Thursday with results out that same day. Rocky Mountain Spotted Fever IgG antibody testing is also available. This test is ran every Friday with results out that same day. We report results by fax, e. mail or phone. A hard copy is also sent by mail.

### Polymerase Chain Reaction Assays:

We offer PCR assays for the amplification of DNA from the following organisms; *Toxoplasma gondii*, *Cryptosporidium parvum*, *Neospora caninum*, *Mycoplasma haemofelis* (previously *Haemobartonella felis* large form), *M. haemominutum* (previously *H. felis* small form). The *Ehrlichia spp* PCR will amplify *Ehrlichia canis*, *Anaplasma phagocytophilum* (previously *Ehrlichia equi*), *Neorickettsia risticii* (previously *E. risticii*) and the *Bartonella spp*. PCR will amplify *B. henselae* (cat scratch disease agent), *B. vinsonii*, *B. clarridgeae*, *B. quintana*, *B. bacilliformis* and *B.elizabethae*. These assays are ran once a week, if received by Friday then will be complete the following week on Wednesday. We report results by fax, e. mail or phone. A hard copy is also sent by mail.

Sample type and handling can be found under test schedule on the home page, or further information can be obtained by contacting Melissa Brewer, Jennifer Hawley or Arianne Morris at 970-297-0367. Dr. Michael Lappin can be contacted at [mlappin@colostate.edu](mailto:mlappin@colostate.edu).

### **ROCKY FORD LABORATORY**

The Rocky Ford Branch Laboratory provides services that include gross necropsy, microbiology, serology and chemistries such as nitrate, prussic acid, and blood chemistries. The lab also has a wide variety of primers and the necessary equipment to complete polymerase chain reactions (PCR) for both DNA and RNA. The laboratory has four full-time employees – Jane Carman Wharry, Linda Tomky, Dayla Pearl, Laura Mendenhall and Jennifer Boden. Part-time personnel are Carol Knudsen, Loxi Proctor and Raymond Montanez.

### **WESTERN SLOPE LABORATORY**

The Western Slope Branch Laboratory, located in Grand Junction, provides diagnostic services in anatomic pathology (necropsies, histopathology), general bacteriology and mycology, selected serologies (including EIA-Coggins and Brucella ovis ELISA), general parasitology including *Tritrichomonas foetus* culturing, and limited tests in other disciplines. We refer tests not performed here to the main laboratory at Fort Collins. Dr. John Andrews and Dr. Don Kitchen share the laboratory director and pathologist position. The laboratory has two full-time employees, Kim Hannafious and Toonie Histia, and two part-time employees, Cheryl Thomas, and Fred Crippen.

Samples submitted via the US Post Office, UPS, FedEx and other couriers are generally delivered in mid to late afternoon and when possible the test procedures are initiated that same day. Samples submitted by overnight or premium services are usually in the mornings. Results are faxed as soon as examinations have been completed.

### **DIAGNOSTIC LABORATORY SPECIALTIES**

#### **Avian Diseases/Foreign Animal Diseases--Dr. Kristy Pabilonia**

##### **Bacteriology--Dr. Doreene Hyatt**

- Antimicrobial susceptibility
- Anaerobic bacteria, including Clostridial diseases
- Fungal pathogens
- Campylobacter and Mycobacteria culturing
- Fusobacterium, Salmonella and Actinobacillus-induced diseases
- Rapid identification and PCR assays for bacterial pathogens
- Testing for contagious equine metritis
- Serologic assays for *B. canis* and *M. paratuberculosis* (*Johne's Disease*)

##### **Parasitology--Dr. Lora Ballweber**

- Fecal egg count reduction test – livestock
- Anthelmintic evaluation
- Wildlife parasites
- PCR detection and identification of endoparasites

##### **Pathology**

- Surgical pathology/oncologic pathology—Drs. Powers and Schultheiss
- Dermatopathology-Drs. Schultheiss
- Food animal diseases--Drs. Mason, Aboellail and Andrews
- Wildlife and exotic pathology--Drs. Spraker and Duncan
- Bone and joint pathology--Dr. Powers
- Endometrial pathology--Dr. Powers
- Respiratory pathology-Drs. Mason
- Ophthalmologic pathology – Dr. Ehrhart
- Neuropathology – Dr. Aboellail

##### **Virology--Dr. Hana Van Campen**

- Bovine herpes viruses and Bovine viral diarrhea virus
- Malignant catarrhal fever
- Bovine respiratory viruses
- Feline herpes virus
- Bovine leukemia virus
- PCR assays for viral pathogens
- CDV/CPV vaccine titers

## Other

Trace and macro-mineral analysis--Dr. Hamar  
Diagnostic toxicology--Dr. Hamar  
Endocrine testing and drug level monitoring--Dr. Lappin  
Toxoplasmosis testing--Dr. Lappin

## REFERRAL LABORATORIES

Submissions for tests not performed in our laboratories will be referred and tracked in our system. Our laboratories will repackage the sample, add appropriate forms and ship it to a referral laboratory. All samples will be shipped priority overnight.

