SUMMER 2021 | VOL. II

The University of Wyoming Department of Veterinary Sciences & Wyoming State Veterinary Laboratory Newsletter

Blue Jay (Cyanocitta cristata)
PHOTO BY KEVIN WILLIAMS
Captured: CASPER, WY

UPDATES

Welcome to the summer issue of the Veterinary Sciences Department/ WSVL newsletter. Since the spring issue we have had a lot happening. Lifting of COVID-19 restrictions at UW has been a huge relief for us all. We have both students, staff, a post-doc, and faculty hired under pandemic restrictions making it particularly challenging for them to connect with and get to know others in the department. We currently have 9 undergraduate students who are obtaining disease research experience through a number of mechanisms including INBRE, the honors program, WY research scholars, and a departmental research internship program. We additionally have a DVM student summer extern. These opportunities are often important in guiding student career directions; and provide invaluable experiential learning. We are pleased to have these students here, and appreciate their energy and enthusiasm they bring with them. Another aspect of normalcy in the department is the frequent visit by high school students interested in UW. We just had our first high school student visit in 18 months!

In the last edition, we provided an update on the University of Wyoming Biocontainment (UWBF) Facility. A major step forward since then is the planned CDC visit to the department in mid-July to assess suitability of the UWBF for working with "select agents". Having this capacity will significantly increase our ability to undertake microbiology research in federally regulated areas important to Wyoming. The UWBF team members have worked very hard for this visit, and we are hopeful it will go well.

In other news, Dr. Brant Schumaker is moving on to a new position as Director of the Wyoming WWAMI medical program after being with the department for 11 years. Brant is an epidemiologist whose research interests included brucellosis and chronic wasting disease. In addition, he had an important role in the Universities response to the COVID-19 pandemic over the last 18 months. We wish him success in his new position.

Please enjoy reading the newsletter; feel free to provide us feedback.

As we start to put the COVID-19 pandemic behind us, the WSVL is starting to return to more normal operations. Although we continue to provide COVID-19 testing services to the University to Wyoming and the public, test numbers are declining, and we look forward to ending our COVID-19 surveillance testing program in July. While COVID-19 has kept us extra busy, we have not ignored our core animal diagnostic functions. Some of you may have noticed that the WSVL Toxicology Section is fully functional again following a hiatus caused by loss of some key personnel and major equipment. Central to restoration of toxicology testing has been the hiring of Dr. Aleksandra Gizejewska-Fattebert.

Dr. Gizejewska-Fattebert obtained both her veterinary degree and a PhD in toxicology in her native Poland and worked in Switzerland prior to arriving in Laramie. She brings extensive knowledge and energy to the WSVL. She has great experience in trace element analysis, a major portion of the toxicology testing requested at the WSVL.

On a less positive note, due to the budget situation in the state, the WSVL will be increasing its fees beginning July 1st, 2021. The amount of the fee increases will vary depending on the cost of testing but will average around 10% across the board. The fee increases are necessary to keep up with the increased cost of testing, a problem that has gotten worse with the intense demands for lab supplies and chemicals brough on by the recent pandemic. While we try to keep our fees as stable as possible (it has been 6 years since there was any increase), the current circumstances make these fee increases impossible to avoid.

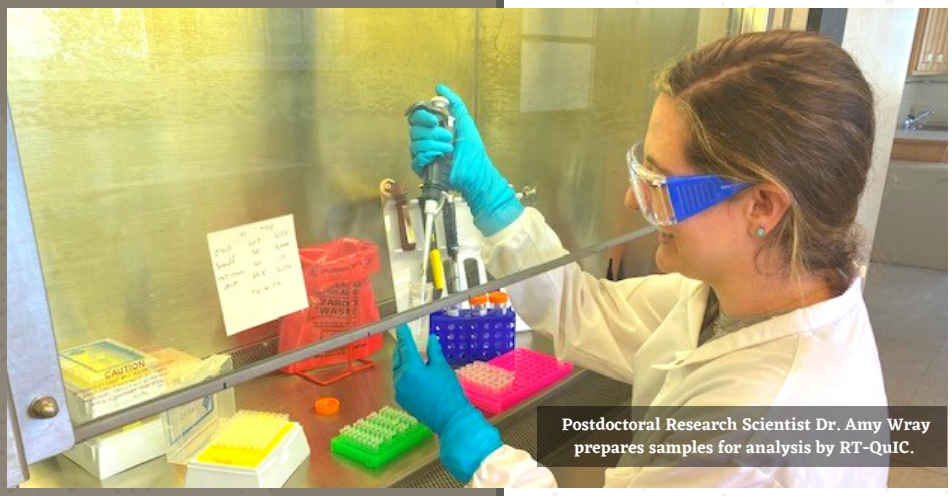
Finally, it is important to recognize that the Wyoming State Veterinarian, Dr. Jim Logan, will be embarking on a well-deserved retirement in mid-July. I want to take this opportunity to thank Dr. Logan for his tireless efforts on behalf of the animals and people of Wyoming over his long career. It has been our privilege in the WSVL to work closely with Dr. Logan on various disease and prevention issues. We will certainly miss his steady hand and calming influence helping Wyoming deal with brucellosis, vesicular stomatitis and other disease problems, not to mention the regulatory hurdles. Congratulations Dr. Logan and best wishes as you "graduate" to retirement.

