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<http://vetextension.wsu.edu/newsletters/>

From the Editor –

Happy New Year! This year is starting off with a bang for WSU Veterinary Medicine Extension. We have a new face and his name is Caio Figueiredo. Caio comes to us via the University of Florida.



Dr. Caio Figueiredo

Dr. Figueiredo concluded his *Medicas Veterinarius* degree at Universidade Anhembi Morumbi in São Paulo, Brazil in 2017, and has since completed MS and PhD programs at the University of Florida. His focus during his graduate studies was on mechanisms of uterine disease development and cure in dairy cows, as well as assisted reproduction techniques, semen extenders, and other aspects related to reproductive efficiency. We'll look forward to getting him out to meet with as many of you as possible over the coming months. In the meantime, Caio is about to live through the reality that "[as the days lengthen, the cold strengthens!](#)"

Aside from that, I want to make certain that the WSU CVM Spring Conference is on your radar. It will be held from Friday evening March 24th- noon on the 26th, here on the WSU campus with 12 CE credits available. We're currently working on the schedule and intend to have a full slate of large and small animal topics. Of note, [Dr. Patricia Talcott](#) is scheduled to present toxicology-based livestock and equine cases. She is threatening retirement so this may be about your last chance to hear her present. For those of you lucky enough to have had Dr. Talcott as a teacher and/or toxicology resource, I'm sure she would love to catch up and hear about where your career trajectory led and why toxicology was the most important course you had during your DVM training!

Goats: Johne's disease

By CS McConnel, Veterinary Medicine Extension

Recently a case presented to WADDL that served as a reminder of the challenges related to managing Johne's disease (MAP, *Mycobacterium avium* subspecies. *paratuberculosis*) within goat herds. This case involved a 5-year-old doe (we'll call her Jane) that was purchased with intake serology performed via ELISA (enzyme-linked immunosorbent assay). This test identifies antibodies produced by a MAP-infected animal. At that time Jane was deemed negative via the ELISA. A year later she was ELISA test negative again as part of annual surveillance within her new herd. Jane was sold to another herd a year later without having been tested and soon thereafter became debilitated and died. At that time her feces was tested for MAP via PCR (polymerase chain reaction) and she was determined to have died of Johne's disease.

Although additional inquiries suggested that Jane had been somewhat of a "poor doer" prior to being sold the second time, her history of negative serologic results from ELISA belied her infection with MAP. Unfortunately, this is fairly common. According to the go-to for Johne's information (<https://johnes.org/>), ELISAs "are designed for rapid, low-cost screening of large numbers of animals. ELISAs are less sensitive than MAP-detection assays (PCR and culture), typically being positive in roughly 30%-50% of the animals that MAP-detection assays will identify as MAP-infected. This is generally because antibody production occurs later in the course of a MAP infection, months or even years after an infected animal has been passing MAP bacteria in its feces." The good news is that ELISAs are >99% specific which means that there is a <1% chance that a positive ELISA is a false-positive. The bad news is that surveillance using ELISAs clearly can miss infected animals and deliver a false sense of security.

It is worth noting that unfortunately fecal PCR has limitations as well. Infected animals that are shedding MAP do not necessarily shed consistently. That means that any given fecal sample has the potential to miss the bacteria's presence. Conversely, it is possible for MAP to be detected in feces as a result of bacterial pass-through as opposed to true infection. In other words, if a herd with infected animals is housed together with the potential for fecal-oral contamination, it is possible for the MAP bacteria to be ingested and pass through the GI tract without establishing an infection—those bacteria can be identified within the feces and falsely indicate infection in that individual.

Overall, a producer should consider impacts of Johne's disease through the lens of both current infection prevalence and/or disease transmission. As such, the following approaches have been laid out to provide some guidance in managing the diagnosis of Johne's disease for goat owners. These recommendations and much more can be found at <https://johnes.org/goats/faqs/>:

Question: Is MAP present in my herd?

Recommendation: Use targeted testing (ELISA or fecal PCR) of oldest or thinnest goats (10% or more of the herd).

Question: How many of my goats are infected?

Recommendation: A good estimate can be made by blood testing (ELISA) all goats after their second kidding or older.

Question: What test should I use to control MAP in my infected herd?

Recommendation: For commercial herds, blood testing (ELISA) on all goats after their second kidding or older is economical. See the Control section (<https://johnes.org/goats/control/>) for further information.

Question: What test should I use to eradicate Johne's disease in my herd?

Recommendation: Breeders must work to eradicate MAP. Pooled fecal culture is an economic way to eliminate the infection in the herd.

Question: Does this skinny goat have Johne's disease?

Recommendation: After ruling out parasites, fecal PCR is best. Even better is necropsy (autopsy) where a pathologist examines the tissues and a microbiologist attempts to detect MAP in tissues by PCR.

Question: What test do I need to sell and transport this goat?

Recommendation: This is determined by the agency managing the shipment or the receiving owner. If I were advising the buyer, I would recommend a test on source herd (all adults or at least 30 head) by fecal PCR (pooling acceptable). Buying young animals from such a herd is reasonable safe. If the herd owner can show you 3 years of whole-herd negative test results that would be even better.

Swine: Duration of swine exhibitions

By CS McConnel, Veterinary Medicine Extension

Time flies and before we know it, we'll be organizing for fair season! In preparation, we thought it might be worthwhile bringing to your attention an article entitled, "Shortening Duration of Swine Exhibitions to Reduce Risk for Zoonotic Transmission of Influenza A Virus" ([Emerg Infect Dis. 2022;28\(10\):2035-2042](#)). Swine exhibitions may not be your thing, but the fact that the authors of this study obtained 39,768 nasal wipes from 6,768 pigs is an impressive feat no matter your interests! Can you even imagine the aural fortitude it took to complete this project? In any event, the importance of the study lies in the fact that swine are critical hosts for influenza A viruses (IAV) because they can be co-infected with IAV from multiple host species. Furthermore, swine also have close proximity with humans through agricultural interfaces, making them a focus as a reassortment vessel for IAV with pandemic potential. Anyone care to revisit a pandemic? Anyway, the impetus to conduct this study came about because the Swine Exhibitions Zoonotic Influenza Working Group, consisting of animal and public health officials, drafted [Measures to Minimize Influenza Transmission at Swine Exhibitions](#) including the recommendation to shorten the duration of exhibitions to 72 hours. However, the various recommendations were based on common public and animal health theories without necessarily being founded on existing scientific evidence for preventing swine-to-human IAV transmission.

As a consequence, the authors of this study sought to evaluate the recommendation to limit swine exhibitions to <72 hours. During 2014 and 2015, they conducted daily IAV testing at 8 agricultural fairs in the United States, in which they sampled all exhibition swine every day to measure changes in prevalence longitudinally during the exhibitions. They then evaluated IAV in swine at agricultural fairs that had implemented the shortened, 72-hour recommendation for swine exhibitions compared with fairs that did not during 2018 and 2019.

Results from the longitudinal portion of the study are shown in Figure 1. The punchline is that the risk for IAV infection in swine continued to rise throughout the duration of the fairs. Given enough time, they found that most of the swine at a fair become infected with IAV, resulting in high viral load within the barn that could lead to zoonotic transmission to humans. These data provided strong support for the recommendation to limit the amount of time swine spend at a fair to curtail the interspecies transmission of IAV at county fairs. In fact, in the 2018-2019 follow-up study it was determined that among county fairs that tested positive for IAV, those that did not apply the 72-hour recommendation had the highest average estimated prevalence. Fairs that released all pigs before 72 hours had significantly lower prevalence estimates compared with fairs that did not release any pigs early ($p = 0.02$). However, there was no statistical difference between fairs that released only some pigs before 72 hours and fairs that did not release any pigs early ($p = 0.33$).

The bottom line is that this study found strong evidence that shortening the duration of swine exhibitions greatly reduces IAV prevalence in swine. This is particularly important in that the 72-hour cutoff can be applied at the fair level and does not require the individual exhibitor compliance required for many mitigation strategies. For example, the effectiveness of the recommendation to not show pigs with clinical signs of IAV infection is highly dependent on individual exhibitor education, awareness, and acceptance. As a result, it is expected that to varying degrees pigs are likely to arrive at exhibitions already infected with IAV. Therefore, recommendations that limit spread of IAV once it has been introduced to a county fair and can be put in place by fair organizers is a critical step toward reducing IAV prevalence in swine and the risk for zoonotic transmission of IAV.

