Colorado State University Veterinary Diagnostic Laboratories

LAB LINES

Diagnostic news and trends from the Colorado State University Veterinary Diagnostic Laboratories
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Environmental Testing

VDL Pathologist Duncan Tracking Climate Change Effect on Polar Bears

Melting of the northern sea ice, which is pushing polar bears from their historic hunting grounds to dry land, risks devastating the great Arctic carnivores, says CSU Veterinary Diagnostic Lab Pathologist Colleen Duncan. Scientists must begin now to collect and analyze data to better understand the impact climate change coupled with infectious disease could have on polar bear population dynamics in the years ahead.

Toward that goal, Duncan has been in northernmost Alaska this spring, participating with a team of fellow researchers from USDA and the U.S. Geological Survey. Polar bears have become a poster species for climate change because the animals—whose scientific name means "sea bear"—have always lived by hunting seals on remote ice. With diminishing sea ice, the bears increasingly are moving inland and are potentially exposed to diseases they have not previously encountered.

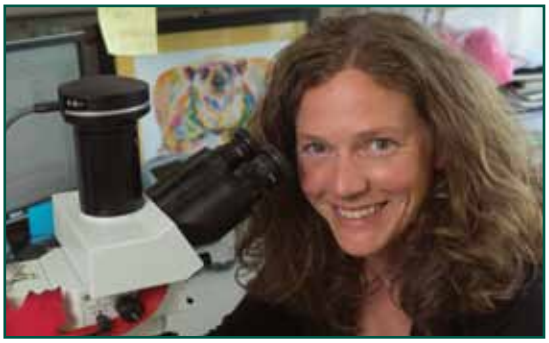
For instance, Duncan says, polar bears have joined the scavengers that feed on whale-bone piles left by indigenous Alaskan tribes. This relatively new behavior means different food, disease and environmental exposure that could affect bear health in multiple ways, she noted.

"We need to study infectious disease in the context of climate change," says Duncan. "One thing on its own doesn't do it. We need to look at the cumulative effects. You can't put a fence around their habitat and save the polar bear."

Duncan and her colleagues' work is notable for collecting samples from wild polar bears, instead of those living in zoos in non-native climates. That at-the-source data mean findings could provide a more realistic view of health changes.

The team tracked, tranquilized, weighed, measured, bled and cultured from one to five wild bears daily, looking for antibodies to help paint an epidemiological picture of infectious disease that can then potentially be associated with changes in ranging, food supply and increased exposure to disease, pollution and people.

— Jeff Dodge, CSU Public Relations Coordinator



Because polar bears are at the top of the food chain in their ecosystem, data from bears provides insight into seals and other Arctic wildlife—information also relevant to native people who depend on wildlife as food.

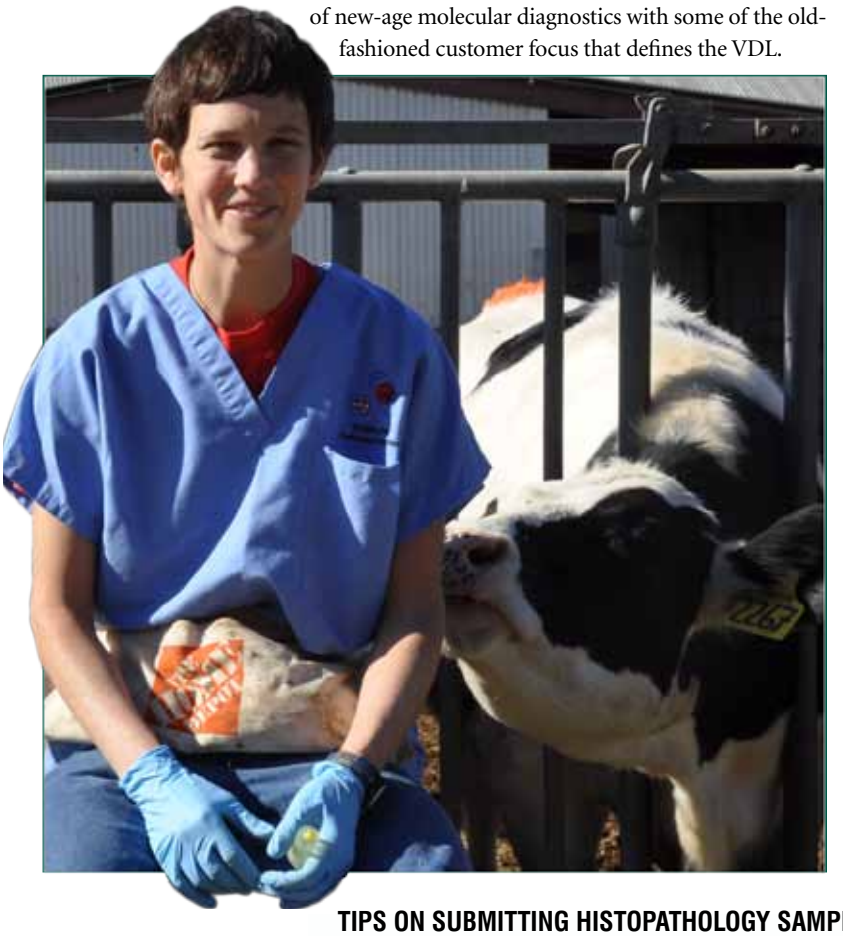
"The question is, 'What's going to happen in the future?'" she asks. "What happens when you get a little bit of infectious disease, a little bit of environmental contamination, and you superimpose that on decreased access to food and interaction with humans? There's the setup for a perfect storm."

Duncan and her colleagues are immersed now in the data analysis they hope will provide new insights into the complex and intertwined effects of climate change and disease on polar bears and other species. The infectious disease project, funded by the North Pacific Research Board, is one of three she has undertaken with fellow investigators Pauline Nol and Kelly Patyk of USDA and Todd Atwood of the USGS. ▲

Get to Know the Laboratory

New Virology Head Christie Mayo Plans to Merge New, Old Strengths

As arboviral specialist Christie Mayo assumes responsibility for the CSU Veterinary Diagnostic Lab's Virology Section and sample receiving, replacing the retiring former section head Hana Van Campen, she looks forward to the opportunity to combine the best of new-age molecular diagnostics with some of the old-fashioned customer focus that defines the VDL.



— Barbara Powers, DVM, PhD, DACVP, CSU VDL Director

"In the next few years," says Mayo, who moved to the VDL in December from University of California at Davis, "I hope to work closely with [Molecular Diagnostics Section Head] Kristy Pabilonia to further expand our capabilities in next-generation sequencing." Exciting new molecular advances will take us beyond the inherent limits of capillary electrophoresis-based sequencing to speed, resolution and throughput we can barely imagine, she says. "The capability to expand beyond sequential DNA identification to processing of literally millions of reactions in a simultaneous parallel sequence will open opportunities in novel pathogen discovery and understanding different phylogenetic relationships we never believed possible."

The challenge then, she says, will be to keep that visionary scientific pioneering rooted in the needs of the customer in the field. That's a philosophy she credits her predecessor Van Campen with upholding—the idea that the lab should always work closely with the university's extension service to reach out to the end user and keep the diagnostics practical to the producers as well as the veterinary practitioner. "Keeping that focus is one of my priorities," she says, "I've always believed that to be a huge strength of CSU Veterinary Diagnostic Lab and the branch labs at Rocky Ford and Western Slope."

