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

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WYOMING STATE VETERINARY LABORATORY
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UPDATES

Welcome to the new WSVL/Veterinary Sciences Department newsletter! The goal of this Newsletter is to keep our WSVL veterinary clients, as well as other stakeholders, alumni, and friends current on activities, announcements, news, and other happenings from the Department. While a relatively small department with 13 faculty we have a lot going on. In addition to the WSVL, there are numerous and varied research projects, and faculty are active in teaching in a variety of undergraduate programs, as well as at the graduate level.

Thanks to support from the University and State, the University of Wyoming Biocontainment Facility, based within the department, is functional and we are working towards the process of registration with the CDC for select agent work. To highlight these and other topics we are planning to have an edition every quarter. We hope that all of our stakeholders will find something informative and enjoyable to read.

The last year has been a difficult time for us all due to the pandemic, and now budget cuts at UW. Despite these challenges there are plenty of good things to report. The newsletter will enable us to not only provide disease updates from the WSVL but also focus on progress and professional accomplishments from faculty and staff. Thank you to the faculty that made time out of their busy schedules for contributing and to Gabriel Lattimer, our office associate, who is doing all the editorial work.

Dr. Jonathan Fox,
Department Head

UW College of Agriculture and Natural Resources Veterinary Sciences

It goes without saying that the past 12 months have been challenging for all of us. The impact of quarantines, social distancing and other pandemic control measures has been significant on WSVL operations. It hasn't been easy but we have done our best to fulfill our service, research and teaching mission, providing animal diagnostic testing for the state of Wyoming.

Last summer President Siedel asked the WSVL to implement an extensive surveillance and diagnostic testing program for SARS CoV-2 infections, the causative virus of COVID-19, in students, staff and faculty at the University of Wyoming. The goal of the program is to quickly identify infections and remove them from the campus community to maintain the safety of the campus and surrounding community and to continue university operations as near to normal as possible. Our diagnostic staff and faculty embraced this challenge and worked tirelessly to get this program up and running as quickly as possible. The result is one of the most extensive testing programs for SARS CoV-2 of any institution of higher education in the country. As you read this, we will have exceeded 100,000 samples tested since October. I am very proud of our staff for stepping up to take on this important project in addition to their animal disease diagnostic duties.

Now that spring is finally here and COVID cases appear to be declining, we can begin to move beyond the pandemic and focus on some exciting new initiatives in the WSVL. More on those in upcoming newsletters.

Dr. Will Laegreid,
WSVL Director

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RABBIT HEMORRHAGIC DISEASE IN WYOMING

By: Dr. Jacqueline Kurz

Dr. Jackie Kurz is the newest veterinary pathologist to join the WSVL. She attended veterinary school at the University of Edinburgh, then completed her residency in anatomic pathology and earned her PhD in dairy cattle genetics at Utah State University. She has a particular interest in ruminant pathology.

A wild, adult, cottontail rabbit was found dead in Albany County, Wyoming last December, and was submitted by Wyoming Game and Fish to the WSVL for plague, tularemia, and rabbit hemorrhagic disease (RHD) testing. Samples of liver and spleen were taken for these tests on necropsy, and several tissues collected for histopathology. This rabbit was in good body condition, and a cause of death was not evident. No lesions suggestive of plague, tularemia, or RHD were macroscopically evident.

However, on histopathology, the cells throughout the liver, which should be arranged in contiguous cords, were dissociated from each other and showed evidence of severe damage or were dead. Additionally, lymphoid tissue within the spleen was necrotic (dead). No abnormalities were found in other tissues examined microscopically.

This was a case of RHD, confirmed by antigen ELISA and PCR by the Foreign Animal Disease Diagnostic Laboratory. This disease is caused by infection by rabbit calicivirus. Several strains of this virus exist, with differing pathogenicity to rabbit populations. This strain, RHDV2, is capable of causing high mortality in rabbits and hares of all ages, both domestic and wild. This is the first rabbit in Wyoming confirmed to be infected with RHDV2.

