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

From the Editor - The end of 2016 and the start of a new year... When I reflected on what Veterinary Medicine Extension accomplished in 2016 (while doing my annual report) I was actually surprised at all the activities. The Genomics Roadshow was in 6 states, heifer talks done in 3 states, a few cattlemen’s talks, 36 email and 39 telephone requests for information, 8 papers published, 3 abstracts, 2 CE programs organized, 1 webinar, 4 research talks, 14 outreach publications... plus... Sometimes we wonder where the year went!

We hope everyone has a wonderful new year and that your businesses are profitable and you find joy in your lives.

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

*** Notice for All Food Animal Producers about Medicated Feeds*** Important: Read Carefully

Refresher on the Newly Implemented Veterinary Feed Directive (VFD) by Dr. Craig S. McConnel, Extension Veterinarian

The FDA’s new **veterinary feed directive (VFD)** rules take full effect January 1st, 2017. Producers who wish to use medicated feeds covered by the VFD rule will need to work with their veterinarians to fill out the appropriate forms. This is a good time to take a look into some of the specifics related to FDA rules for filing a VFD order.

The goals of the VFD rule changes are to: promote judicious use of antibiotics, protect public health, and limit the development of antimicrobial resistance. These policy changes

only cover in-feed and water uses of medically important antibiotics including: cephalosporins, fluoroquinolones, glycopeptides, macrolides, penicillins, quinolones, sulfas, and tetracyclines. These products and some other specific antimicrobials can no longer be used to enhance growth or improve feed efficiency. They can still be used in feed under veterinary supervision to treat animals diagnosed with an illness, control the spread of illness within a herd, and prevent illness in healthy animals when disease exposure is likely. Although medicated milk replacers will fall under the VFD, water soluble powders containing medically important compounds do not fall under the VFD per se. However, they will require label changes from over-the-counter to prescription by veterinarian only. The VFD rule changes do not affect non-medically important products such as Bovatec®, Corid®, and Monensin®.

VFD orders must include veterinarian contact information, animal information, and medication information. The VFD rules allow producers, veterinarians, and feed distributors to use either paper or electronic forms for VFD orders. These forms must be kept on file for two years by each party. Examples of [blank and completed sample forms](#) are available online. There are examples of forms for drugs that are either approved or not approved for use with other drug(s). Animal-health companies such as Zoetis that supply VFD products have also produced VFD forms and 2017 compliant labels specific to each product ([Zoetis forms and compliant labels](#)).

Electronic forms (eVFD) are available through the web-based tool [FeedLINK™](#) accessible through [GlobalVetLINK](#) along with additional resources related to VFDs. For those who will be completing VFD orders frequently, eVFDs may make the process easier due to less paperwork, faster fulfillment, and ensured accuracy. An electronic copy of any eVFD completed in an online system can automatically be sent via email to the feed supplier and producer. The veterinarian's profile will save basic information, unique animal sites, and feed supplier details for later use. Accuracy and label compliance are assisted through built-in calculators that automatically compute dosages and feed volumes.

It is worth noting that the VFD rules regulate the combinations of products that can be used to treat animals. Approved product combinations can be found on product labels and include the following: Aureomycin® can be fed with Bovatec®, Cattlyst®, and Deccox®; Deccox® can be fed with Aureomycin® and Monensin®; and Bovatec® can be fed with Aureomycin®, MGA®, Tylan®, and oxytetracycline. It is important to confirm whether a product can be fed in combination. For example, Rumensin® is not approved to be fed with Aureomycin®.

KEY POINTS

1. Producers will need to have a valid Veterinary Client Patient Relationship (VCPR) to have a veterinarian write a Veterinary Feed Directive for in-feed antibiotics.
2. Antibiotics can no longer be used for growth promotion.
3. Water medications require a prescription.
4. We cannot go off-label with in-feed medications.

One potential area of confusion with VFD rules has to do with the terms *expiration* versus *duration*. The *expiration* defines the lawful period of time that a VFD order can be used to purchase animal feed containing a VFD drug. The expiration date must not exceed 6 months after the date of issuance, and a VFD feed or combination feed must not be fed to animals after the expiration date. The *duration* of use is specified on the product label and refers to the length of time a VFD feed is actually fed to animal. If the duration of use has not been completed before the expiration date on the VFD, a new VFD must be requested from the veterinarian.

Importantly, a veterinarian cannot write a VFD order for extralabel use of medicated feed aside from some options for [minor species](#). This means that producers must adhere to the duration, drug level, and target species specified on the label. In other words, producers are obligated to use the VFD feed as indicated on the VFD and as specified on the product's label.

There are numerous avenues for accessing additional information online regarding VFDs. Contacts within the USDA recommend the following links: [FDA brochures](#) created to provide information about the VFD as well as the VFD Final Rule; [FDA responses to questions](#) that came up during the Farm Foundation workshops; and Kansas State University information on [regulations and veterinary feed directives](#). Feedstuffs.com provides a nice site with summary information and Elanco's preparedness checklists categorized for the [Producer, Veterinarian and Feed Manufacturer](#).

