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In This Issue

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From the Editor – As I write this, I am in Salt Lake City for the American Association of Bovine Practitioners annual conference. It is fantastic to be back in-person catching up with friends and colleagues. There have been a number of presentations that undoubtedly will serve as fodder for future newsletter articles, and a few conversations have spurred thoughts for potential research collaborations.

The icing on the cake was the strong showing by our team of WSU veterinary students in the all-important Quiz Bowl that matches teams of students from the various veterinary colleges. Cougar Pride was on display so keep your eyes out for our team members Emily Violini, Jewel Toenges, Tanya Weber and Clara Maxam who surely will be movers and shakers in the veterinary profession in years to come!

The bottom line is that it is often interactions within our professional networks that help us think outside the box and move forward with our own endeavors. I bring this up because the next couple of months offer several opportunities for catching up with folks from various livestock associations or through our upcoming WSU Fall Veterinary Continuing Education Event on October 30th. See below for details related to several of these CE and association events.

On a final note related to CE, I want to mention that we currently are wrapping up analyses from our various summer research projects and will be rolling out some in-person meetings to bring results to the veterinary community. One of the products we're finalizing is a Calf Field Necropsy Lesion Guide (see below for Lisa Shaw's senior paper summary related to this). If anyone is interested in learning more about this or having a field day related to on-farm postmortem exams, please let me know (cmcconnel@wsu.edu). I hope you enjoy this edition of the newsletter and look forward to connecting with many of you in the coming months.

Small Ruminants: Nonprotein Nitrogen Poisoning

By CS McConnel, Veterinary Medicine Extension

WSU Field Disease Investigation Unit (FDIU) personnel recently helped investigate sudden deaths in a flock affected with non-protein nitrogen (NPN) poisoning. Per the Merck Manual, NPN poisoning (toxicosis) results from excessive consumption of sources of NPN such as urea. Poisoning by ingestion of excess urea or other sources of NPN is usually acute, rapidly progressive, and highly fatal. Sources of NPN have different toxicities in various species, but mature ruminants are affected most. After ingestion, NPN undergoes hydrolysis and releases excess ammonia (NH_3) into the GI tract, which is absorbed and leads to hyperammonemia.

The flock that presented to FDIU had been provided a highly palatable protein tub to supplement relatively poor conserved forage. Although this flock had been exposed previously to protein tubs, the tub of note was produced by a different company and had a more easily consumed texture that led to increased consumption. Affected sheep demonstrated clinical signs within an hour or two of exposure and dominant individuals were more severely affected with several dying prior to veterinary intervention which included oral administration of vinegar and supportive therapy including IV fluid therapy (isotonic saline) and IV administration of calcium gluconate and magnesium solutions in select cases. Analytical confirmation of NPN can be extremely challenging due to the volatile nature of ammonia and the need to collect and freeze all biologic samples while animals are clinically affected or within 30 minutes of death. Samples to collect include serum, ocular fluid, and rumen contents for ammonia testing; along with the NPN source to confirm label composition.

There are various online resources detailing urea and NPN feeding to sheep and cattle including a fact sheet available through Colorado State University Extension. For a deep dive into feeding and managing sheep during drought, you might enjoy perusing a bulletin put together by the Department of Agriculture and Food in Western Australia, or a guide for drought feeding and management of sheep published by the Department of Primary Industries and Meat and Livestock Australia. A fundamental point is that when low carbohydrate rations are fed, clinical signs of toxicity can be seen from as little as 0.3 grams urea per kilogram of body weight (0.14 grams urea/lb of body weight) in animals that have not been fed urea previously. As we saw in the case presented to FDIU, this level of intake can occur incredibly quickly and to the detriment of animals unaccustomed to the NPN source. Consequently, once the decision is made to feed NPN, animals must be adapted slowly to and maintained on a consistent dietary NPN content with no notable deviations.

Cattle: Controlling Internal Parasites

By CS McConnel, Veterinary Medicine Extension

Optimal approaches for controlling internal parasites in cattle are of constant interest for producers and veterinarians alike. Proceedings from last year's American Association of Bovine Practitioners annual conference included an excellent article by Ray Kaplan from the University of Georgia focused on untangling conflicting messages related to this topic. Dr. Kaplan pointed out that a new class of anthelmintic was introduced into the marketplace approximately each decade beginning with phenothiazine in the 1950s through to the avermectin/milbemycins (AM) class in the 1980s. These highly effective and relatively inexpensive drugs led to recommendations for parasite control that were based on the frequent and/or strategic use of anthelmintics. This approach was successful over the decades but has resulted in ever-increasing levels of anthelmintic resistance in all drug classes, involving virtually all the most economically important parasites of all livestock species. Although we do not know how severe and widespread the problem is nationally, studies suggest that resistance to drugs such as AM is both common and widespread.

Second generation drugs within the AM class have provided some improvements but AM resistance demonstrates a class effect—meaning that resistance to a given AM drug tends to confer resistance to all AM drugs. Furthermore, no novel classes of drugs have become available in the US since ivermectin in 1981, even though the new drug monepantel (Zolvix®) is sold throughout much of the world for sheep. Although limited research has investigated the best approaches to reduce the rate with which anthelmintic resistance evolves in cattle, it would seem logical to follow some of the evidence-based recommendations for sheep.

There are several approaches that have proven effective in reducing the rate with which resistance develops in sheep nematodes: 1) using drug combinations from different drug classes administered at the same time, 2) leaving a percentage of the flock untreated, 3) treating selectively based on some measure of parasitism or growth rate, and 4) not treating the ewes and only treating the lambs. That said, differences between sheep and cattle suggest that these strategies may need adapted to overcome difficulties to implementation or impacts on efficacy. For example, not treating cows is unlikely to provide as much benefit as not treating ewes due to differences between the parasite species of importance and host-parasite interaction.

