



# newsletter



June 2004

A Quarterly Publication

Volume 9, Issue 2

## From the Director:

It has now been more than a year since the last edition of this newsletter. The year saw many changes at the Arizona Veterinary Diagnostic Laboratory, some of which you may not be aware. These changes included a re-shuffling of administrative responsibilities, the addition of new personnel, new testing capabilities, a new look to our reports and important changes in billing and data storage.

Dr. Bob Glock stepped down as director effective September 30, 2003. The good news is that Dr. Glock is not leaving the laboratory. He has reduced his time to 80% to "smell the roses" a bit more than his previous schedule allowed but he is continuing his contributions in the diagnostic pathology and outreach efforts of the laboratory.

Since becoming a satellite laboratory of the National Animal Health Laboratory Network (NAHLN) in the fall of 2002, we have been busily putting in place necessary upgrades for biosecurity, training laboratory technicians and setting up new equipment that will enable us to perform testing for foreign animal diseases. Previous to this program, all such testing was performed in federal laboratories - - the National Veterinary Services Laboratory in Ames, Iowa and the Foreign Animal Disease Research Center, Plum Island, New York. We are currently performing surveillance testing for Exotic Newcastle Disease and Highly Pathogenic Avian Influenza in Arizona poultry in cooperation with state and federal agencies. Renovations of the large animal necropsy funded by this program are underway and are anticipated to be complete by late summer.

The funding for the NAHLN also allowed the hire of much needed technical help in the laboratory. New personnel include: Elaine Nakashian, Quality Manager; Daria Borntrager, Data Entry Specialist; Aurora Astorga-Romero, Computer Database Specialist; Dr. Jennifer Wilcox, Molecular Biology (PCR); and Kathryn Wymore, Virology/PCR. The Molecular Biology section of the laboratory has been significantly strengthened by the new NAHLN hires and equipment upgrades.

Ever get frustrated by being put on hold or having to navigate tedious phone answering systems when trying to find out test results? Our NAHLN collaborations also necessitated the renovation of our database system. This will provide the potential for web-based access of test results for veterinarians. No more listening to elevator music! The anticipated start-up is January 2005.

Lastly, we are again cooperating with the Arizona Department of Health Services and the Office of the State Veterinarian in West Nile Virus surveillance in Arizona. As a result, there is yet another new face in the lab. Matt McDaniel, Research Assistant, joined the laboratory last September. Matt performs the sample collections on the dead birds, blood collection on sentinel chicken flocks and the immunohistochemistry test for the virus.

Last year we saw the arrival of West Nile virus with infections documented in humans, birds and horses. If the experience of other states is repeated, we can expect a marked upswing in positive diagnoses this year. For information on submitting dead birds for WNV testing, contact your county health department. Also, remember that cases of suspected viral encephalitis in horses must be reported to the Office of the State Veterinarian within four hours of presentation.

*Greg Bradley, Director*

Arizona Veterinary Diagnostic Laboratory

Access to the AzVDL: Take Tucson Interstate 10 to the Miracle Mile exit #255. Travel approximately 1/4 mile on the south bound frontage road between Miracle Mile and Grant Rd. Turn west onto the farm at the signed entrance.

The University of Arizona

College of Agriculture and Life Sciences

Department of Veterinary Science/Microbiology

2831 N. Freeway

Tucson, Arizona 85705-5021

Fax: (520) 626-8696 Phone: (520) 621-2356

## What's new at the lab

### Courier Service

We are pleased to announce a significant change in the way the Arizona Veterinary Diagnostic Laboratory (AzVDL) provides service to veterinarians. We now offer, at no charge, a courier pick-up service for your laboratory specimens, including biopsy/cytology, microbiology, polymerase chain reaction (PCR), valley fever serology, necropsy and many more. The courier will operate in southern Arizona including Tucson, Oro Valley, Green Valley, Nogales, Sonoita, Benson, Willcox, Sierra Vista, Bisbee, Douglas, Morenci and Safford.