Dr. Jonathan Fox
Department Head

UW College of Agriculture and Natural Resources Veterinary Sciences

Dr. William Laegreid
Lab Director

WSVL WYOMING STATE VETERINARY LABORATORY



Postdoctoral Research Scientist Dr. Amy Wray prepares samples for analysis by RT-QuIC.

CHRONIC WASTING DISEASE AND RT-QUIC

By: Dr. Jennifer Malmberg MA, DVM, PhD, DACVM

RT-QuIC is being used by Dr. Jennifer Malmberg's group to study chronic wasting disease in free-ranging cervids. This article provides an overview of the disease, RT-QuIC, and its applications in diagnostic medicine and research.

Chronic wasting disease (CWD) is fatal neurodegenerative disease that threatens Wyoming's iconic cervid populations, including mule deer, white-tailed deer, elk and moose. The disease is caused by an infectious misfolded protein known as a prion; such diseases are classified as a transmissible spongiform encephalopathies (TSEs).

Chronic wasting disease (CWD) is fatal neurodegenerative disease that threatens Wyoming's iconic cervid populations, including mule deer, white-tailed deer, elk and moose. The disease is caused by an infectious misfolded protein known as a prion; such diseases are classified as a transmissible spongiform encephalopathies (TSEs). Prions are highly resistant to degradation and persist long-term in the environment. There is no effective treatment for CWD, and vaccine development has been met with exceptional challenges. Chronic wasting disease is the only TSE known to infect free-ranging animals, making control far more challenging than for domestic animal TSEs, such as scrapie in sheep and bovine spongiform encephalopathy (BSE) in cattle. Currently there are no tools for eradication.

CWD has far-reaching economic and ecological impacts. In Wyoming, studies have documented CWD as a direct cause of population declines in Wyoming mule deer[1] and white-tailed deer[2], where CWD prevalence in some hunt areas exceed 50%[3]. Currently CWD prevalence in elk is notably lower than in sympatric deer; however, there is evidence that population-level impacts of CWD on elk are likely in absence of improved strategies for disease control[4]. Though CWD is not known to be transmissible to humans, evidence suggests that the species barrier, including the barrier to zoonotic transmission, may be less robust than previously thought[5]. Therefore consumption of infected meat is discouraged, which affects both hunters and management agencies that rely on revenue from the sales of hunting licenses and the use of harvest to control populations. Conventional diagnostic assays for CWD include enzyme-linked immunosorbent assay (ELISA) and immunohistochemistry (IHC).

These methods rely on collection of brain and/or lymphoid tissues for prion detection. While useful for diagnosis of postmortem infections, antemortem detection of CWD by these methods involves invasive sampling (e.g. lymphoid tissue biopsy) and is limited by poor sensitivity during the early stages of the disease. The inability to detect CWD early and through non-invasive sampling limits research that aims to inform CWD management and mitigation strategies. Real-time quaking induced conversion (RT-QuIC) is a highly sensitive experimental prion amplification technique designed for rapid detection of prions in a variety of sample types. This technique allows for enhanced early detection of prions, and is thus suited to support a variety of investigations into the many facets of CWD, including transmission dynamics, pathogenesis, tissue tropism/trafficking, genetic susceptibility, and prion evolution and ecology.

At the most basic level, the pathogenesis of CWD involves conversion of a cellular host protein (PrP^{c}) into a misfolded amyloid isoform (PrP^{res})[6]. Accumulation of the misfolded protein in infected animals causes chronic neurodegeneration, emaciation, and eventual death.

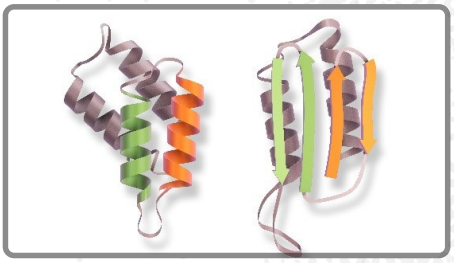


Figure 1: Cellular isoform of prion protein (left), and infectious, misfolded amyloid isoform of prion protein (right).