Regardless of where you access information regarding VFDs, be prepared for the FDA to begin a phased enforcement strategy. As the VFD rules take hold, the FDA will engage in risk-based general surveillance as well as for-cause inspection assignments. The FDA intends to work closely with state regulatory partners and state boards of veterinary medicine in their enforcement strategy. As per [Bovine Veterinarian](#), "while mistakes will be made, producers who operate in good faith and do what they can to comply with the law likely will see warnings and guidance. If, however, producers intentionally circumvent the law, the FDA and society overall will see a need for more stringent enforcement."

Dairy: The Calf Care Audit

by Dale A. Moore, Extension Veterinarian, H. Floren (CVM Class of 2018), and W. M. Sischo (Project Lead)

As part of a USDA grant, our research/Extension group is looking at ways to reduce antibiotic use and antibiotic resistance. The pre-weaned calf area is one area we might be able to work on reducing use. A consideration is that if we could better ensure health and minimize disease, we could reduce the need for antibiotics.

Throughout 2016, we worked on a review of the literature about calf-rearing and the critical control points for calf health. This resulted in a set of monitors that a dairy advisor (the veterinarian) could put in place. We call it the



Calf Care Audit and it includes a **checklist** of items to evaluate on the farm as well as a place to **record** information, a heifer rearing **goals-form**, and a **factsheet** on the use of Petri film for culturing bacteria from milk and colostrum. We have also put together a **narrated slide set** and set of **notes**. They are available at: <http://vetextension.wsu.edu/research-projects/amrcap/outreach/>

For veterinarians desiring continuing education credit, the narrated slide set is also on our continuing education site. Visit <https://apps.vetmed.wsu.edu/CVME/Event/Details/28> . They will need to go through the course, complete a 10 question quiz and will be automatically issued a CE Certificate. PowerPoint notes and the 5 reference documents are also available for those going through the CVME course after they purchase the course!

Dairy: The Genomics of Fertility and Health Traits-- Highlights of Our Research/Extension Projects

by Dale Moore, Extension Veterinarian, WSU and Joe Dalton, Extension Dairy Specialist, University of Idaho

Over the last 50 years, dairy farmers have enjoyed higher production from their cows in part from the use of superior, proven sires and artificial insemination. But, at the same time that milk production has increased, fertility in dairy cattle experienced an overall decline. A 5-year, multi-state, interdisciplinary project, integrated with Extension, is focused on the identification of genomic loci associated with fertility in dairy heifers and cows; discovery of functional **single nucleotide polymorphisms (SNPs)** associated with **daughter pregnancy rate (DPR)** and early embryo development; and evaluation of the efficiency and profitability of increasing fertility in dairy cattle using genetic selection tools.