FROM CSU VDL AND BACK AGAIN

After earning her DVM from University of Georgia in 2006, Mayo first joined the CSU VDL as a microbiology resident while earning her masters degree in clinical sciences here in 2006. Following that study, she moved to

TIPS ON SUBMITTING HISTOPATHOLOGY SAMPLES DURING WINTER

VDL pathologists aim to provide a timely and accurate report on biopsy and necropsy samples, each and every time. However, sometimes the elements conspire against us. Help us prevent poor histologic morphology that results when ice crystals form in tissue samples by ensuring your histopathology samples are packed to reach us without damage:

- **Use adequate fixative and protect from freezing. A 10-to-1 to 20-to-1 ratio of neutral buffered formalin to tissue is recommended—in any weather. Too little reduces the quality of the final slide. In winter months, add about 0.75 cc alcohol, or about one part alcohol to nine parts formalin, to help prevent freezing.**
- **Don't skimp on absorbent packing material. In any weather, you should always wrap the sample container in sufficient absorbent material to soak up all liquid if the container should leak or break in transit. In winter, that absorbent material can also serve the double purpose of helping insulate the sample from the cold.**
- **If possible, ship for overnight delivery.**
- **Communicate with our pathology personnel if you have any questions or concerns. Full communication about your case is critical to get the most from your histopathology submission, and we encourage to call us with any questions or concerns about shipping. Contact the lab at (970) 297-1281, or email dlab@colostate.edu.**

UC-Davis to finish a doctoral program in comparative pathology and then assumed an assistant project scientist role for the school's Veterinary Pathology, Microbiology and Immunology department. Over the last half decade, Mayo has authored more than a dozen studies on bluetongue virus, a globally emerging arbovirus of domestic and wild ruminants that is transmitted by biting *Culicoides* midges. Her credits also include two book chapters, including the definitive one on bluetongue.

Her latest study, just published in the Sept. 12 journal *PLOS ONE*, answers a century-old question about the virus, which costs the cattle and sheep industries in the United States an estimated $125 million annually: How does a vector-borne arbovirus dependent upon summer gnat bites manage to survive the winter?

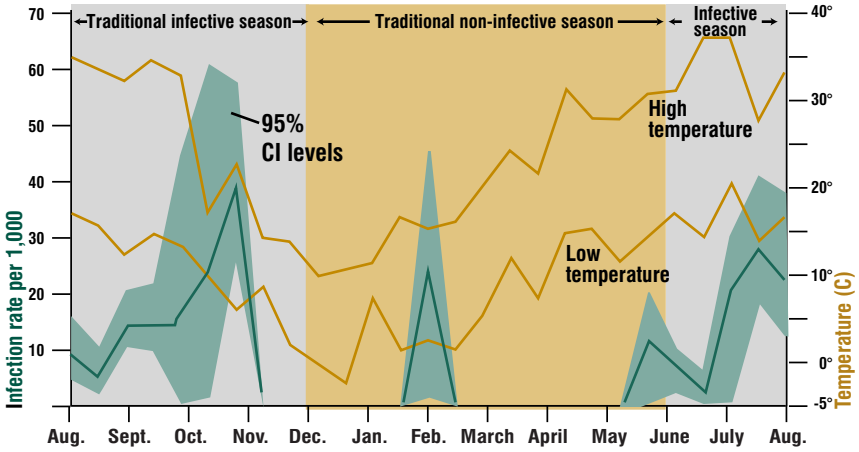
The study used quantitative reverse transcriptase polymerase chain reaction amplification and detection of the BTV S10 gene from midges collected on a working commercial dairy. It concluded that of all the possible explanations—that uninfected female midges emerged during early spring from cohorts oviposited in the fall to feed on an infected animal, that uninfected larval stages remained viable throughout the winter to emerge as host-seeking females in midwinter that then fed on viremic hosts and oviposited, or that the virus was maintained through vertical transmission from immature stages—the most likely mechanism is that long-lived female midges infected during the prior seasonal virus transmission re-emerge in midwinter during a transient period of higher temperature.

The discovery holds important ramifications not only for predicting seasonal bluetongue occurrence and for eventually developing disease controls, but also for implications of the disease if global climate change brings warmer winters around the world.

NEW-AGE DIAGNOSTICS, OLD-SCHOOL SERVICE

Applying that type of transcriptome profiling and other next-generation sequencing to more vector-born arboviruses—specifically the gnat-transmitted wildlife disease epizootic hemorrhagic disease—is first up on Mayo's research priority list. "Colorado offers such a biologist's playground to be able to link viral disease at the wildlife and livestock interface. I've worked a lot with domestic cattle and ruminants but I have the opportunity now to work with the wildlife ruminants. We are in such a great area to do such work."

She sees wider implications both theoretical and practical. "Getting answers in a shorter, faster turnaround; getting more of a quantitative assessment of what's going on in an animal—having been out there in the field myself as a working veterinarian, I understand it's easier to be able to interpret something when you can have more of a quantitative assessment, rather than some of the basic qualitative diagnostic virology alone."



Mayo's latest work used quantitative reverse transcriptase PCR to track seasonal bluetongue infection patterns among midges and sentinel dairy cattle (solid line with 95 percent confidence level shaded), demonstrating infective carriers emerged during the traditionally interseasonal period.

It's an important lesson her mentor and predecessor, Hanna Van Campen, taught her. "She's the person who got me into bluetongue research, her inquisitive nature. She was doing an outreach with a producer and she said, 'Hey resident, come and check this out.' And that resident was me. On that producer's behalf, she got me questioning, creating novel diagnostics in the laboratory—really all the things you should be doing as a young investigator. "

"Hana was hardest on me as a mentor as far as getting me up to speed on diagnostics," she remembers. But it was all for good reason. "Pathogens we're not exactly sure of, things that walk in the door without a name—that's one of the challenges we'll be going through in the next 10 to 30 years. At the front lines will be the veterinarians, and then once they need a diagnosis, it will be up to us. Whether it's virology or parasitology or bacteriology, having some of the tools that CSU allows us to bring to bear, as well as having the capacity to do so, we're going to be in a great position to lead them to theoretical approaches that are, at the same time, practical, timely and affordable." ▲

Mayo replaces her CSU VDL mentor, former Virology Section Head Hanna Van Campen, who retired in October.

Advances in Parasitology

New PCR Parasite Speciation Opens Opportunities In Cattle Deworming

Introduction and widespread adoption of the macrocyclic lactone anthelmintics in the U.S. cattle industry 30 years ago revolutionized internal parasite control, making it more manageable, predictable and cost-effective than it had been historically. One unfortunate side effect, though, was the tendency to approach parasite therapy as standardized across all operations and conditions, and automatic.

Today, two converging phenomena have affected that trend. First, North American cattle producers have joined the rest of the world in facing the issue of emerging resistance to dewormers among important parasites. Continued and repeated exposure to similar anthelmentic classes has begun to result in the inevitable selection for resistant populations, including *Haemonchus contortus*, *Haemonchus placei* and *Cooperia* species. Nearly 15 years ago, it was already predicted to be costing U.S. producers more than $2 billion annually.

Second, advanced diagnostic research has demonstrated the one-size-fits-all approach to parasite control is not only detrimental in terms of resistance, but also that it may not be the most cost-effective option for producers. CSU Veterinary Diagnostic Labs' new polymerase chain reaction test for parasite diagnosis (*LabLines* 2013 Fall/Winter;18(2):15) can now successfully differentiate the five major bovine strongyle genera — *Cooperia*, *Haemonchus*, *Ostertagia*, *Trichostrongylus* and *Oesophagostomum* — within just two to three days. That capability has opened new opportunities for veterinarians and producers to work together to strategically deworm, beyond the old norm of simply treating all cattle with the same product at the same time each year.