T-QuIC relies on a recombinant form of the cellular protein ($rPrP^{c}$) as a substrate, and a process of incubation with periodic shaking to amplify low levels of prions to detectable levels. Prions in a sample act as "seeds" to convert the recombinant protein substrate to the amyloid isoform. This conversion is detectable in real time by the binding of a fluorescent dye (thioflavin T) to the amyloid isoform. RT-QuIC can be optimized for prion detection in a variety of sample types including skin, blood, and excreta (saliva, urine, feces), which aids antemortem detection through noninvasive sampling.

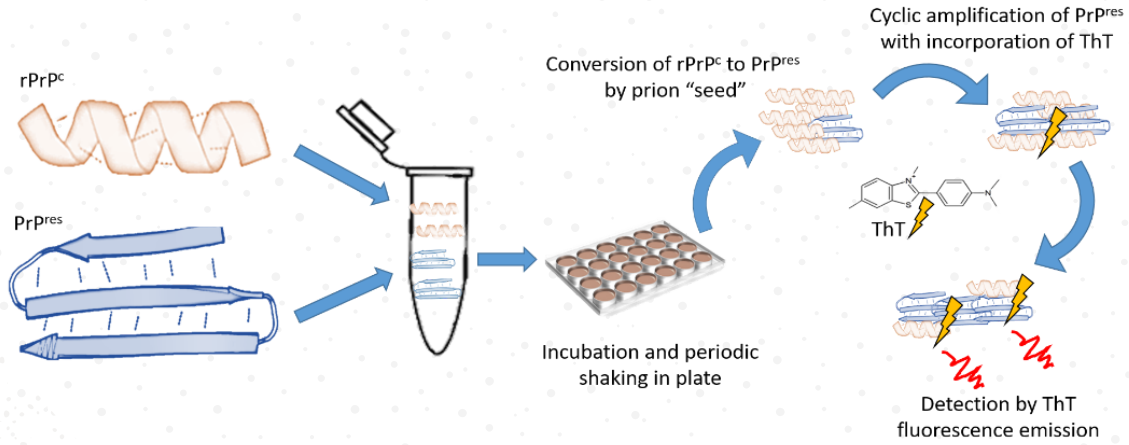


Figure 2: RT-QuIC amplifies low levels of prions to detectable amounts through conversion of recombinant prion protein (rPrPc) to a misfolded amyloid isoform (PrPres) in the presence of a prion "seed". The reaction is measured in real-time by binding of thioflavin T (ThT).