This disease is rapidly fatal in rabbits and hares, which means that most will be in good body condition and may look healthy overall. Unexpected death may be the only presenting sign. Because of the effects of the virus on the vascular system, bleeding from the nose (epistaxis) may be apparent, but this is not a consistent feature.

Internally, the liver may appear pale or soft, and the lungs may have dark areas indicative of hemorrhage. However, as in the current case, there may be no macroscopically appreciable abnormalities either externally or within the internal organs.
The classic histopathology lesions are hepatic necrosis and splenic lymphoid necrosis – the lesions seen in this rabbit – as well as hemorrhages in the lungs and vascular thrombi in various tissues.

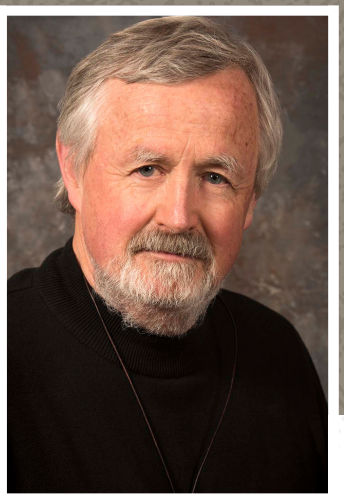
It is important to note that this is a highly contagious disease associated with high mortality. The virus is capable of surviving for long periods in the environment and on contaminated objects, is resistant to some disinfectants, and very few virus particles are required for a rabbit to become infected. Insects and animals scavenging on rabbit carcasses may contribute to virus spread, although only rabbits become ill from the virus. Therefore, the potential for this disease to spread rapidly among rabbit populations is high, and, as such, this is a reportable disease. This disease appeared in California in May of 2020, and since has been detected in Nevada, New Mexico, Arizona, Texas, Utah, Colorado, and now Wyoming. Some of these cases have been in wild rabbits or hares, while others have been in domestic rabbits.

Because of the devastating potential of this disease on rabbits and hares, the public is advised to immediately report unexplained deaths in rabbits and hares to Wyoming Game and Fish (wild rabbits and hares) or a veterinarian (domestic rabbits), particularly if bleeding from the nose is noticed. Rabbit and hare carcasses should be handled with great care to minimize the risk of spreading the virus to other wild or domestic rabbits. Any rabbits or hares submitted to the WSVL where a suspicion of RHD exists should be clearly labeled as such; wild rabbits and hares should be submitted through Wyoming Game and Fish. □

UPDATE: As of 3/18/21, there have been 22 additional cases from WY involving cottontail and jackrabbits. Cases were from Teton, Laramie, and Albany counties.

MYCOPLASMA BOVIS PNEUMONIA IN COMMERCIAL BISON

By: Dr. Donal O'Toole



Most food animal veterinarians are familiar with mycoplasmosis in cattle. On the diagnostic side, we most commonly see it in weaned beef cattle, as well as in young calves. It generally presents as a subacute-chronic polymicrobial pneumonia in weaned cattle, commonly after 1 or more rounds of unavailing antibiotic treatment. In some it is associated with polyarthritis and/or otitis media. There was disagreement in the past about the importance of *Mycoplasma bovis* in bovine respiratory disease (BRD) complex. The consensus is that, except in very young calves where it can be a primary pathogen, its role is to complicate infection due to the common conventional bacterial BRD culprits, and extend the clinical course of pneumonia. Gross and histological features of longstanding pulmonary mycoplasmosis in cattle are often characteristic. The anteroventral portions of affected lungs contain multiple distinctive 1 mm - >1 cm white caseonecrotic nodules **(IMAGE 1)**. It is common to find *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni* and/or *Trueperella pyogenes*, in addition to *M. bovis*, in such lesions. Outbreaks involving *M. bovis* can be frustrating to control. The organism resists many commonly-used antimicrobial agents, due to its lack of a cell wall, which is the target of many antimicrobials. Many aspects of the ecology of *M. bovis* remain poorly understood.[1]

