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In This Issue

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From the Editor – Well, I don't have to mention that we are in the middle of a pandemic. The things that the ag animal faculty deal with on a regular basis in teaching and research includes all the things we continue to learn about during this time: biosecurity, epidemiology, and zoonoses. What we are also learning is that such a disease outbreak changes rapidly; what we might say about it today will likely change tomorrow. We have included some resources for animal owners and veterinarians in this issue.

We have had to cancel many Extension meetings, changed to online teaching, do not meet face-to-face as a faculty anymore, but still have our same responsibilities. One responsibility is providing our readers with what we are up to and what new information to consider for their farms or practices. We still have research write-ups going on, are reaching out in different ways and are here when you need us. Stay safe.

ag animal health *is devoted to the transfer of current, relevant information to food animal owners and veterinarians in the Pacific Northwest*.

Things to Tell the Public About Treatment for COVID-19

By Dale Moore, WSU Extension Veterinarian

As a veterinarian, I get asked a lot of interesting questions about both animal and human health. During this COVID-19 outbreak it is no different, so I try to stay current through various listservs. A couple of things caught my eye recently that all farmers and veterinarians need to be aware of.

The US Food and Drug Administration, the organization responsible for the safety of drugs, sent two emails to their list on the use of various drugs for the purported treatment of COVID-19. **They are**

NOT approved and COULD BE DANGEROUS. However, because we might have these things on the farm or in our practices, we need to make sure that anyone with access to these compounds understands the facts.

The first compound is *chloroquine phosphate* used to treat disease in aquarium fish. The FDA said: **Do Not Use Chloroquine Phosphate Intended for Fish as Treatment for COVID-19 in Humans**. Although there is a formulation for the treatment of malaria in people, this animal drug resulted in at least one fatality. The main message is to not use animal drugs for people.

The second compound is *ivermectin*. The FDA says: **Do Not Use Ivermectin Intended for Animals as Treatment for COVID-19 in Humans.** A pre-publication report on the use of ivermectin on SARS-CoV-2 in a lab setting documented some effect in the lab (not in an animal and not in a human). Although potentially helpful, this drug needs much more study. In addition, there are labeled uses of ivermectin in people and compounds formulated just for them. The ANIMAL DRUGS CAN CAUSE SERIOUS HARM IN PEOPLE. Ivermectin, and like compounds, are found in many parasite control products we use.

It's our job to keep animals (and people) safe. Keep this knowledge about these two products in your back pocket in case you need it, but, hopefully, you will not have to!

Resources:

1. https://www.fda.gov/animal-veterinary/product-safety-information/fda-letter-stakeholders-do-not-use-chloroquine-phosphate-intended-fish-treatment-covid-19-humans?utm_campaign=3-27-2020-Chloroquine&utm_medium=email&utm_source=Eloqua
2. https://www.fda.gov/animal-veterinary/product-safety-information/faq-covid-19-and-ivermectin-intended-animals?utm_campaign=4-10-2020-Ivermectin&utm_medium=email&utm_source=Eloqua

Dairy: Use of Lime in Dairy Cow Stalls

By Dale A. Moore, WSU Extension Veterinarian

Should we put hydrated lime in these stalls?

I recently received a question from a veterinarian about the use of lime in cow stalls:

"I have a producer that was wondering if I could get some information on the pros and cons of using lime in the stalls. She went to a meeting about ventilation in barns and they had advised against the use of lime in stalls. I thought that maybe you would have some current recommendations and resources on the subject so I could give her a complete answer. A lot of dairymen use lime in the stalls here and I honestly haven't formed a strong opinion for or against it."

What a great question! When I was working in Pennsylvania, so much lime was used it often looked as if it had snowed in the tie-stall barns. So, is this a good practice or not? Or, does it depend? Several studies have been done across the globe to look at the use of lime in dairy cow bedding.

There is some evidence that hydrated lime on free-stall *mattresses* can reduce some environmental bacteria levels and prevent mastitis. However, it does so for only 48 hours. In a University of Pennsylvania study (Kristula et al., 2008), the rate of 1 pound of hydrated limestone (per stall) every two days had some effect on bacteria levels but caused some skin irritation on udders and legs. Long term use as the sole bedding material on mattresses may be a problem. In addition, hydrated lime only works on clean surfaces and is not a substitute for cleaning.

A 1997 study by Hogan and Smith investigated bacteria counts in sawdust bedding in free-stalls. There were 3 treatment groups and each set of stalls had the bedding removed and replaced every 7 days.

- Group One: bedding replaced daily in the back one-third of the stall.
- Group Two: one kilogram (2.2 lbs) of hydrated lime spread over the sawdust in the back one-third of the stall every seven days.
- Group Three: sawdust bedding changed every seven days with no other treatment.

The results? Adding lime to bedding reduced bedding bacteria numbers for Group Two cows, but the effect lasted less than 48 hours. By Day 6, bacteria counts were the same in all three groups. Moisture content of the bedding increased to the same degree in all three groups. Similarly, when the researchers examined bacteria numbers on teat ends, counts were slightly lower in Group Two, which got lime in the bedding, but this effect only lasted until the second day. The bacteria most likely to be reduced in number were *Klebsiella sp*. and coliforms. However, even for these types, the effect lasted only a short time.