Results will be reported to our laboratory and will be phoned, faxed or e. mailed to you. You will be assessed a referral/handling fee in addition to the amount the referral laboratory charges for running the test and the Federal Express charges for shipping the samples. Our referral/handling fee is \$13.00 for most submissions. Larger shipments or those requiring special handling (dry ice) may incur higher charges. Samples may be sent directly by you to the referral laboratory to expedite your results. Please call for information regarding these referrals.

## NATIONAL ANIMAL HEALTH LABORATORY NETWORK (NAHLN) AND OTHER OFFICIAL TESTING

Our laboratory is a core member of the National Animal Health Laboratory Network, a federal state partnership with the United States Department of Agriculture. The mission of the NAHLN is to provide accessible, timely, accurate and consistent animal disease laboratory services nationwide and maintain the capacity and capability to respond to a foreign animal disease outbreak and to focus on diseases of livestock, but also to include non-livestock species. Active testing performed under the NAHLN program include BSE, CWD, Scrapie, Classical Swine Fever, Vesicular Stomatitis, Avian Influenza, exotic Newcastle Disease, Foot and Mouth Disease and Pseudorabies.

Other official tests may be required by state, federal or international agencies for movement or certification. Our laboratories are approved by NVSL (National Veterinary Services Laboratory) to perform a number of official tests.

To be sure your submission meets the official requirements, samples must be submitted with the appropriate official form. Complete name, address and phone number of both the owner and veterinarian are needed. Submission forms require an animal identification (registered name, registration number, distinctive markings, etc., depending on the form and test). These forms must be signed by the veterinarian taking the sample(s). Many official tests have specific time constraints that must be met in order for results to be valid; others require special media. Submissions that do not meet these requirements may not be accepted as official by the authorities. The "Test Schedule" section will help you determine what is necessary for each particular test.

Import/export requirements for individual countries are available from the USDA area veterinarian in charge. That office can be reached at (303) 784-6229. The USDA area veterinarian in charge must be informed of all export/import testing prior to submission to the laboratory. We must know of detailed requirements of the country as these may be different from the United States.

## CONTACTING THE LABORATORY

*This section tells how, where and when the laboratory may be reached. Look here for phone numbers, fax numbers, addresses, and availability. Also included in this section is the information needed when calling, for results.*

### Do You Need to Contact the Laboratory?

Many answers to questions regarding submissions can be found in this guide. Simply locate the appropriate section. The summary at the start of each section is a helpful indicator of the information available in that section. Feel free to call the laboratory with any questions. Our professional staff will be available to speak with you if necessary.

Results will be reported as soon as possible by fax, e. mail or telephone followed by a copy by mail. Results are also available on-line after obtaining a confidential private access to only your results. If calling for preliminary results, please have the following information available:

- 1) Name, address and phone number of the submitting or referring veterinarian
- 2) Name of the veterinarian's clinic
- 3) Owner's name
- 4) Animal identification
- 5) Date the sample was mailed or submitted, how was it sent?
- 6) Test(s) requested

With this information our computer system can be accessed quickly so that questions can be answered efficiently. Consult the "Test Schedule" to determine when submissions need to reach the laboratory for the quickest turn around time, and to determine when laboratory work will be complete.

**How, where and when can I reach the Laboratory?**

The Colorado State University Veterinary Diagnostic Laboratory system has three laboratories. The central laboratory is located to the north of the Veterinary Teaching Hospital. The laboratory address, e. mail, phone number and fax number are listed below:

Veterinary Diagnostic Laboratory  
Colorado State University  
Fort Collins, CO 80523-1644  
Phone (970) 297-1281  
FAX (970) 297-0320  
EMAIL [dlab@colostate.edu](mailto:dlab@colostate.edu)

When submitting samples to the Ft. Collins laboratory by mail or special courier, please use the above address for the most efficient delivery.