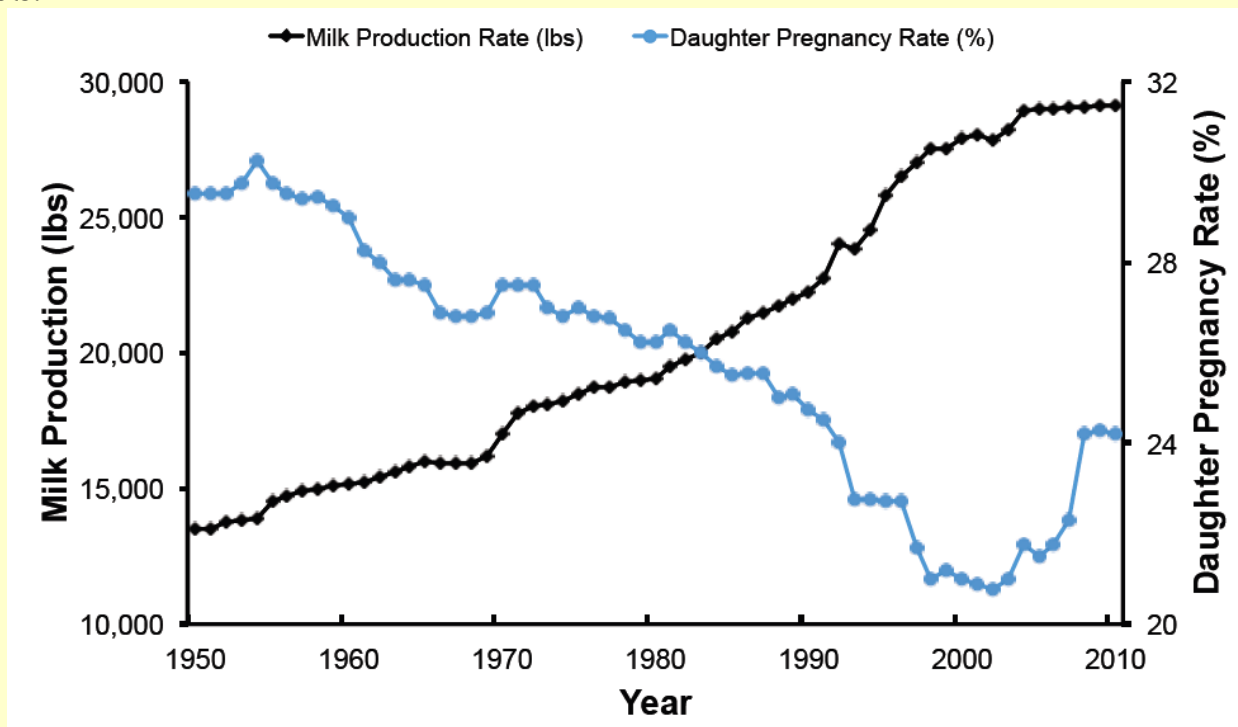


Figure 1. Milk production in pounds per cow and Daughter Pregnancy Rate (%) over time (Dairy Cattle Reproduction Council).

The Extension portion of the project just completed its second *Genomics Road Show* visiting California, Florida, Idaho, Texas, Washington and Wisconsin to discuss research findings and case studies with producers, veterinarians and allied dairy industry professionals. Current results from two USDA-funded grants in this area, and case studies from two genomic testing companies with data from real dairy herds, were presented.

What is depicted in Figure 1 - declining fertility as measured by DPR -- is why the USDA wanted to fund projects investigating how to improve fertility. The reason for the decline has long been thought to be related to selection for milk production, that is, by selecting for high milk production, we were selecting against fertility. Selecting for higher DPR bulls, however, became available in the early 2000's and is likely one of the reasons for the upturn in fertility, perhaps along with increased health, management, and efficient synchronization protocols. This positive trend provided a further spark in interest to look at the cow side for fertility traits using genomics.

Because the bovine genome has been sequenced, researchers have the ability to look at the whole genome (GWAS or Genome-wide Associated Study) and evaluate specific locations (SNPs) along the cow's DNA and try to associate those with specific **phenotypes** (a collection of observable traits - like milk production or conception to first service). (For an introduction to genomics, see our article at: <http://articles.extension.org/pages/73178/genetics-and-genomics:-an-introduction#.VfnUs00gnot>)

What has recently been discovered by our group and others? We'll briefly highlight some of the important findings to date.

- (1) Since 2006, a number of specific genes associated with fetal abnormalities leading to abortion, embryonic death, or reduced fertility have been identified.
- (2) In a GWAS study of Holstein highly fertile (pregnant to first AI) versus subfertile (conceived after 4th AI or never pregnant and culled) heifers, the heritability of fertility was 0.46 (about 46% of the differences observed in fertility may be attributable to genetic individual difference), leading us to conclude that there is ample opportunity to make gains in Holstein heifer fertility with genomic selection (Keuter et al., 2015).
- (3) When looking at bull genomics: 40 SNPs were identified that were related to DPR and 29 of those 40 SNPs were not significantly related to production traits. Therefore, selection for fertility without negative selection for milk yield is possible (Cochran et al., 2013).
- (4) On the cow side, of the SNPs found to be related to DPR in bulls by Cochran et al., 19 were significantly related to DPR in cows, indicating that SNPs associated with genetic estimates of fertility in Holstein bulls maintained their association in a separate population of cows (Ortega et al., 2015).

Nearly 2 million dairy cows, heifers, and bulls have been genomically tested. Genomic testing improves the reliability of the information about a young animal and can speed the genetic progress in the herd. The testing is predominantly done within the first few months of a heifer's life. The information a producer gets back from the company conducting the test is a set of numbers associated with specific traits, like Net Merit \$ or Fat. From that information, producers can rank their heifers by the traits or indices most valuable to their business. Producers have developed different strategies depending on their farms' goals. Some want to improve the overall production of the herd, some want to improve longevity

in the cows, some want to select for animals that will be of superior genetics for flushing embryos and selling genetics. Whatever the farm's goals, all of the producers and consultants we've talked to have emphasized that the farm needs to have a plan for what to do with the information if they are going to genomically test their animals.

In addition to fertility traits, health traits have recently been evaluated and incorporated into the genomic tests. Traits such as the risk for mastitis, lameness, metritis, retained placenta, displaced abomasum, and ketosis have been researched because of their effect on milk production, reproduction and culling. In general, these traits are combined in a health index to allow the producer to select for potentially "healthier" animals genetically.

The bottom line is, there are quite a number of traits in genomic tests available and, as a result of the two USDA funded projects, specific SNPs for fertility will be a great addition in the future.

Cow-Calf: Things to do Now – Spring Calving Herd

From the WSU Beef Management Calendar

January

Prepare for calving season. Select areas (past and new) of your operation to calve heifers and cows separately.

Prepare a calving area and assemble equipment:

- Facilities to warm chilled calves
- Puller and chains
- Ear tags and applicator
- Frozen disease-free colostrum and commercial colostrum supplement
- Oral calf feeder
- 7% iodine for navels
- Scales
- Electrolytes
- Injectable antibiotics
- Syringes and needles
- Injectable Vitamin E/Selenium supplement
- Other medical cabinet supplies (check expiration dates; store as recommended)
- Record book. Record calving dates to assess 21-day conception rates through the breeding season. Goals are 63%, 89%, and 95% pregnant by 21, 42, and 63 days, respectively. Lower values may be due to diseases, bull power issues, or nutritional problems, and should be investigated. Keep calf health records. At a minimum, record date, ID, treatment, and problem treated (pneumonia, scours, etc.).