— Lora R. Ballweber, DVM, MS, CSU VDL Parasitology Section Head; and Ashley K. McGrew, PhD, Post-doctoral Fellow

HOW DEWORMING CONSULTING CHANGES

New testing options now make creating baselines for different geographic regions, herds and animal classes within herds more parasite-species specific. Generalized benchmarking was always possible with the use of fecal egg counts, but the relative blanket effectiveness of anthelmintics typically left producers perceiving them as unnecessary expense.

But now, with the ability to quickly and accurately speciate what's present, veterinarians can offer a more meaningful package of benchmarking that combines fecal egg counts with fecal egg-count reduction tests, in which egg counts before and after treatment serve as a measure of the effectiveness of a treatment program. Coupled with speciation through PCR, fecal egg count reductions can create and then track longterm anthelmentic programs that test for surveillance, evaluate the effects of their management systems on individual parasite populations, monitor for emergence of new parasites and keep a tab on the development of resistance in particular genera.

Beef stocker operations, for instance, are a natural fit for this type of comprehensive worm testing and management. Stocker operators typically commingle and ship calves from multiple sources and locations, usually with little or no history of parasite populations or treatments. That practice leads to significant risk of introducing new parasites, or possibly anthelmentic-resistant parasites, into pastures. We

PARASITE PCR TESTING AT CSU

SAMPLES

- **At least 3 grams of feces from each individual as or immediately after being passed.**
- **Select samples from no more than five individuals for pooled sampling.**
- **Include fecal egg counts if known.**
- **Package in clean, enclosable container, like a sealable plastic bag, devoid of air.**
- **Refrigerate for no more than 24 hours. Ship cold, but protect from freezing and direct contact with ice.**
- **Ship to arrive within 48 hours.**

COST

- **$70 per sample**

TURNAROUND

- **Two to three days**

witnessed this phenomenon when our lab consulted with a large southeastern backgrounder in 2013. The operation reported apparent failures with its long-standing parasite-control programs, based on changes in routine monitoring for strongyle egg counts it had implemented. Being able to identify the particular strongyle genera present was a key piece of the puzzle that was still needed. We conducted PCR analysis, finding *Haemonchus* and *Cooperia* present post-treatment. The PCR results led to a change in treatment approach on the operation. Whereas the cattle were previously treated at the time they were run through the chute, the operation decided to implement a feed-through program of anthelmintics for the cattle on grass. That change helped not only in addressing the *Haemonchus* problem but also in minimizing the stress placed on the calves to handle them for deworming. This case is just one example illustrating how PCR can be used as a tool to reveal which parasites are left behind after treatment and how changes can benefit the operation. ▲

Questions?
Contact the VDL Parasitology Section at (970) 297-1233.

YOUR JOHNE'S DISEASE TESTING OPTIONS THROUGH CSU VETERINARY DIAGNOSTIC LABS

Chronic Johne's disease continues to challenge livestock veterinarians, despite progress toward official control programs in many countries and voluntary efforts in this country to manage and eradicate the disease within herds. Key to success for either type control program are reliable, objective laboratory diagnostic tests. But the *Mycobacterium avium paratuberculosis* that causes Johne's presents unique challenges in designing conducting, validating and reporting tests. Here are the range of options we offer at CSU's Veterinary Diagnostic Labs, all validated and proficiency tested through the National Veterinary Services Laboratories' proficiency testing quality assurance for USDA program diseases.

	Species	Sample Type	Submission Deadline	Turnaround Time	Information
ELISA (IDEXX)	Bovine	Serum/ Plasma (.5 mL)	Tuesdays by 2 p.m.	Tuesday or Wednesday	Detects antibodies against Mycobacterium paratuberculosis by enzyme-linked immunosorbent assay (ELISA) in bovine serum or plasma.
ELISA (Parachek)	Non-Bovine	Serum/ Plasma (.5 mL)	Mon, Wed, Fri by 11 a.m.	Next working day	Detects antibodies against Mycobacterium paratuberculosis by enzyme-linked immunosorbent assay (ELISA) in non-bovine serum or plasma.
ELISA (AGID)	Non-Bovine	Serum (.5mL)	Mon, Tues, and Wed by 2 p.m.	48 hours	Rapidly detects antibodies against Mycobacterium paratuberculosis in serum by agarose gel immunodiffusion (AGID).
Direct Fecal PCR	All (Kit only validated with bovine samples)	Feces (2 grams)	Tuesday by 5 p.m.	Wednesday	Detection of Mycobacterium paratuberculosis DNA from fecal samples by real time PCR. Up to five fecal samples may be pooled together to reduce cost.
Liquid culture	All	Feces, Lymph node, Intestine (2 grams)	Mon, Tues, Wed by 4:30 p.m.	Up to 42 days	Detection of Mycobacterium paratuberculosis using para JEM liquid culture.
Solid culture	All	Feces, Lymph node, Intestine (2 grams)	Mon through Fri by 4:30 p.m.	Up to 16 weeks	Detection of Mycobacterium paratuberculosis using solid culture.

To discuss your Johnes testing options, contact Bacteriology Section Head Doreene Hyatt, at (970) 297-1281 or doreene.hyatt@colostate.edu.

Canine Oncology Innovations

Lymphoangiosarcoma Outcome Review

— *Kaitlin Curran, DVM, PhD, Post-doctoral Fellow, CSU Clinical Sciences; Charles Halsey, DVM, PhD, Staff Scientist, National Cancer Institute, former VDL Pathology Resident; Deanna Worley, DVM, PhD, Assistant Professor, CSU Clinical Sciences*

This retrospective review of canine lymphoangiosarcoma histopathology diagnoses of 12 dogs over 15 years from the CSU VDL database demonstrates cytology appears ineffective in the diagnosis of LAS and that histopathology and immunohistochemistry should be pursued early in the course of disease. Little information exists regarding therapy for this uncommon malignant neoplasia arising from lymphatic endothelium. Characteristic locally invasive tumors often have poorly defined boarders making it difficult to obtain adequate surgical excision.

On the basis of this series of dogs, the longest survival times occurred in dogs receiving exclusive surgical excision or a combination of surgery, radiation or chemotherapy. Survival ranged from 60, 168 and 876 days for three dogs with palliation; 90 days with prednisone in one; 182 days with chemotherapy in one; 240, 267, 487, 630 and 941 days for five receiving surgery; and 574 days for one receiving surgery, radiation and chemotherapy. One dog is alive with recurrence at 243 days following surgery and carboplatin chemotherapy. ▲

Curran KM, Halsey CH, Worley DR. Lymphoangiosarcoma in 12 dogs: a case series (1998-2013). *Vet Comp Oncol*. 2014 Feb 26. doi: 10.1111/vco.12087.

Canine Oncology Innovations

Cell-specific Angiosarcoma Markers

— *Charles Halsey, DVM, PhD, Staff Scientist, National Cancer Institute, former VDL Pathology Resident; Deanna Worley, DVM, PhD, Assistant Professor, CSU Clinical Sciences; Kaitlin Curran, DVM, PhD, Post-doctoral Fellow, CSU Clinical Sciences; Joseph Charles, Research Assistant, CSU Clinical Sciences;; and EJ Ehrhart, DVM, PhD, DACVP, CSU VDL Pathologist*

In this study—the first case series to apply lymphatic endothelial cell-specific immunohistochemical stains to differentiate vascular tumors in dogs—10 cases of cutaneous hemangiosarcoma and 10 cases of lymphoangiosarcoma were randomly selected from CSU VDL archives. Two novel LEC-specific markers, lymphatic vessel endothelial receptor-1 (LYVE-1) and prospero-related homeobox gene-1 (PROX-1), were used to further differentiate between these vascular tumors of either lymphatic or blood endothelial cell origin. The two often show overlapping morphologic features and disparate clinical behavior, and they require different treatments. Current markers fail to differentiate between them.