Those results showed that adding lime to sawdust reduced bacteria numbers in the bedding for one day. There was no impact on the bedding's moisture content. Although previous research found replacing the bedding in the back one-third of the stall helped reduce bacteria, in this study it did not reduce the numbers of bacteria on the teat skin or in the bedding.

In an Auburn University study (Chettri RS, 2006), new lime applied daily with fresh peanut hull bedding applied daily at the back 1/3rd of the stall reduced quarter infection rates and the proportion of cows with SCCs greater than 750,000 cells per ml of milk in the lime "treatment" group. Note, however, that fresh bedding was applied daily.

An Irish study (Gleeson, 2013) found that hydrated lime bedding was associated with lower teat skin Staph and Strep bacteria compared to ground limestone bedding but was not associated with mastitis rates. A German study (Paduch et al., 2013) compared hydrated lime added to sawdust bedding compared to pure sawdust bedding in free-stalls. All stalls were cleaned daily with about two-thirds of a pound of fresh bedding (with or without lime) added per 10 square feet of stall base. All bedding was removed and replaced after three weeks. None of the cows developed mastitis, regardless of bedding. The lime + sawdust bedding cows had fewer teat swab cultures with *Strep. uberis* and coliform bacteria than teats from cows on pure sawdust.

These studies provide some evidence that hydrated lime in sawdust and peanut hull bedding can reduce bedding and teat skin bacterial counts. However, the research stalls were cleaned frequently and may have been different in size and bedding type to our Pacific Northwest farms. I think that RELYING on lime to have a long-lasting effect is challenging. Dr. Ann Godkin who summarized some of the lime-on-bedding literature said: "Here's the environmental mastitis equation: High numbers of bacteria + teat end entry + susceptible cow = new environmental mastitis infection." For environmental bacteria to grow in the bedding, they need an organic substrate, moisture, as well as the right conditions (such as pH) for them. In the picture at the beginning of this article, the stalls were wet at the backs because of their dimensions and cow positioning; part of the herd's set of problems contributing to environmental mastitis.

In addition to the variable effectiveness for mastitis prevention, there have been some reports of slippery alleyways being created using hydrated lime in the stalls. The build-up of this inorganic material can render non-slip grooving ineffective.

The bottom line is that appropriately-sized, clean and dry stalls with regularly-replaced bedding seems to be most important for reducing mastitis. Also, teat condition and keeping cows standing up until teat end "closure" by having fresh or pushed-up feed available after milking still seems to make sense.

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Dairy: Hoof Lesions and Fertility in Jersey Cows

By Dale Moore, WSI Extension Veterinarian

I first got interested in dairy cattle lameness in the mid 1990's. I put together barn meetings with a hoof trimmer and once visited 10 counties in 5 days. Those were the good old days of Extension. As I was putting the research together on the impacts of lameness, such as increased culling, poor milk production, and welfare impacts, I found an article by Sprecher and others at Michigan State University on a lameness scoring system that could predict dairy cattle reproductive performance. That paper gave me another reason I wanted to talk to dairy farmers about lameness prevention, namely, impacts on reproduction.

Since that time, there has been quite a bit of research on lameness and reproduction with some mixed results, some of which is due to the subjective nature of locomotion scoring. A very recent prospective cohort study published in the *Journal of Dairy Science* examined the relationship between actual hoof lesions found in early lactation and a couple of measures of fertility in Jersey cows. The results are very compelling!

The Minnesota (and one Florida) investigators worked with a large Jersey dairy farm system with 10,000 cows on 3 premises. At about 20 days in milk (**DIM**) they evaluated the feet for hoof lesions and body condition scored over 1,600 cows. At 27 DIM, they performed ultrasound the ovaries of those cows to assess if they were cycling. At 41 DIM they again examined the ovaries and body-condition scored the cows and started a timed insemination program. Cows were evaluated for estrus, bred by AI and pregnancy-diagnosed until about 120 DIM when they were again evaluated for hoof lesions and body condition score.

The investigators were looking for differences in three outcomes including ovarian cyclicity, time from calving to first service, and first service conception, potentially associated with the presence of hoof lesions. In their final analyses, they controlled for factors known to be influences on reproduction including parity of the cow, early lactation body condition score and season of calving.

What did they find? If cows had a foot lesion at 20 DIM, they were less likely to be cycling (42% compared to 51%). Cows with infectious foot lesions (digital dermatitis (hairy warts) or foot rot) were even less likely to be cycling (37%). The median time to first service was longer in cows with hoof lesions compared to those without (58 vs 51 days). The risk of first service conception loss was greater for cows with lesions (11%) compared to healthy cows (5.2%) and the median time to pregnancy for cows with hoof lesions was 91 days compared to 77 days for healthy cows.

These findings indicate that pre-existing or early lactation hoof lesions are associated with poor fertility by many measures. Minimizing the occurrence of hoof lesions (see Maday, 2018) in early lactation could affect a dairy farm's bottom line because of the influence on milk production and reproduction and culling.