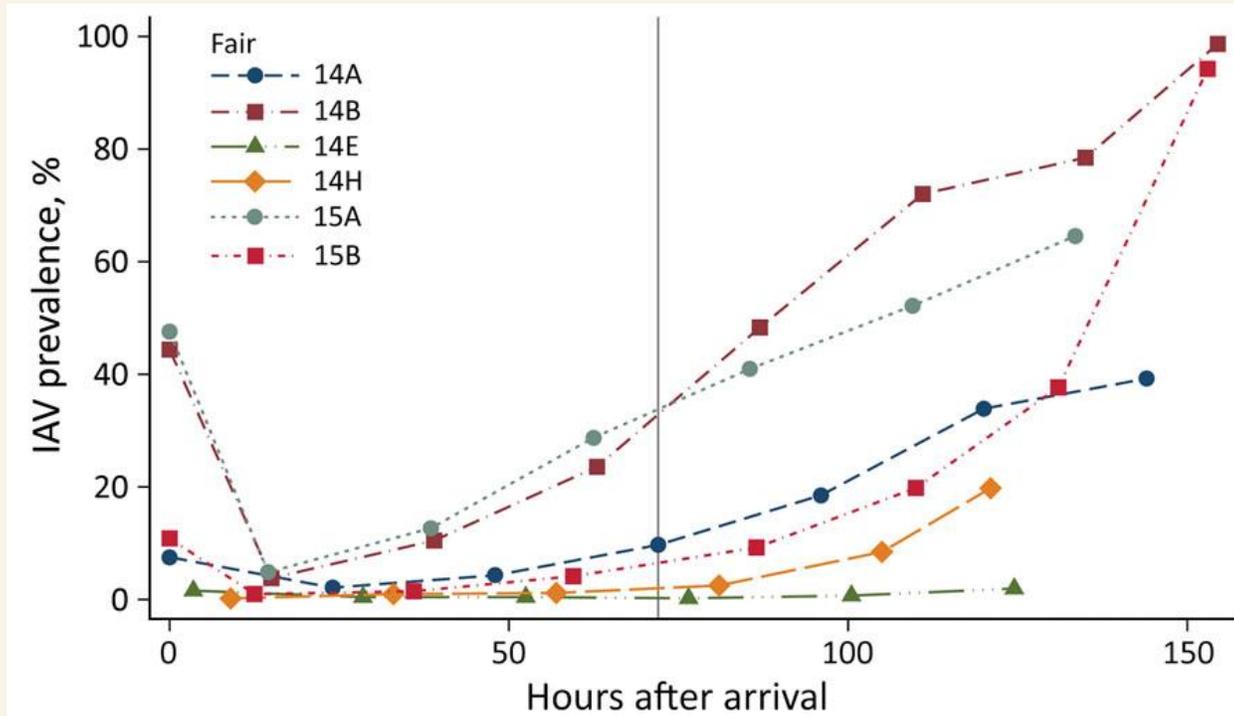


Figure 1. Percentage of pigs that tested positive for IAV by PCR at 6 IAV-positive agricultural fairs, Ohio and Indiana, USA, 2014 and 2015. Each data point represents the prevalence at that sampling timepoint connected with colored lines to indicate trend over time for each individual fair. IAV prevalence rises steeply through the latter half of each fair, indicating the strong role of lengthy show duration in increased viral amplification in each swine population. The reference line shows the recommended 72-hour cutoff for swine show duration.

Dairy: Calf housing

By CS McConel, Veterinary Medicine Extension & John Wenz, Field Disease Investigation Unit

According to the 2020 American Dairy Science Association’s 4th edition of the [Guide for the Care and Use of Agricultural Animals in Research and Teaching](#), commonly known as the Ag Guide, “Calves should be kept in full social contact with at least one other calf for the majority of the milk-feeding period.” That statement has generated a lot of discussion amongst us here within the WSU Field Disease Investigation Unit.

Clearly, calf disease is usually caused by a combination of factors—not just housing type. That said, raising healthy calves in pairs or groups has specific challenges. During the AABP 2022 Recent Graduate Conference, Dr. Knauer at the University of Minnesota provided an outline for dairy calf housing strategies to maximize welfare and meet producer goals. She highlighted the following for large group housing:

1. Overwhelming evidence suggests that an older age at introduction benefits the calf. However, early introduction requires less feeding labor overall (e.g., less individual feeding), so it is an option for some

producers, but they should be aware of the calf training needs and individualized attention needed for successful introduction.

2. If possible, an “all-in-all-out” strategy should be used to manage calves’ entry to and movement from the weaned calf pen.
3. Though not feasible on many large farms utilizing automatic feeding and social housing during the pre-weaning period, small groups (< 8-10 calves/group) are overwhelmingly more successful than large groups.
4. Cross sucking is one of the biggest behavioral challenges associated with social housing that can have detrimental effects to heifer longevity in the milking herd through heifer mastitis and blind quarters at first calving. One way to mitigate cross sucking is to eliminate its development through milk feeding practices that result in satisfied, satiated (and tired!) calves.
5. Protocols should be developed to monitor bacterial counts, machine or milk feeding equipment cleaning, and as-fed total solids level.
6. Weaning can be a particularly difficult time for calves housed in large groups if careful attention to step-down and grain feeding is not taken, particularly when large amounts of milk are being offered. Full weaning from milk should be delayed until 8 or 9 weeks of age, which will allow more time to adequately increase starter intake, leading to rumen development.

Dr. Knauer also identified considerations that should be taken into account for pair housing specifically:

1. The benefits of pairing are most evident when the pair is formed prior to 3 weeks of age.
2. The pair can be created in a variety of ways, depending upon feeding management, facilities/infrastructure already available, and producer goals. Recommendations are for a minimum of 35ft² (3.3m²) of resting space per calf, which correlates to approximately 2 hutches or 2 calf pens per pair.
3. Feeding a milk allowance of ≥6qts(L)/day through a nipple (nipple bucket or bottle) should be considered as a best practice when calves are housed in a pair. This feeding method increases the amount of time it takes a calf to consume her milk meal as compared to bucket feeding, which has several important implications related to cross sucking.

Additional information can be found through the University of Wisconsin regarding pair or group housing of dairy calves. Dr. Van Os has created a very useful [starter guide](#) for pairing or group-housing preweaned dairy calves. The guide provides important considerations that unfortunately are not addressed in the Ag Guide 4th ed. Our primary takeaway from the WI articles is that social housing for calves is not for every farm. Success with social housing is realized on operations where calves are well-managed and appropriately fed, with low exposure and high resistance to risk factors contributing to morbidity and mortality. In other words, farms that are successful at transitioning to social housing tend to be those farm that are already doing an excellent job managing individually housed calves.

Honey bees: Vaccine against American Foulbrood infection

By CS McConnel, Veterinary Medicine Extension

Ok I’ll admit that I know next to nothing about honey bees (*Apis mellifera*), but the fact that scientists have developed an oral vaccination for use in honey bee queens is really cool! In fact, this is the first vaccine approved for any insect within the US. This prophylactic vaccine against American Foulbrood (AFB) consists of an inactivated bacterin using the causative agent, *Paenibacillus larvae*. The company behind the vaccine, [Dalan Animal Health](#), is collaborating with the manufacturer Diamond Animal Health which holds the [conditional license](#). Now, before you get worked up wondering how to run a queen bee through a chute to drench her, you

should know that the vaccine is incorporated into royal jelly, a sugar fed to queen bees. Kind of sounds similar to the way children were given the polio vaccine through sugar cubes, doesn't it?

A safety and efficacy study for this vaccine was recently published in [Frontiers in Veterinary Science](#). It's an interesting article to read, but obviously a bit technical. The take home message is that creating a vaccine for insects was not always believed to be possible. Before the early 2000s, conventional wisdom was that insects could not acquire immunity because they lacked antibodies. In 2015, a [study published in the journal PLOS Pathogens](#) demonstrated that in honeybees an egg-yolk protein called vitellogenin contains immune elicitors that bind to bacteria, prompting immune responses in the offspring. Consequently, researchers realized they could cultivate immunity in a bee population with a single queen.

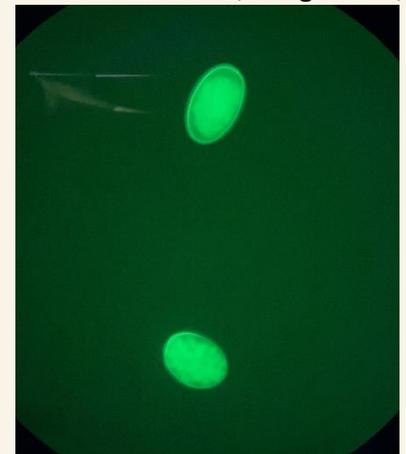
Jump forward to today, and the data presented in the vaccine efficacy study indicate that infection with AFB can be decreased by about 30–50% after vaccination of the queens. Interestingly, it has been shown that virulent AFB spores are present even in asymptomatic hives, having an average of 158 spores per bee; however, an increase in spore loads of 30% (to about 228 spores per bee) can lead to a clinical outbreak of the AFB. This suggests that even a modest decrease in the infection level will keep the disease from manifesting in the hives. This is incredibly important because once a hive shows clinical manifestations of the disease, the only effective way to eradicate it and prevent the spread of the disease is by burning the hive, the equipment, and the colony. Because of its virulent nature and detrimental effects on honey bee colonies, AFB is classified as a notifiable disease worldwide.

The good news is that AFB is actually under far better control than it was a century ago due to treatments such as burning infected hives and administering antibiotics. A much bigger threat to honeybee populations is the Varroa mite, a parasite that sucks blood of the adult honeybees and their brood. No vaccine can eradicate mites, but a vaccine might be able to protect honeybees from the viruses associated with the mites, including deformed-wing virus. Long story short, vaccines and bacterins with even relatively moderate efficacy will have the potential to become an essential management method in honey bees to prevent diseases in the wild.

WADDL: New test for barber's pole worm

By Laura Williams, Parasitology Section Head

The Washington Animal Disease Diagnostic Laboratory is now offering a test to identify *Haemonchus contortus* in small ruminant fecal samples. *Haemonchus contortus*, also known as the barber's pole worm, is one of the most pathogenic gastrointestinal parasites of goats and sheep. Heavy infections can cause anemia, weight loss, poor milk production, and unexpected death. Fecal diagnosis can be difficult since the eggs produced by *H. contortus* are indistinguishable from many other strongyle-egg producing worms in the gastrointestinal tract of small ruminants. WADDL now offers a fluorescence assay that specifically identifies and differentiates *H. contortus* eggs from other strongyle-type eggs. The test requires submission of 3-5 grams of fresh feces. WADDL will perform a fecal flotation to determine whether there are any strongyle-type eggs present in the sample. If there are sufficient numbers of strongyle-type eggs, the fluorescent assay will be completed to provide the submitter the percentage of *H. contortus* eggs present within the strongyle egg population. This information can then be used by veterinarians to guide treatment protocols and management strategies. Please visit the WADDL website <https://waddl.vetmed.wsu.edu/> for more information.