Testing the efficacy of drugs with a fecal egg count reduction test (FECRT) is the best way to determine which drugs are effective on a farm. With this knowledge in hand, it is optimal to use two drugs in combination while leaving 10-20% untreated (selected from the most robust animals) to provide untreated, drug-susceptible refugia. This is an effective strategy to diminish egg shedding, reduce subsequent pasture contamination and reinfection, and dilute out the small number of resistant worms that survive the treatment, thus maintaining a predominantly drug-susceptible worm population.

It is worth noting that resistance develops slowly over many years and is undetectable during this time. However, the last phase of resistance development can happen quite quickly suggesting that the FECRT should be repeated every few (2-3) years. Additional recommendations regarding the management of anthelmintic resistance in livestock are available within the Ruminant Parasitology issue of Veterinary Clinics of North America: Food Animal Practice.

Clearly there is no such thing as a one-size-fits-all parasite control program for cattle. It is important to recognize that any recommendations will not be accepted uniformly by all parasitologists and veterinarians who work with cattle. Nonetheless, there are general recommendations per Dr. Kaplan:

- Beef cows in poor body condition due to suboptimal winter nutrition should be given a treatment in the late winter typically just prior to calving.
- Cows housed in confinement systems where they have little access to pasture may not gain much benefit from treatment and confinement operations may want to conduct on-farm studies to determine if deworming is beneficial.
- Stockers and replacement heifers are at the greatest risk for production loss from parasites, and anthelmintics are important to their health and production using strategic treatments, resistance mitigating approaches, and sound pasture management.

Ultimately, keep in mind that constant vigilance to changes in the host-parasite-environment dynamic (including the emergence of drug resistance) is required. As noted above, the risk/problem of anthelmintic resistance must be considered as drug resistance is extremely common and worsening all the time.

Dairy: Journal of Dairy Science Snippets

By CS McConnel, Veterinary Medicine Extension

There have been several interesting articles of note published within the Journal of Dairy Science over the past few months. This is an attempt to highlight diverse topics without providing excessive content. Not all articles are open access, but Abstracts are available to all.

In the July issue (Vol. 104, Issue 7) Burgers et al. published an open access article investigating the effects of an extended voluntary waiting period (VWP) from calving until first insemination on body condition, milk yield, and lactation persistency. This study was conducted in the Netherlands within a research herd of 500 Holstein-Friesian cows. Cows were assigned to one of three VWP (50, 125, or 200 d) and monitored through one complete lactation and the first six weeks of the subsequent lactation, or until culling. Minimum and mean calving intervals increased with increasing VWP (384 vs. 452 vs. 501 d, respectively). However, the VWP did not affect milk yield per day of the calving interval and did not affect fat- and protein-corrected milk yield (FPCM) per day of the calving interval for primiparous cows. FPCM was lower in multiparous cows with a 200-d VWP, but FPCM was similar in multiparous cows with either a 50- or 125-d VWP. Overall, the findings suggested that the VWP could be extended from 50 to 125 days without an effect on daily yield per day of the calving interval in both primiparous and multiparous cows.

In the August issue (Vol. 104, Issue 8) Zimpel et al. published an article investigating the effects of the maternal level of dietary cation-anion difference (DCAD) fed to prepartum nulliparous cows during the last 22 days of gestation on offspring acid-base balance, metabolism, and growth. This study was conducted at the University of Florida utilizing a total of 132 apparently healthy nulliparous Holstein cows pregnant to timed AI. Three DCAD levels were evaluated: +200, −50, or −150 mEq/kg of dry matter. DCAD levels did not affect acid-base balance in calves, as all calves were born with metabolic and respiratory acidosis that reversed by 1 day of age. This suggested that either the overwhelming effect of respiratory acidosis that calves are born with
or placental control of ion transport prevents maternal acid-base balance perturbations from further affecting the newborn acid-base balance. Overall, maternal DCAD did not affect calf birth weights, colostrum IgG content fed to calves, apparent efficiency of IgG absorption, intake of milk or starter grain, daily weight gains or measures of feed efficiency. The take-home message was that manipulating the DCAD of pregnant nulliparous dams during late gestation did not affect offspring performance in the first 2 months of age.

Another open access article (Swinkels et al.) within the August issue compared quarter and cow level selective dry cow treatment using the California Mastitis Test (CMT). Selective cow level treatment is well supported in the literature and designed to use antibiotics only in infected cows at dry off. However, in the absence of alternative strategies for preventing new infection, such as an internal teat sealant, this approach can lead to an increase in the risk for new intramammary infections. Selective cow level treatment is typically performed at the cow level because quarters have been considered interdependent within cows and an increased risk of infection is perceived in uninfected quarters in infected cows. However, quarter interdependence may be less marked with environmental than contagious mastitis pathogens because the risk of new infection from the environment is assumed to be the same for all four quarters. Ultimately, the objective of this study was to compare antibiotic use and dry period outcomes of selective quarter-level treatment (SQLT) and selective cow-level treatment (SCLT), in dairy herds in the United Kingdom, using CMT (≥1 or ≥2) to determine infection status at the quarter level at dry off. The hypothesis was that selecting antibiotic dry cow therapy at the quarter rather than cow level could further refine antibiotic use without detriment to udder health. All quarters of all enrolled cows received an internal teat sealant and cows were divided into high cell count (≥200,000 cells/mL or clinical mastitis) or low cell count (<200,000 cells/mL, no clinical mastitis) groups based on the previous three months of lactation and clinical mastitis history. The summary findings justified leaving CMT-negative quarters untreated in cows with cow level SCC ≥200,000 cells/mL at dry off. Additionally, the use of antibiotics in CMT-positive (CMT ≥ 1) quarters of low SCC cows at dry off (<200,000 cells/mL, no clinical mastitis) was shown to be *unnecessary* and unlikely to result in significant gains in udder health. The conclusion was that on well-managed farms with a low prevalence of major pathogens and a predominant environmental mastitis etiology, SCLT in *high cell count cows* can achieve a substantial reduction in antibiotic use with only minor consequences for udder health.