Laboratory diagnosis at the WSVL of bovine mycoplasmosis is based on PCR detection, finding caseonecrotic lesions in lungs, and, in some cases, immunohistochemistry. Unless you ask us to do so or we suspect we are dealing with an unusual strain of *M. bovis*, we generally don't attempt culture. Isolation requires special growth media, time, and technical expertise. For that reason it is not a popular hobby among laboratory personnel. *M. bovis* has fastidious growth requirements and does not remain viable for long in autolyzed samples. Commercial vaccines are generally ineffective in spite of *M. bovis* having highly immunogenic surface lipoproteins (phase- and size-variable membrane surface lipoprotein antigens; Vsps).[2] The high spontaneous rate of Vsp phenotypic switching due to DNA re-arrangements makes *M. bovis* a moving immunological target and allows it survive for extended periods in the host animal.

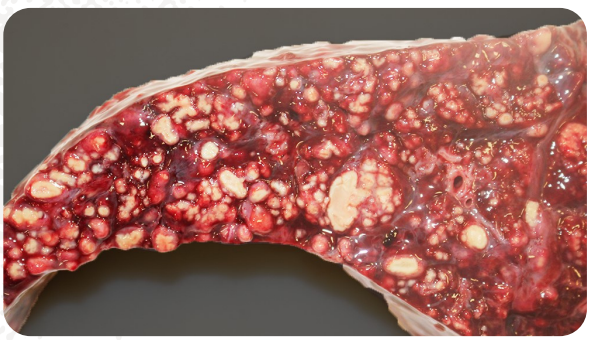


IMAGE 1: Typical small discreet white caseonecrotic foci in sliced lung of backgrounded bovine calf that died of anteroventral bronchopneumonia. Tissue positive by PCR for *Mycoplasma bovis*.
WSVL #16B29149.

IMAGE 2: Large abscess in lung of a thin yearling bull bison. Several large abscesses were present, some resulting in pleural adhesions. Tissue was positive by PCR for *Mycoplasma bovis*. *Trueperella pyogenes* and *Pasteurella multocida* were also present in affected lung. Image: Dr. Tim Dawson.
WSVL #21N2046.

"A recent producer survey found that common signs in affected bison were dyspnea, coughing, reluctance to move, and swollen joints"

Starting around 1999, North American producers and veterinarians began to recognize *M. bovis*-associated pneumonia in bison. Unlike in cattle, clinical cases in bison affected older animals, often 3 or more years.[3] Another difference is that some *M. bovis* isolates from bison can cause pulmonary disease in experimentally challenged bison yet not in cattle.[4] Some *M. bovis* strains are unique to bison.[5] The number of peer-published accounts of outbreaks is limited, but bison producers reported high mortality rates, some of them approaching 30%. Such rates are unusual in feedlots where BRD outbreaks involve *M. bovis*. A recent producer survey found that common signs in affected bison were dyspnea, coughing, reluctance to move, and swollen joints,[3] The syndrome can be recurrent over successive hears in affected herds. Many infected bison with overt pneumonia either die or require euthanasia. Some herd owners report rejection of bison carcasses at slaughter due to severe lung lesions in survivors, indicating that some do survive but with extensive pulmonary damage. The stigma associated with mycoplasmosis in bison operations results in some producers being reluctant to investigate or discuss suspected outbreaks. We diagnosed several episodes in Wyoming bison herds in 2020 and 2021. Lesions included multiple small caseonecrotic foci that are similar to those seen in cattle. Bison may have dramatically large abscesses containing up to 7 liters of purulent or semisolid exudate, some with extensive fibrous adhesions **(IMAGE 2)**. If you find lesions like this in bison, particularly when multiple animals are affected and responses to antibiotics were disappointing, *M. bovis* is a possibility you should consider.