To utilize this service, simply phone the AzVDL at 621-2356 ext. 10 (local Tucson) or toll-free at 1-866-897-1166 from out-lying areas. Cut-off time for same-day pickup is 12 noon. Exceptions are Nogales, Green Valley, Benson and Sierra Vista with a cut-off time of 3:00 PM, Willcox: 2:00 PM, and Douglas: 11:00 AM. Calls received after the cut-off times will be collected the following day. We also offer STAT pickups for a small fee. If you are in an out-lying area and prefer not to request a pick-up you may use our Federal Express account (#1381-3559-4) for specimens and small animals (under 20 pounds). Check the "bill recipient" box and be sure to enter the account number. Check the "Priority Overnight" box. Be sure you prepare the specimen according to the Shipping and Packaging Instructions for Diagnostic Specimens included with this newsletter.

Your biopsy and cytology specimens will be read by one of our three board certified Veterinary Pathologists. All of our reports include a full written description and complete examination of surgical margins; two features that have become increasingly important with the rise in client requests for consultation with veterinary oncologists. In addition, there is never any additional charge for decalcification or pathologist assisted trimming of biopsy specimens. Our pathologists are readily available to take your phone calls regarding any case they have read out. Weekday turn-around times for biopsy and cytology specimens from the Tucson area will be 24 hrs. Specimens from outlying areas will have 24 hr turn-around on cytology specimens and 48 hours on biopsies.

Microbiology submissions to the AzVDL are under the supervision of a board certified veterinary microbiologist. In addition to standard bacterial culture and sensitivity tests, we offer fungal culture and identification and virus isolation. We also offer valley fever serology.

A recent addition to our laboratory is PCR testing. We now offer a long list of PCR tests for infectious agents such as canine distemper, feline herpesvirus, chlamydia and *Ehrlichia canis*. In the near future we will be configuring the PCR laboratory so that we can provide 48 hr turn-around on tests for these agents.

You can elect to receive reports via fax, phone, e-mail or snail-mail. Soon we will be offering web-based access to lab results. For a complete listing of test offerings and prices, you can view our fee schedule on-line at: <http://www.microvet.arizona.edu/AzVDL/pricelist.htm> or call the lab to have a fee schedule mailed to you.

If you have any questions, please feel free to call Barbara Pickard (520-621-2356 ext 12) or myself, Greg Bradley (520-621-2356 ext 16).

### After Hours Specimen Drop-off

We have relocated the refrigerator for after-hours drop-off of specimens. It is now on the north side of the building, next to the chain link fence enclosure. The refrigerator is much larger and can now accommodate animals up to 200 pounds. There are directional signs posted for your convenience.

### New Submission Form with Fee Schedule

We have enclosed a copy of our new submission form. Please note the changes, and notice that the fee schedule is now a check-off form on the back. You can download a copy from our web site or call the office at 520-621-2356 and we will mail copies to you preprinted with your clinic information.

## DIAGNOSTIC UPDATE

The following are selected samples of cases submitted to the AZVDL during the months of March, April, and May.

### BOVINE

We received tissues from an aborted fetus from a beef herd that had a history of persistent diarrhea in several cows. This cow aborted after having had diarrhea, which appeared to respond to treatment. Necropsy tissues were quite autolyzed but heavy populations of group C1 *Salmonella* sp. were isolated from liver, lung, and stomach contents. This appears to be a situation with **salmonellosis** resulting in abortion related to diarrheal disease in adult cows.

**Oleander poisoning** was the cause of the sudden death of two purebred Angus heifers recently placed in a pasture in southern Arizona. The diagnosis was based on the finding of a few oleander leaves (*Nerium oleander*) in the rumen of the dead animals, and oleander clippings in the pasture.

*Mycoplasma bovis* was the cause of **acute purulent arthritis and peri-arthritis** of the stifle joints in two young Holstein calves, and of otitis in one of them.