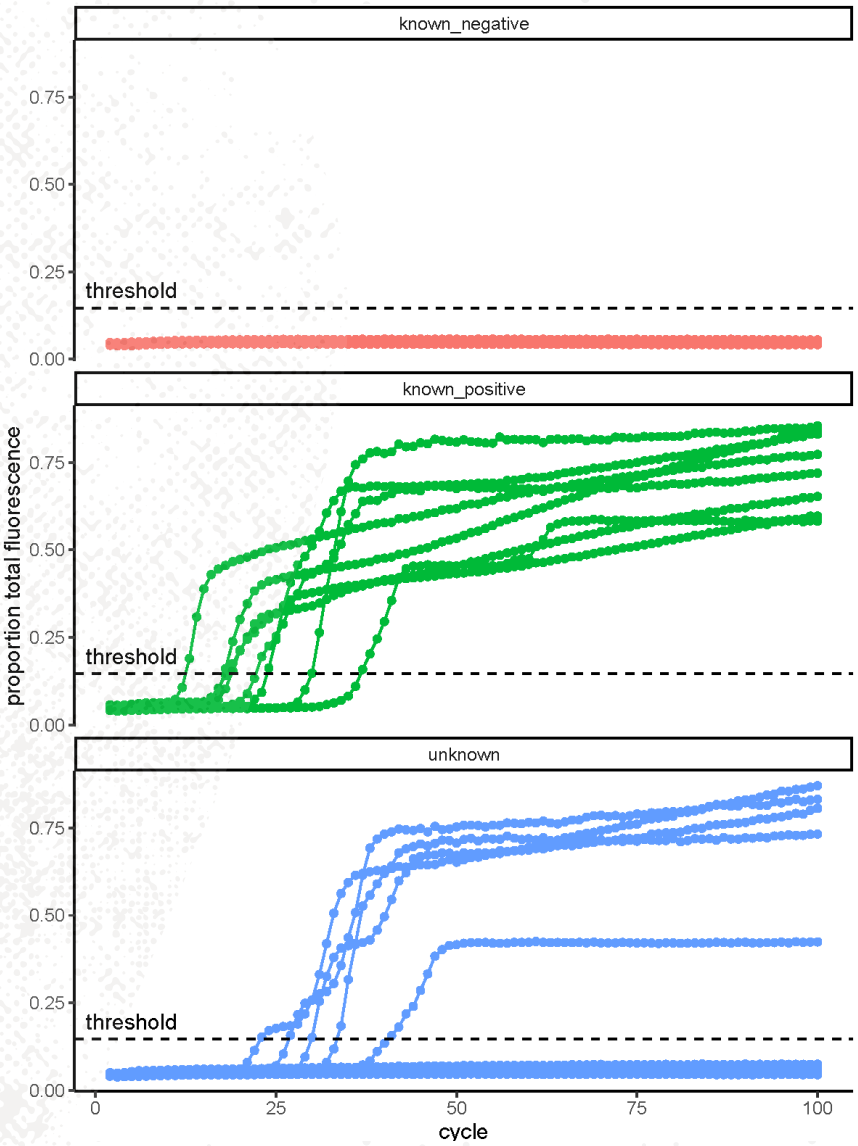


Figure 3: RT-QuIC test run results from 10 June 2021, consisting of 8 known positives, 8 known negatives, and 12 blind unknown samples. The independent variable is the cycle, for which each cycle is 15 minutes. The dependent variable is ThT fluorescence as a proportion of total maximum fluorescence for all sample replicates over time. Threshold line represents the average fluorescence for all samples at cycles 2–8 plus 10 standard deviations.

In collaboration with the Wyoming Game & Fish Department's Veterinary Services Unit, researchers at the WSVL are working to adopt RT-QuIC for application to studies of Wyoming's free-ranging cervid populations. Led by Assistant Professor Jennifer Malmberg and Postdoctoral Research Scientist Amy Wray, the group aims to employ RT-QuIC to help answer important questions such as: How do predators impact CWD ecology? What is the role of uninfected wildlife in spread of prions across the landscape? How is prion shedding influenced by host genetics? Currently, researchers at WSVL are working to determine sensitivity and specificity of RT-QuIC using lymphoid tissues.

Looking forward, one primary goal will be to optimize the assay for prions in other samples types such as ear notches, which will reduce invasive antemortem sampling techniques, such as lymphoid biopsy, during capture of free-ranging cervids for research. Future applications of RT-QuIC are numerous. Currently, RT-QuIC is considered an experimental technique used to support CWD research.

However, recent utilization of the assay for diagnostic criteria of Creutzfeldt-Jakob disease[7] — a human TSE — highlights the potential for diagnostic application of RT-QuIC. While conventional CWD detection assays are expected to remain critical tools for CWD surveillance and diagnosis, preliminary efforts toward cross-laboratory validation of RT-QuIC as a diagnostic assay for CWD are underway.

Adoption of RT-QuIC at the WSVL may therefore afford opportunities to participate in validation efforts and position WSVL for an important role in diagnostic advancement of a regionally important disease that is rapidly increasing in potential global significance.

Dr. Malmberg is supported by funds from the USDA (HATCH multistate), and the UW foundation Wildlife-Livestock Health Center endowment. □

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UPDATE ON JOHNE'S DISEASE

By: Dr. Kerry Sondgeroth DVM, PhD, DACVM

What is Johne's disease?

Johne's disease is caused by a slow growing bacterium called *Mycobacterium avium* ssp. *paratuberculosis*. The disease is named after a German pathologist that recognized acid fast bacteria in the small intestine wall of a thin cow with chronic diarrhea. It was first described in the United States in the 1900s, affecting Pennsylvania dairy cows. Since that time it has been diagnosed in a variety of livestock and wildlife species including multiple breeds of cattle (both beef and dairy), bison, small ruminants, camelids, moose, bighorn sheep, elk, and deer (Bhattarai 2014, Buerglt 2000, Carta 2013).

What are the clinical signs?

In cattle, the typical clinical presentation would be an adult animal, eating well with chronic weight loss and diarrhea. This differs from the presentation in small ruminants in which weight loss and diarrhea are not consistently found(http://www.ojd.com.au/about-ojd/). Other wildlife species can also have variable presentations with only poor body condition or only loose stools (Williams 1979).

How do animals become infected?

The majority of animals become infected early in life by ingesting the bacteria that has been shed in manure. Other possible routes of infection for young animals includes ingesting it through milk, and occasionally across the placenta while in utero. Once infected, the bacteria invades the intestinal wall and begins its slow replication process. Depending on the number of bacteria ingested, clinical signs will develop in 2 to over 10 years.

What diagnostic tests/samples can be used to detect Johne's disease?

