WASHINGTON STATE UNIVERSITY
VETERINARY MEDICINE EXTENSION

ag animal health

VETERINARY MEDICINE EXTENSION

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WASHINGTON STATE UNIVERSITY EXTENSION & WSU COLLEGE OF VETERINARY MEDICINE

In This Issue

YOU CAN VIEW OLDER ISSUES OF *ag animal health*:
http://vetextension.wsu.edu/newsletter/index.htm

From the Editor – Again? I'm talking about antibiotics again? Alright already with the antibiotic resistance. But, just as I was writing this newsletter, the US Food and Drug Administration came out with a press release. This time, FDA's has ordered the prohibition on extra-label use of cephalosporins in food animals. *(See Full article and link to the Press Release below.)* The third generation cephalosporin drugs we use in food animals (we know them as Naxcel®, Exceed®, etc.) can now only be used on-label. That means the kind of animal, dose, frequency, duration and route of administration cannot be different from the label. Take a close look at how you are using these drugs. And, oh, by the way, there are a few exceptions, but only on the order of your veterinarian….

Featured Faculty – Dr. Doug Call, College of Veterinary Medicine

Dr. Doug Call

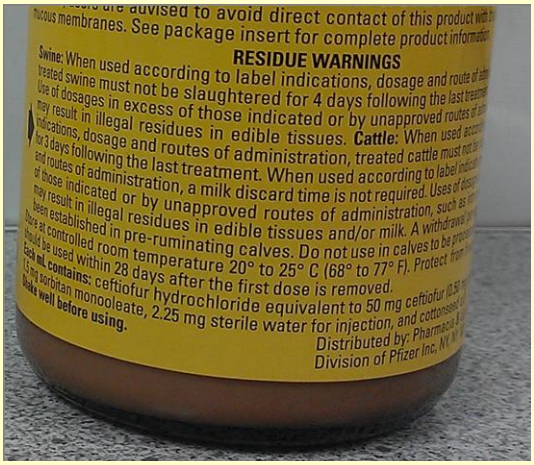
Dr. Call is a Professor in the Department of Veterinary Microbiology and Pathology within the College of Veterinary Medicine. He has both a BS and PhD from WSU. He has distinction of being the Caroline Engle Distinguished Professor of Research on Infectious Disease. He studies many aspects of food and waterborne disease and is part of the team looking at E coli O157:H7 and Salmonella and at bacterial antibiotic resistance. In October, his group published a paper looking at residual different antibiotics' activities in soils. Dissipation of different antibiotics in soils differed. The bottom line was that efforts to control soil contamination needs to be directed toward drugs that remain biologically active in the soil (like cephalosporins and florfenicol) and not those that become inactive (like tetracycline). For more information on this article, see: http://www.ncbi.nlm.nih.gov/pubmed/21856822

FDA Press Release: Ban on Extra-label Cephalosporin Use

By Dale A. Moore, DVM, PhD, Director, Veterinary Medicine Extension, WSU

On January 4, 2012, the US Food and Drug Administration issued an order that will prohibit most extra label use of cephalosporin drugs in food animals (*For the full press release, see webpage*: http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm285704.htm?source=govdelivery). The order is to take effect April 5, 2012. From now until March 6, 2012, the FDA will accept comments about their ruling. What can you do to make sure you are either in compliance or can make meaningful comment?

- Take a look at all the antibiotics you are using.
- Are you using drugs that contain cefiofur? Drugs with cephaparin are NOT included because the only approved use in food animals is for intra-mammary treatment in cows and there is no use of this drug in people.
- If you are using a cephalosporin drug in food animals, how are you using it?
- How does your use correspond to the label with regards to:
    - Dose – mg or ml per pound or kg
    - Route of administration
    - Frequency – how often you give it
    - Duration of treatment with the drug
    - Species or class or age of animal
- If you are using the drug in a manner that is NOT on the label, find out why, start using and training treaters to use it according to label instructions.