WSDA Tailgate Talks: See one, Do one, Teach one

By Dr. Amber Itle WA State Veterinarian

*I think it's safe to say that the most important things I've learned in life have occurred on the tailgate of a pickup truck or at the tail end of a cow. This is the fourth of a multi-part series, where I sit down on a tailgate or at the tail end of a cow and talk to veterinarians about important issues. Today we are going to talk about **mentoring in veterinary practice**.*

We've all heard the expression "See one, Do one, Teach one." I think we all know that couldn't be further from the truth. When I graduated from veterinary school 20 years ago, I started out in a mixed practice in rural Pennsylvania. The first week on the job, my boss went on vacation, and I found myself overwhelmed with endless emergency calls; two hit-by-cars, a parrot that got sat on, a schistosomas reflexus fetotomy, a rhododendron toxicity in a goat, two horse lacerations, a choke, a milk fever and a vomiting dog. The one "to do" usually came well before the one "to see." After two years of learning on the job, rapid burnout from small animal work drove me to join a progressive large animal focused practice.



Dr. Dave Hardman with Jack and Molly

Upon moving to Washington, I was fortunate to join a practice where mentoring students and new associates was part of the cultural norm, thanks to now retired practice owner, **Dr. Dave Hardman**. Dave modeled that behavior for the entire practice in his day-to-day work with co-owners, associates, technicians and veterinary students alike.

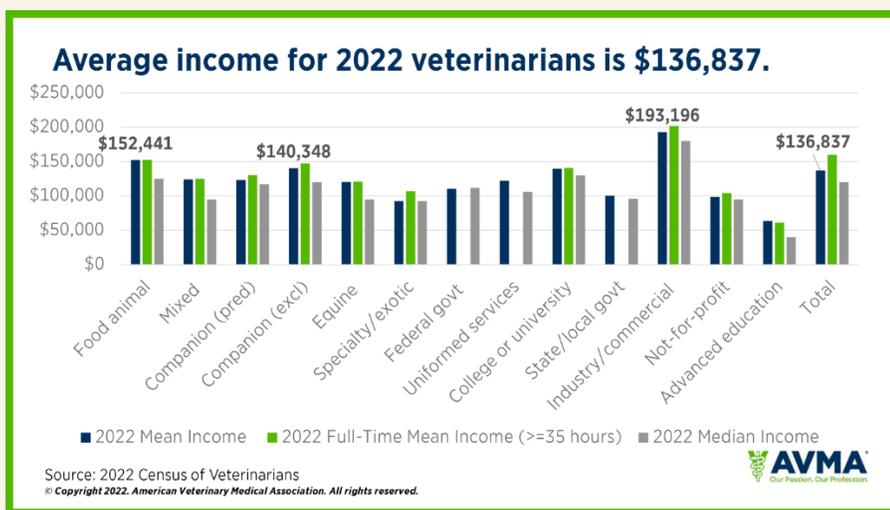
Dave grew up on a small farm in rural Baker City, Oregon where he worked alongside his hometown veterinarian Dr. Bill Kuhl. After high school, Dave spent time riding with him on calls and that mentoring experience influenced the trajectory of his career. After graduating with his Veterinary degree from WSU in 1969, Dr. Hardman worked for a year in Lewiston Idaho, under the supportive mentoring of Dr. Leonard Eldridge (our former WA State Veterinarian). For the next two years he filled the role of ambulatory clinician at Colorado State University and then at Washington State University Veterinary Schools where he worked alongside and mentored veterinary students, not much younger than himself. He says he gained incredible empathy during that time for students and the hardships of practice. He said, "When you come out of vet school, you have a lot of knowledge, but you don't know what to do with it." Dr. Hardman went on to private practice in Lynden WA in 1972 and applied his empathy and interest

in mentoring students his entire career. In fact, for many years, he formally mentored students through the preceptorship program with WSU's Vet school. Those students all have a story about Doc Hardman and the impacts of time spent with him.

Dr. Hardman has since retired from practice about 10 years ago and in that time trends in retention, turnover and contraction in large animal practice can be seen locally, regionally and across the State. In my last [Tailgate Talk article](#), I mentioned that Washington State failed to get applications for three of the four veterinary shortage areas we nominated for the National Institute of Food and Agriculture's (NIFA) [Veterinary Medical Loan Repayment Program](#) and [Veterinary Services Grant Program](#). I worked with veterinarians across the state who are struggling to retain or hire veterinarians, or have been in practice for 50 years and can't find a buyer for their practices. Both of these NIFA programs are designed to attract and/or retain livestock veterinarians by

either focusing on defraying some student loan debt or making practice enhancements to improve services. This fall, [AVMA](#) announced that the [mean debt](#) from earning a veterinary degree was \$147,258 for 2022 graduates from U.S. veterinary colleges, and the mean starting salary for new grads was \$111,242 for those who secured full-time employment.

Although these NIFA programs have put a lot of emphasis on forgiving student debt and have tried to attract and retain livestock veterinarians in underserved areas, they haven't solved the chronic problem. This issue is so much more complex than just debt load. According to [AVMA](#), since 2013, the percentage of new graduates going into companion animal medicine has been increasing, with 48% going into companion animal medicine in 2022. The percentages of new graduates going into the practice types of ***mixed animal, food animal, and equine have been fairly flat*** since 2013. In 2022, 8.9% went into mixed animal practice, 3.2% into food animal practice, and 1.5% into equine practice. Earning potential for food animal practitioners is the second highest among veterinarians according to AVMA, suggesting that there is more to the story than earning potential.



I sat down with Dave over coffee last week to explore reasons retention and recruitment has become more challenging in livestock and equine practice over the years.

1) Mentor, Support and Build confidence

New grads need strong mentoring from practice owners to foster a supportive environment and build confidence to ensure success. I was so fortunate to work side by side with Dr. Hardman for several years where he was my go-to for a “second opinion,” tapping years of experience to better inform my work. He mentored with patience and grace, in a way that didn't undermine my self-confidence while promoting assurance to the owner that they could trust yet *another* new associate. He instilled confidence in the clients, he empowered me to “do one,” he embraced my ideas even if they were different than his.

In small animal practice, veterinarians can “go to the back” to quickly look up differentials or ask a fellow vet or technician for support in challenging cases. Conversely, in large animal practice, it's often just you, the animals and the skeptical client eyeing your every move. There is no place to escape or look up answers or tap resources without complete visibility. Perhaps one of the fastest lessons in Large Animal practice is knowing to admit when you don't know. There is much to be said for saying “I don't know, but I'm going to ask someone smarter than I am.” However, new grads need to be part of a practice culture that promotes a culture of support that gives veterinarians and clients both the confidence that mentoring and group problem solving is the norm, not the exception. Everyone in the practice, including

the client, is responsible for making the practitioner successful. That humility and asking for help is a strength and not a failure.

2) Targeted recruitment in rural communities

Consider mentoring 4H, FFA and farm raised students in your community. Dr. Hardman's story is a perfect example of how early exposure and mentoring can recruit excellent candidates into the veterinary profession that want to work on livestock. Studies show that retention of food animal vets is much higher for students that came from the industry than those that are "converted" in vet school. Students recruited from an area where they can go back to practice are more likely to stay since they are already part of the community and have family nearby to help support them.

3) Keep your practice up to date

The first practice I started with was still mixing up colored squeeze jets for mastitis, casting immediate doubts that I found the right fit. It is important to invest in practice upgrades, new equipment and the ability for new grads to apply what they know. They are an asset to the practice bringing the most up to date understanding of the latest advancements in medicine, surgery and technology. Focus on fostering talent, by empowering new veterinarians to perform the full range of work they've been trained in and are qualified to do. If the practice is not progressive, associates are more likely to leave. Create a progressive work environment by offering CE opportunities, being open to change and adopting new techniques or ideas that new veterinarian brings to a practice to make them feel valued by leadership.

Take advantage of the [Veterinary Services Grant Program](#). (applications open in [February](#)) to update your equipment or provide new services. This can help livestock practices looking for new ownership to transition and improve business practice so their practices are desirable to buy. Practices might consider offering "good will" buy in right away, so the veterinarian feels invested and motivated to stay.

4) Paradigm shift in veterinary practice

In the last decade, our profession has seen a bit of a paradigm shift with regard to demographics and values. Now, millennials have overtaken Gen Xers as the largest generation of the veterinary workforce. Employee turnover and attrition is [twice as high](#) as it is for physicians in medical practice. AVMA found that [over 40% of practitioners](#) who graduated during the last 10 years are thinking of leaving the profession. They cited mental health (33%) and work-life balance (27%) as their top reasons. According to studies from the Centers for Disease Control and Prevention, [1 out of 6 veterinarians](#) has considered suicide. While male vets are 1.6 times more likely to die by suicide than the general population, female vets are [2.4 times more likely](#), and 80% of vets are women.

Some practices have rapidly adapted to the demands of a new generation of the veterinary workforce to promote retention by incorporating changes like supporting mental health, addressing work life balance, providing opportunities to buy in, adjusting schedules to provide reasonable work hours, increasing wages, offering signing bonus/ productivity bonus opportunities and eliminating on call responsibilities. As more mixed animal practices sell the large animal component of their practice, it begs the question of whether this paradigm shift has had an impact on recruitment and retention of livestock vets. Are large animal practices embracing the same types of incentives that small animal practices are?

Full-time veterinarians were working more hours than expected this year according to AVMA. For years, the veterinary profession was based on a model of customer service to be available 24/7. Although there is a deliberate step away from this model in small animal practice, it is much more challenging to address the issue of afterhours calls in large animal practice. The next generation of veterinarians share the value of work life balance and may not be willing to work the 60-80 hours a week often expected in large animal practice. Some practices I have spoken with have tried to address this challenge by sharing

emergency services with other practices in a geographic area or provided incentives for the associate vet (let them have the money!). Long, demanding hours remain a concern for understaffed and overworked owners and associates alike, especially in large animal practices.