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Dairy: Amber's Top Ten Tips: Farmer Well-being

By Amber Adams Progar, WSU Dairy Management Specialist amber.adams-progar@wsu.edu

As I sat down to choose a topic for this article, I couldn't stop thinking about the difficult times we are currently facing as a society. COVID-19 is affecting all our lives. It pangs me to watch milk being dumped down the drain, while many school-aged children won't receive milk with their lunch (if they receive a lunch) today because of school closures. It is during times like this that we are pushed to the limits and our well-being is threatened. This is why today's article will focus on the people that make the dairy industry thrive, YOU. My hope is that the information below will help you realize that you are not alone, your well-being matters, and tools are available to help you improve your well-being.

1. **Prevalence of stress among dairy farmers**
A survey of 265 Finnish dairy farmers revealed that 42% of the farmers were stressed and 9% of them experienced severe burnout (Kallioniemi et al., 2016).

2. **Prevalence of anxiety and depression among dairy farmers**
Out of 170 Midwestern U.S. dairy farmers surveyed, 71% of them met the criteria for Generalized Anxiety Disorder and 53% of them met the criteria for Major Depressive Disorder. Personal finances and time pressures were listed as the greatest concerns (Rudolphi et al., 2020).

3. **Farmer well-being influences animal well-being**
Over 900 Norwegian dairy farmers participated in a study in which farmer well-being was compared to animal well-being. Farmers with lower levels of stress and better well-being had animals with better well-being (cow health, longevity, fertility, etc.; Hansen and Østerås, 2019).

4. **Farming pressures**
In Wales, 582 dairy and beef cattle farmers identified the top five farming pressures as: finances; weather; tuberculosis; paperwork; and farm management. Farmers who identified finances as the key pressure were more likely to have a lower well-being (Crimes and Enticott, 2019).

5. **Importance of social support**
Among 121 Irish farmers, increases in financial and non-financial stress caused increases in farmer anxiety and depression. However, farmers with strong social support had less non-financial farm stress, as well as fewer cases of anxiety and depression (Furey et al., 2016).

6. **Coping with farming pressures**
Thirty-two Canadian male farmers participated in intensive interviews, in which all farmers agreed that work breaks and vacations were crucial coping strategies. Time spent with family was listed as particularly powerful a coping strategy (Roy et al., 2017).

7. **Positive impacts on dairy farmer well-being**
Finnish dairy farmers identified family, working with cattle, healthy farm animals, a reasonable workload, and a sustainable farm economy as factors that have a positive impact on dairy farmer well-being (Kallioniemi et al., 2018).

8. **Relationship between mental health and physical health**
A survey of 79 Australian dairy farmers showed that farmers with higher levels of exhaustion and stress experienced lower levels of physical and mental health. On the other hand, farmers who practiced mindfulness had better physical and mental health than farmers who didn't practice mindfulness (Eddy et al., 2019).

9. **Barriers to seeking help**
A focus group of Australian farmers, farmers' partners, and general practitioners emphasized that farming is more than just employment, it is a lifestyle. The focus group stated that seeking help requires time away from work, which is a key barrier. Finances may also present a barrier to seeking help (Vayro et al., 2020).

10. **Role of ag professionals**

Ag professionals (veterinarians, farm consultants, etc.) have established relationships with dairy farmers. They play a key role in identifying, mitigating, and supporting farmers during difficult times (Stanley-Clarke, 2019).

Remember: you are not alone, your well-being matters, and tools are available to help you improve your well-being.

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9. Stanley-Clarke. 2019. The role of agricultural professionals in identifying, mitigating and supporting farming families during times of stress: findings of a qualitative study. Aust. J. Rural Health 27:203–209.
10. Vayro et al. 2020. 'Farming is not just an occupation [but] a whole lifestyle': a qualitative examination of lifestyle and cultural factors affecting mental health help-seeking in Australian farmers. Sociol. Rural. 60:151-173.

Sheep: Death in 2-month Old Lambs

By Dale A. Moore, WSU Extension Veterinarian

Several two-month-old lambs from one small flock died recently. What could have caused this to happen? What could be done to prevent this?

These lambs died suddenly without apparent signs except some mild abdominal distension. The veterinarian submitted tissue samples to the diagnostic lab. The resulting lesions found, and bacteriology identified, *Clostridium perfringens* Type C.

These bacteria can be found in low numbers in normal, healthy animals in their intestines but can be triggered to cause disease. A sudden change in diet is the most likely reason that they start to grow in numbers. As the bacteria grow, they release toxins that cause damage to the intestines and other organs.

Treatment requires a lot of medications and sometimes intravenous fluids and other supportive care. Prevention is worth the effort and is focused on vaccination. Most veterinarians will recommend a "3-way" vaccine that has antigens for *Clostridium perfringens* Types C and D as well as tetanus. Two doses of the vaccine are required to initiate immunity. Vaccinating ewes one to two months before lambing is recommended and lambs must receive colostrum. Lambs that are 6 to 10 weeks old should also be vaccinated for the first time and receive one or two boosters.

Any feed changes should be made gradually to reduce the chances for these bacteria to overgrow. Often, it is the best-eating, fastest growing lambs that are affected when grain is first fed. If animals are to be turned out onto new, lush pasture, allowing limited access on the first several days is wise.