To diagnose Johne's disease ante-mortem, we can utilize serum samples or fecal samples. For serum, we utilize the VMRD ELISA (https://vmrd.com/test-kits/bovine), which will detect antibodies from cattle and small ruminants. Serology assays can only diagnose exposure, and it typically takes a minimum of two years for antibodies to develop. Additionally, the serology assay is not very sensitive; so a negative result must be interpreted with caution. For serum, we utilize the VMRD ELISA (https://vmrd.com/test-kits/bovine), which will detect antibodies from cattle and small ruminants. Serology assays can only diagnose exposure, and it typically takes a minimum of two years for antibodies to develop. Additionally, the serology assay is not very sensitive; so a negative result must be interpreted with caution.

For fecal samples, we utilize a PCR; and can pool up to 5 samples in one reaction. If the pool is positive, then we can perform an individual PCR assay. The caveat for fecal PCR is that cattle in the sub-clinical stage may be intermittent shedders of the bacterium. So a false negative result is possible. If the clinical signs remain or worsen, then testing a new fecal sample is recommended. To diagnose Johne's disease post-mortem, we can utilize gross and histologic findings on the small intestine and the mesenteric lymph nodes. On gross examination the small intestine will be thickened with prominent Peyer's Patches. The thickened intestinal wall is due to an increased number of macrophages and lymphocytes present, in response to the bacteria.

These bacteria can be observed throughout the tissue, when acid-fast stained. In Figure 1 (johnes.org), the top of the image shows mucosal thickening of the ileum in comparison to normal mucosa in the bottom of the image.

Figure 1: Top- Mucosal thickening of the ileum/ Bottom- Normal mucosa

Does Wyoming have Johne's disease?

Yes! The percentage of samples that test positive for Johne's disease has been increasing over the past few years. These graphs show the percentage of positive cases from 2019, 2020, and 2021. The left graph indicates the percentage of positives by serology testing, and the right graph indicates the positives by fecal PCR. WSVL has tested an increasing number of positive samples in both cattle and small ruminants. Keep in mind the 2021 numbers are incomplete, and only are shown through May.

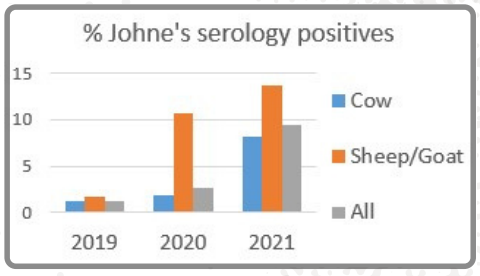

Figure 2: Percent of Johne's Serology Positives by Year

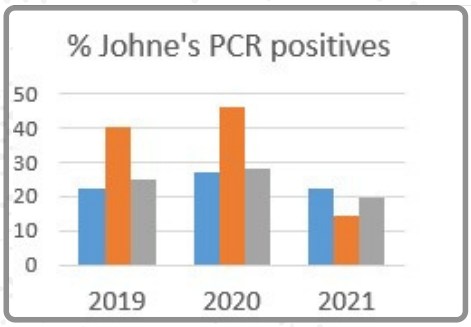

Figure 3: Percent of Johne's PCR Positives by Year

Who do I contact if I have more questions?

At WSVL, you can contact Dr. Kerry Sondgeroth with additional questions about testing strategies and control options at **ksondger@uwyo.edu**, or **307-799-9925**. □

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CANINE DISTEMPER IN A RACCOON

By: Dr. Myrna Miller DVM, PhD

A raccoon was observed stumbling and foaming at the mouth in a public area of F.E. Warren Airforce Base. The immediate public health concern was possible rabies virus infection and risk of human exposure. Other public health concerns included possible toxin or poison exposure. Rabies testing at the Wyoming State Veterinary Laboratory was negative. Due to the close contact with humans, a definitive diagnosis was pursued in the case. Canine distemper in raccoons and coyotes can mimic the signs of rabies. Canine distemper virus (CDV) is contagious to nonvaccinated dogs and many wild carnivores, but is not contagious to humans. Raccoons with distemper may approach people, appear sick and sleepy, stumble, and have seizures.

Canine distemper virus (CDV) is highly infectious to dogs and other wild carnivores, including big cats such as lions and tigers, but unlike rabies it is not contagious to humans. In Wyoming, CDV has been found in raccoons, coyotes, wolves and unvaccinated domestic dogs. Transmission usually occurs through direct contact with body fluid, including urine and feces. In addition to the neurologic signs seen in advanced cases, sick animals may have respiratory signs such as runny eyes and nose and a cough, or gastrointestinal symptoms such as vomiting and diarrhea. The neurologic signs in advanced cases can mimic those caused by rabies, or animals may exhibit seizures and muscle spasms.