### PORCINE

**Severe chronic pneumonia, probably due to aspiration of foreign material**, was diagnosed in a four-month-old Hampshire cross pig. The owner reported that the animal "keeps getting sick". The pig would go off feed and develop a nasal discharge. At necropsy the lungs were firm, discolored dark reddish, and were consolidated and sank in fixative. Microscopically bronchiolar lumens contained fragments of foreign material, which were aspirated at some time in the past.

**Pasteurella pneumonia** was diagnosed as the cause of death in a female Duroc pig. The animal died unexpectedly after a "short illness". At necropsy there was bilateral, anteroventral consolida-

tion of the lungs involving at least 80% of lung parenchyma. *Pasteurella multocida* was isolated from affected lung tissue and microscopic lesions were typical.

### CAPRINE

**A severe, diffuse, fibrinous pleuritis** due to *Mannheimia* ("*Pasteurella*") *haemolytica* infection was diagnosed in a two-month-old goat kid. The animal became ill and died after an illness of about 18 hours. At necropsy there was prominent roughening due to fibrin deposition on the visceral pleura of both lungs. Microscopic lesions were typical.

### EQUINE

We received a near-term fetus with a history of several other abortions in this group of horses. The identification of **Equine Herpesvirus (rhinopneumonitis)** is supported by the presence of gross and microscopic necrotic foci throughout the liver. This type of abortion is still seen periodically in spite of the availability of vaccines.

The AZVDL received a call recently from the owner of a seventeen-year-old gelding that died unexpectedly. The owner found the horse in its paddock "humped up" and quivering. The owner haltered the horse and attempted to lead it a short distance. The horse suddenly reared up, collapsed, and died. Necropsy revealed a **transverse fracture of the C1-C2 vertebrae** with resultant severing of the cervical spinal cord in the area.

**Abdominal hemorrhage** caused by the necrosis of a large splenic lymphoma was the cause of death of a ten-year-old Quarter horse mare following a short episode of clinical disease that included ventral edema, abdominal pain, and pale mucosal membranes.

**Intestinal intussusception causing** intestinal obstruction with *E. coli* septicemia and shock was the cause of death of a three-day-old Quarter horse foal. *Salmonella arizonae* was also isolated from the affected intestine and may have caused initial enteritis that precipitated the intussusception.

## Diagnostic Update

### AVIAN

We received a heron that was found dead. There was no evidence of injury. Numerous hemorrhages were noted in the lungs and air sacs both grossly and microscopically. There were also areas of necrosis in the liver observed microscopically. The diagnosis is **bacterial hepatitis** with *Salmonella* sp. isolated.

A Cockatiel had a history of lethargy, anorexia, and generalized illness for 9 months. There were yellow plaque-like lesions over the tongue. This bird was quite thin and the illness is the apparent result of heavy **infection with *Candida albicans*** both in the crop and in the oral cavity.

*Syngamus trachea* (avian gapeworm) was the cause of **granulomatous tracheitis** in Pacific parrotlets in a zoo collection.

**Chronic toxic hepatitis** of unknown etiology was diagnosed in two unrelated cases in adult Amazon parrots. Although aflatoxins are often incriminated in these chronic processes, laboratory confirmation of the causative agent is almost always impossible in these types of conditions.

A severe hepatic hemochromatosis with 23,812 ppm of liver iron was the necropsy finding in a seven-year-old Mynah affected with **Iron Storage Disease**.

**Ischemic myocardial necrosis** was the cause of sudden death in an aged Amazon parrot with severe arteriosclerosis of the cardiac arteries, many of which exhibited greatly thickened intima and media.

Intrathoracic hemorrhage produced by a **rupture of the aorta** was the necropsy finding in a seven-year-old Cockatiel. The rupture was located in an atherosclerotic lesion in the thoracic aorta.

**Psittacine herpesvirus** infection with secondary septicemia was diagnosed in a fifteen-year-old, Double Yellow Head Amazon parrot. The bird was noticed perching low then at the bottom of the cage the day it died. There had been no prior indication of illness.