Line up calving season help for monitoring heifers and cows for calving difficulties. Make sure mature cows have a body condition score (BCS) of 5 or greater and first-calf heifers have a BCS of 6 or greater. Booster vaccine for scours as needed. Monitor cow herd for bovine respiratory disease (BRD). Administer injectable Vitamin E/Selenium supplement to bred heifers and cows in last month of pregnancy if recommended by veterinarian.

February

Sort close-up cows from those farther off from calving, but monitor both groups. Consider new calving ground every two weeks for uncalved dams. Observe calving heifers closely. Expect calving difficulty and intervene if:

- No progress after 60 minutes of labor.
- Calf is backwards (only calf's tail is visible or dewclaws are pointed up).
- Calf's head and two feet are not visible.

Calving difficulty can result in an increased incidence of BRD in pre-weaned calves due to a reduced ability to absorb colostral antibodies. Dip newborns' navels with disinfectant when possible.

Identify calf with ear tag and/or tattoo while it is young and easy to handle. Administer injectable Vitamin E/Selenium if indicated. Record calf ID, dam ID, birth date, and birth weight if possible. Weigh registered calves during the first 24 hours. Castration and dehorning are less stressful when performed on young animals.

Call A.I. technicians for spring breeding appointments.

Determine how much you can spend for bulls and/or semen.

Monitor calves for scours, pneumonia and navel ill. For neonatal calves, administer oral antibodies for specific disease-causing organisms on farm if recommended by veterinarian.

March

Monitor for difficult calving.

Management of cow herd both before and after calving can affect calf health and the incidence of BRD in your herd. Dip newborns' navels with disinfectant when possible.

Identify calf with ear tag and/or tattoo, brand while calf is young and easy to handle.

Administer injectable Vitamin E/Selenium if indicated. Record calf ID, dam ID, birth date, and birth weight if possible. Weigh registered calves during the first 24 hours. Castration and dehorning are less stressful when performed on young animals.

Watch for calf scours:

- Give fluids to scouring calves that become dehydrated.
- Consult your veterinarian for proper diagnosis and treatment.
- Move cows approaching calving to a clean pasture.

Vaccinate calves 6 to 8 weeks or older for clostridial diseases (blackleg) according to label recommendations.

Separate cows that have calves and increase their feed in accordance with their increasing nutrient requirements.

Line up A.I. sires and/or purchase new bulls at least 30 days before the breeding season.

Require performance records and check health history including immunizations. Choose a breed and use Expected Progeny Differences (EPDs) plus visual observation to select the bull that best fits your production and marketing program. Quarantine purchased bulls for at least 30 days.

Evaluate yearling replacement heifers for reproductive tract score, weight, and projected mature frame score. Heifers should be 55-65% of expected mature equivalent weight before being bred.

Record the identification number of the last calf born on the appropriate calendar date to serve as record for a PVP program.

For neonatal calves, administer oral antibodies for disease-causing organisms on farm as recommended by veterinarian.

Continue monitoring calves for scours, pneumonia and navel ill.

Consider the Sand Hills calving system, a pasture rotation calving system to reduce calf disease. Information is available at:

<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1016&context=rangebeefcowssystem>.

Prepare cow and calf facilities for pre-turnout handling. Employ low-stress techniques. If transportation is required to move cows and calves to pasture, employ techniques to reduce stress and the associated risk for BRD.

Provide supplemental magnesium in preparation for movement to spring pastures, which may place cows at risk for grass tetany.

Sheep Disease Manual for the Sheep Owner

The diagnostic laboratory sees samples from sheep flocks on occasion. The more the owner of those sheep knows about potential sheep diseases and flock management, the better the conversation they can have with their veterinarian or the pathologists.

I recently came across a very well-written manual on sheep diseases. Although written in the United Kingdom, most of the issues sheep producers in the UK deal with are the same ones we deal with in the US and the Pacific Northwest. (One thing missing is Q-Fever.) The pictures, although graphic, are very good and the control measures listed for each condition, including the basic biosecurity practices when purchasing animals, are very appropriate. Even better, the manual is offered for free as a PDF on the Internet. For this basic primer on sheep diseases and management, go to:

<http://beefandlamb.ahdb.org.uk/wp/wp-content/uploads/2016/01/BRP-sheep-disease-directory-190116.pdf>

WSU Ag Animal Health Research Abstracts

1) Enger BD, White RR, Nickerson SC, Fox LK. Identification of factors influencing teat dip efficacy trial results by meta-analysis. *J Dairy Sci.* 2016;99(12):9900-9911.