Pet dogs can be tested for CDV. The virus can be detected in samples such as urine or blood, or swabs of the conjunctiva (eye). Deceased animals can be tested using tissues including, lung, brain, and urinary bladder.

Supportive care may be beneficial in mild cases, but there is little hope of survival in advanced cases with signs of a brain infection.

Safe and effective vaccines are available for domestic dogs. All puppies should be given a series of 2 or 3 doses, followed by an annual or every three booster to maintain full protection. Since CDV infects raccoons and coyotes, it is not uncommon for Wyoming farm and ranch dogs to become infected with and die from CDV. This case illustrates why vaccines are recommended for ranch dogs that never come to town and are not often around other dogs.

The main public health concern for this case was potential rabies virus infection. It is important not to approach a wild animal that is acting strangely. If there is any potential for human contact the animal should be tested for rabies and public health officials notified. As this case demonstrates, even if the animal does not have rabies, they could have other infectious diseases and should still be handled appropriately. □

Interview with Graduate Student Maggie Johnson

Tell us a bit about yourself. Where you are from, hobbies, etc.

Maggie in a nutshell— I love to spend time outdoors, fishing, hunting, and hiking. I was raised on a small ranch outside of Elk Mountain, Wyoming which exposed me to working outdoors, ranching, and enjoying fishing and hunting. Both my parents' passion for the outdoors really spurred me to find a passion where I can help conserve wildlife and agriculture and share my perspective with others.

What was your thesis research project? What did you do? What were your findings?

My thesis project was focused on Mycoplasma bovis bacteria, a common bacterial pathogen found in cattle which in 2019 and 2020 caused a large die off of North American Pronghorn in Gillette, Wyoming due to massive pleuropneumonia. This epizootic event was the first time M. bovis was ever isolated from pronghorn. My thesis has three major focuses; First, conducting surveillance for M. bovis in wildlife (pronghorn, mule deer, and white-tailed deer) by taking nasal swabs from these animals and testing them by PCR for M. bovis. Second, I conducted cell culture assays to explore the ability of different strains of M. bovis to adhere to different host cell types. Adhesion is the first step in the interaction between the host and Mycoplasma species. Lastly, I conducted an environmental persistence study to determine the pathogen's ability to remain viable outside on substrates (hay, water, dirt, mineral supplement) found in cattle habitat.

Can you explain more about the process when approaching a research project from start to finish?

Overall, conducting a research project from start to finish is such a multifaceted endeavor. There are highs and lows that come with balancing taking classes, your lab work, going out in the field, and most importantly writing about your findings. It can be very daunting in the beginning to know there is so much more to come and so many tasks at hand, but you go day by day and set goals for yourself to accomplish along the way and before you know it, your research is complete and you are sharing results.

What were some aspects of working on a research project that were most exciting or interesting to you?

I was lucky enough that my research involved multiple types of research. I spent plenty of time in the lab running PCRs, learning about cell culture, and infecting cells with bacteria, but also spent time in the field conducting field necropsies and taking nasal swabs with capture crews. Each of these was unique and exciting in its own way. I also really enjoyed being able to teach undergraduates and share what knowledge I could with them. I thought it was really exciting to with and collaborate with so many people that helped on my project, within the department and WSVL and outside agencies and researchers.

How was working with your faculty advisor? What assistance or advice did they provide in your research journey?

I got the pleasure of being Dr. Malmberg's first graduate student and have enjoyed the relationship we have built. From starting with an empty lab to ending with a functional lab that is growing with undergraduate, masters, and PhD students, as well as post-doctoral researchers, Jenn has been supportive of me every step of the way. I feel very lucky to have Jenn as my faculty advisor, she has encouraged me, kept me on track, and provided me with mentorship I hadn't found in my collegiate journey until now.

Any advice for students who want to pursue a graduate degree?

My advice for students looking to pursue a graduate degree is to find a project you really are interested and excited about and do what you can to pursue the research. Reach out to faculty advisors and see if they have any projects that align with your interests, you never know where you may end up!

What are your plans for the future?

I credit my future plans to all the experience I have gained from working at WSVL and in the Department of Veterinary Sciences throughout my undergraduate degree and my master's degree. After I officially graduate in August, I plan to continue living in Laramie and will work full-time for the Wyoming Game and Fish Department in the Wildlife Health Lab housed in WSVL. I hope to continue collaborating on projects with the Malmberg Lab and other labs here in the department for the foreseeable future.

QUOTABLE

"find a passion where I can help conserve wildlife and agriculture and share my perspective with others".