On a more philosophical level, the September issue (Vol 104, Issue 9) included an Invited Review by Brown and Bradford that explored the mechanisms of inappetence (hypophagia) during disease. This article is of particular

interest to our FDIU research team given our ongoing research into neonatal calves and the relevance of disease-induced hypophagia on their management. Obviously, this is a topic that spans dairy populations including mature cows transitioning to lactation or experiencing diseases such as metritis or mastitis. Ultimately, the mechanisms controlling feed intake (FI) in diseased animals are complex and should be appreciated within the context of the natural adaptive mechanisms the animal uses to fight off infection. Signaling from the immune system during disease occurs both centrally and peripherally to decrease FI, but it remains difficult to predict the degree and duration of FI depression based on immense variation in factors such as pathogen type and load, immunocompetency, and plane of nutrition.

Anorexia during disease can be a natural mechanism of host defense with at least four plausible benefits. First, animals that are sick are more likely to have ingested pathogens recently, and hypophagia limits the oral introduction of additional pathogens. Second, in prey species such as cattle there would likely be an evolutionary advantage to limiting grazing during disease to avoid predation. A third mechanism that may be more broadly beneficial is the reduced availability of trace minerals (particularly iron) to inhibit bacterial survival due to decreased intake as well as mineral sequestration by acute-phase proteins. Finally, both a lack of glucose availability and increased ketone body concentrations induced by hypophagia contribute to controlling systemic inflammation, providing negative feedback on immune-initiated inflammatory signaling.

Cytokines produced by immune cells, such as IL-1β and TNF-α, play a critical role in actively reducing FI, with the most potent action occurring in the central nervous system. Other factors potentially affecting feed intake during disease include acute-phase proteins and leptin, a hormone produced by adipose tissue that acts on the hypothalamus to reduce FI. Ultimately, disease and inflammation have a marked effect on gastrointestinal motility and secretions, with consequences for the animal's ability to consume food. It must be pointed out, however, that the effects of an immune response on passage rate and gastric function are confounded with reduced FI, because meals trigger increased gastrointestinal motility. Therefore, an assertion of the ability of cytokines or other immune factors to directly mediate these responses should be interpreted cautiously.

Monitoring FI can help implement intervention strategies for impending disease insults given that perturbations in FI can be detected prior to visual disease diagnosis. Because this response is so broadly associated with general illness behavior—which may be initiated by anything from a respiratory infection to poor liver function—there is no universal treatment that is likely to be appropriate for animals experiencing depressed FI. Generally, cattle showing hypophagia are subjected to closer scrutiny, including comprehensive physical examination, and a diagnosis stemming from such examinations can motivate condition-specific treatment. However, this leaves open the question as to whether hypophagia can—or should—be addressed directly given that it is not necessarily the case that increasing feed intake by any means possible will improve health outcomes for diseased cattle. Nonetheless, the most common strategy used to promote FI in diseased animals is adjunct use of anti-inflammatory drugs. Ultimately, using technology to detect early changes in FI likely will allow for earlier and more effective treatment of diseased animals.

Update from the Washington State Veterinarian's Office: Animal Health Program

By Amber Itle, Interim WA State Veterinarian

The mission of the State Veterinarian's office is to protect and enhance animal health and animal well-being, promote the economic vitality of the livestock industry by minimizing exposure to animal diseases and to safeguard the citizens of Washington State by identifying and limiting the exposure to zoonotic diseases.

Animal Health Program has Openings: WSDA's Animal Health Program seeks a licensed and accredited field veterinarian for Eastern Washington to protect animal and public health through regular inspections surveillance, detection, control and eradication. This position will also work to raise public awareness and support the department's cooperative agreement with USDA.

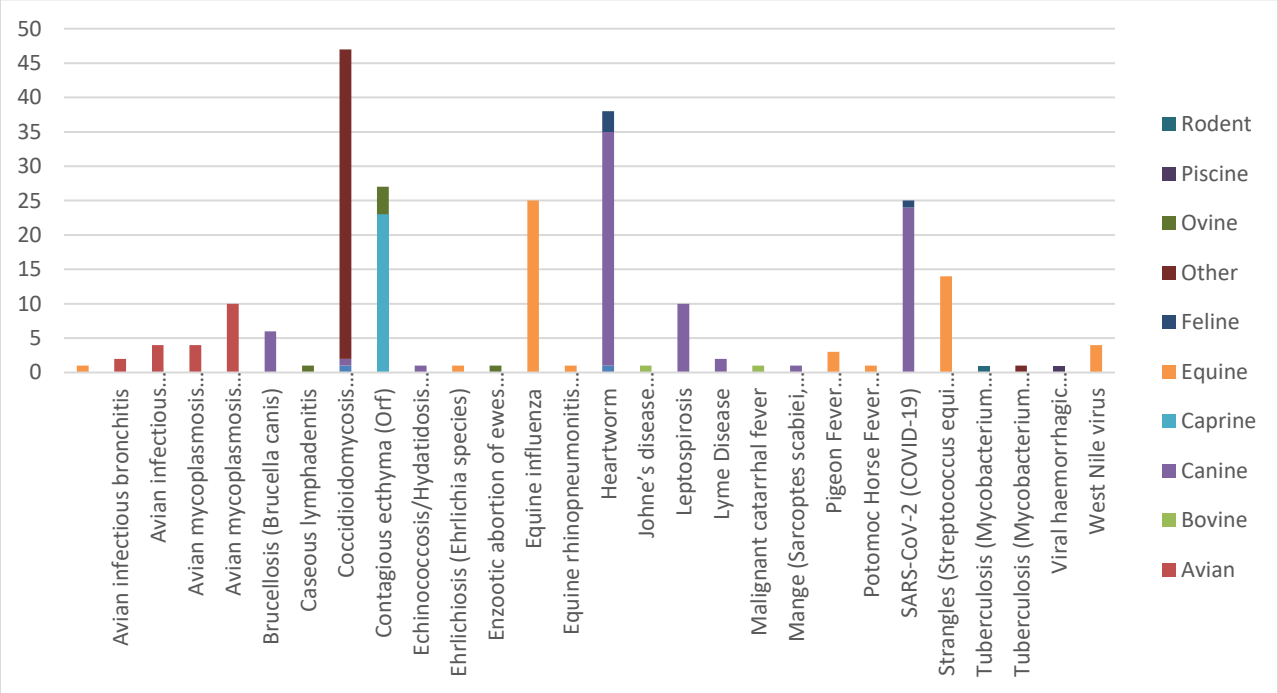
The program is also recruiting for an animal health technician for Western Washington. This position conducts avian disease surveillance and testing, assists with administrative tasks and data entry, helps deliver and develop outreach and education materials and assists WSDA field veterinarians with animal/avian disease response and preparedness.