In this study, all 10 out of 10 cases of lymphoangiosarcomas were immunopositive for Factor VIII-related antigen. Eight of the 10 cases of previously diagnosed lymphoangiosarcomas were immunoreactive to LYVE-1. Given the often overlapping histomorphology and disparate treatment and prognosis, we recommend application of LYVE-1 and PROX-1 to definitively differentiate between these tumors of vascular origin. ▲

Halsey CH, Worley DR, Curran K, Charles JB, Ehrhart EJ. The use of novel lymphatic endothelial cell-specific immunohistochemical markers to differentiate cutaneous angiosarcomas in dogs. *Vet Comp Oncol*. 2014 Mar 5. doi: 10.1111/vco.12088.

Case	Initial diag.	Factor VIII-RA	LYVE 1	PROX 1	Final diag.
1	LAS	+	+	+	LAS
2	LAS	+	+	+	LAS
3	LAS	+	+	+	LAS
4	LAS	+	+	+	LAS
5	LAS	+	+	+	LAS
6	LAS	+	+	+	LAS
7	LAS	+	–	–	HSA
8	LAS	+	+	+	LAS
9	LAS	+	–	–	*
10	LAS	+	+	+	LAS

* Poorly differentiated angiosarcoma

Case	Initial diag.	Factor VIII-RA	LYVE 1	PROX 1	Final diag.
11	HSA	+	–	–	HSA
12	HSA	+	–	–	HSA
13	HSA	+	–	–	HSA
14	HSA	+	–	–	HSA
15	HSA	+	+	+	LAS
16	HSA	+	–	–	HSA
17	HSA	+	–	–	HSA
18	HSA	+	–	–	HSA
19	HSA	+	–	–	HSA
20	HSA	+	–	–	HSA

Veterinary Ocular Pathology

Retinal Lymphoma Case Review

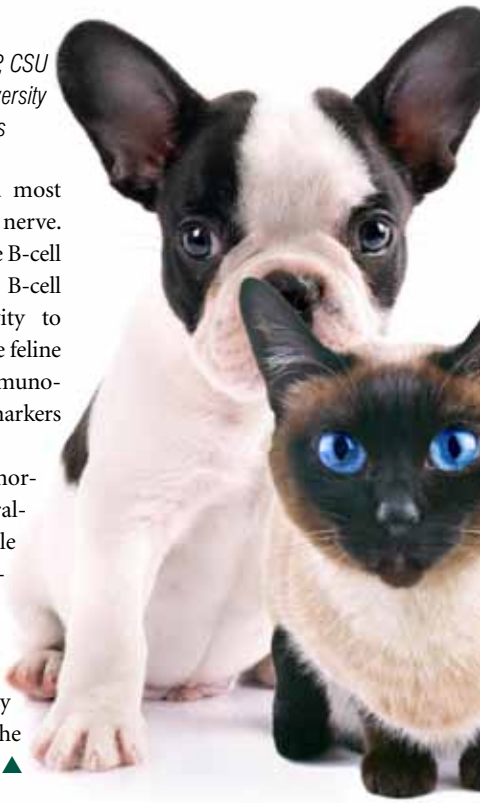
This study queried the databases of CSU's Veterinary Diagnostic Lab and Wisconsin's Comparative Ocular Pathology Lab to identify cases between 1996 and 2013 of retinal lymphoma in dogs and cats, an uncommon and previously uncharacterized entity of adult dogs and cats. Hematoxylin and eosin slides were reviewed to confirm the diagnosis of lymphoma, to assess the extent of retinal involvement, and to classify each lymphoma according to the World Health Organization classification system. Inclusion criteria were established to select lymphoma cases with a distinct affinity for the retina and relative sparing of other intraocular tissues. Additionally, immunophenotyping of each case was done using immunohistochemistry for CD3 and PAX5 and/or CD79acy.

Eight canine and six feline cases were ultimately incorporated into this retrospective study, based on explicit inclusion criteria. Findings included:

- No breed predilections.
- The mean age of the affected dog was 7 years (range of 4 to 10 years); cats, 11 years (range from 6 to 19 years).
- Typical morphologic features included pleomorphic medium-to-large cells with minimal cytoplasm, indented or folded nuclei, and prominent, multiple nucleoli.
- Mitotic activity was consistently high, and most cases had neoplastic involvement of the optic nerve.
- Most of the cases were classified as diffuse large B-cell lymphoma subtype. Eight neoplasms were B-cell lymphomas, confirmed by immunoreactivity to PAX5 in six cases or CD79acy in two cases. One feline case was of T-cell origin, evidenced by CD3 immunoreactivity. Coexpression of B-cell and T-cell markers was identified in the three remaining cases.

These findings demonstrate the typical morphologic and immunophenotypic features parallel the malignant counterpart in humans. While the characteristic dissemination pattern of retinal lymphoma in people is largely confined to the central nervous system, the frequency and extent of neoplastic involvement of extraocular tissues in the dog and cat remains unclear. Early enucleation and clinical staging may improve the prognosis. ▲

— *Jennifer L. Malmberg, DVM, CSU VDL Anatomic Pathology Resident; EJ Ehrhart, DVM, PhD, DACVP, CSU VDL Pathologist; and Richard Dubielzig, DVM, University of Wisconsin Professor of Pathobiological Sciences*



Veterinary Ocular Pathology

Mule Deer Anterior Segment Dysgenesis

A blind female mule deer fawn was found swimming circles in a lake near Pueblo. Following humane euthanasia, gross findings included thin body condition, bilateral microphthalmia and corneal opacity, and a perforating corneal ulcer in the left eye. Histologic abnormalities of both eyes included complete collapse of the anterior segment, corneal edema, sclera-like collagen of the posterior cornea, complete loss of Descemet's membrane and corneal endothelium, anterior synechiae and dysplasia of the iris and ciliary body, and aphakia.

Additionally, within the anterior segment of the eye and intimately associated with the posterior cornea was an aggregate of dysplastic heterogeneous tissue composed of dense collagen, lens cells, disorganized neuroretinal tissue, abnormal glandular structures, neovascularization and neuronal differentiation. The left eye had additional lesions associated with a perforating corneal ulcer including chronic-active inflammation, hemorrhage, fibrinoid vasculitis, and retinal detachment.

A similar disease presentation known as microphthalmia and anterior segment dysgenesis has been described in white-tailed deer, but not mule deer. It is suspected to be associated with teratotoxin exposure in-utero. Also described in other species, it includes a large spectrum of presentations and severity. Causes are predicted or known to include genetic mutations, in-utero infections, fetal teratotoxin exposure, vitamin deficiencies, hypoxia, medications, vaccinations, trauma or idiopathy. Further case reports may help elucidate a pattern of disease and potential etiology. ▲

— *Laura L. Hoon-Hanks, DVM, CSU VDL pathology resident; Karen A. Fox, DVM, PhD, DACVP, Colorado Parks and Wildlife Wildlife Pathologist; and EJ Ehrhart, DVM, PhD, DACVP, CSU VDL Pathologist*

Chemistry and Toxicology

Western Whorled Milkweed Poisoning in Livestock

—*Gene Niles, DVM, DABVT, Director, CSU VDL Rocky Ford Branch*

Within the last several months, four cases of poisoning have been presented to the Rocky Ford Laboratory due to ingestion of western whorled milkweed, also known as horse tail milkweed.[1] Three cases involved horses; one, goats. In all of the cases, the milkweed was found in alfalfa hay.