5) Supporting a predominately female veterinary workforce

Women account for [78% of the U.S. veterinary population](#) and [60% of the veterinary workforce](#). As a mother of 3 kids, who has worked full time through my entire career, I can speak to ways in which female veterinarians need support from practice owners to incentivize retention in practice.

Let's rewind back to my first practice experience. Often when I arrived on the farm, I was greeted by an unwelcoming, "Oh, great.... A new vet" or "Where's the man vet (Doc)?" "That's not how Doc does that," "Doc could get that done faster," or "Doc never gave them sedatives," and countless other comments that undermined my ability to do the job. Worse yet, it was not uncommon to hear things like "this is not women's work," "shouldn't you be home raising children," or "you aren't big enough/ strong enough" which translated in my mind to "you just aren't enough and never will be." Instead of feeling deterred, I used those words to work harder, to think of innovative ways to solve problems. At 5'2" and 110 pounds, I had to use other tools than brute force to get the job done. I was determined to find a way, but it wasn't easy.

First, as part of the mentoring and supportive practice culture, female veterinarians need practice owners, associates and clients to have confidence in their abilities. While working on some of the NIFA shortage area nominations, I had veterinarians tell me that their clients don't want a woman vet. However, I would encourage practice owners to translate confidence in female veterinarians to producers and not cater to the "I only want a man vet" mentality. Women can do this work just as well but might use different tools, strategies or procedures to get the job done. And let's face reality, women are the future of the veterinary workforce for the foreseeable future.

Among women in the veterinary profession, 72% are under 52 years old, meaning they could still have child-rearing obligations. Although often unspoken, practice owners are concerned about providing maternity leave and accommodating flexible schedules to help with child rearing activities. We need to stop seeing childbearing as a practice burden especially with shifting demographics but rather recognize that with the right support structure, we can keep professional moms working. Support female veterinarians by thinking about what you would want for your own mother or daughter or granddaughter. They are an important part of our profession.

It's also important to remember that many veterinarians are married to professional spouses that may have trouble finding jobs in rural communities. Usually one spouse takes the "lead" depending on who has the best opportunity, precluding some vets from going to or staying in rural practices. This is especially true with more female veterinarians with professional husbands who can't find relevant work in their field.

There are many reasons that retention and recruitment has become more challenging in livestock and equine practice over the years. I would encourage each and every veterinarian to think about how we can do better to build relationships with recent graduates who seek to expand their knowledge, confidence, productivity, and clinical skills in private or public practice settings. Beyond the professional role he played in my life, Dave remains a trusted friend and he passed along the passion to give back, and "teach one" to the next generation of veterinarians. We all need to channel our inner "Dr. Dave Hardman" or whoever that special mentor in your life was that showed you the way and made you successful. Perhaps we could start by changing the expression to **"See one, Do more, and Teach many."**

WSDA: What veterinarians should know about GFI#263

By Dr. Bruce Hutton, WSDA Region 3 Field Veterinarian

Background: Misuse or overuse of antibiotics in human and veterinary health care, as well as food production medicine, is a major inciting cause of antimicrobial resistance leading to a serious threat to both human and animal health worldwide. Recognizing the significant human health concerns caused by resistant pathogens, the CDC released the [national strategy](#) for combating antibiotic-resistant bacteria in September of 2014. This document was intended as an action plan designed to develop a strategy to slow the emergence of resistant bacteria through surveillance, diagnostics, research, and collaboration between stakeholders. As a result, two Guidance for Industry (GFI) documents were developed (GFI #209 and GFI #213). GFI #209 dealt broadly with the judicious use of antimicrobials in food producing animals, whereas GFI #213 more specifically targeted the use of medically important antimicrobials in the feed and water of food producing animals. In 2017, the implementation of GFI #213 effectively eliminated the use of medically important antimicrobials for growth promotion in the feed or water of food producing animals. In addition, it required a Veterinary Feed Directive (VFD) for medically important antimicrobials added to feed, and a prescription for medically important antimicrobials added to water when used to prevent, treat, or control a specific condition.

Building on GFI #209 and #213, in 2018 the FDA center for veterinary medicine released a [5-year plan](#) designed to raise awareness of antimicrobial resistance and provide a guide for antimicrobial oversight in veterinary settings. A component of this plan was to issue and implement a strategy to convert all dosage forms of over the counter (OTC) medically important antimicrobial drugs approved for use in food-producing animals to veterinary prescription status. On June 10th, 2021, the FDA finalized [GFI #263](#) which outlines the processes necessary to accomplish this task. GFI #263 placed a 2-year deadline on implementation which means that by **June 11th, 2023, all medically important antimicrobials approved for animal use will require a veterinary prescription.**

Impact: So, what does all this mean for food animal veterinarians. In June of 2023 producers who are used to treating their own animals will now be required to obtain a veterinary prescription prior to purchasing medically important antimicrobials which were previously available without a prescription. There are a handful of OTC medications in various formulations which will transfer to prescription status when GFI #263 is implemented in June of 2023. They include sulfas, penicillin, oxytetracycline, tylosin, lincomycin, and the intermammary tubes ToDay and ToMORROW. As we all know, veterinarians are required to establish a valid VCPR prior to issuing a prescription. According to the WVMA board of governors, a VCRP exists when the veterinarian:

- Has assumed responsibility for making clinical judgements about the patient, and the client or key party has agreed to follow the instructions of the veterinarian.
- Has sufficient knowledge of the animal(s) to generate a preliminary diagnosis. For herd health, this can be done through examination of records, consultations with operations' management personnel, and understanding of local epidemiology of diseases. Having sufficient knowledge means the veterinarian:
 - Has examined the animal(s) in the last 12 months or sooner if appropriate.
 - Is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s) or by medically appropriate and timely visits to the premises where the animal(s) are kept (in cases involving operations with several animals, such as encountered at farms, laboratories, or in shelters).
 - Is readily available for follow-up and continued care or has arranged for emergency coverage and continuing care and treatment.

The impact of GFI #263 on veterinarians should be minimal as existing clients requiring prescription medications should already have a valid VCPR. There may be a slight uptick as owners who only irregularly use veterinary services realize they do not have the valid VCPR required to obtain a prescription. Confounding the problem is the shortage of food animal veterinarians especially in rural areas which may make the establishment of a VCPR difficult. Client and community education between now and June 2023 would help to alleviate problems. Food animal veterinarians should be actively involved in engaging and promoting the transition well before the June 2023 deadline.

Why Should We Change: First and foremost, veterinarians as health care providers should embrace the one health concept. There are numerous antimicrobials used in both veterinary and human health care settings. Their misuse, in either setting, promotes antimicrobial resistance which has global negative animal and human health effects. Removing OTC medications from the shelf and requiring their use on or by the order of a licensed veterinarian provides an extra layer of oversight. The use of OTC antimicrobials in food animals has a long tradition. It is almost a badge of honor for an owner to report they have not used a veterinarian for years. Unfortunately, seasoned food animal practitioners could easily fill a book with “what the heck were they thinking” stories of antimicrobial misuse by lay persons. Food animal veterinarians working under a VCPR are uniquely positioned to promote judicious antimicrobial use through client education and prescribing antimicrobials only when necessary. A veterinarian’s knowledge of antimicrobial use including choice of antibiotic, dose, duration, and route of administration is critical to ensuring the proper use of antibiotics in animals.

Lastly, producers and veterinarians should understand that consumer attitudes toward food animal production systems are changing. Conventional programs utilizing hormones or antimicrobials for disease prevention and growth promotion are less accepted in the marketplace. Extreme programs such as the No Antibiotics Ever (NAE) program used in poultry production are effective but can have [unintended consequences](#). Consumers are bombarded daily about perceived problems within the US food production industry. The food animal industry, including food animal veterinarians and producers, should take the helm and promote balanced programs such as the Certified Responsible Antibiotic Use ([CRAU](#)) program.

The U.S. Food and Drug Administration’s Center for Veterinary Medicine (CVM) has developed some materials that you might find helpful. Below are links for species-specific fact sheets - these include information on products/indications that will be transitioning as part of GFI 263 and information on how interested animal owners can locate a vet. Also linked below are a brochure and poster which detail the importance of veterinary involvement as products transition to Rx.

1. Antibiotic Stewardship in Veterinary Medicine Brochure – <https://www.fda.gov/media/162067/download>
 - Español – <https://www.fda.gov/media/162068/download>
2. Antibiotic Stewardship Poster – <https://www.fda.gov/media/162075/download>
 - Español – <https://www.fda.gov/media/162076/download>
3. Antibiotic Stewardship in Beef and Dairy Cattle - <https://www.fda.gov/media/162069/download>
 - Español – <https://www.fda.gov/media/162070/download>
4. Antibiotic Stewardship in Poultry – <https://www.fda.gov/media/162071/download>
 - Español – <https://www.fda.gov/media/162072/download>
5. Antibiotic Stewardship in Sheep and Goats – <https://www.fda.gov/media/162073/download>
 - Español – <https://www.fda.gov/media/162074/download>
6. In addition, CVM has posted a [list of affected applications](#) on its website as well as a [Farmer and Rancher Q&A](#).