Both recruitments will remain open until filled. First review of applications is scheduled for the week of Oct 25.

WSDA Disease Reporting Tool for Veterinarians! The **WSDA Animal Disease Reporting Tool (Reportable Animal Disease; RAD)** is provided to report suspected or confirmed diagnoses of reportable diseases. The tool may also be used to report new or unusual animal diseases or disease clusters with potential public health significance, including zoonotic or potentially zoonotic diseases in animals that 1) Have never or rarely been observed in WA, or 2) Appear in a new species or show evidence of higher pathogenicity than expected, or 3) Appear in a higher-than-expected number of animals clustered in time or space. Find the tool here: https://fortress.wa.gov/agr/apps/rad/. Be RAD and report in RAD!

Reportable Disease Trends:

Cases of Reportable Diseases in 2021 by Species



West Nile Virus: Washington now has 10 confirmed cases of West Nile Virus in un/under-vaccinated horses and one alpaca. For more information about West Nile Virus, see WSDA Ag Brief posted here. You can find detailed statistics and the WDOH map for 2021 on the WA State Department of Health's website: West Nile virus surveillance activity in Washington :: Washington State Department of Health

SARS-CoV-2: Testing of animals for SARS-CoV-2 in Washington must be authorized by the WSDA State Veterinarian and WA State Public Health Veterinarian. WADDL has tested over 200 animals for SARS-CoV-2, including wildlife samples (mink, otters, weasels, tamandua, beaver, bobcat). All wildlife samples have tested negative. UW One Health program and WADDL are continuing the Covid and Pets Study (CAPS) of SARS-CoV-2

in companion animals from COVID-19 positive households in Washington. They have sampled over 70/100 households so far. Preliminary results suggest twenty-four dogs that were negative on rt-PCR have tested serologically positive and 37 were negative/indeterminate. Five King County dogs and a single Pierce County cat have tested positive for SARS-CoV-2 by rt-PCR which makes the cases reportable to OIE.

Rabbit Hemorrhagic Disease (RHDV2): WSDA continues to follow up on reports of rabbit mortality events. The last new confirmed positive premises was reported in December 2019. Rabbit Hemorrhagic Disease Virus (RHDV) is a highly contagious, fatal disease in both domestic and wild rabbits that has spread across 15 states in the US in since April 2020. The strain of RDHV2 in the SW outbreak is phylogenetically distinct from the RHDV2 virus in WA and British Columbia indicating that infection is from two distinct points of infection. You can find the maps for the SW strain here: USDA APHIS | 2020 Rabbit Hemorrhagic Disease -- Affected Counties

Medgene Labs, Brookings, SD, has been granted permission by USDA's Center for Veterinary Biologics (CVB) to market and distribute an experimental Rabbit Hemorrhagic Disease Virus vaccine under emergency use authorization. The Medgene product is an inactivated (killed) recombinant subunit vaccine that builds immunity to RHDV-2 specific antigenic proteins in the rabbit. The vaccine is administered as a subcutaneous injection and is a 2-dose regimen, with the booster dose being delivered 21 days following. As of October 1, 2021, Medgene has been approved to start distribution of the vaccine. The company intends to achieve conditional use by the end of the year, and full approval by mid-2022. As a requirement to distribute this product, Medgene Labs must obtain approval from the state veterinarian to ship in each individual state. WA State Vet's Office has approved its use by licensed veterinarians.

Mycobacterium Bovis: In the last year, Wisconsin, Michigan, Texas, and New Mexico and South Dakota have all had confirmed cases of tuberculosis. There is increasing concern that M. bovis may be transmitted from latently infected humans or Mexican roping steers. WSDA relies on accredited veterinarians to conduct TB surveillance by performing caudal fold tests prior to interstate or international movement. In order to perform Tuberculosis testing in Washington, Veterinarians must be type 2 accredited and pass the Bovine Tuberculosis Course found here. The official CFT tuberculin test should yield a false positive responder rate of 1-3%. The reaction may range from a palpable skin thickening to a visible lump in the caudal fold. USDA monitors the response rate reported by each accredited and regulatory veterinarian conducting official tuberculin tests as outlined in Appendix C of Bovine Tuberculosis Eradication Uniform Methods and Rules. Accredited vets with low response rates will be contacted by a state or federal veterinarian to address the shortfall and offer retraining. If a veterinarian's responder rates don't align with expectations without valid justification, they are at risk of being reported to NVAP for removal of accreditation.

African Swine Fever (ASF) poses an ongoing threat. The Dominican Republic has slaughtered tens of thousands of pigs after detecting outbreaks of ASF in 14 of the country's 32 provinces in early August with estimated economic losses of around $180 million. On September 20, USDA reported a positive case of ASF in Haiti. USDA continues to assist with surveillance, control, and eradication efforts in both domestic and feral swine. In addition, USDA issued a Federal Order to establish additional requirements for dogs imported into the United States for resale from countries where African swine fever (ASF) exists. ASF can be transmitted via dogs' fur and bedding, which represent a possible pathway for the introduction of disease.