Interview with Graduate Student Tyler McLaughlin

Tell us a bit about yourself. Where you are from, hobbies, etc.

I am from Cherokee, IA and received my Bachelor of Science degree in biology from Iowa State University. I love doing anything outdoors. My fiancé and I spend our free time hiking, fishing, and playing boardgames. We also love spending time with our two cats, Mouse and Bella.

What was your thesis research project? What did you do? What were your findings?

My research project focused on improving analytical sensitivity of a quantitative PCR previously developed by a previous member of our lab, Dr. Noah Hull. To do this, I adopted a magnetic bead extraction approach and compared this new method to our current silica spin column kit. After optimization we found that we could utilize larger sample sizes using magnetic bead extraction and doing so lead to higher analytical sensitivity.

What were some aspects of working on a research project that were most exciting or interesting to you?

The most exciting aspect of working on a research project for me is achieving the results you were hoping for. Especially with PCR, you do not know how your experiment is going until you get the results.

How was working with your faculty advisor? What assistance or advice did they provide in your research journey?

I really enjoyed working under Dr. Schumaker. Our weekly meetings were probably the greatest assistance he gave me, especially during the pandemic. Every week, we had a scheduled meeting time where we discussed my project, classes, and anything else I wanted to discuss. We had a lot of constructive discussions about my project, and Dr. Schumaker provided great advice along the way.

Any advice for students who want to pursue a graduate degree?

I think the best advice I could give to student pursuing a graduate degree would be to find a position that will challenge yourself, especially for your master's. I was given this advice a long time ago and I fully agree with it.

What are your plans for the future?

In the short term, I am actively looking for positions around the country and will be getting married at the beginning of October. Ultimately, I hope to acquire a PhD in disease ecology. (Tyler will be pursuing a PhD degree at University of Wisconsin studying infectious diseases in bats.) ◘

Interview with Kurt-Swanson-Bucholz Extern Yesenia Rodriguez

Tell us a bit about yourself.

My name is Yesenia Rodriguez. I just completed my first year of vet school May 21, 2021. I was born and raised in Arizona, and am fortunate enough to be able to attend vet school at Midwestern University in Glendale, Arizona.

Tell us a bit about your background in veterinary medicine.

Like most aspiring veterinarians, I knew since I was a kid that I wanted to work with animals. I completed my bachelors in Biology with an emphasis on animal physiology and behavior. When I graduated in 2016 I worked as a Veterinary assistant for a few months working with cats, dogs, and small exotics. Due to some financial reasons I had to put my plans for vet school on hold and find a new job. This led me to work at a blood testing lab for a few years where I gained an appreciation for lab work. Once I felt financially stable I took on another veterinary assistant job at a small animal clinic and prepared for vet school applications.

What are some of the topics that you have researched in the past?

I have done undergraduate research on burrow hole density in human populated areas vs, non-populated areas.

I have also helped do research on axial musculature in ground dwelling snakes vs arboreal snakes.

What excites you about the opportunity to extern here at the University of Wyoming?

I am so excited to be able to learn about the different diagnostics in veterinary medicine. Being able to learn about parasitology, virology, pathology, bacteriology, histopathology, and serology is important to me because diagnostics are so important in the world of veterinary medicine. I'm also extremely grateful that I have been given this opportunity because I will get to do a research project on large strongyles in horses. This is such a great opportunity because there just is not a lot of research on these parasites and being able to be a part of that is amazing.

What are your plans at the completion of your externship?

My plans after completing the externship is to return to Arizona and take all the knowledge I have learned with me to help complete my next few years of school.

Anything else we should know?

I am absolutely so grateful for the Kurt-Swanson-Bucholz externship, it is such a great opportunity for me as a vet student to be able to do a research project and learn so much about diagnostic medicine. ◘

DEPARTMENT PUBLICATIONS

1. Functional connectivity in a continuously distributed, migratory species as revealed by landscape genomics. 2021. Melanie E.F. LaCava, Roderick B Gagne, Kyle D. Gustafson, Sara Oyler-McCance, Kevin L. Monteith Matthew J. Kauffman, Daniel J. Thiele, and Holly B. Ernest. In the journal, Ecography.