If animals or samples are delivered in person, the laboratory is open from 7:30 a.m. until 5:00 p.m. weekdays. On the weekend there is a pathologist on call for emergencies. Contact may be initiated by calling the Veterinary Teaching Hospital emergency number at (970) 221-4535 or the Diagnostic Laboratory voice messaging system at (970) 297-0354.

The laboratory furnishes an after-hours refrigerator for small submissions. This refrigerator is in the foyer near the Large Animal Reception for the Veterinary Teaching Hospital. To place samples in this refrigerator, enter the building through the Veterinary Teaching Hospital large animal reception area. Clinical Pathology samples are to be delivered to this same refrigerator, BUT be sure to push the button on the wall to alert staff that samples are present. Whole animals delivered after hours for necropsy must be submitted through the Veterinary Teaching Hospital emergency service (small animal reception) prior to 10:00 p.m. Emergency personnel will take the appropriate history, owner and veterinarian information. Be sure to let them know that the submission is intended for the Diagnostic Laboratory. A pathologist will conduct the necropsy the following day.

General laboratory information is available on the World Wide Web for clients with access to the Internet at <http://www.dlab.colostate.edu>.

**Branch Offices**

One of our branch laboratories, the Animal Disease Diagnostic Laboratory, is located in Rocky Ford, Colorado. The laboratory address, phone number and fax number are listed below.

Animal Disease Diagnostic Laboratory  
27847 Road 21  
Rocky Ford, CO 81067  
Phone (719) 254-6382  
FAX (719) 254-6055

The laboratory is open from 8:00 a.m. - 12:00 p.m. and 1:00 p.m. - 5:00 p.m. on weekdays. Please contact the laboratory regarding submissions outside regular business hours.

Our other branch laboratory, the Western Slope Animal Diagnostic Laboratory, is located in Grand Junction, Colorado. The laboratory address, phone number and fax number are listed below:

Western Slope Animal Diagnostic Laboratory  
425 29 Road  
Grand Junction, CO 81504  
Phone (970) 243-0673 FAX (970) 242-0003

The laboratory is open from 8:00 a.m. - 12:00 p.m. and 1:00 p.m. - 5:00 p.m. on weekdays. Please contact the laboratory regarding submissions outside regular business hours.

**SUBMISSION INFORMATION**

*The information in this section offers some general guidelines for submitting and shipping animals or samples. It will indicate which forms to use and how to complete them.*

**General considerations**

While we will accept submissions from animal owners, it is strongly recommended that for maximum value, that submissions to the laboratory be made through and with the assistance of practicing veterinarians. The veterinary practitioner can evaluate animal health problems, determine suitable laboratory submissions, interpret laboratory results and recommend and

implement necessary treatment. Results of laboratory work will be returned to the submitter or veterinary practitioner unless otherwise requested.

Laboratory cases that require special consideration by our professional staff will be assigned to the case coordinator, Dr. John Maulsby. He will keep you informed of results as they become available, and will compile all of the work performed to a concise conclusion. This system insures that your case is handled professionally by a coordinator who is familiar with the entire situation as presented, rather than the portion that is seen only in his or her area of specialty. When testing large numbers of animals, please contact the laboratory in advance so media and staff can be available to insure a timely turn-around of your test requests.

Mail and courier service shipments are received daily at the Ft. Collins laboratory usually before noon. Samples received on Saturday are held and can be refrigerated by our central receiving area until Monday. Please properly package and label those items needing refrigeration. Consult the "Test Schedule" section for when submissions need to reach the laboratory for the quickest turn-around time.

### **Always include a history**

By clearly defining the problem that you are trying to evaluate, the laboratory can better suggest the most effective and sensitive tests in pursuit of a particular diagnosis. This information is best conveyed to the laboratory on the request form that you fill out when submitting an animal specimen. In general, more information is better than less information. The more complete the historical and clinical information, previous diagnostic results, and questions to be resolved on the submission form, the easier it is for the laboratory to choose the most effective and efficient course of evaluation for your specimens. If you have questions on a confusing or persistent problem, feel free to contact the laboratory for suggestions on how to most effectively approach your diagnostic dilemmas and utilize the laboratory most effectively.

### **What should I send?**

Two common errors in laboratory submissions that can hinder or interfere with diagnosis are: 1) Post-mortem autolysis and 2) Specimens obtained too late in the course of disease. Specimens for histologic evaluation and FA testing require optimal preservation of cellular and tissue integrity. This means that specimens for these types of tests should be harvested as soon after death as possible (preferably within minutes) and should be preserved and shipped appropriately. Further, sampling of tissues late in the course of a disease process may be too late to detect the primary pathogens involved in creating the initial insult to the affected tissues - this is particularly true in bovine respiratory disease.