**Megabacteriosis** was diagnosed in a female Mouse bird that died. The bird had no visible fat stores. Microscopically, large stacks of long, blunt ended organisms consistent with so-called "megabacteria" were identified in the mucosal glands of the proventriculus and the koilin layer of the ventriculus.

**Zinc intoxication** was diagnosed in a nine month-old female parrot. According to the submitting veterinarian, the bird was lethargic and regurgitating. Weakness became progressive and blood work indicated a hepatopathy and an anemia. Necropsy did not reveal any evidence of infectious disease. Zinc intoxication was diagnosed on the basis of elevated levels of zinc in liver tissue (80 ppm: reference 25-40 ppm).

**Avian tuberculosis** was diagnosed in a female Quaker parrot. The submitter noted that the bird died after an illness of 3-4 hours duration. The bird was found at the bottom of its cage and died shortly thereafter. Large foci of granulomatous inflammation that contained acid-fast organisms were found within the liver and lung. The source of the infection was not determined.

**West Nile virus infection** was diagnosed in a canary that was received for necropsy in late May 2004. According to the history, the bird became "lethargic and fluffed". The bird was kept in an outdoor aviary. Necropsy revealed multifocal myocardial necrosis with accompanying inflammation. Multifocal hepatocellular necrosis was also evident. West Nile virus immunohistochemistry and PCR testing was positive.

### FELINE

Feline **calicivirus** was isolated from the lungs of an eight-year-old domestic shorthair that died. The cat was from a cattery in which several other cats were exhibiting signs of respiratory illness.

A six-week-old, domestic shorthair kitten from an abandoned litter became pyrexia and hypoglycemic. It seized and died. Necropsy lesions were those of necrotizing enteritis consistent with feline **panleukopenia**.

## Diagnostic Update

The effusive form of **Feline Infectious Peritonitis** was the cause of death of a thirteen-year-old domestic shorthair feline with a history of progressive weight loss with hypergammaglobulinemia, icterus and ascites. Necropsy findings were the classical lesions of emaciation, marked peritonitis with accumulation of viscous exudates, and fibrin covering the serosal surfaces.

The non-effusive form of **Feline Infectious Peritonitis** was diagnosed in two unrelated cases involving young cats: a nine-month old domestic shorthair with pyogranulomatous meningoencephalitis, and a one-year-old domestic shorthair with disseminated pyogranulomatous infiltrations and a secondary bacterial pneumonia.

### CANINE

**Hepatic lipidosis** was the apparent cause of death of an eight-week-old puppy. This animal had severe hepatocellular vacuolation resulting from the lipidosis. The pathogenesis of hepatic lipidosis in young dogs or so-called fatty liver syndrome is thought to be related to limited energy stores and higher metabolic demands associated with an incompletely developed glycometabolic pathway.

A seven-year-old Corgi died suddenly but the history indicates there had been some weight loss with normal laboratory tests and x-rays. The apparent cause of death was **hypoadrenocorticism** with a complete lack of identifiable adrenal cortical tissue. This condition is generally referred to as idiopathic adrenocortical atrophy.

**Granulomatous Meningoencephalitis (GME)** was diagnosed in a fifteen-month-old female Jack Russell terrier with slowly progressive extensor rigidity of the left front leg that led to euthanasia. It was also diagnosed in a nine-year-old male Dachshund male that had to be euthanized because of rapidly progressing neurological deterioration following dental cleaning with extraction. These two unrelated cases illustrate the great variability of the disease in its clinical course and signs, and the ages and breeds of the dogs

affected. The cause of GME is not yet known.

**Bromadiolone intoxication** was diagnosed in a six-year-old female Labrador found dead after a massive mediastinal hemorrhage. 1020 ppb of Bromadiolone were detected in the liver. The history supplied did not indicate any exposure to anticoagulant rodenticides.

**Brodifacoum intoxication** caused an acute abdominal hemorrhage in a seven-year-old Beagle with a history of possible rodenticide ingestion. An anticoagulant screen of the liver detected 2027 ppb of Brodifacoum.