Epizootic Hemorrhagic Disease Virus (EHDV) and Bluetongue Virus (BTV): The Department of Fish and Wildlife are mapping positive cases of EHDV and BTV throughout the state (Hemorrhagic Surveillance 2021 - Google My Maps). White tailed, mule deer and big horn sheep continue to die of the disease. Although most cervid species are susceptible, white tailed deer are hardest hit with these common viruses with reports of up to 20% of exposed wild deer dying of the disease. WSDA has had several reports of EHDV and BTV in domestic sheep, cows, yaks and an alpaca since July. For additional information regarding bluetongue virus in sheep check out the Fall 2019 Veterinary Medicine Extension newsletter.

Animal Disease Traceability Program:

Join over 500 Washington veterinarians and technicians and sign up for FREE eHealth Certificates in Oregon's Veterinary Information System (OVIS). Don't let the name confuse you, the OVIS System can be used to issue CVIs for Washington animals moving interstate anywhere in the U.S. OVIS can also be used to create brucellosis vaccination and TB test records. The application is free of charge and available for use online: https://oda.direct/OVIS. Help videos and additional materials are available at https://oda.direct/OVISHelp. Contact ***Gerald Franks (360) 902-7566 or David Hecimovich (360) 725-5493 with questions.***

In the last few years, WSDA has worked hard to build infrastructure and promote Animal Disease Traceability and support private veterinarians by providing free RFID tags, handheld readers and access to free animal health records in the field and at public livestock markets. Here are some fun facts to show some of our progress in the last year:

- 59,690 (75%) of all tags distributed to 62 veterinarians were official 840 RFID. Only 20 veterinarians are still requesting metal tags.
- 5,031 (80.3%) of CVIs received from 803 accredited vets in 45 states were eCVIs and only 1,232 (19.7%) were paper
- 500+ WA Veterinarians and 74 Authorized Users (technicians) have accounts in the OVIS system.
- 89 RFID Stick Readers have been distributed to WA veterinarians.
- 5 RFID readers have been distributed to support fairs
- All 6 public livestock markets in the state have employed the Saletime system vet module and receive free RFID tags and readers
- 6 slaughter facilities in the state have capability to retire all RFID tags information electronically when animals are harvested. WSDA captures 99% of animals harvested in the state.
- Approximately 30,000 dairy bull calves that move interstate annually have RFID tags placed prior to movement

Thanks to all the veterinarians in Washington that have been early adopters of RFID technology, electronic health certificates, and market software that made our ADT program successful. Thanks to you, we are able to track and trace animals in minutes. And remember…. BE RAD and REPORT in RAD! If you have any questions or would like additional information, contact Dr. Amber Itle at aitle@agr.wa.gov.

Veterinary Medicine Loan Repayment Program and Veterinary Services Grant Program

By Amber Itle, Interim WA State Veterinarian

Are you working in a food animal or mixed animal practice and feeling overworked? Are you having difficulty recruiting or retaining veterinarians? Have veterinarians in your region recently retired? Have neighboring practices moved away from large animal work and you are the last veterinarian in your area to offer food animal services? Have large/mixed animal positions in your practice or area remained open for months/years? Has your region of the state experienced significant growth/expansion of livestock operations without an increase in veterinary capacity? Do you need specialized equipment or support to expand services in your area?

If you answered yes to any of these questions, then the VMLRP or the VSGP may be for you (**nominations must be finalized and submitted to USDA by Monday, November 8th**).

The **Veterinary Medicine Loan Repayment Program (VMLRP)** will pay up to $25,000 each year towards qualified educational loans of eligible veterinarians who agree to serve in a NIFA-designated veterinarian shortage situation for a period of three years. ***If you believe you are in a shortage area situation, contact the State Veterinarian to establish a nomination.*** A panel of animal health experts will evaluate the nomination to determine if the area can be designated as a shortage area. Each year approximately 190 shortage situations are approved with about 150 veterinarians applying for 60-70 available awards.

The purpose of the **Veterinary Services Grant Program (VSGP)** is to relieve veterinarian shortage situations and support veterinary services. There are two types of grants for VSGP: Education, Extension, and Training (EET) to support veterinary students, and Rural Practice Enhancement (RPE). The EET grants aim to develop, implement, and sustain veterinary services through education, training, recruitment, placement, and retention of veterinarians, veterinary technicians, and students of veterinary medicine and veterinary technology. The RPE grants aim to establish or expand veterinary practices in rural areas and allow veterinarians to buy specialized equipment to expand services.

If you would like to apply to nominate a shortage area, consider these questions as they will be critical for a successful nomination:
1. What counties/regions in Washington are short on large and mixed-animal vets?
2. What has created the shortage?
3. Which of the following species require care in the underserved area? (beef, dairy, swine, poultry, small ruminant – select all that apply)
4: What will be the impact to the industry and the community if the veterinary shortage is not solved?

This award can be an excellent recruitment tool for practices that have had difficulty hiring vets into rural areas of the state. Please know that these awards are **not** limited to new graduates—any practitioner with at least $15,000 in eligible student loan debt and who graduated from an AVMA accredited vet school can apply. Again, **nominations must be finalized and submitted to USDA by Monday, November 8th**, so please reach out to Dr. Itle (aitle@agr.wa.gov) ASAP if you are interested.

Ruminants: Epizootic Hemorrhagic Disease (EHD)

By Amber Itle, Interim WA State Veterinarian

EHD virus, similar to Bluetongue virus (BTV), is an *Orbivirus* from the Reoviridae family that is transmitted between ruminants by biting midges (*Culicoides*) and gnats that act as vectors and must bite an infected animal to transmit the virus. These midges can fly short distances up to 1- 2 km, but they can be blown much farther by wind allowing the potential for disease spread to occur quickly among populations.

Most outbreaks are seen in late summer or early autumn associated with the return of rain and wet weather, which provides breeding areas for biting midges. However, some outbreaks may be linked to droughts such as what we have experienced this year, which can concentrate animals and vectors around diminishing water sources.

Cases in white-tailed deer range from sudden death to varying severity of clinical signs including fever, anorexia, lethargy, weakness, stiffness/lameness, respiratory distress, oral cavity ulcers, nasal discharge and excessive salvation. Swelling of the head and neck or mucous membranes of the mouth and eyes are common presentations of the disease.