For more detailed information on this diagnosis and disease, see:

1. https://extension.colostate.edu/topic-areas/agriculture/enterotoxemia-overeating-disease-of-sheep-and-goats-8-018/
2. https://www.merckvetmanual.com/generalized-conditions/clostridial-diseases/enterotoxemias

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Livestock: Fly Control -- Get Ready!

By Craig McConnel, WSU Extension Veterinarian

A recent article on fly control highlights the impact of flies on disease and productivity in livestock. The article by Richard Hack is available online and has been summarized below. House flies (*Musca domestica*) and stable flies (*Stomoxys calcitrans*) are the principal fly pests of confined livestock. These flies are more than a nuisance with their capacity to transport disease causing organisms such as the bacteria responsible for pinkeye. Stable flies are about the size of a house fly but with piercing mouthparts that make them particularly irritating with the potential to reduce livestock productivity. Reductions in weight gain and milk yield due to fly irritation typically occur because of animals exhibiting fly avoidance behaviors. These include stomping feet and bunching together which can impact the time spent feeding and resting.

Although these flies are associated most often with confined operation, stable flies are becoming a more serious problem for pastured cattle as well due to their association with hay waste residues. If food is not limiting, flies will complete their life cycle in about 10 days at 85˚F, 21 days at 70˚F and 45 days at 60˚F. The optimum temperature for fly development is around 80˚F with lower and upper thermal limits of approximately 55 and 115˚F, respectively. Eggs can hatch within nine hours after oviposition and, under ideal conditions, take about 7-10 days to progress from the egg to adult stage. However, cooler weather, dry media and scarce food may increase development time to two weeks or more. Hypothetical calculations suggest that a pair of flies that initially reproduce in April have the potential to be the progenitors of up to 191 quintillion, 10 quadrillion (191,010,000,000,000,000,000) flies by August! Of course, this can never happen because of predators, parasites, and other factors but it raises the specter of a *flypocolypse* without proper fly control in place.

Integrated pest management (IPM) is recommended for implementing a successful fly control program. Waste and manure removal remove fly breeding areas resulting in a reduction in larvae and viable areas for adults to lay eggs. Although each operation is unique, common fly breeding sites include calf hutches; silage leak and spill areas; animal stalls and pens; feed preparation, storage and manger areas; water sources; calf, hospital, and maternity areas; feed troughs; and inside and outside manure handling areas. Frequent removal of manure prevents fly buildup and breaks the breeding life cycle. Lightly scattering manure outdoors kills eggs and larvae by drying. Ensuring proper drainage ensures that surface water does not build up. Cutting grass and vegetation short removes fly resting areas.

Monitoring adult and larval fly populations is a key component of IPM enabling farm managers to monitor impending emergence of adult flies and provide a basis for timing and frequency of control options. Several methods exist for monitoring fly populations including spot cards, sticky ribbons, and scudder grids. Average flyspecks of 50-100 per spot card indicate a high fly activity and a need for intervention. An average weekly sticky ribbon count above 100 flies per stationary tape, or after walking 300m in the barn in case of moving tapes is considered a high fly activity. A count of less than 20 flies on a scudder grid is likely to indicate satisfactory fly control. In addition to adults, regular monitoring of larval populations is also very important to predict impending fly burst. Routine visual inspection of manure piles for potential hot spots of larval development is useful, and maggots also can be monitored by pupal traps or extracting immature larvae from manure using Berlese funnels or floating them in 0.6m sucrose solution.

Biological control should be part of an overall fly control program with the aim to increase the efficiency of natural enemies. Parasitoid wasps, predatory beetles and mites are used for control of juvenile stages of flies. In addition, several species of entomopathogenic nematodes have been studied for their potential as biocontrol agents against flies. In general, biological control can include practices such as provisioning for temporary manure-refuge of natural fly enemies, manure moisture management, and selective use of less toxic pesticides. For example, a recent study demonstrated that realistic concentrations of imidacloprid in fly breeding habitat may interfere not only with house flies developing to the pupal stage, but also with parasitoids locating and utilizing house flies.

Although chemical use around lactating dairy animals is limited, the use of insecticides for fly control is often an important component in IPM. In situations where pesticides become the only control tool, resistance management requires pesticides to be rotated between different chemical classes deploying different modes of action. Alternate use of pyrethroids, organophosphates, neonicotinoids, spinosyns, insect growth regulators and other classes of insecticides is recommended.

Larvicides are applied to the manure to kill maggots and can be applied as a spot spray, granules, or feed-through premix. They are typically insect growth regulators with cyromazine being the leading active ingredient. Adulticides can include selective applications of chemicals to the walls and ceilings of housing where flies rest, as well as the use of baited hang boards and fly baits in bait stations are compatible with biological agents. Surface residual spray applications are typically pyrethroids which provide some repellent activity and control the adult flies upon contact with the surface. Space sprays are natural pyrethrin-based with the synergist piperonyl butoxide or organophosphates. Space sprays or mist sprays are used to quickly knockdown adults and suppress overwhelming populations with short residual actions. Their low residual activity reduces the possibility of resistance; however, they should be applied sparingly and at maximum twice a week at regular intervals. Baits are effective for maintaining low fly populations and typically contain the sex attractant (Z)-9-tricosene and a neonicotinoid (chemical class). The bait formulations are very useful in trapping and killing adult flies, but the bait stations should be positioned to avoid food and water contamination.