Two meta-analyses were conducted using data from peer-reviewed natural exposure (NE) and experimental challenge (EC) teat dip efficacy trials to identify factors influencing the new intramammary infection (IMI) rate. A NE data set containing 16 studies and an EC data set containing 21 studies were created. New IMI rate was calculated based on the percentage of new quarter infections per month (PNQI/mo) for each observation, in both data sets, and used as the dependent variable for model derivation. A linear, mixed-effects model with a random study effect, weighted by number of quarters eligible for infection, was derived for each data set. The final NE model included the effects of experimental design (split herd or split udder), mastitis pathogen group (*Staphylococcus aureus*, *Streptococcus agalactiae*, environmental streptococci, gram-negative species, *Corynebacterium* spp., or coagulase-negative staphylococci), postmilking treatment (iodine, chlorhexidine, linear dodecyl benzene sulfonic acid, chlorine compounds, phenol compounds, or undipped negative controls), and the interaction between mastitis pathogen group and postmilking treatment. Overall, *Corynebacterium* spp. had the highest new IMI rate (0.0139 ± 0.0018 PNQI/mo), and environmental streptococci and gram-negative species had the lowest (0.0023 ± 0.0022 PNQI/mo). Additionally, trials utilizing a split herd

experimental design had a 2-fold higher new IMI rate than trials using a split udder design. The final EC model included the effects of mastitis pathogen (*Staph. aureus* and *Strep. agalactiae*), postmilking treatment (iodine, chlorine compounds, "other" active ingredients, or undipped negative controls), geographic region of study (Eastern, Southern, and Pacific Northwest), and the 2-way interactions of region and pathogen group and postmilking treatment and pathogen group. Overall, *Staph. aureus* and *Strep. agalactiae* had similar new IMI rates. Quarters dipped postmilking in either iodine (0.0127 ± 0.0099 PNQI/mo), chlorine compounds (0.0258 ± 0.0095 PNQI/mo), or "other" active ingredient teat dips (0.0263 ± 0.0106 PNQI/mo) had lower new IMI rates than undipped quarters (0.0859 ± 0.0087 PNQI/mo). **These results indicate that experimental design influences the new IMI rate of teat dip efficacy trials and that using an effective postmilking teat dip has a greater effect on controlling the new *Staph. aureus* and *Strep. agalactiae* IMI rate than the teat dip's active ingredient.**

2) Nicholas RA, Fox LK, Lysnyansky I. Mycoplasma mastitis in cattle: To cull or not to cull. Vet J. 2016;216:142-147.

Bovine mastitis caused by mycoplasmas, in particular *Mycoplasma bovis*, is a major problem for milk production and animal welfare in large dairy herds in the USA and a serious, although sporadic, disease in Europe and the Middle East. It causes severe damage to the udder of cattle and is largely untreatable by chemotherapy. *Mycoplasma mastitis* has a distinct epidemiology and a unique set of risk factors, the most important of which is large herd size. The disease is often self-limiting, disappearing within months of outbreaks, sometimes without deliberate intervention. Improved molecular diagnostic tests are leading to more rapid detection of mycoplasmas. Typing tests, such as multi-locus sequence typing, can help trace the source of outbreaks. An approach to successful control is proposed, which involves regular monitoring and rapid segregation or culling of infected cows. Serious consideration should be given by owners of healthy dairy herds to the purchase of *M. bovis*-free replacements. Increased cases of disease could occur in Europe and Israel if the trend for larger dairy herds continues.

3) Kasimanickam RK, Hall JB, Whittier WD. Fertility of Angus cross beef heifers after GnRH treatment on day 23 and timing of insemination in 14-day CIDR protocol. Reprod Domest Anim. 2016; Nov 14. doi: 10.1111/rda.12866. [Epub ahead of print]

This study compared artificial insemination pregnancy rate (AI-PR) between 14-day CIDR-GnRH-PGF2 α -GnRH and CIDR-PGF2 α -GnRH synchronization protocol with two fixed AI times (56 or 72 hr after PGF2 α). On day 0, heifers (n = 1311) from nine locations assigned body condition score (BCS: 1, emaciated; 9, obese), reproductive tract score (RTS: 1, immature, acyclic; 5, mature, cyclic) and temperament score (0, calm; and 1, excited) and fitted with a controlled internal drug release (CIDR, 1.38 g of progesterone) insert for 14 days. Within herd, heifers were randomly assigned either to no-GnRH group (n = 635) or to GnRH group (n = 676), and heifers in GnRH group received 100 μ g of GnRH (gonadorelin hydrochloride, IM) on day 23. All heifers received 25 mg of PGF2 α (dinoprost, IM) on day 30 and oestrous detection aids at the same time. Heifers were observed for oestrus thrice daily until AI. Within GnRH groups, heifers were randomly assigned to either AI-56 or AI-72 groups. Heifers in AI-56 group (n = 667) were inseminated at 56 hr (day 32 PM), and heifers in AI-72 group (n = 644) were inseminated at 72 hr (day 33 AM) after PGF2 α administration. All heifers were given 100 μ g of GnRH concurrently at the time AI. Controlling for BCS (p < .05), RTS (p < .05), oestrous expression (p < .001), temperament (p < .001) and GnRH treatment by time of insemination (p < .001), the AI-PR differed between GnRH treatment