WSDA: Feeling Blue about Bird Flu

By Dr. Amber Itle WA State Veterinarian

It has been nearly a year since Highly Pathogenic Avian Influenza (HPAI), a highly contagious and deadly foreign animal disease appeared in the United States. The sad part is that it's not going away due to a resurgence of outbreaks during southern migration. At the time of this writing, the [United States Department of Agriculture's \(USDA\) Animal and Plant Health Inspection Service \(APHIS\)](#) has confirmed the detection of highly pathogenic avian influenza (Eurasian HPAI H5 2.3.4.4b) in 702 premises in 47 states. Within Washington, HPAI caused high mortality and morbidity in domestic birds with significant animal welfare concerns and trade implications resulting in massive economic impacts for our state. Since May 5, 2022, Washington has confirmed cases in 39 backyard, non-commercial premises and one commercial operation across 15 counties, with our [most recent backyard detection](#) on January 6, 2023 in Thurston County and a 1.1 million bird commercial layer operation detection on December 10, 2022 (**Figure 1**).

Washington State is not known as a large commercial poultry state but has 9 M layers in 222 flocks and 29 M broilers in 259 flocks. There are over 800 organic backyard flocks, many niche farms and exhibition birds statewide. Here are some of the statistics we've tracked throughout the outbreak:

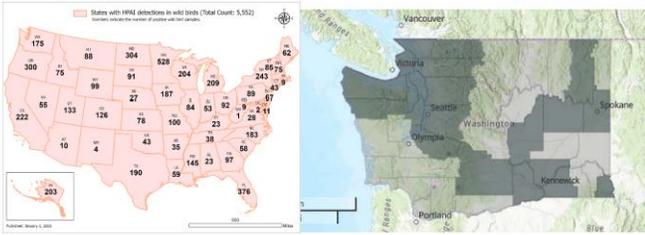
- 80% of the positive premises were in Western WA
- 12% of positive premises were designated as "poultry" and 88% "non-poultry"
- 300+ sick bird calls were received—investigated an additional 29 that were negative
- 100% of positive cases reported high morbidity/ mortality
- There were variable clinical signs—waterfowl species were more likely to exhibit neurologic signs
- Flock sizes ranged from 2 - 414 birds—85% were fewer than 100 birds
- 100% of infected flocks had contact with wild waterfowl or shared water/feed sources
- Most of the flocks contained mixed species

The Washington Department of Fish and Wildlife continues to report increasing numbers of cases in [wild birds](#) including reports of significant wild bird die offs or neurologic signs in a variety of wild bird species including: Canada geese, bald eagles, snow geese, sand hill cranes, red tailed hawks, peregrine falcons, ravens, gulls, great horned owls, and mallard ducks. USDA confirmed 175 detections in wild birds in Washington through routine surveillance as of December 21, 2022. Eight states (including Washington) have reported H5N1 in wild, carnivorous mammals (skunks/raccoons) and reports in seals, fox and bears have also been documented in the United States. There is clear evidence that the virus continues to persist in the environment and in residential wild birds that overwinter here. The most common risk factor for infection is proximity to water sources or ponds where wild waterfowl congregate, increasing environmental viral load and risk of transmission to domestic flocks. [Download the latest WSDA HPAI update](#) or [WSDA HPAI online webmap](#).

Highly Pathogenic Avian Influenza (HPAI) UPDATE

By the Numbers – State Wild Bird HPAI Surveillance

USDA confirmed 175 HPAI detections in wild birds in Washington through federal surveillance as of January 3. [Data source](#)



Most recent wild bird presumptive positive through state surveillance December 16 (Walla Walla County) Washington Dept. of Fish and Wildlife Avian Influenza detections map. [Data source](#).



January 6, 2023

Highly Pathogenic Avian Influenza (HPAI) UPDATE

Cases in Washington	
40	
County	# Premises
Clallam	2
Cowlitz	1
Franklin	1
Jefferson	2
King	7
Kitsap	2
Okanogan	1
Pacific	1
Pierce	6
Snohomish	8
Spokane	1
Thurston	2
Walla Walla	1
Whatcom	1
Yakima	4

By the Numbers – Washington State

Currently, there have been 1 affected commercial flocks, 39 affected backyard flocks and over a total of **1,018,182** birds affected in this outbreak in Washington. [Washington State Avian Influenza Outbreak Map – Overview of Control and Infection Zones](#)



Last presumptive positive January 4 (Thurston County)
New data available at agr.wa.gov/birdflu

Counties Impacted	Total Detections	Open SZ/CA
15	40	4

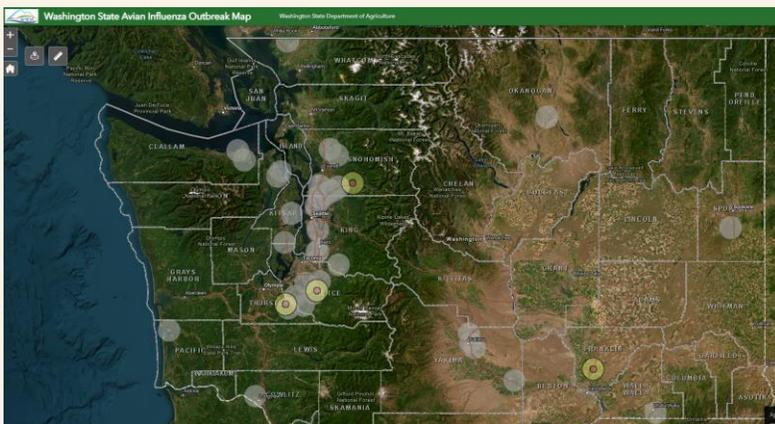


Figure 1: Areas of HPAI detection within Washington: Circles show surveillance/ control areas and distribution of cases across the State. Gray circles indicate zone closures. Yellow indicates open zones.

Euthanasia Methods

WSDA has three fully stocked emergency management trailers strategically positioned across the State for backyard depopulation and disposal efforts.



The trailer contains all equipment and supplies needed for depopulation, disposal, cleaning & disinfection, restraint and PPE for easy access and use.

The trailer was also used to transport carcasses to landfill. The lining allows for cleaning and disinfection inside and out.

Figure 2. Emergency Response Trailer

The three major ways that WSDA handled euthanasia was 1) small container CO₂ (67%), 2) small container CO₂ and long range shot with Wildlife Services (29%), and 3) cervical dislocation (2%).

Small container CO₂ proved to be an effective and reliable tool that was used in some capacity for almost all of our backyard responses. A CO₂ cylinder with a regulator was used to deliver gas into a simple garbage can lined with disposable bags. Supplies were portable, inexpensive, easy to clean/disinfect and replace. WSDA contracted to have a portable CO₂ chamber custom built to assist with larger outdoor flocks without enclosures. The model was based on a similar chamber owned and employed by Wildlife Services. The aluminum box has two access points for gas and can fit a large number of birds at one time. Metal sawhorses were purchased to hold the chamber at waist level for ease of use.

Long range shot executed by USDA APHIS Wildlife Services was a critical addition during our response. Many of the flocks had access to large, expansive properties that included challenging terrain, ponds and/or other water sources. Oftentimes, many of the birds could not be contained in pens or were free-range. A significant number of flocks were composed of mixed species including domestic and wild waterfowl and some feral birds that were difficult to distinguish. Wildlife Services were able to humanely and professionally dispatch birds that could not be caught or that escaped. The key to their success was to be made aware of all species and anticipated numbers on the premises ahead of time (chickens, guinea fowl, turkeys, peacocks, emus) as well as the ability to assess the property to identify other safety risk factors (nearby homes). Dispatch activities were sometime performed in the evenings when birds perched up for the night in the trees and oftentimes required multiple visits to fully complete the task. Baiting over the course of several days was used as a tool in some cases to bring birds into enclosures. The process was made easier when the owner was not present to protect public safety and avoid the emotional impact of the process on the owner.

Cervical dislocation was only used in two cases to extinguish a single remaining bird or a bird that was missed on a depopulation day.

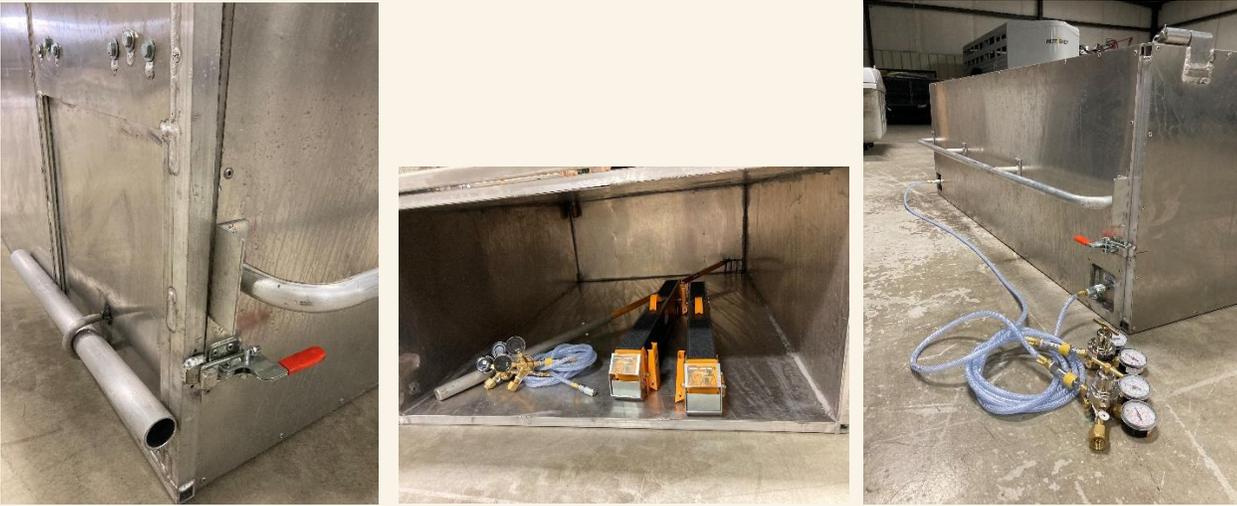


Figure 3. Custom Built CO2 Chamber

Challenges

One of the most challenging parts of our response was working with backyard owners that view their birds as their pets, not a food source or as a means of commercial production. Washington State Department of Agriculture has strong, robust relationships with our commercial flocks as we audit biosecurity plans, have regular meetings, keep communications open and practice response in tabletop exercises. These activities allow for strong relationships, compliance and realistic expectations for response processes. However, with backyard flocks, trusting relationships must be built in just a few days, sometimes in just a few hours. This requires the case manager to have a strong understanding of HPAI response policy/process as well as nimble, diplomatic communication skills.

