



Newsletter

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Quarterly Publication of the **Arizona Veterinary Diagnostic Laboratory** and Cooperative Extension

From the Director:

We warmly welcome Drs. Sharon Dial and Howard Frederick who recently joined the Department of Veterinary Science and Microbiology as adjunct faculty. Dr. Dial, a pathologist and Director of Animal Diagnostic Laboratory (a private veterinary reference laboratory in Tucson) and Dr. Frederick, a nutritionist, have been working closely with AzVDL and will collaborate with the teaching programs of the Department. Dr. Frederick has contributed to this newsletter as well.

Construction work of the I-10 frontage road between Miracle Mile and Grant Road is almost completed. Hopefully we will have direct access to the highway within the next few weeks.
Carlos Reggiardo, Director

Selenium Deficiency

Selenium Deficiency. The last issue of AzVDL Newsletter (Volume 2, Issue 1) made reference to the wide spread incidence of selenium (Se) deficiency in Arizona. Several cases were reported, ranging from unthriftiness and diarrhea to 'white muscle disease'. There is an area of the state, from the New Mexico border to Gila Bend, that has been associated with Se deficiency. During the last 3 years, samples of forage and whole blood were collected from sites within this region, as well as other areas, and analyzed for selenium. A few representative values are reported

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Custom mineral supplementation of range cows in Arizona

Diagnostic Update

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



Bovine

Copper deficiency of the secondary type (i.e. due to elevated dietary molybdenum intake) was diagnosed in two 1-year old Holstein heifers. The animals were part of a herd being raised as dairy replacements. They had been noted by the owner to be scouring profusely while being pastured on an irrigated fescue pasture in southern Arizona. Six other heifers had died previously. On necropsy, liver copper levels were 3.9 ppm and 7.8 ppm. Analysis of the pasture forage revealed 11 ppm copper (the recommended¹ dietary in-

take for cattle is 10-25 ppm) but the forage contained 8.4 ppm molybdenum (dietary molybdenum for the bovine is considered to be elevated if it exceeds 5.0 ppm¹). Scouring (diarrhea) in cattle is associated with excess molybdenum intakes. Excess dietary molybdenum will induce a secondary copper deficiency by reducing absorption and storage (of copper) by forming, along with dietary sulfur,
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below as being fairly typical. All of the forages sampled, with the exception of native 3-Awn, were deficient (Se is considered adequate between 0.1 and 0.3 ppm of the complete diet). All of the alfalfas and Bermuda grasses (sampled from the Phoenix and Yuma areas) were found to be extremely low in Se, ranging from 0.01 to 0.06 ppm. These results suggest that the selenium-deficient area in Arizona probably extends beyond that originally reported.

Table 1 Selenium Values in Arizona Forages (1993-1996)

Selenium Content (ppm)			
	<u>n</u>	<u>Ave</u>	<u>Range</u>
Natives			
Grama, black	11	0.032	0.01 - 0.10
3-Awn	10	0.13	0.01 - 0.34
Mesquite	12	0.09	0.02 - 0.11
Cultivated			
Alfalfa, Arizona	22	0.013	0.01 - 0.04
Bermuda, Arizona	20	0.014	0.01 - 0.06
Mixed Grass, AZ, CO	8	0.042	0.01 - 0.18

The average whole blood Se from all cattle sampled was less than half the value considered to be adequate ¹ (Table 2). These data represent herds that were not supplemented with Se prior to sampling and exhibited various symptoms of deficiency (dystocia, retained placentas, stillborns).

Blood samples from horses were submitted by veterinarians working on patients with gait problems and/or lameness, regardless of supplementation history. Tucson horses were deficient regardless of supplementation history. Furthermore those horses not receiving supplement were 50% lower in whole blood selenium than the total sample population. The Phoenix sampled cases were on the low edge of adequate.