PhD student, now graduate, Melanie LaCava conducted this study for one of her PhD chapters in Holly Ernest's lab. Melanie, Holly, and team found three distinct genetic groups of mule deer in the western, northern, and southern parts of Wyoming, despite the fact that mule deer are a highly mobile species found throughout the state. Melanie and team identified features of the environment, such as elevation, habitat types and highways, that promote or inhibit the movement of mule deer genes across the state. This study was a broad collaboration among institutions and agencies including University of Wyoming, the Wyoming State Veterinary Laboratory, Wyoming Department of Game and Fish, the US Geological Survey, Colorado State University, Arkansas State University, Wyoming Cooperative Fish and Wildlife Research Unit, and others. This work sets the genetic foundation for our next project that examines how genetics impacts chronic wasting disease prevalence in mule deer throughout Wyoming.
Link to paper:
https://onlinelibrary.wiley.com/doi/10.1111/ecog.05600

Link to Wyoming Public Media feature, May 22, 2021:
https://www.wyomingpublicmedia.org/science/2021-05-22/wyoming-mule-deer-stick-together-in-three-distinct-genetic-groups

Uwyo News and media release on the paper
http://www.uwyo.edu/uw/news/2021/05/uw-study-reveals-environmental-characteristics-for-three-genetic-groups-of-wyoming-mule-deer.html

2. Translocations maintain genetic diversity and increase connectivity in sea otters, Enhydra lutris. 2021.Shawn Larson, Roderick B. Gagne, Jim Bodkin, Michael J. Murray, Katherine Ralls, Lizabeth Bowen, Raphael Leblois, Sylvain Piry, Maria Cecilia Penedo, M. Tim Tinker, Holly B. Ernest. In the journal, Marine Mammal Science.

A collaboration with lead author at the Seattle Aquarium and experts at institutions across the US, Canada, and France. Sea otters, once abundant along the nearshore waters of the North Pacific Ocean, have dwindled to very low numbers due to an expansive fur trade in the 19th and 20th centuries. The Southern Sea Otter in California is now listed as federally threatened. Holly Ernest with former postdoc, now Asst. Professor at University of Pennsylvania Erick Gagne, contributed genetic data, analyses, and expertise in the determination that reintroductions and growth of remnant groups have enhanced connectivity and gene flow between populations throughout many of the sampled Northern populations.This study provides evidence to expect that future reintroductions of otters to fill the gap between the California and Washington populations can ultimately restore genetic connectivity and genetic diversity to the isolated California population. This work sets a foundation for our following project that examines relationships between infectious disease causes of sea otter mortality and genetic relatedness.
Link to the paper: https://doi.org/10.1111/mms.12841

3. Burden and regional distribution of Toxoplasma gondii cysts in the brain of COBB 500 broiler chickens following chronic infection with 76K strain. Britta Beck, Thomas Grochow, Gereon Schares, Radu Blaga, Delphine Le Roux, Berit Bangoura, Arwid Daugschies, Simone A. Fietz. (2021) Vet Parasitol. 296:109497. doi: 10.1016/j.vetpar.2021.109497.

Toxoplasma gondii is a zoonotic pathogen that can cause brain inflammation in infected humans and animals including poultry. This study aimed at the parasite distribution in different brain areas of chickens and potential explanations why chickens are showing less clinical signs than infected mammals.

4. Dictyocaulus cervi-like lungworm infection in a rocky mountain elk (CERVUS CANADENSIS NELSONI) from Wyoming USA. Berit Bangoura, Bill Brinegar, Terry E. Creekmore. (2021) J Wildl Dis. 57(1):71-81. doi: 10.7589/JWD-D-20-00023.

Elk is known to host the bovine lungworm (*Dictyocaulus viviparus*). This case study describes the presence of another related lungworm in Wyoming elk that has not been described in Wyoming wildlife before and may have epidemiological and clinical relevance.

5. Survey of coyotes, red foxes and wolves from Wyoming, USA, for Echinococcus granulosus s. l. Parasitol Res. Michael J. Pipas, David R. Fowler, Katherine D. Bardsley, Berit Bangoura. (2021). 120(4):1335-1340. doi: 10.1007/s00436-021-07059-1.

Echinococcus granulosus is a small tapeworm in carnivores that may lead to cyst formation in inner organs of intermediate hosts like ruminants and humans that may show severe disease if infected. In this study, wolves and coyotes were shown to harbor and potentially spread the tapeworm in Wyoming, with wolves playing a seemingly more important role as hosts.

6. Iron activates microglia and directly stimulates indoleamine-2,3-dioxygenase activity in the N171-82Q mouse model of Huntington's disease. David W. Donley, Marley Realing, Jason P. Gigley, and Jonathan H. Fox. 2021. In the journal, PloS One.
https://doi.org/10.1371/journal.pone.0250606

The study demonstrates that elevated iron intake in early life (modelling an iron-supplemented diet) promotes neuroinflammation in the brains of adult mice. David Donley was a graduate student in the department. Marley Realing was an undergraduate student in the microbiology program, and is currently in medical school at the University of Washington. Dr. Gigley is in the department of Molecular Biology.

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