[Owner communication](#) and support was critical to our response. In just a few weeks, WSDA successfully put up a website, a HPAI Facebook group, press conferences, press releases and interviews to help reach backyard producers and answer questions. Despite these efforts, the reality of what would happen if your flock was confirmed positive with HPAI, was a difficult subject to broach with many owners. Responsible flock owners diligently reported illness and mortality to our sick bird hotline, not realizing that the entire flock, even healthy birds would be euthanized if test results came back positive.

These birds were pets, 4 H projects, the result of years of breeding, show birds, rare heritage breeds and many of them had names. No amount of indemnity was enough to compensate these owners for their losses. Many owners questioned why wild birds were allowed to stay and were in fact even protected, while their domestic flock had to be completely extinguished. The inability to keep hatching eggs and try to restore lost genetics was also heartbreaking for many. In addition to anger and frustration from owners, safety was of some concern for some of our backyard responders as depopulation efforts were often not welcome.

The uniqueness of each flock, response, conversation, and process had to be customized to each premises, which was extremely time consuming and emotionally exhausting for owners and responders alike. Some of our responders were known to deliver handmade cards to owners to show support and empathy for what owners were experiencing. Compassion fatigue is real and many of our responders reported “burnout” throughout the response. Although the Department of Health has mental health resources, they were under promoted and under-utilized.

Conclusion

Washington has been successful in using customized euthanasia methods for backyard flocks infected with HPAI including a combination of small container CO2, long range shot and cervical dislocation methods. However, backyard response is time consuming, resource heavy and emotionally taxing for owners and responders alike.

Moving forward, backyard flock response deserves a revision from USDA avian health policy staff. Current policy for depopulation and surveillance often discourages reporting, especially once flock owners understand the consequences of a positive test result. As long as infected wild birds are migrating through flyways across the country, the infection reservoir will be a persistent threat. The response to backyard flocks as well as the “poultry” vs “non-poultry” designation should be adjusted to think of this as a control program. Backyard flock response should be scaled back or adapted rather than trying to apply an eradication effort designed for commercial flocks to preserve trade. Discussion around the use of vaccine for zoological collections and backyard flocks must be considered to protect bird welfare and economic viability of backyard flocks and niche markets that do not export products internationally. This would ensure the sustainability of a long-term backyard response efforts and economic viability for backyard flocks in weeks, months and maybe years to come. We need common sense solutions (and viral reassortment to low pathogenicity) to help us stop feeling blue about bird flu.

WSDA: 2022 Animal Health Program top accomplishments

By Dr. Amber Itle WA State Veterinarian

Emerging and Reportable Disease Trends for 2022

The Animal Health Program’s (AHP) mission 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 safeguard the citizens of Washington State by identifying and limiting the exposure to zoonotic diseases.

Private veterinarians and veterinary laboratories in Washington [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. During 2022, 157 case reports were submitted to the Washington State Veterinarian. Some of the reported diseases are considered endemic (“monitored” diseases that we monitor for changes in trends over time), whereas foreign animal or emerging diseases are classified as reportable and “actionable” requiring prompt immediate response from our team. Any reportable diseases with public health significance are immediately reported to the Department of Health.

Companion Animal Reportable Disease Trends

Aside from the HPAI cases mentioned above, canine and equine species generated the most reports to the AHP. In particular, case reports of strangles (*Streptococcus equi equi*) and equine influenza virus were most commonly reported due to the endemic and contagious nature of these diseases. Heartworm and Leptospirosis were the top cases of canine reports. All of these diseases are endemic in Washington and are monitored, not actionable diseases.

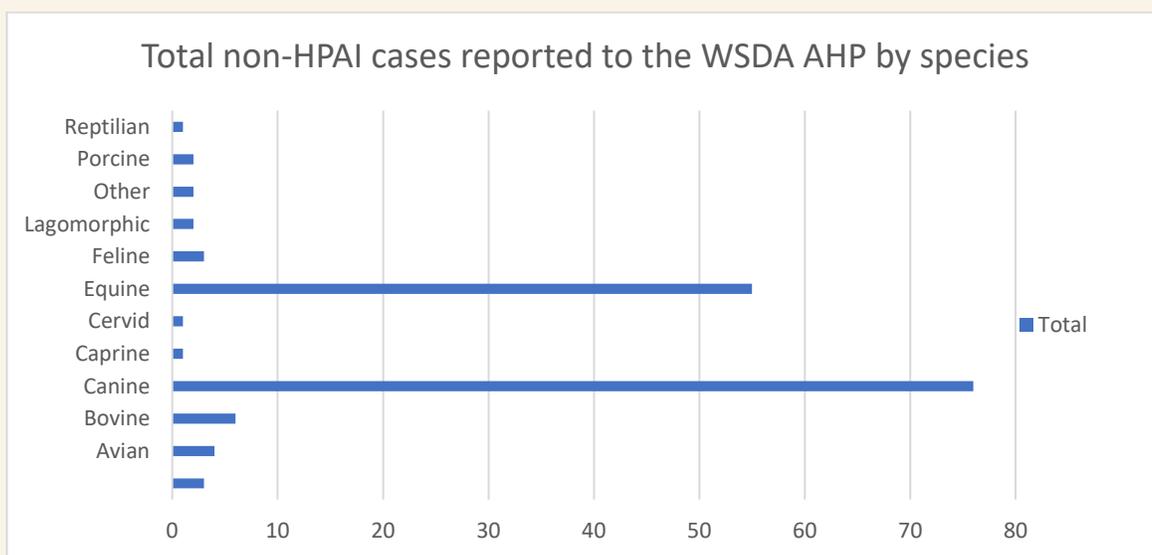
Brucella canis is a zoonotic disease that requires reporting to the Department of Health. The number of cases of canine brucellosis have increased in recent years in Washington, but it is unclear whether this increase is due to improved awareness among veterinarians leading to more diagnostic testing, improved reporting, or a true increase in prevalence. There is some concern that increased importations of dogs originating from the southern United States or countries with higher prevalence of *B. canis* are contributing to this increase. Of canine cases reported in Washington from 2005 through 2020, 54% originated from other US states (TX, OK, GA, CA, AZ, NM,

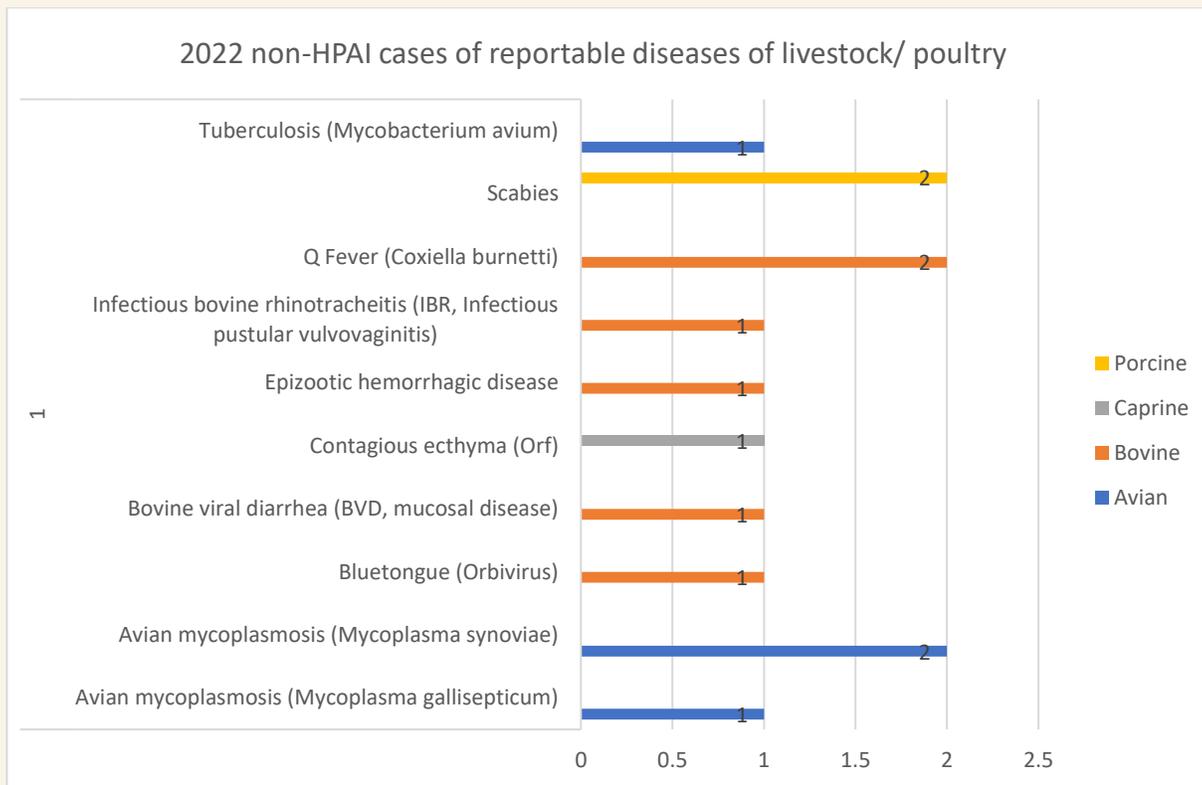
MT, HI), 23% originated internationally (Mexico, China, South Korea), 12% originated from breeders in Washington, and 12% had an unknown origin.