Table 2 Whole Blood Selenium Values

	parts per million (ppmwet weight)		
	<u>n</u>	<u>Ave</u>	<u>Range</u>
Cattle			
Range cows, Central Ariz.	18	0.073	0.037 - 0.092
Range cows, S.E. Ariz.	12	0.043	0.026 - 0.056
<u>Pastured cows, N.W. Phoenix</u>	<u>10</u>	<u>0.046</u>	<u>0.025 - 0.11</u>
Adequate			0.200 - 1.20 ¹
Horses			
Tucson, all samples	40	0.149	0.07 - 0.26
Tucson, unsupplemented	23	0.096	0.07 - 0.12
<u>Phoenix, all samples</u>	<u>11</u>	<u>0.185</u>	<u>0.14 - 0.23</u>
Adequate			0.17 - 0.25 ¹

With the exception of the 'white muscle disease' case, all of the animals from this population could have been considered clinically normal, but may be representative of the "tip of the iceberg" of selenium deficiency. Mineral deficiencies are chronic conditions which slowly develop through a period of months of insufficient intake. Production and immune function can be dramatically affected long before the so-called "clinical signs" (such as white muscle disease) can be identified.

The Arizona Veterinary Diagnostic Laboratory is highly interested in nutritional deficiencies of livestock in Arizona and is actively trying to expand its diagnostic services in this area. We feel that this area needs considerable further investigation. Studies concerning selenium, as well as other nutrients such as copper and zinc are in progress. Protein supplementation strategies for Arizona range cattle also need further refinement. Veterinarians having questions in this regard should feel free to contact the AzVDL diagnosticians.

Howard Frederick

¹ from Mineral Levels in Animal Health by R. Puls, 1995.

unabsorbable copper tetrathiomolybdate complexes in the rumen. In this case, the calculated copper:molybdenum ratio was 1.3:1. It is reported¹ that the “ideal” dietary copper:molybdenum ratio for cattle should be >6:1.

¹ from Mineral Levels in Animal Health by R. Puls, 1995.

Carbofuran toxicosis was diagnosed in a bull that was necropsied in the Phoenix area. The bull, along with several wild birds, died after being allowed access to tank wastewater that analysis revealed to be contaminated with pesticides. Brain tissue and whole blood from the bull had subnormal acetylcholinesterase activities (0.0735 and 0.0858 $\mu\text{mol}/\text{min}/\text{g}$, respectively; $2.33 \pm 0.13 \mu\text{mol}/\text{min}/\text{g}$ is reported² in the literature to be “normal” for bovine brain). GC/Mass spectral analysis subsequently identified carbofuran in the rumen contents of the bull.

²Brain Cholinesterase Activity in Animals and Birds by B.R. Blakely and K. W. Skelly, Veterinary and Human Toxicology, 30 (4) August 1988.

Clostridium chauvoei (Blackleg) was isolated from blood taken from a live 500 lb. cross-bred steer. The animal was observed to be “sick/lying down” and had an elevated temperature (105.5°). *Clostridium chauvoei* was also isolated from the blood of a dead herdmate that was taken at necropsy. Histologic examination of tissues from this animal revealed acute, necrotizing myocarditis with gram positive bacilli; compatible with *Clostridium chauvoei* infection. The animals had an uncertain vaccination history. Blackleg susceptibility in the bovine peaks between 6 and 24 months of age. The organism can sometimes be isolated from the blood of dead (unvaccinated) animals which would constitute a finding that would be suspicious of infection, especially if the animals are of the appropriate age. *Clostridium chauvoei* is not thought to be a highly competitive saprophytic invader in carcasses so its isolation from tissues or blood is generally considered suspicious of infection. Definitive diagnosis is established by finding typical lesions of necrotizing myositis in skeletal or cardiac muscle. Such lesions may not always be obvious and can take patience to locate at necropsy, sometimes requiring the dissection of all appropriate muscle groups. Testing of imprints of suspect lesions can then be done using fluorescent antibody staining for rapid confirmation of the diagnosis.