Sporadic clinical cases and outbreaks have also been reported in cattle, bison, yaks, and other animals, although most infections in these species are subclinical. However, both domestic and bighorn sheep are extremely susceptible and may die suddenly. Clinical signs in cattle are similar to those in deer. If you notice any of these signs, especially oral lesions with excessive salivation, crusting of the muzzle and/or lameness, notify your private veterinarian or the state veterinarian immediately. This is because EHDV and BTV are cause vesicular lesions similar to Foot and Mouth Disease. Each year, WSDA Animal Health Program veterinarians follow up with these cases to rule out foreign animal diseases.

EHDV in a dairy cow. Photo courtesy of Dr. Ben Smith, WSDA

There is no specific treatment for epizootic hemorrhagic disease other than supportive care. Measures to reduce exposure to infected midges/ gnats can include avoidance of environments such as low-lying, damp pastures where vectors breed, stabling animals from dusk to dawn, eliminating sources of stagnant water, avoiding livestock/wildlife interface, and/or the use of insecticides or insect repellents to help protect groups of animals. The disease usually subsides after the first hard frost kills the disease-carrying vectors.

Cattle: An Overview of Captive Bolt Euthanasia and the Use of Xylazine as a Sedative Prior to Euthanasia

By Ben Smith, WA State Field Veterinarian Region 4 & Dana Dobbs, WA State Field Veterinarian Region 3

Due to recent difficulties obtaining euthanasia solutions, and the refusal of rendering companies to accept animals that have been adulterated with those type of solutions, there have been many requests for alternative euthanasia options. One such option is a captive bolt.
Similar to a firearm, these devices utilize a penetrating bolt to stun an animal. They are used extensively at slaughter facilities to render animals senseless prior to exsanguination or pithing (necessary to ensure death). Various Euthanasia Downloads related to brochures and Wall Charts can be found on the Iowa State University, Dairy Extension, Human Euthanasia website.

Recently, the Kansas Department of Agriculture Division of Animal Health (KDA-DAH) hosted a webinar titled "Where the Rubber Meets the Road". This webinar provides an excellent overview of a Grassroots microgrant study conducted by Dr. LewAnn Schneider. Her study investigated the difficulties associated with euthanizing large numbers of cattle and the benefits of using xylazine as a sedative prior to euthanasia.

During a Foreign Animal Disease (FAD) or high mortality event, swift and efficient disposal of carcasses is critical. Cattle in pens can be difficult to restrain, which often leads to human fatigue, especially for those with limited experience handling cattle. In addition, there are inherent safety hazards with the use of firearms in this situation (skill, shot placement, safe backdrop, etc.). While chutes can provide excellent restraint, processing cattle through them can be slow, and once sedated, the carcass must be removed from the chute. This can create safety hazards and heavy equipment operators might have difficulty maneuvering in front of the chute. So what did the study find?

Grass Roots Project Overview:
Three feedlots participated, and no animals were harmed during the study. Different amounts of xylazine were injected to determine the minimum effective dose based on weight. The time it took for the animal to reach sternal recumbency was recorded using a scale of 1-4, with cattle sedated at level 3-4 briefly attempting to rise upon approach or remaining in sternal recumbency. For this study, sedated animals were shot with a paintball gun to simulate a gunshot. Sedated animals did not react to the gunshot, making the euthanasia process easier, more humane, and safer for personnel. The cattle recovered and were later harvested (there is a 4-day meat withdrawal time for xylazine in harvested animals).

It was determined that during a Foreign Animal Disease (FAD) or high mortality event the appropriate dose of xylazine to achieve sternal recumbency can be injected quickly, followed by gunshot or captive bolt. Dr. Schneider recommends intramuscular (IM) injections, as these are more expedient and require less skill than intravenous (IV).

By using a minimal yet effective xylazine dose, cattle in pens can be euthanized in alleys or other areas more accessible to heavy equipment, streamlining the disposal process. Similarly, cattle with minimal sedation can walk out of a chute to become recumbent in more open areas. Also, less is better when conserving available xylazine supplies during a response. **Note: animals sedated with Xylazine should be composted or sent to a landfill, not rendered.**

The nitty gritty take-homes from this study: Concentration of Xylazine used: 100 mg/mL. **Doses evaluated in the study**: 1 mL to 2.75 mL IM on three different weight classes (0.194 mg/kg – 1.058 mg/kg). The study found that a **MINIMUM of 0.4 mg/kg is recommended.**

Basic, field expedient guidance: 2 mL IM for 1.000 lbs cattle, 1 ml IM for 500 lbs. The study found that 1 ml IM typically worked for anything 700 pounds or less.

In summary, it is easy to see that the use of xylazine as a sedative prior to euthanasia in a FAD or high mortality event can offer many advantages. Cattle can be quickly sedated with a minimal dose, followed by a safe and effective means of euthanasia and disposal. For additional detail related to the euthanasia of cattle, check out an article by Jan Shearer entitled Euthanasia of Cattle: Practical Considerations and Application (Animals, 2018. 8(4): 57).

Public Health & Biosecurity: A National Survey of Licensed Clinical Veterinarians on Current Zoonotic Disease Practice and Prevention

By Minden L. Buswell, WSDA Reserve Veterinary Corps Coordinator

This survey is being conducted by Annalisa Fama, a joint degree DVM/MPH student at the University of Illinois. Although you have likely received other surveys from either your veterinary or public health associations, this survey targets all licensed clinical veterinarians across the United States through a partnership with the National Association of State Public Health Veterinarians. This survey seeks information on how often veterinarians engage in recommended practices for preventing zoonotic diseases, including but not limited to consistent and correct PPE usage, frequent client and staff education, and self-reported knowledge on diagnosis, prevention, and identification of common zoonotic diseases. By taking 15-20 minutes to reflect on your experiences, you can aid state and national public health agencies to understand where education is lacking and where these agencies can better allocate resources to veterinarians to aid in prevention of zoonotic disease transmission.
Please let Annalisa know if you have any questions or concerns (afama2@illinois.edu). The survey can be found at https://go.illinois.edu/Zoonoses