If you are interested in reading more about current research into fly control, check out a recent publication from the USDA Agricultural Research Service in Lincoln, NE, where researchers investigated the autodissemination of pyriproxyfen. It provides some interesting food for thought regarding the impact on control measures of fly population size, the proportion of population that is treated, manure type, and location and delivery method of chemicals.

Swine: Skin Lesions in Baby Pigs

By Dale Moore, WSU Extension Veterinarian

A veterinarian was presented with 3-week old piglets with skin lesions that appeared scabby, thickened and "greasy". A couple of piglets on the farm had died. The veterinarian submitted some skin samples to the diagnostic lab. From the fresh skin samples, many *Staphylococcus hyicus* were cultured and an antimicrobial susceptibility test showed that they were resistant to drugs in the penicillin class of antibiotics (beta-lactams).

"Greasy pig disease", or exudative epidermitis, is caused by an infection with *Staphylococcus hyicus*. There are several strains of this bacterium and five exotoxins that target skin cells. Pigs are usually less than two-months old when they succumb to this disease, and it is rarely seen in adults.

Normal piglets and sow. (Photo by K Heaton)

The first signs are skin reddening, listlessness and refusal to eat. In the acute form of the disease, death can occur in just few days. Treatment with the appropriate antimicrobial drug can be effective if started early, in combination with antiseptics applied to the skin daily.

The disease is initiated by predisposing factors including concurrent infection with a viral disease (like parvovirus), nutritional deficiencies (minerals, vitamins), parasitism, inadequate housing (poor ventilation, poor hygiene, high humidity), immune system deficiency (such as pigs born to gilts), and skin trauma (from fighting).

Prevention includes high levels of hygiene for the sows and some individuals suggest washing sows. Controlling the environment with good ventilation, clean and dry pens, controlled humidity and elimination of overcrowding are other strategies. Although first described over 150 years ago, this disease is still with our pig herds and requires our attention.

For more detailed information:

1. https://www.merckvetmanual.com/integumentary-system/exudative-epidermitis/overview-of-exudative-epidermitis
2. https://vetmed.iastate.edu/vdpam/FSVD/swine/index-diseases/greasy-pig

Poultry: Marek's Disease in Backyard Poultry

By Laura Chen, Branch Chief, WADDL-AHFSL

Marek's Disease Virus (**MDV**) is prevalent in the commercial poultry industry and common among backyard flocks. While widespread vaccination has reduced disease incidence in commercial chickens, the same is not necessarily true among backyard chickens. In a recent case series, MDV was identified as the presumptive cause of death in 21.7% of backyard poultry necropsies (n = 2,687) (Cadmus KJ et al., 2019).

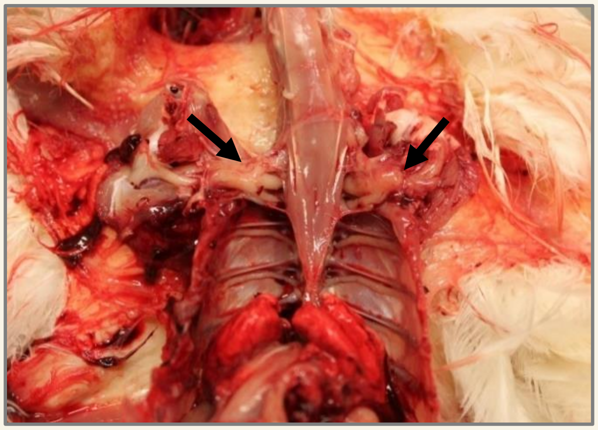
MDV is caused by a highly transmissible, uniquely lymphotropic, alphaherpesvirus called *gallidherpesvirus-2*. Strains are further classified by *live* experimental infection into one of four pathotypes, including mild, virulent, very virulent, and very virulent plus.

Transmission
Bird-to-bird transmission can be rapid once the virus is introduced into the flock. Production and shedding of infective viral particles occur in feather follicle epithelium and can happen as soon as 2 weeks post infection. Direct and indirect transmission are both described, with inhalation of feather dander being the route of infection. Vertical transmission does not occur. If new birds are added to an affected flock, they are at risk for infection if they have not been vaccinated.

Clinical Symptoms
Clinical disease is most commonly described in younger chickens but can also occur in older chickens. The disease is uncommon in turkeys and quail and is rarely identified in other species of birds. The incubation period of MDV can be as short as 3 weeks.

While multiple disease syndromes have been described with MDV, lymphoid neoplasia is generally the best recognized manifestation. Clinical symptoms can be highly variable, significantly complicating antemortem diagnosis based on symptoms alone. More specific symptoms include asymmetric progressive paralysis; asymmetric gray discoloration of the iris; or enlarged feather follicles. Less specific symptoms include weight loss, depression, dyspnea, and gastrointestinal signs. Sudden death with an absence of symptoms is also reported.