Plants in the genus *Asclepias* are generally divided into two broad categories labeled as broad-leaved and narrow-leaved milkweed. All animals are susceptible to illness due to milkweed, but clinical signs and affected symptoms differ by genus. Clinical signs associated with broad-leaved milkweeds such as *A. latifolia*, or showy milkweed, *A. syriaca*, or common milkweed, and *A. speciosia*, or broadleaf milkweed, involve the digestive and cardiovascular systems. On the other hand, narrow-leaved milkweeds can produce clinical signs of digestive and cardiac toxicity as well as neurotoxicity. Narrow-leaved varieties of milkweed with verticillate leaf patterns are sub classified as verticillate-leaved milkweeds. This subcategory only causes neurotoxicity. *Asclepias fascicularis*, Mexican milkweed, *A. verticillata*, eastern whorled milkweed, *A. pumila*, plains whorled milkweed, and *A. subverticillata*, or horsetail milkweed, all fall into this category.

HORSETAIL MILKWEED

Horsetail milkweed is the plant of most concern throughout the southern plains. It commonly grows in dense stands within pastures and areas surrounding hay fields. Unlike the cardiotoxic milkweeds which are extremely unpalatable, horsetail milk weed is eaten by some animals when green—even more readily when presented in hay. Drying seems to improve its palatability and the plant easily blends into the hay during baling. Poisoning due to horsetail milkweed has been previously reported in horses, sheep, cattle and poultry.

The toxin is cumulative, with clinical signs occurring in horses and sheep when plant material approaching 1 percent of the body weight of the animal is eaten. Cattle require ingestion of approximately 2 percent of their body weight to produce clinical signs. The amount required by goats is not known. Illness can occur rapidly when large amounts of milkweed are eaten at one time or can be delayed for several hours. The leaves contain the most toxin, but all parts of the plant are toxic. The toxicity does not diminish with drying. The specific neurotoxic agent in verticillated milkweeds has not been identified. Horsetail milkweed has very fine stems and narrow leaves allowing it to blend in with grass and alfalfa hay making thorough examination necessary to detect contaminated hay.

HAY THE LIKELY CULPRIT

In the cases involving horses presented to the Rocky Ford VDL, all owners initially found multiple horses dead without any previous signs of clinical illness. Clinical signs observed in the other horses on these farms included depression, anorexia, ataxia with progressive posterior weakness, vague signs of colic, frequently laying down, stumbling and falling resulting in lateral recumbency ending with seizures, paddling and convulsions. All the horses that became non-ambulatory and had seizures in these cases died. The horses

References.
***Clinical Veterinary Toxicology*; Plumley. Mosby,2004.**
***Toxic Plants of North America*; Burrows & Tyrl. Iowa State Press, 2001**

and goats that remained on their feet and continued to eat survived. In two instances, it took several weeks for the horses to become clinically normal.

In the case involving the goats, six out of 13 adult Boer does were found to have varying degrees of incoordination, muscle tremors, stumbling and falling within two hours after they were fed a bale of newly purchased alfalfa hay. Three of the goats began convulsing and died. The other affected goats recovered uneventfully.

Other clinical signs reported to occur in livestock include mydriasis, head pressing, muscle twitching, jaw chomping, standing with its head high and back arched and moving with a high-headed, jackrabbit-like gait when excited. Ruminants may salivate excessively and bloat.

DIAGNOSIS AND THERAPY

Gross and microscopic lesions are nonspecific. Careful examination of stomach and rumen contents for horsetail milkweed is indicated when acute deaths and clinical signs suggest the possibility of milkweed poisoning.

Even though the horses that became non-ambulatory and had seizures in the cases reported here all eventually died, horses exhibiting violent seizures have been reported to make complete recoveries. Therapy for verticillate-leaved milkweed is symptomatic. Medication to control seizures and administration of activated charcoal is indicated, when possible. ▲

Lab Updates for Western Slope Lab Users

Add these New Tests to your Kit

Recent staffing and instrumentation upgrades at our VDL Western Slope lab at Grand Junction have added significant stature and experience to our testing capabilities. All of our test kits have been validated and are licensed by the USDA. We continue to strive to offer the best and most appropriate testing available for our valuable clients on Colorado's western slope:

—Don Kitchen, DVM, PhD, DACVP,
CSU Western Slope VDL Pathologist and Director

CAE/OPP CELISA

We are now offering caprine arthritis encephalitis (CAE/OPP) testing. CAE virus is a member of the small ruminant lentivirus group which also includes ovine progressive pneumonia, or OPP. CAE can cause chronic diseases of the joints and occasionally encephalitis in young goats. It is important to determine whether CAE-positive goats are present in your herd in order to develop a CAE-free herd. This disease is most commonly transmitted to kids via the colostrum shortly after birth; however, evidence now indicates horizontal transmission can occur, as well. Animals are infected for life, and the virus does not clear as the animal ages.

We offer a cELISA test for this disease, which is validated and USDA licensed for the detection of viral antibodies against this small ruminant lentivirus. This test is more sensitive than the AGID test with a sensitivity of 85 to 90 percent, and a specificity of 100 percent. We do offer the AGID test for OPP in sheep as well, but feel the cELISA is the test of choice. If additional verification of results is desired, PCR molecular testing can be done to analyze for viral antigen.

BVD TESTING

We are now offering bovine virus diarrhea (BVD) testing on sera and ear notches. The majority of test requests are for BVD ear notch pooling, and we offer that as well. The BVD pool testing uses the PCR methodology. The antigen capture ELISA (acELISA) provides individual sample results, and will be used for verification of positive PCR pool results. Both tests are validated and USDA-licensed for detection of BVD genetic material or antigen.

EIA ELISA TESTING

We began EIA ELISA testing a few months ago which offers same day results for clients having that need. The testing requirements for transportation to various states varies from state to state so be sure and check the individual state requirements before requesting a specific test. The ELISA test does offer advantages in some cases, as our routine AGID EIA test requires 48 hours.

OTHER TESTING BEING EVALUATED

- Q-Fever, ELISA
- Ruminant abortion screen, real-time PCR
- Ruminant diarrhea screen, ELISA
- Johne's disease, Fecal PCR
- Johne's disease, ELISA ▲

If you would like to see any other specific tests added, please call and we will evaluate it for possible addition to our available tests.

CSU VDL In Press

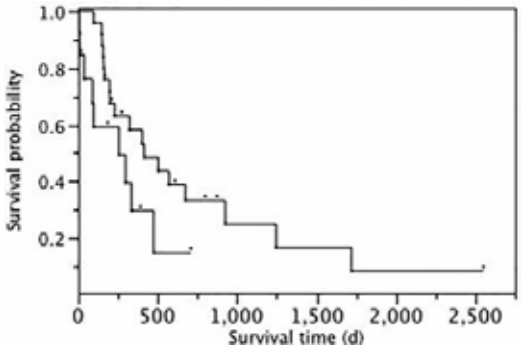
A Roundup of VDL Faculty Research

A BETTER PICTURE OF APPENDICULAR OSTEOSARCOMA IN SMALL DOGS

Amsellem PM, Selmic LE, Wypij JM, Bacon NJ, Culp WT, Ehrhart NP, Powers BE, Stryhn H, Farese JP. Appendicular osteosarcoma in small-breed dogs: 51 cases (1986-2011). *J Am Vet Med Assoc*. 2014 Jul 15;245(2):203-10. doi:10.2460/javma.245.2.203.