**Canine Infectious Hepatitis** with typical viral inclusions throughout the liver, spleen, kidneys and brain was diagnosed in a twelve-week-old Dachshund puppy from Tucson. The disease is still relatively frequent in puppies that fail to receive passive immunity or when vaccinations are neglected.

**Histiocytic sarcoma** was the cause of sudden death in a nine-year-old Golden Retriever. The dog had no prior signs of illness. At necropsy, the right ventricular myocardium was thickened and replaced by firm pale-tan tissue. Scattered foci of similar appearance were present throughout the left atrial myocardium. The liver and spleen contained 2.0-3.0 cm pale tan masses.

A fourteen-week-old, male Bull terrier died following a clinical history of listlessness, pallor and bloating. Anemia was present on a CBC. The *Ehrlichia canis* titer was negative. Impression smears of the lung revealed large numbers of intraerythrocytic parasites consistent with *Babesia canis*.

A two-and-one-half-year-old, castrated male Labrador retriever died unexpectedly two days after being admitted to a kennel. The owner reported the dog had vomited twice two days prior but only once on the day of admission. The caretaker reported no vomiting the following day. At necropsy there was marked, bilateral atrophy of the adrenal cortex. The diagnosis was **hypoadrenocorticism**.

**Hypertrophic osteodystrophy** was diagnosed in a twenty-two-week-old male Great Dane canine. The

## Diagnostic Update

animal was euthanized after it developed swelling of the long bones of all four legs just above the carpal and tarsal joints. The submitter described reluctance to walk, anorexia, and lethargy. At necropsy there were large firm swellings that appeared to be due to extensive extraperiosteal fibrous proliferation over the affected areas of the long bones. Cortical bone was minimal to absent in the affected areas. Microscopic lesions were typical of canine hypertrophic osteodystrophy. Hypertrophic osteodystrophy is a disease of unknown cause and affects young, fast-growing dogs of the large and giant breeds. Affected dogs are usually three to six months old, but may be two months to nearly two years at the time of first presentation. The distal radius and ulna are usually the most severely affected but all fast growing bones may be involved.

**Canine distemper** was diagnosed in a six-month-old female pit bull canine. The animal was feral and was euthanized after it became acutely "neurologic" and aggressive, with a body temperature of 107.7 degrees Fahrenheit. Microscopic lesions were typical of canine distemper virus. Rabies testing was negative.

**Gastric torsion** was identified in a seven-and-one-half-year-old neutered female English bulldog. The dog died twelve hours after recovering from ear surgery. The dog was "doing great, recovered fully" and was found dead outside at 5 AM. Necropsy revealed a 180-degree counter-clockwise gastric torsion.

Several samples of suspected bait have been recently that have been positive for **ethylene glycol**. Veterinarians should keep ethylene glycol poisoning in mind when they are presented with a dog that has suddenly become ataxic, incoordinated, and is vomiting. We have also had several cases of **strychnine poisoning** in dogs.

### EXOTICS

**Squamous cell carcinoma of the nasal cavity** was diagnosed in an eight-year-old Lop rabbit that had a history of chronic nasal and ocular discharge. At necropsy, the right nasal cavity was filled with a white mass covered by white, mucoid exudates.

### WILDLIFE

**Chromoblastomycosis** was the cause of death in an adult

*Rana tarahumarae* frog from a zoo collection. The infection involved multiple organs including the kidney, liver and mesentery. Chromoblastomycosis is an opportunistic infection by saprophytic fungi found in the environment.

**Verminous gastritis** due to *Spiroptera nasuta* was diagnosed in a cactus wren found dead in a mixed species aviary. The proventriculus had large numbers of coiled parasites within the serosa. Cross-sections of the nematodes were visible in the lumen of the proventriculus, mucosal glands, tunica muscularis and serosa on microscopic examination.