Serology for *M. bovis* is of limited value when assessing the status of individual bison with pneumonia, but can be helpful at a herd level. Clinically healthy bison in unaffected herds can carry the organism in their upper respiratory tracts. Few commercial vaccines exist for *M. bovis*. The current practice among bison owners is to use autogenous products. Several such vaccines are used for problem herds. Their efficacy is unknown. Generally they contain several strains isolated from bison that died with *M. bovis* pneumonia. If you are dealing with a confirmed outbreak of mycoplasmosis in bison and wish to pursue an autogenous vaccine, please let WSVL's bacteriology unit know so that its folks can attempt isolation. Drs. Sondgeroth and Malmberg are particularly interested in mycoplasmosis and wish to pursue it both diagnostically and as a research target. This is due in part to a recent collaborative investigation they did with Wyoming Game and Fish personnel of a die off in pronghorn involving *Mycoplasma bovis*.[6] (for footnotes see page 6)

PUBLICATIONS

Here are some recent peer-reviewed papers from our faculty, staff, students, and collaborators. Contact the authors if you have questions or would like a pdf copy.

- Ecol Appl. 2020 Sep;30(6):e02129. doi: 10.1002/eap.2129. **Chronic wasting disease undermines efforts to control the spread of brucellosis in the Greater Yellowstone Ecosystem.** Matthew Maloney, Jerod A Merkle, David Aadland , Dannele Peck, Richard D Horan, Kevin L Monteith, Thach Winslow, Jim Logan, David Finnoff, Charles Sims, Brant Schumaker

- Emerging Infectious Diseases, 2020 Nov, 26(12):2807-2814. DOI: 10.3201/eid2612.191375 ***Mycoplasma bovis* Infections in Free-Ranging Pronghorn, Wyoming, USA.** Malmberg JL, O'Toole D, Creekmore T, Peckham E, Killion H, Vance M, Ashley R, Johnson M, Anderson C, Vasquez M, Sandidge D, Mildenberger J, Hull N, Bradway D, Cornish T, Register KB, Sondgeroth KS.

  "This paper represents the first report of *Mycoplasma bovis* (*M. bovis*) in free-ranging pronghorn. In addition to documenting this important bacterial disease in a new species for the first time, this paper characterizes the pathology and the genetics of the infection in this novel host. We show that M. bovis causes acute, fatal pneumonia in pronghorn. We also show that the bacterial strain isolated from pronghorn is genetically unique compared to strains from cattle and bison; however, more research is needed to adequately compare strains across hosts".

- J Wildl Dis, 2021 Jan https://doi.org/10.7589/JWD-D-20-00034 . **Detection of Deer Atadenovirus A DNA in Dam and Offspring Pairs of Rocky Mountain Mule Deer (Odocoileus hemionus hemionus) and Rocky Mountain Elk (Cervus canadensis nelsoni).** Kayla M. Kauffman , Todd Cornish, Kevin Monteith, Brant Schumaker, Tayler LaSharr, Katey Huggler, Myrna Miller.

- The Veterinary Clinics of North America. Food Animal Practice, 2020, 36(1). **Ruminant Coccidiosis.** Bangoura, B., & Bardsley, K. D.

- Vaccines (Basel), 2021 Jan 26;9(2):90. doi: 10.3390/vaccines9020090. **OvHV-2 Glycoprotein B Delivered by a Recombinant BoHV-4 Is Immunogenic and Induces Partial Protection against Sheep-Associated Malignant Catarrhal Fever in a Rabbit Model.** Smriti Shringi, Donal O'Toole, Emily Cole, Katherine N Baker, Stephen N White, Gaetano Donofrio, Hong Li, Cristina W Cunha

- Journal of Mammalogy, Volume 101, Issue 4, 31 August 2020, Pages 1061–1071, https://doi.org/10.1093/jmammal/gyaa054. **Pronghorn population genomics show connectivity in the core of their range.** Melanie E F LaCava, Roderick B Gagne, Sierra M Love Stowell, Kyle D Gustafson, C Alex Buerkle, Lee Knox, Holly B Ernest.