VDL Director Barb Powers participated in this study that data-mined Veterinary Society of Surgical Oncology members' records for histologic diagnosis of appendicular osteosarcoma in dogs weighing less than 33 pounds, in order to describe signalment, clinical signs, physical exam and findings based on radiography, lab work and histology. It also examined metastatic incidence and pattern, treatments, time to development of metastases, survival times and selected prognostic survival indicators. Based on 51 dogs, they found:

- Tumors were most commonly located in the humerus (n=15) and femur (n=14).
- Of the nine, 16 and 26 dogs that, respectively, were treated nonsurgically, underwent amputation of the affected limb only, or underwent curative-intent treatment, mean survival times were 112, 257, and 415 days.
- For dogs in the nonsurgical group, MST decreased significantly as the tumor histologic score increased.
- For dogs in the amputation-only group, MST decreased as body weight increased.
- Tumor histologic grade and mitotic index were subjectively lower, and MST following amputation of the affected limb without adjuvant chemotherapy was longer, compared with those for similarly affected larger dogs in other studies.



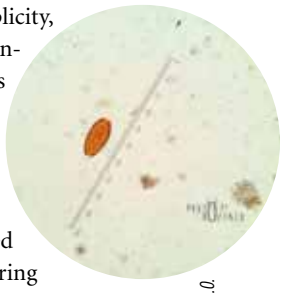
MST of 257 days for amputation-only dogs didn't differ significantly (P=0.1) from the 415 days for dogs in the curative-intent group. Dots above each survival curve represent dogs censored because they were still alive at the end of the study period, were lost to follow-up or died from unrelated causes.

- MST did not differ significantly between dogs in the amputation-only and curative-intent groups, a finding that warrants further investigation of the importance of adjuvant chemotherapy.

WILL IT FLOAT?

Ballweber LR, Beugnet F, Marchiondo AA, Payne PA. American Association of Veterinary Parasitologists' review of veterinary fecal flotation methods and factors influencing their accuracy and use-Is there really one best technique? *Vet Parasitol*. 2014 Jul 30;204(1-2):73-80. doi: 10.1016/j.vetpar.2014.05.009.

VDL Parasitology Section Head Lora Ballweber led this critical review of the accuracy and historical usage of the numerous variations in the old standby fecal flotation test for diagnosis of gastrointestinal parasites. Although the advantages of simplicity, low cost and time savings have generally led practicing veterinarians to favor the gravitational float method over centrifugation, the trade-offs in that choice have likely been accuracy. However, an important question remains unanswered across numerous studies comparing the techniques: How much accuracy is lost? Several fundamental technical factors influence the ability to accurately detect parasites, including:



- How much material is examined?
- How much dilution occurs?
- Is a centrifuge used?
- How much time is allowed for flotation?
- The type and specific gravity of flotation solution.

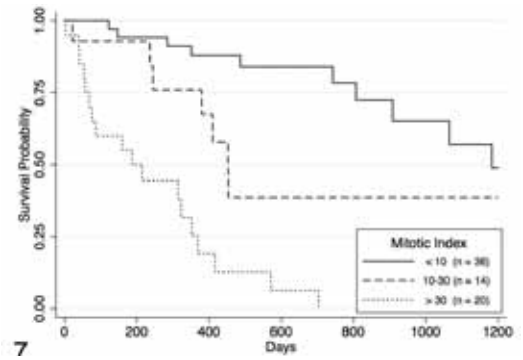
While it may become acceptable to mandate one particular method for one particular use, Ballweber writes, it is clear there's no reliable one-size-fits-all fecal float. All studies using fecal flotations should be required to provide a precise description of the method used, and using new methods sans validation and quality control assessments should be discouraged.

MITOTIC INDEX PREDICTS SURVIVAL TIMES FOR DOGS WITH RENAL CARCINOMA

Edmondson EF, Hess AM, Powers BE. Prognostic Significance of Histologic Features in Canine Renal Cell Carcinomas: 70 Nephrectomies. *Vet Pathol*. 2014 May 14. In press.

In this study, VDL Post-Doctoral Fellow Elijah Edmondson and Director Barb Powers retrospectively analyzed 70 cases of canine renal cell carcinoma with adequate follow-up from a total 214 cases found in the VDL data-

base between February 1996 and January 2012, representing 25 states and two Canadian provinces. They then constructed a multivariate Cox proportional hazards model using stepwise selection to evaluate potential histologic predictor variables. It showed mitotic index, nuclear size, nuclear pleomorphism, tumor differentiation, invasiveness, Fuhrman nuclear grade, and clear cell morphology were all significantly associated with survival times, both overall and tumor-specific.



Kaplan-Meier survival curve for dogs in the three years following nephrectomy for renal cell carcinoma, according to mitotic index, which stratifies dogs based on overall survival.

Their multivariate analysis revealed micotic index, defined as the number of mitotic figures in ten 400 fields, as the sole independent prognostic variable. Median survival for dogs with an MI greater than 30 was 187 days, compared with 1184 days for dogs with an MI of less than 10. Dogs with an intermediate MI of 10 to 30 had a median survival of 452 days.

IMMUNOPHENOTYPING OF T-CELL LYMPHOMA

Seelig DM, Avery P, Webb T, Yoshimoto J, Bromberek J, Ehrhart EJ, Avery AC. Canine T-zone lymphoma: unique immunophenotypic features, outcome, and population characteristics. *J Vet Intern Med*. 2014 May-Jun;28(3):878-86. doi:10.1111/jvim.12343.

VDL Pathologist EJ Ehrhart collaborated in this study of 20 dogs using concurrent histology and immunophenotyping by flow cytometry to determine whether loss of expression of the CD45 antigen could serve as specific diagnostic feature of the T-zone lymphoma form of canine T-cell lymphoma. Such immunophenotyping is an important tool in classifying human cases.

Ehrhart and colleagues classified lymph node biopsies from 35 dogs with T-cell lymphoma using WHO criteria — 20 from dogs with CD45- and 15 with CD45+ T-cell lymphoma. The results showed all 20 CD45- cases were classified as T-zone, while the 15 CD45+ cases were classified as aggressive T-cell, demonstrating the unique immunophenotypic features of T-zone lymphoma can be used for diagnosis. In addition, the researchers used an additional 494 dogs diagnosed by immunophenotyping to characterize the affected population, finding affected dogs showed a median survival of 637 days, 40 percent of cases were in golden retrievers, median age at diagnosis was 10 years, and the majority had lymphadenopathy and lymphocytosis.

CAT-BITE *MYCOPLASMA*: ANTIBIOTIC RESISTANT?

Torres-Henderson C, Hesser J, Hyatt DR, Hawley J, Brewer M, Lappin MR. Pilot study to evaluate the role of Mycoplasma species in cat bite abscesses. *J Feline Med Surg*. 2014 Mar 18. In Press.