[GnRH (Yes - 60.9% (412/676) vs. No - 55.1% (350/635); $p < .05$)] and insemination time [AI-56 - 54.6% (364/667) vs. AI-72 - 61.8% (398/644); ($p < .01$)] groups. The GnRH treatment by AI time interaction influenced AI-PR (GnRH56 - 61.0% (208/341); GnRH72 - 60.9% (204/335); No-GnRH56 - 47.9% (156/326); No-GnRH72 - 62.8% (194/309); $p < .001$). In conclusion, 14-day CIDR synchronization protocol for FTAI required inclusion of GnRH on day 23 if inseminations were to be performed at 56 hr after PGF2 α in order to achieve greater AI-PR.

4) Dalton J, Moore DA, Spencer TE, Hansen PJ, Cole JB, Neiberghs H. Genetics, genomics and fertility. *Clinical Theriogenology* 2016;8:3:165-170.

Interpretive Summary: Genome-wide association studies are powerful tools for improving understanding of the genetic make-up and performance potential of animals. Genomic testing and selection is underway on many dairies today. Recent research on dairy cow fertility provides evidence that 1) there are ample opportunities to make significant gains in Holstein heifer fertility using genomic selection, and 2) there are a large number of DNA markers associated with daughter pregnancy rate (DPR) that do not have negative associations with production traits, which may allow farmers to select for improved DPR without compromising milk, fat, and protein production. Identification of genomic loci associated with fertility in first-lactation Holstein cows is underway, with results expected in late 2016-2017.

Technical Abstract: In order to enhance the sustainability of dairy businesses, new management tools are needed to increase the fertility of dairy cattle. Genomic selection has been successfully used by AI studs to screen potential sires and significantly decrease the generation interval of bulls. Buoyed by the success of genomic selection on the male side, coupled with continuing fertility challenges on the female side, researchers are investigating genomics and the potential to increase the fertility of lactating dairy cattle. Genome-wide association assays are powerful tools being used by scientists to gain greater insight into the genetic make-up and potential of animals. Genomic testing and selection is underway on many dairies today. Producers are sampling animals while still young ---- and employing a variety of management strategies to optimize use of their cattle. In fact, nearly 250,000 females were genotyped in 2014, with greater than 100,000 sampled before 6 months of age. **Promising research results provide evidence that 1) there may be ample opportunity to make significant gains in Holstein heifer fertility using genomic selection, and 2) there are a large number of SNPs associated with DPR that are not negatively associated with production traits, perhaps allowing for selection for DPR without compromising production.** Lastly, identification of genomic loci associated with fertility in primiparous Holstein lactating cows is underway, with results expected in late 2016-2017.

5) Schaefer DA, Betzer DP, Smith KD, Millman ZG, Michalski HC, Menchaca SE, Zambriski JA, Ojo KK, Hulverson MA, Arnold SL, Rivas KL, Vidadala RS, Huang W, Barrett LK, Maly DJ, Fan E, Van Voorhis WC, Riggs MW. Novel Bumped Kinase Inhibitors Are Safe and Effective Therapeutics in the Calf Clinical Model for Cryptosporidiosis. *J Infect Dis*. 2016;14(12):1856-1864.

Cryptosporidiosis, caused by the apicomplexan parasite *Cryptosporidium parvum*, is a diarrheal disease that has produced a large global burden in mortality and morbidity in humans and livestock. There are currently no consistently effective parasite-specific pharmaceuticals available for this disease. Bumped kinase inhibitors (BKIs) specific for parasite calcium-dependent protein kinases (CDPKs) have been shown to reduce infection

in several parasites having medical and veterinary importance, including *Toxoplasma gondii*, *Plasmodium falciparum*, and *C. parvum*. In the present study, BKIs were screened for efficacy against *C. parvum* infection in the neonatal mouse model. Three BKIs were then selected for safety and clinical efficacy evaluation in the calf model for cryptosporidiosis. **Significant BKI treatment effects were observed for virtually all clinical and parasitological scoring parameters, including diarrhea severity, oocyst shedding, and overall health. These results provide proof of concept for BKIs as therapeutic drug leads in an animal model for human cryptosporidiosis.**

{Editor's Note: For calves with diarrhea caused by cryptosporidiosis, a new drug that reduces diarrhea severity, pathogen shedding and health would be very welcome on the dairy farm. Keep your fingers crossed that the compounds studied here will work on the farm and be available to veterinarians and producers.}

What's New at WADDL?

There is quite a bit new at WADDL. Three new faculty, to be exact. So - if you call the lab, and you want to know who you are talking to, we've added their pictures and short biographies.



Dr. Kyle Taylor

Kyle R. Taylor, DVM, PhD - Dr. Taylor is originally from western Washington and received both his bachelor's and veterinary degrees at Washington State University. His background is in field wildlife biology and his PhD from Hokkaido University in Japan was in zoonotic diseases of wildlife with a primary focus on *Borrelia* species. Recently he has been in Florida for his pathology residency at the University of Florida and a pathology fellowship at Disney's Animal Kingdom. Kyle will be performing diagnostic duties in WADDL and will be teaching 1st year veterinary students General Pathology.