WSU CVM Senior Paper Highlights

Epizootic Bovine Abortion

By Staheli Wilkinson (Advisor: Dr. George Barrington)

Summary: Epizootic Bovine Abortion, also known as Foothill Abortion, is caused by a tickborne bacterium, *Pajarellobacter abortibovis*. Infection by this bacterium causes late term abortion storms in cattle that have never been exposed to the bacteria, most commonly first calf heifers. Foothill abortion is detrimental to beef cattle producers who have operations in the mountainous regions of California, Oregon, and Nevada. Adult, pregnant cattle usually show no signs of the infection. Aborted fetuses most often exhibit enlarged lymph nodes, spleens, and livers. A definitive diagnosis of foothill abortion can be achieved through fetal pathology findings that are pathognomonic for the disease. Until recently, prevention of the disease was achieved through complex management practices. However, a foothill abortion vaccine was released into the commercial market in the fall of 2020.

Management of Reportable Diseases in Cattle Production Medicine

By Marissa Soderberg (Advisor: Dr. Alan Goldhahn)

Summary: Major disease outbreaks in the cattle operations across the United States are relatively rare in today's times. However, many producers are still being responsible and taking precautions to prevent major disease outbreaks in their herds. Among the most dangerous diseases, there are three that come to mind as a cattle producer. The effects of brucellosis, Foot and Mouth disease (FMD), and trichomoniasis have had severe implications in the agricultural economy in the past. Though the prevalence of each disease is different, all three are still very dangerous if a herd does become infected. In the past 90 years, Foot and Mouth disease has been eradicated from the United States but is still present around the world. In comparison, some herds of bison and elk in the Yellowstone National Park area are endemic and infamous for harboring brucellosis. In addition to FMD and brucellosis, trichomoniasis can also lead to severe financial and herd losses.

Presynchronization of Beef Heifers for Artificial Insemination: A Comparison of Two Protocols

By Katriana Jorgensen-Muga (Advisor: Dr. Ramanathan K Kasimanickam)

Summary: Artificial insemination (AI) is a valuable tool to increase the genetic diversity, decrease the calving window, and reduce problems associated with dystocia. Estrus synchronization in heifers historically has resulted in sub-optimal rates of estrus expression and pregnancy rate to AI due to the heifer's relative sexual immaturity, follicular dynamics, and decreased responsiveness to pharmacologic intervention. Comparison of two separate presynchronization protocols based upon the traditional CIDR-CO-Synch protocol was performed with the hypothesis that the addition of two GnRH injections (CCGOS) would result in higher estrus expression and pregnancy to AI rate than the addition of one GnRH injection (CCOS). Heifers at four different locations underwent either a CIDR-CO-Synch program (one GnRH, CCOS treatment) or a CIDRGnRH-CO-Synch (two GnRH, CCGOS treatment) protocol prior to artificial insemination. Heifers that underwent the CCGOS protocol had increased follicular size at time of AI but there was no significant difference in estrus expression or pregnancy rate. Numeric differences in pregnancy rate that favored presynchronization (CCGOS) resulted in a substantial increase in the pregnancy to AI rate at three of the four operations. Choosing a synchronization program for an operation is highly variable based upon the operations goals, facilities, and heifer development. Presynchronization may economically benefit operations that focus upon breeding heifers with prepubertal status or that vary in general developmental status. Particularly, implementation of reproductive tract scoring combined with presynchronization of prepubertal heifers may allow operations to capitalize upon the reproductive potential of heifers that otherwise would be less likely to become bred early in the reproductive season.

Johne's Disease in Cattle and Sheep

By Leah Swannack (Advisor: Dr. George Barrington)

Summary: Johne's Disease is the clinical presentation of disease cause by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). MAP infects the intestines of wild and domestic ruminants resulting in diarrhea, chronic weight loss, and eventual death. It is spread fecal-oral, transmammary, and transplacental. It is an economically serious disease for livestock producers that can be very difficult to control. In addition, there is also concern about risk for zoonotic potential of MAP. It has been identified as a component in some cases of Crohn's disease in people. This paper will be discussing the history of paratuberculosis, how the disease progresses, treatment options, control measures, and prevention strategies. There will also be discussion on the differences in disease presentation between cattle and sheep.

Development and Implementation of a Neonatal Dairy Calf On-farm Necropsy Program

By Leigh Shaw (Advisor: Dr. Craig McConnel)

Summary: Management of neonatal dairy calf mortality is a constant struggle for farms around the United States. Calves in production operations are at a high risk of contracting various viral and bacterial infections leading to outbreaks of scours and respiratory illness. These illnesses are often only tracked by treatment records and treatment decisions are made by the workers who utilize basic diagnostic criteria before initiating treatment. Necropsies remain a relatively underutilized resource for tracking these diseases. This is thought to be due to veterinarians having decreased confidence or undervaluing the merits of performing necropsies. This study looked to evaluate the value of performing necropsies as well as develop resources for a continuing education program to make necropsies more accessible to both veterinarians and workers alike. Findings indicate that although performing gross postmortem evaluations alone can overlook specific pathologies, they tend to provide insight into the primary organ system underlying an animal's cause of death. This project also showed that like all things the ability to recognize these lesions improved with experience. Using these findings and the photographs and videos procured during the project, materials have been developed for a continuing education program. These materials include written guides covering common lesions and advice on the materials and setup needed to perform necropsies on dairy calves, a digital photo library of common lesions, videos of the entire necropsy process, and resources for recording findings of the necropsies.