Below are some general considerations regarding the submission of animals or samples to the laboratory. Specific instructions can be found in the "Test Schedule" section.

### **Whole Animals**

When submitting whole animals for necropsy, recently dead, preferably untreated animals that exhibit signs typical of the disease problem, are the submissions of choice. Whenever it is practical, we prefer to examine two or three recently deceased animals that are affected. To encourage such submissions, a regular fee is charged for the first animal with a reduced, often minimal fee for the additional one or two submissions, providing these animals are in the same consignment and will not require specialized laboratory services.

Animals should be necropsied as quickly after death as possible. When size permits, the carcass should be placed in a refrigerator as soon as possible. Do not enclose in a plastic bag until after the carcass is well cooled, as the bag will hasten autolysis from entrapped body heat. If there will be a delay in submission, the carcass may be frozen. Although refrigerated tissues are preferred, the frozen carcass will be suitable for some diagnostic procedures.

### **Tissues or Other Specimens**

Package fresh tissues in inner leak-proof containers such as Whirlpaks. Surround these with enough absorbent material to soak up any spills and ship in a leak-proof, well-insulated outer container. Include several ice packs to keep the tissues cold until their arrival at our laboratory. Make sure samples are properly identified.

Package intestinal samples, or other samples known to contain bacteria or viruses, carefully to avoid cross contamination of other fresh specimens. Please see our website for detailed information on shipping regulations or contact the laboratory.

### **Fixed Tissue**

Package fixed tissue in leak-proof containers surrounded by absorbent material. This is especially important for our continued service because of concern regarding shipment of and exposure to chemicals such as formalin. In addition to public safety, fresh tissue accidentally exposed to formalin is non-diagnostic for many laboratory procedures. Parafilm insures against leakage on most containers. If time is allowed for tissue to fix properly before mailing, only a small amount of formalin needs to be shipped with the sample. Label individual tissue containers with veterinarian, owner, animal ID and type of specimen. Please do not use narrow necked containers as it is very difficult to remove fixed tissue from them. We supply fixative-filled jars in pre-paid mailers for your convenience. Please see our website for detailed information on submitting biopsy specimens.

## **Serology**

Submit samples for serology in sterile tubes. Serum should be cleanly separated from the clot. Paired serum samples give a more definitive diagnosis on many serologies. Generally, the first should be taken at the onset of symptoms (acute) and the second should be taken two weeks later (convalescent). See "Test Schedule" for the specific recommendation on test(s) being requested. If it is recommended that you submit paired sera, use the following guidelines. The acute sample may be held (please spin it down and save frozen serum) at your clinic until the convalescent is drawn; then send them both to the laboratory. Be sure they are dated accordingly.

The acute and convalescent sera may also be submitted at the time they are taken, but be sure to label the tube and submission form with the date. Forms accompanying the acute sample should state that convalescent will follow (we recommend two weeks) and whether you would like the acute sample evaluated upon receipt or held until the convalescent arrives. Convalescent forms should indicate that acute sera was sent previously so that both samples can be run side by side for accurate titer comparisons.

## **Cultures**

Use transport media when appropriate to preserve samples during shipment. Transport media are available upon advance request for anaerobic cultures, campylobacter cultures, trichomonas cultures, mycoplasma cultures, viral isolation. See the "Test Schedule" to determine if special transport media will be required.

## **Clinical Pathology**

CBC's need to be run within 30 hours of collection and should be submitted in an EDTA tube accompanied by fresh blood smear. Chemistry panels are run on serum with the clot removed as soon as possible after blood collection, and prior to shipment. Slides for cytologic analysis should be prepared as aspirates or imprints and carefully packaged and shipped unfixated, unstained and with care not to expose slides to formalin fumes.

## **Shipping**

When sending samples to our laboratories, a variety of carriers can be used. Choose a carrier that will deliver within 24 - 48 hours. Please see the special comments column in the "Test Schedule" section for specific recommendations. Try to avoid weekend and holiday delivery. A carrier that utilizes a tracking system and quick delivery is suggested.

Most submissions should be shipped with several ice packs. The "Test Schedule" should be consulted for specifics. Pre-paid mailing labels will be provided upon request. When using these labels, simply drop the package in the mail and postage will be included on your bill. Postage will be prorated when several submissions are received in the same shipping container.