Diagnosis
Antemortem diagnosis of MDV can be difficult because of the variability in clinical symptoms. A presumptive diagnosis of MDV can be achieved by a combination of signalment, clinical signs, necropsy, and histopathology. Specific lesions include lymphoid neoplasia in the peripheral nervous system (see image) and various visceral organs. Avian leukosis virus and reticuloendotheliosis virus can occasionally overlap in morphology. Additional diagnostics, including immunohistochemistry and quantitative PCR, are necessary to increase confidence in the diagnosis.



Chicken in dorsal recumbency with viscera reflected caudally. Bilaterally, brachial plexuses (arrows) are markedly enlarged, supportive of brachial plexus lymphoma.

Prevention
Unfortunately, there is no cure for MDV and once a chicken is infected, it is a lifelong infection. The best way to protect a flock is by vaccination either *in ovo* or at 1 day of age. While a wide range of vaccines are commercially available, the majority require liquid nitrogen storage, making them impractical for owners other than those with larger hatcheries. There is a single lyophilized vaccine product requiring storage only in refrigerated conditions and is available in 1,000 dose vials. Proper vaccine storage and handling is imperative to maintain efficacy regardless of vaccine

type. Worth noting, the lyophilized vaccine product must be used within 1 hour after rehydration and should not be stored for use later.

The Avian Health & Food Safety Lab in Puyallup, WA, can test for Marek's Disease. Call or email if you have questions. https://waddl.vetmed.wsu.edu/avian Email: WADDLAHL@vetmed.wsu.edu Phone: 253-445-4537

Reference:

1. Cadmus JR, et al. Causes of mortality in backyard poultry in eight states in the United States. J Vet Diagn Invest 2019;31:318-326.

WSU Ag Animal Faculty Research Updates

(1) Ratzburg K, Jorgensen-Muga K, Murugesan J, Kastelic J, Kasimanickam V, Kasimanickam R. Presynchronization with CIDR, with or without GnRH, prior to CO-Synch in beef heifers. Theriogenology. 2020;146:80-87. doi: 10.1016/j.theriogenology.2020.02.005.
Objectives were to compare ovarian responses and pregnancy per AI (P/AI) in Angus-cross beef heifers (n = 521; 4 locations) synchronized with CIDR-CO-Synch (CCOS) versus CIDR-GnRH-CO-Synch (CGCOS) protocols. Heifers were assigned a reproductive tract score (RTS: 1, immature, acyclic; 5, mature, cyclic), body condition score (BCS: 1, emaciated; 9, obese) and temperament score (0, calm, 1, excitable). Heifers in the CCOS (n = 261) group received a CIDR on Day -20 (removed on Day -13), 100 µg GnRH on Day -10, 25 mg PGF2α on Day -3 and were timed inseminated 60 h later, with concomitant GnRH (Day 0). Heifers in the CGCOS (n = 260) group received a CIDR on Day -26 (removed on Day -19), 100 µg of GnRH on days -16 and -10, 25 mg of PGF2α on Day -3 and were timed inseminated 60 h later, with concomitant GnRH (Day 0). Ovarian ultrasonography was done in a subset of heifers (n = 60; 30 in each group) to determine number and size of ovarian follicles and presence of corpus luteum (CL). There was increased ($P < 0.05$) percentage of heifers with CL in CGCOS group compared to heifers in CCOS group on Day -10 (82.3 vs 68.2%) and on Day -3 (88.3 vs 75.1%). Average size of the largest ovarian follicle on Day 0 was greater for heifers in CGCOS group compared to CCOS group ($P < 0.05$). However, P/AI did not differ between CCOS and CGCOS groups, 55.0% (143/260) and 59.8% (156/261), respectively ($P > 0.1$). In conclusion, CIDR presynchronization with or without GnRH (CCOS and CGCOS protocols) in beef heifers resulted in similar P/AI. Adding GnRH to presynchronization with CIDR resulted in more heifers with a CL at PGF2α and increased preovulatory follicle diameter at AI. Future studies are needed with bigger sample size and CIDR + CO-Synch treatment as control to determine economic benefit.

(2) Kasimanickam R, Kasimanickam V, Kastelic JP, Ramsey K. Metabolic biomarkers, body condition, uterine inflammation and response to superovulation in lactating Holstein cows. Theriogenology. 2020;146:71-79. doi: 10.1016/j.theriogenology.2020.02.006.
The objective was to determine associations between response to superovulation and body condition, subclinical endometritis and circulating metabolic biomarkers [adiponectin, leptin, insulin, IGF1, tumor necrosis factor (TNF) α, interleukin (IL) 1ß, IL6, and urea] in lactating dairy cows. Ten multiparous lactating Holstein cows in each body condition score (1-5; 1 emaciated; 5 obese) category (BCSC) 2.00 to < 2.50 (BCSC1), 2.50 to < 3.00 (BCSC2), 3.00 to <3.50 (BCSC3), 3.50 to <4.00 (BCSC4) and 4.00 to 5.00 (BCSC5) groups (total n = 50) were randomly selected and superovulated, timed artificially inseminated with frozen-thawed semen from three sires and embryos collected (n = 50 collections). At embryo collection, blood samples and embryo recovery fluid were collected for determination of metabolic markers and presence of subclinical endometritis (lavage technique; > 6% PMN). In total, 379 embryos were collected (average of 7.6 embryos per superovulation). Mean numbers of total ova and embryos was greater for cows in