VDL Bacteriology Section Head Doreene Hyatt teamed with CSU Clinical Sciences veterinarians to culture and use polymerase chain reaction amplification on 26 cats with abscesses suspected of being caused by cat bites, in search of the incidence of *Mycoplasma* species in those wounds. Their PCR found four of the samples, or 15.4 percent, were positive, while only one cultured positive. Of the half those four in which adequate DNA was obtained to sequence, one was most homologous with *M. felis*, and the other was most homologous with *M. equigenitalium* and *M. elephantis*. The single cat of the 26 that didn't respond to antibiotic therapy by day 7 was positive for with *M. equigenitalium* or *M. elephantis* on days 0 and 12, and ultimately responded to enrofloxacin and clindamycin. Those results suggest that although *Mycoplasma* can contaminate cat-bite abscesses, beta-lactam antibiotics appear adequate for treatment. ▲

CSU VDL in the Field: Disease Updates

Watch for Plague, Tularemia in Colorado

The cottontail rabbit population in Colorado appears to be increasing, following a fairly widespread die-off of predatory red foxes due to sarcoptic mange over the last several years. Accompanying that rise in rabbit populations has been an increase in two extremely important zoonotic diseases that occur in Colorado: tularemia and, possibly, plague. In 2014, CSU's Veterinary Diagnostic Labs conducted 56 tests for plague, of which one was positive, and 72 for tularemia, of which four were positive.

Plague and tularemia affect rodents and could therefore easily spill over into domestic animals, especially dogs and cats. Both diseases present clinically with similar signs and are extremely difficult to delineate clinically.

PLAGUE

Plague is caused by the non-motile, Gram-negative, rod-shaped bacteria *Yersinia pestis*, of the family *Enterobacteriaceae*. At the present time, plague in the United States has only been documented west of the Mississippi.

Plague can infect more than 200 species of rodents. In domestic animals, it is most common in outdoor cats and rarely in dogs. Three forms of plague have been described in humans; similar clinical manifestations can be seen in domestic and wild animals:

- **Bubonic form**. In animals — especially felids — it is manifested by submandibular abscesses, similar to those seen with chronic stomatitis or gingivitis associated with bad teeth
- **Pneumonia form**. Also not unusual in cats, this form is highly transmissible to other animals and man.
- **Fulminating septicemia form**. Manifested by sudden, unexpected death, this form is also pneumonic and highly transmissible. Although relatively rare in animals, it can occur.

Plague is primarily transmitted by fleas, ticks, lice and mosquitoes and, of course, by direct contact with infected tissues, especially blood, and via inhalation. Treatment is with antibiotics and antibiotics of choice include streptomycin, gentamicin, doxycycline or chloramphenicol.

TULAREMIA

Tularemia is caused by a Gram-negative, non-motile rod-shaped bacteria, *Francisella tularensis*. Of the four subtypes of *F. tularensis,* only two are found through-out North America as well as Colorado: *F. tularensis* subspecies. tularensis, nearartic, biovar type A, and *F. tularensis* subspecies palaearctica, holoarctica, biovar type B.

More than 125 animal species are known to be susceptible to tularemia, including many species of rodents, dogs, cats, cattle, sheep, rabbits, squirrels, foxes, bears, beavers and birds. Tularemia is primarily transmitted by ticks, fleas, lice and mosquitoes. Transmission to humans is most common via fleas, biting flies and other ectoparasites and by direct contact with infected blood, excreta or soft tissues. It can also be transmitted by inhalation of infected dust and by ingestion of contaminated food or water. Human to human transmission is extremely rare.

— Terry Spraker, DVM/PhD/DACVP, CSU VDL Pathologist

One of Tularemia's common gross lesions is multifocal necrosis of many organs, including the liver.

The clinical manifestations in animals are similar to plague, but more often combined — a lymphadenitis that goes septic causing acute hemorrhagic pneumonia. In the more subacute form, multifocal necrosis in many organs, especially the lung, liver and spleen, is a common gross lesion. Tularemia can be chronic, especially in dogs, and the main clinical sign would be swollen, painful lymph nodes. Diagnosis is made by history of exposure to wildlife, especially rabbits and rodents, along with appropriate clinical signs. Confirmation is done by PCR of swollen lymph nodes or affected liver or spleen. The clinical manifestations of tularemia are extremely similar to plague, but any fulminating bacterial infection could present with similar signs — that is why a confirmation of the diagnosis is so important. If an animal that has tularemia is treated, antibiotics of choice include streptomycin, gentamicin or ciprofloxacin.

Animals suspected of having plague or tularemia should be submitted to CSU's Veterinary Diagnostic Lab for definitive diagnosis. It is best to send the whole carcass, because necropsy in private practice settings poses significant zoonotic risk. To help protect laboratory personnel from that risk, please label your package appropriately. ▲

PLAGUE AND TULAREMIA TESTING AT CSU

- **$60 per sample**

TURNAROUND

- **Same-day if ordered stat; 1 to 3 days otherwise**

Get to Know the Laboratory

New Members Join the Lab Team

Laura Hoon-Hanks' mother's career as a nurse midwife sparked her original interest in medicine. After deciding veterinary medicine was her calling, she followed a University of Montana biology/zoology bachelor's degree with her DVM from CSU. Her research at CSU's Prion Lab centered around new necropsy and histopathology techniques for chronic wasting disease. As a new VDL pathology resident this year, her work will focus on vector-borne and zoonotic infectious disease pathology. Outside work, she mountain bikes, hikes, backpacks, white-water rafts, rock climbs, snowboards and trail runs.

Emily Rout, new pathology resident, grew up in Pennington, N.J., and earned her bachelors degree in biology from Maine's Colby College. Following a stint studying a rare human bone marrow failure syndrome at the National Institutes of Health's Genome Research Institute, she came to CSU for vet school. There, she worked in labs studying biomarkers for equine regenerative anemia and canine lymphoma, and also completed a one-year small-animal emergency and critical-care internship. She plans to continue studying canine lymphoma and leukemia under the combined clinical pathology residency and PhD program she began in 2014. She swims, skis, cooks and runs with her husband and two dogs.

Dipu Mohan Kumar followed his DVM and a master's degree in diagnostic microbiology with a stint at University of Connecticut, where he helped validate a robust primer design tool for avian influenza viral subtype identification. His Ohio State doctoral dissertation that followed helped elucidate the ligand used by the tick-borne zoonotic pathogen *Ehrlichia chaffeensis*, its monocyte receptor and the actin cytoskeletal mobilization pathway involved in its host cell entry. As a new VDL microbiology resident, he looks forward to the opportunity to teach vet students, engage in research projects and talk to clients, in addition to lab rotations.

Allison Vilander, a Washington native, joins the VDL as a pathology resident. After receiving her bachelor's degree from University of Washington, where she worked as a research technician, she went on to earn her DVM there, where she discovered a love for pathology. She is especially interested in how pathology training can complement her research interests. She plans to continue working in the area of infectious disease, and she has a special interest in animal models of human disease.

Katherine Luntsford, who joins the VDL's tissue-trimming biopsy area, has worked as a veterinary technician since 2003 at various practices on the front range. An alumnus of Colorado Mountain College who is currently studying at San Jaun College online, she has worked with wildlife in Rifle, Colo., is a retired Scottish Highland dancer who is into crossfit and loves the outdoors.

Alex Fenton comes to VDL's Western Slope Lab at Grand Junction from Rio Rancho, N.M. She has a bachelor's degree in microbiology and biochemistry from New Mexico State and has recently worked at the Lovelace Respiratory Research Institute in Albuquerque. She has trained in necropsy of various species, including primates, and has worked with the BSL-3 Microbiology Group at Lovelace. She joins the lab as a technician.