Heartworm cases continue to be reported in Washington but have been trending downward in recent years. According to the American Heartworm Society (AHS), more than a million pets in the U.S. have heartworms, despite the disease being preventable. Washington State citizens adopt thousands of rescue dogs and cats every year some with international origins and many with origins in the Southern U.S., where heartworm is common. Washington is one of the few states in the U.S. where Heartworm disease is not considered an endemic disease. Trends in the last few years show a decline in cases, but we can't be sure whether that is related to a decrease in disease, a decrease in testing, or a decrease in reporting. We need your help to test for and report cases of heartworm so we can better inform you of these trends over time. We need to get tough on heartworm, so we don't have to learn to live with it in the future. More information can be found here: [Heartworm is a Reportable Disease WSVMA, American Heartworm Society](#).

Rabbit Hemorrhagic Disease (RHDV2) killed hundreds of domestic and feral domestic rabbits in Island and Clallam counties in 2019. The strain killed domestic rabbits only; native wild rabbits and hares were not vulnerable to it. Washington State Department of Agriculture confirmed the presence of rabbit hemorrhagic disease virus type 2 (RHDV2) in King and Thurston County rabbits this past year with both resulting in 100% mortality of all rabbits in the colony. Both cases were classified as the SW strain determined by whole genomic sequencing. To date, 45 States have authorized the use of an emergency use, domestic vaccine (Medgene Labs) available for veterinarians to be administered and boosted in 21 days.

Equine Infectious Anemia was detected in Washington for the first time in seven years, when the disease was confirmed in two Washington horses this fall. The two horses resided on separate farms in Yakima County but were together on one of the farms earlier this summer. A private veterinarian tested the first horse, a 7-year-old quarter horse gelding, after the owner became concerned about possible exposure to EIA while recently stabled at an out-of-state facility. Both infected horses were actively involved in the quarter horse and bush track racing circuits in both Washington and California.





WSDA: Winterizing your animals

By Dr. Ben Smith WA Assistant State Veterinarian

The cold weather has already started, but we still have a few months left to go before spring warms things up. Making sure your animals are winterized properly takes a little thought and preparation. The most important thing to remember is to provide a clean and fluid water source. If possible, water heaters will increase intake and decrease the incidence of colic. Animals can't get enough fluid from eating snow, so don't rely on this. Salt is another important source of minerals that is often overlooked. The loose form is better for getting correct mineral intake than blocks. The animal often cannot lick a block enough to really get proper levels of minerals in a deficient area.

Grass tetany, or low magnesium, is common in cows during spring calving and is linked to the level of mineral intake during the winter. Without appropriate supplementation an affected cow may require emergency measures to survive. Low magnesium in the blood of an animal can be caused by low magnesium levels in feed and/or reduced magnesium absorption.

Contributing causes of grass tetany include:

- magnesium levels are lower in cool season grasses and cereals than in legumes or weeds
- levels are low in grasses grown on leached acid sandy soils
- levels are low when potash and nitrogen fertilizers are used and growth is vigorous
- high moisture content in grass causing rapid gut transit and low uptake
- reduced absorption of magnesium resulting from high rumen potassium and nitrogen and low rumen sodium
- low energy intake, fasting or sudden changes in feed
- bad weather, especially winter storms

- stress such as transport or yarding
- low roughage intake (young grasses have low roughage and often poor palatability)
- low intake of phosphorus and salt.

Making sure animals are up to date with all the vaccinations and deworming recommended for your local area is also a good idea. Cold snaps followed by warming trends can stress the animals and make it easier for pneumonia to set in. You don't want to be feeding a large infestation of parasites either, so consider performing fecal egg counts to determine whether appropriate treatment is required.

Blanketing animals is not really necessary unless they are old and having difficulty keeping on weight. As long as there is a wind break, most large animals can stand very cold temperatures. Adequate protein and energy intake will provide the animals with thermoregulatory capability in most cases, provided they were in good shape coming into the winter. It is very difficult to get thin animals to gain weight in the wintertime without lots of extra nutritional help.

Even at this stage of the winter, you might consider analyzing your hay for protein, vitamin/mineral, and energy content. Just because it is green and looks nice, doesn't mean it is any good. Sampling some bales and sending it to the lab is easy and not that expensive. Be sure to get a representative sample because the nutrient levels will vary within a field. The results from this analysis will give you a good idea of what supplementation, if any, is needed.

Performing a few of these common-sense maintenance activities will bring your animals through the winter in good shape. My grandpa always said you can't starve a living out of a cow, and that's a very true statement!

WSU Ag Animal Faculty Research Updates

1. Effects of a farm-specific fecal microbial transplant (FMT) product on clinical outcomes and fecal microbiome composition in preweaned dairy calves

Slanzon GS, Ridenhour BJ, Parrish LM, Trombetta SC, Moore DA, Sischo WM, McConnel CS.

DOI: [10.1371/journal.pone.0276638](https://doi.org/10.1371/journal.pone.0276638)

Abstract: Gastrointestinal disease (GI) is the most common illness in pre-weaned dairy calves. Therefore, effective strategies to manipulate the microbiome of dairy calves under commercial dairy operations are of great importance to improve animal health and reduce antimicrobial usage. The objective of this study was to develop a farm-specific FMT product and to investigate its effects on clinical outcomes and fecal microbial composition of dairy calves. The FMT product was derived from feces from healthy donors (5-24 days of age) raised in the same calf ranch facility as the FMT recipients. Healthy and diarrheic calves were randomly enrolled to a control (n = 115) or FMT (n = 112) treatment group (~36 g of processed fecal matter once daily for 3 days). Fecal samples were collected at enrollment and again 9 days later after the first FMT dose. Although the FMT product was rich in organisms typically known for their beneficial probiotic properties, the FMT therapy did not prevent or ameliorate GI disease in dairy calves. In fact, calves that received FMT were less likely to recover from GI disease, and more likely to die due to GI disease complications. Fecal microbial community analysis revealed an increase in the alpha-diversity in FMT calves; however, no major differences across treatment groups were observed in the beta-diversity analysis. Calves that received FMT had higher relative abundance of an uncultured organism of the genus *Lactobacillus* and *Lactobacillus reuteri* on day 10. Moreover, FMT calves had lower relative abundance of *Clostridium nexile* and *Bacteroides vulgatus* on day 10. Our results indicate the

need to have an established protocol when developing FMT products, based on rigorous inclusion and exclusion criteria for the selection of FMT donors free of potential pathogens, no history of disease or antibiotic treatment.

2. Transcriptional changes detected in fecal RNA from neonatal dairy calves of different breeds following gastrointestinal disease of varying severity

McConnel CS, Slanzon GS, Parrish LM, Trombetta SC, Shaw LF, Moore DA, Sisco WM.

DOI: 10.1371/journal.pone.0278664

Abstract: Gastrointestinal (GI) disease is a major health concern in preweaned dairy calves. The objective of this fixed cohort study was to use RNA isolated from preweaned Holstein and Jersey heifer calf feces to study the molecular adaptations to variable clinical GI disease. The study was conducted on a commercial calf ranch in the western U.S. Enrolled calves were assessed twice daily for variations in demeanor, milk intake, and hydration. Fecal consistency scores were recorded at enrollment (day 1), and on the day (day 10) that a fecal sample was collected for differential gene expression (DGE). Calves with diarrhea on either day were classified as having either uncomplicated, localized GI disease (scours), or systemic GI disease (systemic enteritis). Eighty-four calves' fecal RNA was evaluated for DGE, of which 33 calves (n = 20 Holstein; n = 13 Jersey) were consistently healthy. The remaining 51 calves (n = 23 Holstein; n = 28 Jersey) experienced varying severity of GI disease during the sampling window. Genes of interest were related to the inflammatory response (i.e., IFNG, NFKB1, NOD2, TLR2, and TLR4) and cell membrane or cytoplasmic transport (i.e., AQP3, FABP2, KRT8 and SLC5A1). Breed-specific findings indicated that AQP3, IFNG, and TLR4 were upregulated in Holsteins with systemic enteritis, whereas KRT8 was downregulated in systemically affected Jerseys. Holsteins did not appear affected by scours aside from a tendency for DGE of toll-like receptors (TLRs) on the day of diarrhea. However, Jersey calves consistently demonstrated a tendency to upregulate IFNG, NFKB1, and TLR4 when affected with either scours or systemic enteritis. These findings were more pronounced in systemically affected Jersey calves and were observed as a delayed response to both scours and systemic enteritis. These findings support previous observations suggesting that Holstein calves may be better equipped than Jersey calves to rapidly fight pathogen invasion.

3. Improving farm-level antimicrobial stewardship benchmarks by reporting antimicrobial use within the context of both the magnitude of disease pressure and the outcome of therapy

Schrag NFD, Godden SM, Singer RS, Lombard JE, Wenz JR, Amrine DE, Lubbers BV, Apley MD.

DOI: 10.3389/fvets.2022.1022557

Abstract: This manuscript explores a method of benchmarking antimicrobial use within the context of farm level therapeutic incidence (a proxy for disease incidence), and the outcome of that therapy. This is reported both within the same farm over time (2016-2019), as well as evaluated across participating farms. Reporting antimicrobial use in this format addresses multiple primary questions necessary for evaluating on farm antimicrobial stewardship: How much disease is recorded? How much antimicrobial use is recorded? How often are antimicrobials included in therapy for each disease? What is the outcome of therapy? The three primary metrics reported are: therapeutic events per 100 cow years (TE/100CY), antimicrobial regimens per 100 cow years (REG/100CY), and the percent therapeutic success (% Success). Success was defined as: the cow remained in the herd and had no further TE recorded within 30 days of the end of the TE being evaluated. These measures identify opportunities for change on an individual farm, such as improvement in disease prevention, or a change in choices about when to include an antimicrobial in the treatment protocol. Therapeutic outcomes provide additional context, in some instances demonstrating differences in recording practices and case definitions, while in other cases serving to safeguard animal welfare as efforts are made to decrease antimicrobial use in

the future. Although developed for farm level reporting, the metrics may also be more broadly summarized to meet future reporting requirements for marketing chain or national level antimicrobial use reports. The process outlined here serves as a prototype to be considered when developing antimicrobial use reporting systems where farm level antimicrobial stewardship is the primary objective.