  "This study examined the population genetics and ecology of pronghorn, across multiple habitats and throughout Wyoming – research at large landscape scales that had never been done previously. First author PhD Candidate Melanie LaCava conducted the work in the Wildlife Genomics and Disease Ecology Lab of her mentoring professor, Dr. Holly Ernest, a UW Professor and Wyoming Excellence Chair. Melanie discovered that pronghorn have genetic connectivity throughout the state. While pronghorn behavior is severely impacted by highways, roads, fencing and other forms of human development, the species also exhibit flexible social and migratory behavior, and that leads to wide dispersal of their genetics. Collaborations included Wyoming Department of Game and Fish, others in our and other UW departments, and other universities".

- J Vet Diagn Invest. 2021 Jan;33(1):101-103. doi: 10.1177/1040638720966960. Epub 2020 Oct. **Fatal Chlamydia psittaci infection in a domestic kitten.** Hailey Sanderson, Marce Vasquez, Hally Killion, Madison Vance, Kerry Sondgeroth, Jonathan Fox. This paper describes findings in the first confirmed case of *Chlamydia psittaci* infection in a domestic cat. The infection resulted in severe hepatitis and pneumonia.

- Trends in Ecology and Evoluation. 2021 DOI: https://doi.org/10.1016/j.tree.2021.01.008 **Bioaccumulation of Pathogen Exposure in Top Predators.** Jennifer L. Malmberg, Lauren A. White, Sue VandeWoude.

  "Predator–prey interactions present heightened opportunities for pathogen spillover, as predators are naturally at risk of exposure to infectious agents harbored by prey. Some prey-to-predator spillover events result in severe disease with significant conservation implications, while others are clinically silent in the predator host. In this paper, we use a detailed case study in felids to highlight the risk and varied outcomes of spillover in an apex predator as an important but overlooked aspect of conservation medicine and predator ecology".

THE UNIVERSITY OF WYOMING BIOCONTAINMENT FACILITY

Above: COVID Testing at the UW Biocontainment Facility
Below: Dr. Elizabeth Di Russo Case

We are pleased to introduce Dr. Elizabeth Di Russo Case as a recent addition to our faculty. Dr. Case is an Assistant Professor and was recruited from Texas A&M University. She is the Scientific Director of the University of Wyoming Biocontainment Facility (UWBF) located within the department, and is also going to teach and develop her research program. Dr. Case studies the molecular interactions of pathogens with their hosts. She has focused her efforts on bacterial diseases that domesticated animals and wildlife can pass to humans. Her research is focused on investigating *Coxiella burnetii*, the infectious agent of human Q fever which is also a common cause of abortion in small ruminants in Wyoming, and also an important zoonosis.

The newly remodeled UWBF will serve as a research center for studies of infectious diseases that affect the health of animals and humans.

It provides approximately 2,500 square-foot of biosafety level 3 (BSL3) laboratory space. This specialized containment suite allows for safe research with pathogens that cause severe disease or respiratory illness through inhalation of aerosols. The UWBF includes a large necropsy room, where animals potentially infected with zoonotic diseases such as Q-fever, and brucellosis can be studied. The UWBF also houses a select agent repository, and laboratories where biological agents and toxins that have the potential to pose a severe threat to public health and safety can be contained and studied. The facility has a range of engineered features and equipment to ensure the safety of laboratory personnel and the environment.

The UWBF is currently operational for BSL3 level pathogens that are not select agents. Dr. Case is a key member of the team that is working toward the laboratory being registered with the CDC for work with select agents. This group includes Denise Merrill (Biocontainment manager) and Madeline Dalrymple, Ellie Riske, and Molly West. They are currently developing documentation for submission to the CDC for review as part of the select agent registration process. In the meantime, the university's COVID-19 surveillance and testing program is housed within the UWBF. This has been instrumental in refining our safe research practices and procedures in the newly minted research space. Select agents include a number of pathogens that are important in Wyoming, not only the agent of Q-fever, but also brucellosis, tularemia, and plague. We are fortunate to welcome Dr. Case to our department.