Dr. Chrissy Eckstrand

Chrissy Eckstrand, DVM, PhD, Dipl. ACVP - Dr. Eckstrand joined the diagnostic team at WADDL as an anatomic pathologist in October 2016. Dr. Eckstrand is a Delaware native, received her DVM from Atlantic Veterinary College in PEI Canada, and completed an anatomic pathology residency and PhD at University of California, Davis. She has a special interest in understanding the pathogenesis of naturally occurring viral diseases of domestic animals. Her graduate work focused on two feline viruses of clinical importance, feline immunodeficiency virus (FIV) and feline infectious peritonitis virus (FIP), and has research experience working with other viruses such as West Nile virus (WNV) and various small ruminant retroviruses. Dr. Eckstrand has a joint appointment with the Department of Veterinary Microbiology and Pathology and will be teaching Veterinary Virology to second year veterinary students next fall.



Dr. Claire Miller

Dr. Claire Miller recently joined the Washington Animal Disease Diagnostic Laboratory (WADDL) in December 2016 as Section Head of Bacteriology and Parasitology and Clinical Assistant Professor in the Department of Veterinary Microbiology and Pathology. In addition, she is Director of the Clinical Microbiology Residency Program which is responsible for training new veterinary microbiology specialists. Dr. Miller completed her DVM at Washington State University, as well as her clinical microbiology residency and PhD. Her PhD focused on gene and protein expression differences between a DNA adenine methyltransferase mutant of *Salmonella Typhimurium*, as well as other strains of *Salmonella*. Dr. Miller's primary interests include clinical microbiology and topics in antimicrobial resistance testing and interpretation of susceptibility data.

Have you heard the news that the Washington Animal Disease Diagnostic Laboratory (WADDL) now offers a single test for detection of intestinal *Bovine Rotavirus*, *Coronavirus* and *Cryptosporidium*? By Dr. C. Eckstrand

WADDL's multiplex PCR test was developed to detect the presence of all three pathogens from a single intestinal sample. The test requires only 1 gram of fresh feces. If a necropsy is performed, 1-2 mls of intestinal contents or 1 gram of fresh intestinal tissue should be submitted. All three pathogens primarily affect the lower small intestine (jejunum and ileum) and can also affect the colon (*coronavirus*) and thus a section of distal small intestine is preferred.

Bovine Rotavirus, *Coronavirus*, and *Cryptosporidium* are highly contagious pathogens associated with significant diarrhea (scours) and possible death in neonatal calves. Infection with more than one of these pathogens is not uncommon and increases the severity of disease. *Salmonella* and *E. coli* are also important causes of neonatal diarrhea and can be tested for using the same fecal sample that you submit to WADDL for the multiplex PCR. Neonatal calf diarrhea is often a multifactorial disease influenced by both management and environmental factors such as adequate colostrum intake, hygienic housing, and bacterial pathogen interactions.

The *Bovine Rotavirus*, *Coronavirus*, and *Cryptosporidium* multiplex PCR is run on weekdays and has an average turnaround time of 3 days. Pooling of samples from multiple animals is not acceptable. Please submit fresh individual samples in leak-proof containers and delivered on ice packs. If formalin fixed tissue is collected and submitted, histopathology is encouraged to corroborate microscopic lesions with the multiplex PCR test results aiding in a more accurate diagnosis.

As compared to previous testing for neonatal calf diarrhea cases, this multiplex PCR combines virus and parasite detection into one assay that has increased sensitivity for only \$42 per sample for Washington state clients and \$63 per sample for out of state clients. Submission of four or more samples reduces that price to \$34 per sample for in state clients and \$51 for out of state clients.

WADDL is fully accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD) and serves veterinary practitioners with a complete arsenal of diagnostic assays, timely results, and on duty veterinary microbiologists and pathologists to aid in the diagnosis of neonatal calf diarrhea. Learn more about WADDL at: <https://waddl.vetmed.wsu.edu/>

WSDA Corner

We have a new State Veterinarian, Dr. Brian Joseph, at the WA Department of Agriculture. Dr. Joseph is a graduate of UC Davis School of Veterinary Medicine. He has served as a zoo veterinarian, in the Army Reserves, and now will be leading the animal health group for the state. For WSDA contact information for Dr. Joseph and others in Animal Health, go to: <http://agr.wa.gov/foodanimal/animalhealth/contactus.aspx>

Washington Winter Time Health Essentials by Dr. Scott Haskell, Asst. State Veterinarian