Tick infestation due to *Dermacentor albipictus* of range cattle from the north-central area of Arizona was identified with the assistance of the UA Department of Entomology Insect Identification Service. This one-host tick that is widespread in the U.S. and Canada and can be found on deer, elk, cattle, and horses. Although not diagnosed in this case, the species is reported to be a probable vector of anaplasmosis in cattle.



Equine

Chlamydia psittaci was isolated from liver and lung of a near-term Quarter Horse fetus. There were no significant fetal lesions, and only necrotic changes in the placenta with minimal inflammatory reaction. We have repeatedly isolated chlamydia from similar abortion cases in horses. In the absence of a clear-cut placentitis or any experimental studies, it is impossible to know whether these agents are the cause of the abortion.



Porcine

Arizona has been declared Pseudorabies free as of 4/1/97. Serological testing of all imports and show pigs will continue for the time being.



Small Ruminants

Salmonella dublin septicemia was diagnosed in a 2 week old goat. The herd had been experiencing high kid mortality for some time. Although no significant gross lesions were observed, microscopic changes were severe and included vasculitis, interstitial pneumonia, hepatitis and splenitis. *S. dublin* and *S. typhimurium* are the most common serotypes associated with salmonellosis in goats. Severe outbreaks are usually seen in situations of deficient management. In this case, liver copper and selenium levels (5ppm and 0.15ppm respectively) were deficient to marginal, suggesting trace mineral deficiencies as contributing factors.



Avian

Duck plague (duck viral enteritis) was diagnosed in two exotic ducks of different species which were found dead in a zoo pond. The ducks had lesions of fibrinonecrotic esophagitis, cloacitis, and necrotizing hepatitis and splenitis. Microscopically, the affected areas contained cells with intranuclear inclusion bodies typical of the causative herpesvirus. The National Veterinary Services Laboratory, Ames, Iowa confirmed the infection by isolation of the virus from tissues of one of the two birds. This is a reportable disease with the potential for devastating impact on domestic and wild waterfowl.

Severe **parasitic bronchiolitis** due to air sac mites was the cause of death in a female Blue Rumped parrotlet.

An adult, male Black Spotted Barbet died following a two week history of weakness and incoordination. At necropsy there was massive distention of the cloaca and distal colon by urates and fecal material, respectively. Microscopically there was a multifocal granulomatous pneumonia with colonies of coccoid bacteria in the lungs and severe necrosis and granulomatous inflammation destroying much of the sacral spinal cord also associated with coccoid bacterial colonies.

Systemic amyloidosis affecting the liver, kidney and spleen was the cause of death in a fifteen-year-old, Fulvous whistling duck from a zoo collection. Amyloidosis is not uncommon in waterfowl. The amyloid is of the reactive type (AA). This form is seen following some chronic inflammatory diseases. However, evidence of ongoing, chronic inflammatory disease is inconsistently identified in affected waterfowl. Therefore, the cause of this disease is poorly understood in these species.

Aspergillosis of the syrinx was the cause of death in a two-year-old Yellow-headed Amazon parrot and an African Gray parrot. The birds were presented by two different owners but had a common history of severe, unresponsive respiratory dyspnea before death. Masses of fungal hyphae and associated inflammatory products obstructed the lumen of the syrinx in both birds. There were no lesions in the lungs.

Psittacine proventricular dilatation syndrome was found in a ten-year-old, male Greenwing macaw with a three week history of wasting. The bird had no body fat and there was marked wasting of skeletal muscle. The proventriculus was dilated, thin walled and filled with undigested food. There were characteristic microscopic lesions of lymphoplasmacytic myenteric ganglioneuritis in the wall of the proventriculus.

Moderate to severe diffuse **bronchiolitis and parabronchiolitis** of undetermined etiology was diagnosed in a 25 gram Orange Wing amazon that died during a nail trimming procedure at the veterinarian's office. The bird had a rhinitis with occlusion of the nares and a fatty liver that was mildly inflamed. The presence of prominent catarrhal exudate within the bird's lower respiratory airways was also noted.