BCSC2, BCSC3 and BCSC4 groups compared with cows in BCSC1 and BCSC5 groups ($P < 0.01$). Total number of transferrable embryos were greater for cows in BCSC 2 and BCSC3 groups compared with cows in BCSC1, BCSC4 and BCSC5 groups ($P < 0.01$). Mean number of total ova and embryos and of transferrable embryos was higher for cows with 0 or 1-6% PMN compared to cows with >6% PMN ($P < 0.01$). In addition, there was a quadratic association between blood urea nitrogen concentrations and % transferrable embryos ($r^2 = 0.85$; $P < 0.05$) and between BCS and % transferrable embryos ($r^2 = 0.73$; $P < 0.05$). Circulating adiponectin, leptin, insulin, IGF1 and TNFα were greater in cows with moderate to good body condition compared to thin or obese cows ($P < 0.05$). Circulating adiponectin, leptin, IGF1 and insulin were greater in normal cows (≤6% PMNs), whereas, TNFα and IL1ß and IL6 were greater in cows with subclinical endometritis ($P < 0.05$). In conclusion, BCS and subclinical endometrial inflammation were associated with superovulatory response and embryo quality. Further, circulating metabolic biomarkers were associated with superovulatory response and embryo quality, likely due to donor's metabolic status and uterine environment. Optimizing superovulatory responses and embryo quality in lactating dairy cows requires management of nutrition and uterine health.

(3) Kasimanickam RK, Kasimanickam VR, Oldham J, Whitmore M. Cyclicity, estrus expression and pregnancy rates in beef heifers with different reproductive tract scores following progesterone supplementation. Theriogenology. 2020;145:39-47. doi: 10.1016/j.theriogenology.2020.01.028.
Two experiments were conducted to determine effects of progesterone (P4) on cyclicity, estrus expression rate (EER) and artificial insemination pregnancy rate (AIPR) in beef heifers with various reproductive tract scores (RTS; 1 to 5; 1, immature, acyclic; 5, mature, cyclic). In Experiment 1, Angus-cross heifers (n = 100, 20 per RTS category; mean (±SEM) age, 15 ± 0.8 mo) were randomly assigned to receive a CIDR (Days -17 to -10) or no CIDR (untreated control), with weekly blood samples and ultrasonography (Days 0-85). Among heifers with RTS 2 to 4, median interval to cyclicity were shorter ($P < 0.05$) for heifers in CIDR versus control. In Experiment 2, Angus-cross heifers (n = 11,098) were assigned RTS, body condition score (BCS; 1 to 9; 1, emaciated; 9, obese) and temperament score (calm versus excitable). Heifers with RTS 2-5 (n = 10,569) were allocated to CO-Synch (n = 5099) or CO-Synch + CIDR (n = 5470). Estrus was detected until AI (72 h after PGF2α), with pregnancy diagnosis ~70 d later. Controlling for RTS ($P < 0.0001$), BCS ($P < 0.0001$), temperament ($P < 0.0001$), age ($P < 0.0001$), treatment by RTS ($P < 0.01$), treatment by BCS ($P < 0.01$), and treatment by age, EER differed between CO-Synch and CO-Synch + CIDR (71.0 vs 75.9%, respectively, $P < 0.0001$). Accounting for RTS ($P < 0.0001$), BCS ($P < 0.0001$), temperament ($P < 0.0001$), age ($P < 0.0001$), heifers detected in estrus ($P < 0.0001$), RTS by treatment ($P < 0.01$), BCS by treatment ($P < 0.01$), and age by treatment, AIPR differed between CO-Synch versus CO-Synch + CIDR (55.3 vs 61.0%, $P < 0.0001$). In conclusion, exogenous P4 hastened cyclicity in pre- and peri-pubertal beef heifers. Further, it increased EER and AIPR. However, RTS, BCS and age influenced EER and AIPR. Among RTS 4 and 5, EER was greater for CO-Synch + CIDR vs CO-Synch. Among RTS 3 to 5, AIPR was greater for CO-Synch + CIDR versus CO-Synch. Progesterone status or supplementation at onset of synchronization protocols was critical to pregnancy outcomes, emphasizing heifer development for early puberty or progesterone supplementation.

(5) Subbiah M, Caudell MA, Mair C, Davis MA, Matthews L, Quinlan RJ, Quinlan MB, Lyimo B, Buza J, Keyyu J, Call DR. Antimicrobial resistant enteric bacteria are widely distributed amongst people, animals and the environment in Tanzania. Nat Commun. 2020;11(1):228. doi: 10.1038/s41467-019-13995-5. ***(Allen School)***
Antibiotic use and bacterial transmission are responsible for the emergence, spread and persistence of antimicrobial-resistant (AR) bacteria, but their relative contribution likely differs across varying socio-economic, cultural, and ecological contexts. To better understand this interaction in a multi-cultural and resource-limited context, we examine the distribution of antimicrobial-resistant enteric bacteria from three ethnic groups in Tanzania. Household-level data

(n = 425) was collected and bacteria isolated from people, livestock, dogs, wildlife and water sources (n = 62,376 isolates). The relative prevalence of different resistance phenotypes is similar across all sources. Multi-locus tandem repeat analysis (n = 719) and whole-genome sequencing (n = 816) of Escherichia coli demonstrate no evidence for host-population subdivision. Multivariate models show no evidence that veterinary antibiotic use increased the odds of detecting AR bacteria, whereas there is a strong association with livelihood factors related to bacterial transmission, demonstrating that to be effective, interventions need to accommodate different cultural practices and resource limitations.