Malignant Catarrhal Fever (MCF): Virus Strains and Vaccines

By Emily Cole (Advisor: Dr. Chrissy Eckstrand)

Summary: Malignant Catarrhal Fever (MCF) is a lymphoproliferative syndrome found in ruminants. It is caused by multiple virus strains. Of all the viruses in the MCF group, AlHV-1 and OvHV-2 are the more prevalent. AlHV-1 is most common in Africa as its carrier, the wildebeest, is found there. OvHV-2 is carried by sheep, so it is found worldwide and the most prevalent strain in America. In an adapted host, infection is often inapparent, while unadapted susceptible species often develop fatal infections with signs ranging from acute death to catarrhal ocular-nasal discharge, mucosal lesions, and diarrhea. The presence of mucosal ulcers puts MCF on the differential list with reportable dangerous viruses such as foot-and-mouth disease. Besides natural carriers, infections are dead-end and do not spread from susceptible-to-susceptible species but from a point source. There are no treatment options. Management practices have been the only sense of control utilized to minimize outbreaks since its incidence warranted enough economic loss to become concerning. Current operations either accept the risk or separate carrier species from clinically susceptible species as well as monitor incoming ruminants with antibody testing. Initial diagnostics are based on serological screening of possible carrier species, and histopathology with PCR of the suspected MCF-related death. Vaccines have been delayed by many obstacles, but AlHV-1 and OvHV-2 vaccines are under development with initial animal trials currently under way.

WSU Ag Animal Faculty Research Updates

1. Impact of heat stress on embryonic development during first 16 days of gestation in dairy cows

Ramanathan K Kasimanickam, Vanmathy R Kasimanickam

DOI: 10.1038/s41598-021-94278-2

Abstract: Objective was to elucidate the effects of heat stress (HS) on embryo development during first 16 gestational days (GD) and circulating hormone concentrations on GD-16 in lactating Holstein cows. Cows in HS and control (CON) groups were exposed to temperature humidity index (THI) of ≥ 73 and < 73, respectively, for 3 weeks before the experiment. GD-7 (67 vs 49%) and GD-16 (52 vs. 31%) conception rates following single insemination were greater (P < 0.01) for CON compared with HS cows. Control cows produced more GD-7 transferrable embryos following superovulation compared with HS cows (84.8 vs 53.1%; P < 0.001). Mean (± SEM) length (45.2 ± 10.6 vs. 59.2 ± 9.1 mm) and weight (31.4 ± 4.3 vs. 42.4 ± 6.2 mg) of GD-16 conceptus were greater for CON compared with HS cows (P < 0.05). Control cows yielded more filamentous conceptus (≥ 25 mm) compared with HS cows (71 vs 45%; P < 0.05). Progesterone (2.09-fold) was higher, and cortisol (1.86-fold), prolactin (1.60-fold), substance-P (1.55-fold), Isoprostane-8 (1.34-fold) and prostaglandin F metabolites (1.97-fold) were lower in CON compared with HS cows (P < 0.05). Progesterone positively, and substance-P, isoprostane-8 and the THI negatively were associated with GD-16 conceptus length (P < 0.05). In conclusion, altered hormones concentrations in heat-stressed cows plausibly resulted in lower GD-7 and GD-16 conception rates, fewer GD-7 transferable embryos, and stunted GD-16 conceptus elongation.

2. Pregnancy and offspring sex ratio following insemination with SexedULTRA and conventional semen in cows in a commercial beef operation

Ramanathan Kasimanickam, Vanmathy Kasimanickam, Kamron Ratzburg

DOI: 10.1111/rda.14008

Abstract: Pregnancy rate per AI (PR/AI) and breeding season pregnancy rates between insemination with sexed semen (SS; at 18 hr after the onset of oestrus) and conventional semen (CS; at 12 hr after the onset of oestrus,) and offspring gender ratio between two groups were compared. Angus cross cows (n = 686, during 2019 and 2020 breeding seasons) were oestrus-synchronized using Select-Synch + CIDR protocol and were observed thrice daily for oestrus until 72 hr after PGF2α administration. Cows expressed oestrus (n = 513) were inseminated with either SS (n = 246; SexedULTRA 4M™; y chromosome-bearing sperm) or CS (n = 267). Cows (n = 173) that failed to express oestrus at 72 hr after PGF2α received 100 μg of GnRH and CS insemination concomitantly. Two weeks later, cows were penned with natural service sires (bull:cow ratio 1:25) for 45 days. Pregnancy was diagnosed 30 days after bull removal. Calves' gender was determined at birth. For cows that expressed oestrus, PR/AI did not differ (p > .1) between SS (65.0%) and CS (66.7%) groups. The overall PR/AI differed (p < .05) between SS (65.0%) and CS (56.4%) groups. The natural service PR differed (p < .001) but breeding season PR (p > .05) did not differ between SS vs. CS groups. Bull:heifer gender ratio following AI was 88:12 and 52:48 for SS and CS groups, respectively, with an overall 66:34 ratio. Bull:heifer gender ratio for the two breeding seasons was 79:21 and 52:48 for SS and CS groups, respectively, with an overall 62:38 ratio. In conclusion, the fertility of SS insemination at 18 hr after onset of oestrus was 97% of CS insemination at 12 hr after onset of oestrus. Though breeding season pregnancy did not differ between SS and groups, preferred calf gender was 25 percentage points greater for SS over CS application. The gender accuracy was 88%.

Continuing Education

Veterinarians

1. WSVMA DVM Masterclass—Diarrhea, metabolic acidosis, and fluid therapy in dairy calves updates, by Dr. Leal-Yepes WSU CVM. Tuesday, October 19th 12 p.m. (1 hr webinar)

2. WSU Fall Veterinary Continuing Education Event. Hybrid CE on campus or via zoom. 9 a.m. – 12 p.m., Saturday, October 30th. To view the agenda visit: http://cvme.vetmed.wsu.edu/cvme-index/fall-conference/agenda

Producers

1. The 2021 Washington State Sheep Producers' Annual Convention will be held November 4th-6th at the Earthbox Inn in Friday Harbor WA.
2. The 2021 Washington Cattlemen's Association Convention will be held November 11th-13th at the Three Rivers Convention Center, Kennewick WA.
3. The 2021 Washington Dairy Conference and Trade Show will be held December 6th-8th at the Great Wolf Lodge near Centralia WA.

GUESS THAT BREED!

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