Marty Svetlik, a new lab technician at VDL Western Slope, comes from Schenectady, N.Y. She earned her bachelors degree in molecular biology from University of Tampa and her masters degree in virology from New York's Albany Medical College. Marty worked in two different positions as laboratory assistant and obtained significant laboratory experience as a graduate student. ▲

Get to know the lab

VDL's Pabilonia a 'Future Leader'

It was during her residency at CSU's Veterinary Diagnostic Lab, says Kristy Pabilonia, that she first developed specific interests in zoonotic diseases as well as infectious diseases of livestock and poultry. "It's a really fascinating field, particularly when we look at animal production in other parts of the world," says the now head of two sections in the VDL, Avian Diagnostics and Molecular Diagnostics.

Her experience, which began as a lab volunteer while a CSU DVM student, helped lead to her selection as one of 10 participants in the 2013/2014 AVMA Future Leaders Program. Today, she works closely with state and federal agencies on avian, foreign animal, and zoonotic diseases, and is frequently sought out for her experience in the emerging field of backyard poultry. As coordinator of the Colorado Avian Surveillance Program and the Colorado Poultry Health Board, she's often called on for help by other countries that don't have the necessary zoonotic disease expertise or diagnostic laboratory capacity to improve or safeguard their livestock, poultry and human populations.

"Food security is very different in these communities," she says. "We are raised with such abundance. We have emergency resources. It's hard to even imagine the struggles people in developing countries have every day just trying to provide any food for their families."

Her desire to improve veterinary medicine led Pabilonia to apply last year to the AVMA Future Leaders Program. The yearlong program helps develop veterinarians ready to lead the profession into the future.

"This is a great program," she says. "As we move into the future, it's exciting to be a part of a profession that has such global importance and impact." ▲

CSU Veterinary Diagnostic Lab is looking for other livestock operations to tour throughout the coming year. Tours will help provide information about various livestock business entities and the reasons they utilize the diagnostic services we provide as an integral part of livestock enterprise management. If you're interested in hosting us, contact Charlie Davis, (970) 297-0370 (970) 689-1632 charlie.davis @colostate.edu

In cooperation with Weld County Extension's Keith Maxey, VDL Lab Coordinator Charlie Davis toured Producer's Cattle Feedlot at Greeley in October with VDL's Lora Ballweber, EJ Ehrhart, Dipu Mohan, Danielle Goranson and Michelle Miller. The tour not only provided a look at the complexity of a cattle feeding, but also gave participants the opportunity to interact with feedlot manager Jeff Loyd regarding aspects of the business relevant to their specific area of interest.

CSU's Veterinary Diagnostic Lab hosted the 2nd Annual Comparative Ocular Pathology Society meeting in September. The meeting had many stimulating ocular-focused talks and presentations by pathologists and ophthalmologists that spanned diagnostic, basic ocular research and industrial interests. The meeting was well attended with participants from throughout the United States, as well as international participants from as far as Israel and Mexico City.

CSU VDL ON THE ROAD: UPCOMING CONFERENCES, SYMPOSIA AND APPEARANCES

VDL Director ***Barb Powers,*** Western Slope Lab Director ***Don Kitchen***, Parasitology Section Head ***Lora Ballweber,*** Avian Diagnostics and BSL3 Operations Section Head ***Kristy Pabilonia***, Chemistry and Toxicology Section Head ***Dwayne Hamar*** and retiring Virology Section Head ***Hana Van Campen*** all attended this year's 57th annual meeting of the ***American Association of Veterinary Laboratory Diagnosticians*** in October in Kansas City.

Powers also attended the ***Colorado Veterinary Medical Association***'s strategic planning session in October and the association's leadership forum in November and the annual conference in September, where the Veterinary Diagnostic Lab hosted the association and gave attendees a tour of the lab. She and ***VDL Lab Case Coordinator Charlie Davis*** will attend the ***Colorado Cattlemen's Association*** mid-winter meeting in January.

Bacteriology Section Head ***Doreene Hyatt*** traveled to ***Perugia, Italy***, in early October to lecture to vet students, followed by a bacteriology conference in ***Prato, Italy***.

Pathologist ***Tawfik Aboellail*** will attend the 2015 ***American College of Veterinary Internal Medicine Forum*** in Indianapolis in June, where he will participate in the Liver Study Group on hepatic biopsy acquisition, pathology and interpretation.

VDL Pathologist ***E.J. Ehrhart*** attended the ***American College of Veterinary Pathologists*** annual meeting, Nov. 8 through 12, in Atlanta, along with VDL interns ***Jenn Malmberg*** and ***Dan Regan***.

VDL Pathologist Paula Schaffer attended the ***7th International Symposium on Aquatic Animal Health***, Aug. 31 through Sept. 5, in Portland, to help the lab become more engaged in the research of aquatic animal health and the important diagnostics needed in this field.

VDL Lab Case Coordinator Charlie Davis coordinated and attended several field trips this fall to Harper Sheep Feedlot in Eaton and Producers Cattle Feedlot in Greeley, and an Extension-sponsored swine producer meeting in Greeley. He will be attending the National Western Stock Show and Rodeo in Denver in January, and the 2015 Colorado Cattlemen's Association Mid-Winter Conference in January.

VDL Pathologist ***Colleen Duncan*** travels to the ***Alaska Marine Science Symposium*** in January in Anchorage.

Avian Diagnostics and BSL3 Operations Section Head ***Kristy Pabilonia*** heads to Las Vegas Feb. 3 to 5 for an AAVLD Accreditation Committee meeting, to San Jose Feb. 18 and 19 for a USDA Live Bird Marketing System meeting, and to an International Symposium on Avian Influenza, April 12 to 15 in Athens, Ga.

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Veterinary Diagnostic Laboratories
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REGULAR COLUMNS

LAB LINES

INSIDE THIS ISSUE

Update from the Director

In this issue of *LabLines*, the breadth of the work of Colorado State University's Veterinary Diagnostic Laboratories is apparent, ranging from studying the effects of climate change on polar bears to increases in zoonotic disease (plague and tularemia) to advances in our knowledge of oncology, anthelmintic resistance, plant toxicity and ophthalmology.

BARBARA POWERS, DVM, PHD, DACVP
DIRECTOR

Many of these issues coordinate well with CSU's new One Health Initiative, our focus on collaborative research that draws on our notable expertise in teaching, research, and clinical service aimed at optimal health for people, animals and the environment. Watch the next issue of *LabLines* for more on this new initiative. We hope you enjoy the interesting and informative articles inside.

We are also excited to welcome our new Virology Section Head, Dr. Christie Mayo, who has become one of the nation's leading experts on bluetongue disease in cattle. She brings a high level of enthusiasm to advancing our Virology Section and continuing her research in arboviruses. We will miss the long-time leadership of Dr. Hana Van Campen, who retired as previous Virology Section Head. We are also enjoying our new pathology and microbiology residents who have been added to our program, and we welcome new staff to the laboratory. Please also note articles from our branch laboratories in Rocky Ford and Grand Junction.

We recently returned from the American Association of Veterinary Laboratory Diagnosticians meeting in Kansas City. It was a great pleasure to see many of you there and get another opportunity to learn from some of the world's best experts in this growing field. In September we were pleased to be able to host the CSU-CVMA reception Friday night for the annual CVMA conference. We had much fun visiting friends and offering tours of the lab

Upcoming in January, we will have our External Advisory Committee meeting to help guide our future directions. As always, our goal is to provide excellent quality diagnostic services in a timely manner. With that goal in mind, I invite you to feel free at any time to send me your questions, comments, suggestions or thoughts. Contact us at (970) 297-1281 or via our Website.

Barbara E. Powers