Winter brings a special set of challenges for Washington beef cattle producers. Every time winter comes around I know there will be an influx of phone calls about changes in cattle disease patterns. To me, the cold damp conditions of winter bring their own challenges to the Washington beef producer. When temperatures go from warmer to colder I think of pneumonia and respiratory issues. When the rains come and the mud is thick I think of foot rot and when animals are moved inside I think of lice! When the snows come I think of down cows. A whole different change in disease patterns with each condition! So to start with, how can Washington beef producers minimize the effect of weather patterns? First, producers must carefully assess body condition on pregnant cows when calves are weaned; develop a plan to provide adequate nutrition to allow cows to maintain body condition prior to their next calving. Creep feeding calves may also be a tool producers wish to utilize. Cows must be in good body condition (preferably a BCS, body condition score of 6/9). This allows your animals to handle bad and abrupt changes in weather, allow health and safe calving and then rebreeding. Adequate nutrition for Washington producers as assessed by BCS at the start of winter will help you and your herd succeed. Those diseases mentioned initially will be lessened in their impact on herd health. With many operations, a balanced diet may just mean adding a trace-mineral supplement to your cows' diet along with native pasture. Some good quality hay may be required, and a protein supplement if your grass becomes too dry, or too thin and sparse. If your cows are deficient in protein or phosphorus through the fall and winter months, they just won't rebreed on time post-calving.

Washington beef cattle must maintain their body temperatures throughout the winter months and to accomplish this they must maintain a constant core temperature. It is pretty obvious to all of us in the livestock industry that cattle nutritional requirements increase in cold weather; few producers actually have a feel for how much these energy requirements change. So what is the 'critical temperature' of an animal? Critical temperature is generally defined as "the lower end of the cow's comfort zone and it is the temperature at which producers need to increase the nutrition provided." The critical temperature for cows with good body condition scores and a full coat is about 20° F. As winter temperatures drop below this value, producers need to improve or increase feed for these cows about 1% more for each degree (F) drop below this critical temperature. This information is for cows that have a BCS of 6/9 and plenty of hair coat. For short haired and thin cows the critical temperature is about 30° F. Producers will need to feed an extra 2% for each degree F below this. Additionally, when cows are wet or very damp their critical

temperature is about 50° F. Again producers need to improve or increase feed for these cows about 1% more for each degree (F) drop below this critical temperature. Bedding can also be an important tool during winter months to help mitigate cold. This can help keep cattle clean and provide insulation from snow or frozen ground. Respiratory disease is severely decreased when these nutritional practices are followed.

Washington beef cows also need protection from the wind, especially during periods of severe wind chill; this is a key point in protecting the health of beef cattle during the winter months. Wind protection can be provided by the construction of wind fences or planting trees/vegetation for the creation of 'shelterbelts'. Where natural shelter areas for cattle are not readily available, producers can also provide portable wind fences for protection. For Washington producers, replacement heifers supplemented with forage may be more susceptible to severe wind chill. These animals can become cold soaked and substantially chilled. This reduces gain and thriftiness which in the end can lead to potentially severe health challenges. Again, pneumonia and respiratory diseases are the result of animal stress.

Feeding cows later in the day during severe cold or wind will also help with cattle health. Supplemental feeding later in the day increases individual cattle heat production during the night hours and decreases cattle stress. Research has shown that feeding cows at night can also alter the time cows calve. Studies have shown that 85 percent of calves born between 6 A.M. and 6 P.M. were from cows that were fed between 5 and 10 P.M. at night. Also minimize the impact to riparian areas by not feeding near water courses.

Take Home Messages:

1. Critical temperature for beef cattle with an adequate to heavy winter coat is 20 °F.
2. Washington producers should increase herd energy consumption 1% for every degree of coldness below the lower critical temperature of beef cattle.
3. To reduce the incidence of respiratory disease in cattle kept inside barns, proper ventilation will reduce health issues.
4. Reduce mud to reduce foot rot and lameness issues. Mud and manure on hides' decreases dressing percentages and yield, thereby reducing cattle pricing.
5. Beef cattle that are provided clean, dry, draft/wind free bedding have a lower energy requirement and decreases the incidence of disease.
6. Watching critical temperatures and providing energy during these periods will decrease animal stress, disease potential and increase production.

Continuing Education

Veterinarians

Calf Care Audit -- \$50 + 1 CE credit – Visit <https://apps.vetmed.wsu.edu/CVME/Event/Details/28> . Go through the course, complete a 10 question quiz and you will be automatically be issued a CE Certificate. PowerPoint notes and the 5 reference documents are also available for those going through the CVME course after purchase of the course!

CVM Spring Conference. April 21-23, 2017. WSU College of Veterinary Medicine in Pullman, WA. For more information go to: <http://cvme.vetmed.wsu.edu/>

Producers

Pacific Northwest Animal Nutrition Conference. January 18-19, 2017. Red Lion Inn, Richland, WA. For more information and registration, go to: <http://www.pnwanc.org/Registration.html>

Visit our website for information on current research projects and outreach materials for veterinarians and producers! <http://vetextension.wsu.edu/>

Send newsletter comments to the Editor: *ag animal health*
Veterinary Medicine Extension - Washington State University
P.O. Box 646610
Pullman, WA 99164-6610
(509) 335-8221 VetExtension@vetmed.wsu.edu

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