Pneumonia and polyserositis of undetermined etiology was diagnosed in a 4 week old lovebird. Three other birds in the flock had also died but were not necropsied.

Metastatic mineralization was diagnosed in chickens in which **dietary overdosage of vitamin D** was suspected. Mineralization in endocardium and epicardium of heart, tunica adventitia of splenic and hepatic arterioles, glomerular mesangia, basement membranes of kidney, tunica mucosa of proventriculus, and tunica serosa of gut and renal capsule was identified microscopically.

Lymphoid leukosis was diagnosed in chickens. The birds were emaciated and had enlarged livers that were largely replaced by whitish tumor-like masses. Many of the hens also had tumor masses in the kidneys, proventriculus and bursa of Fabricius. Ultimately, **5%** of the birds in the flock were affected.



Canine

A one year old, spayed female Queensland Heeler died unexpectedly. At necropsy, the abdomen was filled with unclotted blood.

Anticoagulant rodenticide poisoning was diagnosed after finding 59 ppb of bromadiolone in the liver of the dog. The owner reported that they had not placed rodenticides in an area accessible to the dog. Malicious poisoning was suspected.

“Granulomatous meningoencephalitis” (GME) was diagnosed in a three year old, male collie euthanized following a 2-3 day history of neurologic signs. The initial signs were limping on the hind limbs and staggering. The next day, the dog was found lying in front of a water bowl and then began pacing and dragging its hind legs. Head pressing was noted by the referring veterinarian and the dog appeared disoriented. Postural reactions were somewhat worse on the left side and the dog circled to the right. The dog also exhibited a bradycardia. Chest radiographs revealed a mild interstitial pattern. A CSF tap revealed no cells and a protein of 45 mg/dl. Blood work revealed a mild anemia. The *Ehrlichia canis* titer was negative. A weak titer was present to *Coccidioides immitis*. The lesions were considered consistent with a right sided cerebral lesion. Treatment with intravenous fluid, corticosteroids, mannitol and intravenous fluconazole was instituted. The dog's condition declined and uncontrollable seizures ensued prompting euthanasia. Gross necropsy findings were bilaterally symmetrical dark red/black mottling of the right and left caudate nuclei. Microscopically, the affected foci were characterized by expanding perivascular aggregates of macrophages, plasma cells and lymphocytes separated by concentric layers of reticulin fibers. Extensive parenchymal edema, hemorrhage and necrosis were present in the adjacent neuropile. Less severe lesions were present in the thalamus and white matter of the midbrain. Evidence of an active *Coccidioides immitis* infection was not found. GME is an idiopathic disease. Most cases occur in adult dogs, 1-3 years of age. There is no breed predilection.

Necrotizing meningoencephalitis of Maltese dogs was diagnosed in a ten month old, spayed female Maltese. The dog presented with facial and mandibular muscle twitching, conscious proprioceptive deficits, ataxia, tachycardia and fixed, unresponsive pupils. The onset had been sudden according to the owners. There was no history of trauma, previous illness or exposure to toxins. Necropsy findings included a severe, multifocal, necrotizing meningoencephalitis which principally involved the cerebral hemispheres and an acute, multifocal, severe myocardial necrosis in the heart. Necrotizing meningoencephalitis of Maltese dogs is morphologically identically to the similarly named disease of Pugs. The disease affects

juvenile to young adult dogs of both sexes. The cerebral hemispheres are primarily involved and clinical signs reflect this distribution. Most dogs have seizures, depression, circling and visual deficits. Ataxia and paresis are less common and indicate involvement of the brain stem, cerebellum and/or spinal cord. Myocardial necrosis is sometimes noted in animals with CNS lesions and is thought to be caused by chronic epinephrine release somehow mediated by the injury. Myocardial necrosis has been documented in Pug encephalitis. Clinical signs referable to the myocardial lesions may or may not be present.