EXTERNAL COMPETITIVE GRANTS RECEIVED

Title: BFP 19 Ethiopia AH@Wyoming
Sponsor: Foreign Agricultural Services/Department of Agriculture
Veterinary Sciences Faculty: Dr. Brant Schumaker

Title: RWO 204: Using genetic analyses to inform on-the-ground conservation for multiple sagebrush-associated wildlife species
Sponsor: U.S. Geological Survey/Department of the Interior
Veterinary Sciences Faculty: Dr. Holly Ernest

Title: California Black Bear Genetics
Sponsor: California Department of Fish and Wildlife
Veterinary Sciences Faculty: Dr. Holly Ernest

Title: Environmental CWD transmission
Sponsor: Knobloch Family Foundation
Veterinary Sciences Faculty: Dr. Brant Schumaker

Title: Environmental Pathways of CWD Transmission
Sponsor: U.S. Geological Survey/Department of the Interior
Veterinary Sciences Faculty: Dr. Brant Schumaker

Title: Pasteurella multocida associated with sinus tumors in BHS
Sponsor: Wyoming Game and Fish Department
Veterinary Sciences Faculty: Dr. Kerry Sondgeroth

FACULTY AND STAFF

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WSVL Director, Professor

Dr. Gerard Andrews
Associate Professor, Director - Microbiology Program

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Assistant Professor, Scientific Director UW Biocontainment Facility

Dr. Todd E. Cornish
Associate Professor, Pathologist

Dr. Holly Ernest
Wyoming Excellence Chair/ Professor

Dr. Jacqueline Kurz
Assistant Clinical Professor, Pathologist

Dr. Jennifer Malmberg
Assistant Professor, Pathologist

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Research Scientist, Biocontainment Manager

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Samantha Clinton
Laboratory Technician III, Regulatory Serology

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Aleksandra Gizejewska-Fattebert
Laboratory Technician III, Toxicology

Elizabeth Butkus
Laboratory Technician III, Virology

Jennifer McKenna
Laboratory Technician III, Virology

Marce Vasquez
Laboratory Technician III, Virology

Leslie Sims
Laboratory Technician I, Case Research Lab

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HAVE FEEDBACK?

Please let us know if you have any suggestions or feedback on this newsletter. Send comments to glattime@uwyo.edu.

Footnotes from MYCOPLASMA BOVIS PNEUMONIA IN COMMERCIAL BISON by Donal O'Toole

1. Calcutt MJ et al.: 2018, Gap analysis of *Mycoplasma bovis* disease, diagnosis and control: an aid to identify future development requirements. Transbound Emerg Dis. 65 Suppl 1:91-109. doi: 10.1111/tbed.12860. Epub 2018 Mar 27.

2. Perez-Casal J et al: 2017, Status of the development of a vaccine against *Mycoplasma bovis*. Vaccine 2017, 35, 2902–29073. 3. Bras AL et al.: 2017, Clinical presentation, prevalence, and risk factors associated with *Mycoplasma bovis*-associated disease in farmed bison (Bison bison) herds in western Canada. J Am Vet Med Assoc. 250(10):1167-1175.

4. Register KB et al.: 2018, Relative virulence in bison and cattle of bison-associated genotypes of *Mycoplasma bovis*. Vet Microbiol. 2018 Aug;222:55-63. doi: 10.1016/j.vetmic.2018.06.020. Epub 2018 Jun 30

5. Register KB et al,: 2019, Comparison of multilocus sequence types found among North American isolates of *Mycoplasma bovis* from cattle, bison, and deer, 2007-2017. J Vet Diagn Invest. 2019 Nov;31(6):899-904. doi: 10.1177/1040638719874848. Epub 2019 Sep 11

6. Malmberg JL et al.: 2020, *Mycoplasma bovis* infections in free-ranging pronghorn, Wyoming, USA. Emerg Infect Dis. 26(12):2807-2814. doi: 10.3201/eid2612.191375 .

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THE WORLD NEEDS MORE COWBOYS.