Mailing labels for biopsies are provided with our biopsy mailer kits. These labels need only be placed visibly inside the outer container we furnish. Initially you will receive a mailing containing six specimen bottles filled with 10% buffered formalin. As bottles are received by the laboratory, replacement mailers will be returned to you. Please see our website, newsletter (Lablines) or contact the office for detailed information regarding shipping regulations.

## **Courier Service**

We have an agreement with Federal Express and UPS for specimen shipment. The discounted cost of using this service will be added to your accession charge. Saturday service (Pickup or Delivery) is an additional charge.

## **What form do I Need?**

Proper submission forms need to be fully completed. Results are only as accurate as the information with which we are provided. Every aspect of a submission is critical. Several types of forms are used, official, general, and a few other forms specific to a test..

## **General Submissions**

The most commonly used form is for general diagnostic work. Please include all owner, animal, sample and veterinarian information. This information is important for tracking disease trends and incidence by area. Do not forget to include your phone, fax number and e. mail address. Computer files are not always immediately accessible, so this information is needed on each and every submission.

Submit a complete history. This includes the animal identification, breed, age, sex, the date the samples were taken and the type of sample(s) submitted. Be sure to note clinical signs, treatment, duration, morbidity and mortality in the group, previous laboratory test results and description of affected tissues. If related work has previously been submitted, please include the date it was submitted and the diagnostic laboratory number if you know it. Please indicate differential diagnoses suspected. On the bottom half of the form, please indicate the tests to be performed. On the blank line to the left of the choice note the number of samples to be tested.

## **Official Submissions**

Our form for official tests can accommodate up to 20 animals. It provides an area for the signature of the veterinarian who collected samples, and a space for animal identification, all of which are necessary for official testing. This

form should be used for all official testing except Equine Infectious Anemia. EIA forms can be obtained from the Cooperative Brucellosis Laboratory. Their phone number is (303) 844-3185.

### **Is there significance from negative results?**

Most assuredly there are! The importance of negative results on a particular case are often overlooked because we have a tendency to focus on the fact that we do not have a definitive diagnosis in hand. This should not blind us to the fact that important information has been gained from the diagnostic evaluation and that this information may suggest other diagnostic avenues to be pursued. For example, the lack of evidence for an infectious cause of abortion is tremendously useful in that it tells you that common abortifacient agents (that are often communicable) are not likely to be the cause of your problem.

Problems incurred due to incomplete information, inappropriate submissions, significant autolysis, or samples obtained late in the course of disease, certainly can prevent or hinder obtaining a definitive diagnosis. However, problems that are less easily addressed include the contribution of many genetic, toxic/metabolic, and environmental factors that do not produce significant or specific lesions that are not easy to detect by routine diagnostic methodology.

## **FEE POLICIES**

*This section defines some general fee policies. It will help explain how the charges are based. It also will outline any discount policies regarding multiple submissions, paired serologies, screens and panels.*

The majority of the laboratory's funding comes from fee-generated revenue. A small amount of state support and federal support for specific diseases allows us to perform tests that would be unprofitable in commercial laboratories. The CSU Diagnostic Laboratories set prices competitively with other state diagnostic laboratories when possible. Fee increases occur July 1 of every year and are required to cover increases in salaries and supplies of the laboratory.

### **Minimum Charge**

A minimum of \$10.00 will be assessed on each submission. This minimum charge covers handling and processing. If the cost for the requested test is less than \$10.00, your invoice will show the actual charge for the work performed plus a minimum fee adjustment to show a total of \$10.00.

### **Multiple Submissions Discounts**

Multiple submissions for the same disease condition that are received at different times may qualify for a discount. Many times a problem may be better identified if samples are received from animals at varying stages of the disease, and this may require submission at different times. Be sure to mention previous cases that have been submitted. Refer to these by the diagnostic laboratory accession number.

Multiple submissions for the identical disease condition received at the same time may also qualify for a discount. Again the frequency of identifying the causative agent increases with the availability of diagnostic submissions.

### **Panels and Screens Discounts**

Several diagnostic panels and screens are available at the laboratory. These offer a combination of recommended or commonly used tests for a discounted price.

**Fungal serology screen-** The fungal screen includes serologies for Blastomycosis, Coccidioidomycosis, Histoplasmosis and Aspergillosis.

**Bovine respiratory panel-** The panel includes serology for infectious Bovine Rhinotracheitis, Bovine Virus Diarrhea, Parainfluenza-3 and Bovine Respiratory Syncytial Virus.