**Contagious ecthyma and severe bronchopneumonia** was diagnosed in a desert bighorn lamb, which was found freshly dead. Proliferative, cauliflower-like lesions were present on the muzzle and lips. Internally there was anteroventral consolidation of the lungs. Affected areas of the lung sank in fixative. A mixed bacterial flora, which included *alpha streptococci* and *E. coli*, was isolated from the lung tissue. The lamb was from northwestern Arizona.

**Trichomoniasis** has been diagnosed in a number of morning doves from the east side of Tucson. Affected birds had large, firmly adherent, cheesy plugs attached to pharyngeal mucosa. Microscopic changes were typical and cultures for trichomonads were positive.

---

### Submission Tip:

Good carcass preservation in hot weather is possible. We recommend bagging smaller carcasses in plastic and promptly packing them in ice to cool them down rapidly. Carcasses can usually be held for several days if the ice is replenished. Before shipping, the ice should be replaced by leak-proof "cool packs". The "icing down" method of cooling is preferable to refrigeration in a standard refrigerator, which usually isn't cold enough and doesn't cool rapidly enough to prevent decomposition.

Large carcasses can be similarly cooled by placing them in a large poly-tarp in the bed of a trailer or pick up and packing an ample supply of bagged ice around them. The carcass should then be covered with a tarp and ideally, an old blanket for insulation.

## Featured article: vesicular stomatitis (Vs)



Recently, Dr. Rick Willer, Arizona State Veterinarian, announced that Vesicular Stomatitis (VS) had been identified in eastern New Mexico. This follows reports of VS being found in Texas. This information sheet will provide basic information on VS.

VS is a viral disease of **cattle, swine, horses and wild ruminants**. VS is seen in the United States, Mexico, and Central and South America. Humans have been infected with VS and report an influenza-like disease. The transmission of VS is not understood, but insect transmission may be involved as a mechanical vector. In May 1995 an outbreak was reported in the Southwest and VS was seen in horses in Arizona. VS then moved into New Mexico in June and along river valleys into Colorado and Utah. This follows the pattern of insect emergence in these areas. The direct transmission of VS has been reported in dairy cattle by milking machines, in swine in close confinement and in cattle eating rough forage causing oral abrasions. These abrasions allow the virus to more readily invade the oral mucosa.

There are three serotypes of VS: (1) New Jersey, (2) Indiana (with three subtypes) and (3) Isfahan (also with three subtypes). The most common serotypes seen in the United States are New Jersey and Indiana-1. The VS virus is stable in soil for weeks and can resist extreme changes of pH (unlike the Foot and Mouth Disease virus). There is a wide range of disinfectants that are effective against the VS virus.

The clinical appearance of VS is very similar to Foot and Mouth Disease (FMD). After exposure to the virus there is a short incubation period (2-4 days). This is followed by fever and the formation of vesicles (blisters) on the lips, muzzle and tongue. In horses often the entire top surface of the tongue may slough off. There is excessive salivation and refusal to eat. Cattle will also have vesicles on the teats and in the area between the toes. Milk production quickly falls. In dairies five to 60% of the cattle will show clinical signs, but mortality is low (one to 5%). Older, higher producing dairy cattle are more susceptible and loss of production can be serious. In a 1982 outbreak of VS, in California, two dairies lost more than \$225,000.

It is important to note that VS, unlike FMD, can infect horses. VS can also infect swine, producing fever and vesicles in the snout, tongue, coronary band and interdigital space. Sheep and goats in contact with VS will show a serological response but seldom show clinical signs. Animals that have had VS will have antibodies for several years, but may still become reinfected. Unlike FMD there is no evidence that animals with VS will become carriers.