4. Contrasting Fecal Methanogenic and Bacterial Profiles of Organic Dairy Cows Located in Northwest Washington Receiving Either a Mixed Diet of Pasture and TMR or Solely TMR

Slanzon G, Sischo W, McConnel C.

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Abstract: Currently, little is known regarding fecal microbial populations and their associations with methanogenic archaea in pasture-based dairy cattle. In this study, we assessed the fecal microbiome of organic dairy cows across different time points receiving a mixed diet of pasture and total mixed ration (TMR) or TMR only. We hypothesized that the fecal methanogenic community, as well as co-occurrence patterns with bacteria, change across diets. To test these hypotheses, we analyzed TMR and pasture samples, as well as the V3-V4 region of 16S rRNA of fecal samples collected over the course of a one-year study period from 209 cows located on an organic dairy in Northwest Washington. The inherent variability in pasture quality, quantity, availability, and animal preference can lead to diverse dietary intakes. Therefore, we conducted a k-means clustering analysis to identify samples from cows that were associated with either a pasture-based diet or a solely TMR diet. A total of 4 clusters were identified. Clusters 1 and 3 were mainly associated with samples primarily collected from cows with access to pasture of varying quality and TMR, cluster 2 was formed by samples from cows receiving only TMR, and cluster 4 was a mix of samples from cows receiving high-quality pasture and TMR or TMR only. Interestingly, we found little difference in the relative abundance of methanogens between the community clusters. There was evidence of differences in diversity between pasture associated bacterial communities and those associated with TMR. Cluster 4 had higher diversity and a less robust co-occurrence network based on Spearman correlations than communities representing TMR only or lower-quality pasture samples. These findings indicate that varied bacterial communities are correlated with the metabolic characteristics of different diets. The overall good pasture and TMR quality in this study, combined with the organic allowance for feeding high levels of TMR even during the grazing season, might have contributed to the lack of differences in the fecal archaeal community from samples associated with a mixed pasture and TMR diet, and a TMR only diet. Mitigation strategies to decrease methane emissions such as increasing concentrate to forage ratio, decreasing pasture maturity and adopting grazing systems targeting high quality pasture have been shown to be efficient for pasture-based systems. However, the allowance for organic dairy producers to provide up to an average of 70% of a ruminant's dry matter demand from dry matter fed (e.g., TMR), suggests that reducing enteric methane emissions may require the development of novel dietary strategies independent of pasture management.

WSU CVM Senior paper highlights

1. The Different Castration Techniques in Beef Calves

By Katie Webb (Advisor: Dr. George Barrington)

Summary: Castration in calves is a very important procedure in every beef cattle operation in order to decrease unwanted breeding, increase ease of handling and enhance the quality of meat. There are many methods of castration in calves, including surgical orchiectomy, scrotal shortening, band castration, Burdizzo emasculature,

chemical castration and immunological castration, among others. These methods can be combined with analgesia of different variations, ranging from lack thereof to multimodal analgesia to even anesthesia. This paper compared multiple different groups and found no definitive evidence that one technique or analgesic protocol reduces stress in the long term, to an extent that affects overall weight gain, when compared with the others.

Conclusions: There is no definitive evidence found in the writing of this paper that gives clear indication on whether one method of castration causes the least stress, and by extrapolation, pain response, in calves. There has been evidence discussed that leads us to believe that castration in younger calves produces less stress, which is most likely why the recommendations from the American Veterinary Medical Association include early castration. However, the stress response from the many different techniques is difficult to accurately evaluate due to confounding factors including handling stress, time involved, environment, diet, and procedural complications, among others. Based on studies that examine painful behavior, analgesia of some sort should be used, though producer compliance on a large scale may be diminutive until an option arises that is both low-cost, easily accessible, easily administered, and quickly effective. At this time, recommendations cannot be made based on lack of solid evidence to perform one technique over the others, and the decision will ultimately come down to producer or veterinary preference and cost involved.

2. An Overview of the Risks and Benefits of Drinking Unpasteurized Cow's Milk

By Nikki Christensen (Advisor: Dr. Kerry Rood)

Summary: Consumption of unpasteurized, "raw" milk is a very polarized topic throughout the world today. In the United States, public health officials have various regulations in place regarding the sale of raw milk. Specific organizations such as Winston A Price Foundation and the Raw Milk Institute feel there is over-regulation of raw milk by governmental agencies such as the Centers for Disease Control, United States Department of Agriculture, and the Food and Drug Administration. Consumption of raw milk poses a risk of disease transmission when processing, such as pasteurization, is not performed. Pasteurization plays a significant role in disease prevention by ensuring a safe product for consumers. Specifically, through utilizing a combination of heat, time, and pressure to cook the milk and kill harmful pathogens. The community of raw milk consumers and producers is steadily growing around the world due to the belief that pasteurization degrades nutrients naturally found in raw milk. They also believe that with good management and proper handling techniques, safe raw milk is an attainable goal. The extent of this paper reviews risks and benefits of drinking unpasteurized milk and providing educational resources for producers, consumers, and veterinarians to help them achieve their goals for their families, farms and businesses through animal health and ultimately, consumer health and safety.

Conclusions: Raw milk consumption is very controversial in the world today. As discussed, there are pros and cons to either side of the argument. One hundred years ago the masses moved away from the countryside to live in the city. The reverse seems to be happening today. People are actively seeking to be connected to the family farm or create a micro-version of it in their gardens and back yards. The continual unrest in the economy and world food sources will potentially cause many more people to resort back to home-grown food sources. We as veterinarians need to be prepared for this shift. Though, we may not all treat large herds on large-scale operations, we may help a family by treating their one milk cow or a small dairy that provides milk their community.

Farm management recommendations for the producers consist of minimizing cattle contact with wildlife, rodent control, separating dogs, cats, chickens, or other wild birds from milking areas, implementing an on-farm risk analysis management program through the Raw Milk Institute (Rawmilkstitute.org). Cow management recommendations include *Brucella abortus* vaccination, *Mycobacterium abortus* test screening for TB annually,

implementing artificial insemination into the breeding program, and housing cows and calves separately. Milk management recommendations consisting of regular bulk tank testing for Coliform bacteria (at least monthly)- < 10 coliforms/ml raw milk, Standard Plate Count (at least monthly) - < 5000 per ml of raw milk, as well as zero tolerance for pathogenic bacteria such as, *Salmonella spp.*, *E. coli* O157:H7, *Campylobacter spp.* and *Listeria monocytogens*.

A family's choice to consume raw milk is not without risks and should be a well-educated decision. Veterinarians play a vital role in the health and safety of our clients and consumers. Unpasteurized, raw milk has a very wide variety of avenues for pointed research and reviews. For the purposes of this paper subjects such as intricate details concerning cow nutrition, raw goat milk, cow genetics (breed or beta-casein A2A2), drug withhold times for raw milk, organic labeled milk and colostrum were not discussed in the scope of this paper.

Resources for consumers/producers

- A Campaign for Real Milk (Weston A. Price Foundation): www.realmilk.com
- British Columbia Herdshare Association The B.C. Fresh Milk (BCFM) Project: <http://bcherdshare.org>
- Raw Milk Producers <https://www.rawmilkproducers.co.uk/>
- Centers for Disease Control and Prevention; "Raw (Unpasteurized) Milk": www.cdc.gov/features/rawmilk
- Real Raw Milk Facts www.realrawmilkfacts.com
- Common Standards for Raw Milk Producers: www.rawmilkinstitute.org
- Pasteurized Milk Ordinance: <https://www.fda.gov/media/99451/download>
- Farm to Consumer Foundation: f2cfnd.org
- Farm-to-Consumer Legal Defense Fund: <https://www.farmtoconsumer.org/>

3. Comparison of Progesterone Based Estrus Synchronization Protocols with Differing GnRH and PGF2alpha Injections in Beef Heifers

By Amy Allen (Advisor: Dr. Ram Kasimanickam)

Summary: The selection and breeding of replacement beef heifers is vital for continued success of beef cattle operations. This study evaluates three different progesterone-based estrus synchronization protocols and their effect on estrus response rate and artificial insemination pregnancy rate. Protocols used were CIDR-GGPG, CIDR-PGPG and CIDR-GPG on a sample of Angus beef heifers (n = 1197) from five spring calving locations. Results revealed all protocol types at all locations are effective in inducing estrus. Additionally, independent variables of body condition score, reproductive tract score and calm temperament are positively associated with estrus expression rate. These independent variables coincide with factors that contribute to the onset of puberty. From a beef producer standpoint, the utilization of these heifer selection measurement tools is necessary to select reproductively mature heifers. Appropriate replacement heifer selection and implementation of estrus synchronization protocols will ensure higher pregnancy rates, shorter calving seasons, and increased productivity.

Conclusion: All protocol types at all locations demonstrated effectiveness in induction of estrus. Acceptable estrus expression rates and P/AI were observed independent of body condition score, reproductive tract score and temperament. Regarding these findings, beef heifer reproductive management should be prioritized to ensure efficacy of estrus synchronization protocols and continued reproductive efficiency.

Continuing Education

Veterinarians

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