**Bovine abortion panel-** The panel includes serologies performed on the dam for Infectious Bovine Rhinotracheitis, Bovine Virus Diarrhea, Leptospirosis (5 serotypes), Neospora and Brucella abortus routinely. Blue Tongue and Toxoplasmosis are available upon request.

**Abortion screen-** The screen differs from the panel in that the screen submission includes samples taken at necropsy and shipped to the laboratory. These may or may not include serum from the dam. Please see "Test Schedule" for specific recommendations for what to submit for this screen.

**Abortion screen/necropsy-** If a fetus (fetuses) is submitted, the necropsy will be performed and samples collected for tests routinely run on fetuses. Up to two animals on one consignment will be done for the price of one.

**Diarrhea screen-** Fecal samples will be tested for up to two animals for a reduced price. If the actual charge is less, that is the charge that will appear on the invoice. The diarrhea screen includes bacterial cultures, examination for Rotavirus, Coronavirus, Parvovirus (or a combination of these depending on the species of animal) and a parasitology exam.

**Diarrhea screen/necropsy-** If a scouring animal(s) is submitted, the necropsy(ies) will be performed and the appropriate samples collected. Up to two animals on the same consignment will be tested for the price of one.

### **Submissions for Outside Referrals**

Some specimens must be referred to other laboratories. A charge of \$13.00 covers handling and processing and is in addition to the shipping charge and the charge of the referral laboratory. Larger shipments or those requiring special handling may incur higher charges.

## **RESULTS**

*This section explains how results are reported, and lists the type of information required by the laboratory to access a particular submission.*

All results are reported as soon as possible to the referring or submitting veterinarian (or animal owner if no veterinarian is listed) unless otherwise requested. Results can be phoned, faxed, or sent by electronic mail as indicated on the submission form. Veterinarians may obtain access to their results from our computer system. This system is password protected and provides results ONLY of those cases submitted by the requesting veterinarian. To obtain a password for your results, call the Diagnostic Laboratory.

If results are to be reported by phone, fax or e. mail, the appropriate number and/or e. mail address **must** be included on every submission. Significant preliminary results will be called as well. In cases where multiple laboratory sections are involved, results requiring interpretation will be reported by the coordinator in charge of that case but individual test results will be reported by the laboratory section. Check the "Test Schedule" section to determine when results can be expected. If you need to call us about a particular accession, please have available for us the following information:

1. Name, address and phone number of the submitting or referring veterinarian
2. Name of the veterinarian's clinic
3. Owner's name
4. Animal identification
5. Date the sample was mailed or submitted, how was it sent?
6. Test(s) requested

This will provide the information necessary to quickly track the submission by computer and connect you with the appropriate laboratory personnel if required.

A copy of all the pertinent completed laboratory work will be sent to the person to be billed (along with an invoice) when the case is finalized. In cases where the owner is billed, a copy of the results will also be sent to the referring veterinarian unless otherwise requested.

Cases are often finalized before all tests are complete. Any significant results that are produced after we have finalized the case will be reported as they become available.

## **BILLING**

*This section explains our billing procedures and how to remit payments.*

### **Billing**

Billing for the Diagnostic Laboratory system is done through the Commercial Accounts Receivable Department of Colorado State University. When becoming a client of the Diagnostic Laboratory, an account number will be assigned if one has not previously been assigned elsewhere in the university. This nine-digit number will be permanently assigned unless it is inactive for over one year.

When making the first submission, complete and accurate information is required to set up an account. Veterinarians need to include a complete, unabbreviated clinic name, address, phone number, e. mail address and fax number. Full names of veterinarians should be included. These can be added and deleted as your staff changes.

Submissions directly from owners need to include full name, company name (if any), address, phone number, fax number, e. mail and referring veterinarian.

### **Payment**

This invoice may be paid upon receipt. Please make all checks payable to Colorado State University. If the services are being paid from the invoice, please indicate the Diagnostic Laboratory accession number and your Colorado State University account number so that payment will be credited correctly. The Commercial Accounts monthly statement reviews of all work done through

the university on your account number. Diagnostic laboratory results will be designated by FXXXXXXX, or WXXXXXXX or RXXXXXXX where the XXXXXXXX is the accession number. If you choose to pay from the statement, please direct the entire balance due to:

CSU Cashier  
6015 Campus Delivery  
Colorado State University  
Ft. Collins, CO 80523-6015

The university assesses a 1.5% monthly interest charge on the unpaid balance after thirty days. You can contact them at 970-491-6143 for account balance inquires.