It is very important to note that the clinical signs of VS are very similar to Foot and Mouth Disease (FMD). FMD is a very serious foreign animal disease and if an outbreak of FMD were to happen in the United States it would have a catastrophic impact on livestock production. The two diseases cannot be distinguished without laboratory testing. However, horses are not affected by FMD and will be infected by VS. If cattle, swine or horses show oral blisters, salivation, and blisters on the coronary band or between the toes, **a state or federal veterinarian must be contacted immediately**. If there is an outbreak of VS or FMD it is very important to identify the outbreak quickly and prevent the further spread. In controlling VS a 30-day quarantine of affected premises is used. Note that VS is not a foreign animal disease, it will appear in the southwest every 10-15 years. The control programs for VS are much less drastic than those programs used to control a disease such as FMD. Usually with VS the movement of livestock to shows, fairs and auctions is prevented to reduce the chance of further infections. Be sure to check for current regulations if you plan to move animals from Arizona to New Mexico or if you plan to bring animals into Arizona. Animals with VS will recover if provided high quality, soft feed. There are vaccines for VS but they are only used during severe outbreaks and should not be used without contacting regulatory veterinarians.

If you need to contact the state or federal veterinarians their numbers are below:

Office of the State Veterinarian (602-542-4293)  
USDA, APHIS-Veterinary Services office (480-491-1002).

If you have questions of VS or FMD please contact me at the Arizona Veterinary Diagnostic Laboratory, telephone 520-621-2356 ext 19

*S Peder Cuneo D.V.M., MS*  
*Extension Veterinarian University of Arizona*  
*e-mail cuneo@u.arizona.edu*

The University of Arizona  
Dept. of Veterinary Science and Microbiology  
Arizona Veterinary Diagnostic Laboratory  
2831 N. Freeway  
Tucson, AZ 85705-5021

NON-PROFIT ORG.  
U.S. POSTAGE PAID  
TUCSON, ARIZONA  
PERMIT NO. 190

**Director:** Greg Bradley DVM, Diplomate ACVP

**Diagnosticians:**

Robert D. Glock DVM, PhD, Diplomate ACVP  
Sharon M. Dial DVM, PhD, Diplomate ACVP  
Ted H. Noon DVM  
Carlos Reggiardo DVM, PhD, Diplomate ACVM

**Extension Veterinarian:**

Peder Cuneo DVM, MS, Diplomate ABVP

**Administrative Staff:**

Barbara Pickard, Administrative Associate  
Aurora Astorga, Computer Database Specialist  
Elaine Nakashian, Quality Control Manager  
Cindy Martinez, Daria Borntreger, Emma Timmerman

**Necropsy:** James Hicks, Animal Technician Senior

Ryan Knoper, Student Laboratory Assistant

**Toxicology/Nutritional Testing:**

Barbara Rickert, Research Specialist

**Histology:** Andrea Perez, Research Specialist

Marsha Hernandez, Histotechnologist

**Immunohistochemistry:**

Matt McDaniel, Research Lab Assistant

**Microbiology:** Brooke Mourreale, Research Technician

**Virology:** Mark Shupe, MS, Senior Research Specialist

Belinda Lockett, Research Technician  
Kathy Wymore, Research Technician

**Molecular Procedures:**

Jennifer Wilcox, PhD, Molecular Genetics  
Nancy McCullough, Research Specialist

**Adjunct Faculty:**

**Diagnostic Services offered at AzVDL:**

**Pathology:** gross necropsy, histopathology, cytology, immunohistochemistry or other diagnostic tools used to determine the cause of disease

**Microbiology:** the use of microbiological techniques to identify bacteria, viruses, parasites, and other infectious agents, and their relationships to animal diseases

**Toxicology:** The study of poisons, their identification, chemical properties, biologic effects, and the disease conditions they cause

**Nutritional Testing:** chemical analysis of feed, forage, and body tissue samples for nutritionally relevant levels of nutrients

**Serology:** analysis of serum to monitor animals' prior exposure to diseases

**Molecular Diagnostics:** PCR testing for common diseases of companion animals

This newsletter can be accessed electronically via <http://microvet.arizona.edu/AzVDL/index.htm>

The University of Arizona College of Agriculture and Life Sciences is an equal opportunity employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to sex, race, religion, color, national origin, age, Vietnam Era Veteran's status, or disability.