Streptococcus canis (group G) was the cause of severe, purulent bronchopneumonia and death in a suckling, Great Dane puppy.

Cardiomyopathy, dilated type, was diagnosed in a 9 year-old neutered male cocker that was presented to an emergency service with the complaint that the dog had been "coughing last 4 days". A hemogram revealed an elevated white blood cell count (33,770). Cardiomyopathy of the dilated type is a common form of heart disease in the canine. Clinical signs can range from subclinical to acute-onset heart failure.

Streptococcal pneumonia was diagnosed in a 6 year-old female Mastiff that weighed 146 pounds. At the time of presentation to the veterinarian, the dog was lethargic, had a body temperature of 103.2° and a leukocytosis. Beta-hemolytic streptococci were isolated from consolidated, pneumonic lung tissue.



Feline

A thirteen-year-old, female domestic cat died following a four day history of lethargy and anorexia. No vomiting was noticed. At necropsy **lymphosarcoma** of the distal ileum was found. There was rupture of the affected bowel resulting in acute peritonitis.

Endometritis and septicemia due to a **group G *Streptococcus sp.*** was the cause of death in a two-year-old, lynx point Siamese that died suddenly three days following queening.

Astrocytoma of the spinal cord was diagnosed in a 17 year-old female domestic shorthair cat that had signs of a progressive hindleg paralysis. No lesions were seen on a CT scan and the cat was non-responsive to corticosteroid treatment. All parameters on the hemogram and clinical chemistry panels were within normal limits. Vaccinations were current and FeLV/FIV testing was negative. The tumor was a large grayish, poorly demarcated gelatinous mass found in

the C₇-T₁ area of the spinal cord.



Wildlife

Carbofuran toxicosis was diagnosed in 4 mourning dove and 3 mockingbirds that had access to the same wastewater as the bull reported above in the bovine section. The birds had subnormal brain acetylcholinesterase levels (all <1 µmol/min/g). GC/Mass Spectral analysis revealed the presence of carbofuran in the crop and/or gizzard contents of the birds.



Exotics

Oleander poisoning was suspected in a four year old llama which died following a one week history of colic, cardiac arrhythmia and bruxism. The animal escaped the evening before the clinical signs began. Oleander plants were present in the neighborhood and it was suspected that the llama ate some of the plants during its nighttime frolic. At necropsy the cecum contained watery green fluid. Scattered hemorrhages were present on the endocardium of the left ventricle. Microscopically there was multifocal myocardial necrosis in the heart. Confirmation of oleander poisoning via two-stage thin-layer chromatography was declined.

Inclusion body disease of boid snakes was diagnosed in a male and female Columbian boas from the same household. The female aborted two weeks before death, followed by lethargy and anorexia. At necropsy, there was severe suppurative salpingitis, and mild fibrinous pericarditis. *Salmonella arizona* was isolated from the oviduct, liver, lung, small intestine and pericardial sac. Typical eosinophilic inclusion bodies were present in the cytoplasm of neurons and epithelial cells of the kidneys, exocrine pancreas, thyroid gland, oviduct, respiratory and gastrointestinal tract and hepatocytes of the liver. The male was euthanized following signs of decreased tone of the ventral abdominal musculature and the necropsy diagnosis in the female. Intracytoplasmic, eosinophilic inclusion bodies were found in a sampling of tissues similar to the female. It has been suggested that boid inclusion disease results in immunosuppression of the snake and can lead to secondary infections such as that found in the female.

Cardiomyopathy was diagnosed in a thirteen year old beaver from a zoo which died unexpectedly.

by Greg Bradley, T.H.Noon, Carlos Reggiardo

Comments on Diagnostic Update can be directed to Dr. Greg Bradley via e-mail at: gabrad@ag.arizona.edu

Arizona Veterinary Diagnostic Laboratory

By vehicle the only access to the AzVDL is via Prince Road (I-10 Tucson exit 254), south on La Cholla to the West Campus Agricultural Center Farm. Follow the signs and the dirt road to the facility.

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