(6) Liu J, Zhao Z, Avillan JJ, Call DR, Davis M, Sischo WM, Zhang A. Dairy farm soil presents distinct microbiota and varied prevalence of antibiotic resistance across housing areas. Environ Pollut. 2019;254(Pt B):113058. doi: 10.1016/j.envpol.2019.113058.
Dairy cattle of different ages experience different living conditions and varied frequency of antibiotic administration that likely influence the distribution of microbiome and resistome in ways that reflect different risks of microbial transmission. To assess the degree of variance in these distributions, fecal and soil samples were collected from six distinct housing areas on commercial dairy farms (n = 7) in Washington State. 16S rRNA gene sequencing indicated that the microbiota differed between different on-farm locations in feces and soil, and in both cases, the microbiota of dairy calves was often distinct from others ($P < 0.05$). Thirty-two specific antibiotic resistance genes (ARGs) were widely distributed on dairies, of which several clinically relevant ARGs (including cfr, cfrB, and optrA) were identified for the first time at U.S. dairies. Overall, ARGs were observed more frequently in feces and soil from dairy calves and heifers than from hospital, fresh, lactation and dry pens. Droplet-digital PCR demonstrated that the absolute abundance of floR varied greatly across housing areas and this gene was enriched the most in calves and heifers. Furthermore, in an extended analysis with 14 dairies, environmental soils in calf pens had the most antibiotic-resistant Escherichia coli followed by heifer and hospital pens. All soil E. coli isolates (n = 1,905) are resistant to at least 4 different antibiotics, and the PFGE analysis indicated that florfenicol-resistant E. coli is probably shared across geographically separated farms. This study identified a discrete but predictable distribution of antibiotic resistance genes and organisms, which is important for designing mitigation for higher risk areas on dairy farms.

WSDA Corner

USDA now offering free RFID tags
By David Hecimovich, WSDA Animal Services Division

During the past year, the Washington State Department of Agriculture (WSDA) has been providing free RFID tags to veterinarians for regulatory work. A recent announcement from the U.S. Department of Agriculture (USDA), ensures WSDA will be able to continue providing those tags.

In February 2020, USDA announced it would begin providing RFID tags as a free electronic alternative to metal “brite” tags and orange Official Calfhood Vaccination (OCV) tags. The alternative brite tag option will be an RFID low-frequency, white button tag. The OCV option will be an orange RFID low-frequency button imprinted with “OCV.” No state code is imprinted on the RFID tag.

Each state can order an amount based on data from the USDA National Agriculture Statistics Service, equal to their percentage of total beef/dairy replacement heifers nationally. USDA has allocated funding for approximately eight million RFID tags in the U.S. Washington's allotment is 1.56% of tags available, or 118,947 tags. Funding is expected to continue next fiscal year depending on availability of funds. Supplies of tags are also dependent on the rate that tag manufacturers can produce them.

Veterinarians using the tag for regulatory work will be prioritized, but producers may also have access as supplies allow. The use of the RFID tag will give the accredited veterinarian options to support producers who vaccinate for brucellosis or move classes of cattle required to have official ID for interstate movement. The RFID also facilitates the use of electronic platforms for animal health records that improve animal disease traceability.

Resources for Animals and COVID-19

Spring Cattle Work Calls for COVID-19 Precautions:
http://agnetwest.com/spring-cattle-work-calls-for-covid-19-precautions/

If you have animals:
https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html

WADDL COVID-19 Response:
https://waddl.vetmed.wsu.edu/

CDC Interim Guidance - Safe Practices for Workers who may have been Exposed:
https://aabp.org/resources/covid19/critical-workers-implementing-safety-practices.pdf

Continuing Education

Veterinarians

Academy of Dairy Veterinary Consultants Spring Meeting, April 18, 2020, ONLINE!
https://academyofdairyveterinaryconsultants.org/

Producers

University of Idaho Beef Cattle Webinar. April 22, 2020.
Spring Work: Herd Vaccination Protocols and Processing.
Time: 12:00 PM Mountain Time (US and Canada). Join Zoom Meeting: https://uidaho.zoom.us/j/534657804
Mobile: (346) 248-7799 US (Houston) (669) 900-6833 US (San Jose)
Meeting ID: 534 657 804

University of Idaho Sheep & Goat Webinar. April 16, 2020.
Nutrition. Time: 12:30 PM Mountain Time (US and Canada)
Join Zoom Meeting: https://uidaho.zoom.us/j/685028298
Mobile: (346) 248-7799 US (Houston) (669) 900-6833 US (San Jose)
Meeting ID: 685 028 298

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