Are there exceptions to this order? Yes, there are exceptions. These drugs can be used to treat an extra label disease condition on the order of the veterinarian but ONLY using the labeled dose, route, frequency and duration. There are some exemptions for Minor Species like ducks, etc. There are **NO allowable *prevention* uses** of these drugs – that means you cannot give every newborn calf a "dose" to try to "prevent" scours, for example.

What if you think a particular extra label use is really warranted? The US FDA is accepting comments from the public about this order until March 6, 2012. Go to the link above to find out how you can make comments.

What about the other drugs we use? There are still a number of drugs we cannot use in food animals or that we cannot use off label (like the sulfa drugs in dairy cattle). It might be a good idea to go through all the drugs you are using and make sure everyone is using them on label too.

WSU Research Highlights

(1) **Theriogenology October 2011. 76:1036-1041. Presynchronization with GnRH 7 days prior to resynchronization with CO-Synch did not improve pregnancy rate in lactating dairy cows.**
Alkar A, Tibary A, Wenz JR, Nebel RL, Kasimanickam R.

The objective was to determine the effect of presynchronization with GnRH 7 d prior to the initiation of resynchronization with CO-Synch on pregnancy/AI (P/AI) of resynchronization in lactating dairy cows, and the effect of GnRH on P/AI from previous breeding. All parity Holstein cows (n = 3287) from four dairy farms were enrolled. Cows not detected in estrus by 28 ± 3 d (Day -7) after a previous breeding were assigned to receive either GnRH (100 µg, im; n = 1636) or no GnRH (Control; n = 1651). Cows not detected in estrus during the 7 d after GnRH underwent pregnancy diagnosis (35 ± 3 d after previous breeding, Day 0); non-pregnant cows (n = 1232) in the Control (n = 645) and GnRH (n = 587) groups were resynchronized with a CO-Synch protocol. Briefly, cows received 100 µg GnRH on Day 0, 25 mg PGF(2α) on Day 7, and 72 h later (Day 10) were given 100 µg GnRH and concurrently inseminated. Serum progesterone concentrations (n = 55 cows) were elevated in 47.3, 70.9, and 74.5% of cows on Days -7, 0, and 7, respectively. The proportion of cows with high progesterone concentrations on Day -7 and Day 0 were 44.1% and 88.2% ($P < 0.003$), and 55.2% and 33.2% ($P > 0.1$), for GnRH and Control groups, respectively. Accounting for significant variables such as locations ($P < 0.0001$) and parity categories ($P < 0.05$), the P/AI (35 ± 3 d after AI) for resynchronization was not different between GnRH and Control groups [26.7% (95% CI: 23.2, 30.5; (157/587) vs 28.4% (95% CI: 25.0, 31.9; (183/645); $P > 0.1$]. There were no significant location by treatment or parity by treatment interactions. Accounting for significant variables such as location ($P < 0.0001$) and parity categories ($P < 0.001$), the P/AI was not different between GnRH and Control groups for the previous service [60.2%; 95% CI: 57.9, 62.6; (986/1636) vs 59.1%; 95% CI: 56.7, 61.5; (976/1651); $P > 0.1$)]. There were no significant location by treatment or parity by treatment interactions. In conclusion, more cows presynchronized with GnRH 7 d prior to resynchronization with CO-Synch had elevated progesterone concentrations at initiation of resynchronization than those not presynchronized. **The GnRH treatment 7 d prior to resynchronization with CO-Synch, when given 28 ± 3 d after a previous breeding, did not improve P/AI in lactating dairy cows; furthermore, compared to the control, it did not significantly affect pregnancy rate from the previous breeding.**

(2) **Journal of Dairy Science April 2011. 94:1864-1872. Factors associated with the rectal temperature of Holstein dairy cows during the first 10 days in milk.**
Wenz JR, Moore DA, Kasimanickam R.

Daily evaluation of rectal temperature (RT) during the first 10 d in milk (DIM) is used to facilitate the early identification of postpartum complications, particularly metritis in dairy cows. The factors associated with RT of postpartum dairy cows have not been clearly established and the RT threshold used to define fever has been variable**. The objectives were to identify factors associated with the rectal temperature (RT) of postpartum dairy cows and provide descriptive statistics of the RT during the first 10 DIM to clarify the normal range of RT for cows.** Daily RT was evaluated from 1 to 10 DIM for all cows calving during 2 consecutive summers on a single 1,500-cow Holstein dairy. Cows were placed into metabolic/digestive (METB), infectious (INF), and no recorded disease (NONE) groups based on disease diagnoses during the first 10 DIM. Cows were grouped based on calving difficulty and parity. Multiple linear regression models with repeated measures were used to evaluate the factors associated with RT. Three hundred and ninety-two cows were evaluated, of which 45% were primiparous and 32% required assistance at calving. No difference was observed in calving assistance by parity. First disease diagnoses peaked in the INF and METB groups at 3 and 1 DIM, respectively. The RT of primiparous cows was 0.1 to 0.2°C higher than that of multiparous cows from 1 to 8 DIM, accounting for calving difficulty, twin births, month of calving, and disease group in the model. The INF group cows had a higher RT than did NONE group cows (38.9±0.04 to 39.2±0.73 vs. 38.7±0.03°C, respectively) on each of the first 10 DIM, which was approximately 0.6°C higher from 3 to 5 DIM. The RT of cows with metritis was at least 0.1°C higher (38.8±0.05°C) than that of NONE group cows beginning 4 d before diagnosis. The mean RT of primiparous, defined healthy (NONE group) cows was 38.8±0.02°C, with an upper normal limit (mean+2 SD) of 39.6°C. The mean RT of multiparous cows in the NONE group during the first 10 DIM was 38.7±0.01°C, with an upper normal limit of 39.5°C. **The RT of dairy cattle during the first 10 DIM was associated with parity, month of calving, and an infectious disease diagnosis, particularly the diagnosis of metritis. The normal RT of dairy cattle in the immediate postpartum period, during the warm summer months, is potentially higher than that generally reported.**

Can I Feed Out My Cull Cows? By Dale A. Moore, DVM, PhD

At the end of 2011, cull dairy cow prices (Turlock, CA market) were fetching up to $0.72 for high yielding cows and $0.45 for the very low end cows. Many are anticipating even higher prices this month and into the future. A question that comes up from time to time is – can I improve my cull cows and get more for them? There are just a couple of studies that have looked at trying to answer this question.

In a recent study published in the December 15, 2011, *Journal of the American Veterinary Medical Association*, investigators from the University of California, Davis, evaluated the effect of a "reconditioning" program for thin dairy cows on body weight gain, carcass quality, and their shedding of bacterial pathogens. Thirty-one cull dairy cows with a Body Condition Score (BCS) of 2.5 or less (on a 5-point scale) were purchased from a livestock market and held at the University feedlot. As they came off the trailer, they were randomly assigned to immediate slaughter (controls), a group fed a high concentrate diet for 28 days or a group fed a high concentrate diet for 56 days.

The intitial body weight was about 1,066 lbs on average and all the cows were about 3 years old. The Average Daily Gain for the 28 day group was 0.7 lbs per day and was 3.1 lbs per day in the 56-day group. Hot carcass weight (HCW), dressing percentage, and ribeye area were much greater for the 56-day feeding group than the 28-day group but no difference between the 28-day group and the cows that were slaughtered immediately after arrival. The 28-day group had significantly lower marbling score than the 56-day group and the control cows.

The total cost of the feeding was $76.77 for the 28-day group and $166.76 for the 56-day group. When all the prices paid for better product and all the costs incurred were determined, there was a net loss of $71.32 per cow for the 28-day group and $112.80 for the 56-day group compared to the control cows. Bottom line is that unless the feedout period is sufficiently great (more than 28 days), the cost of feed much lower, and/or the price differential is very great, it still does not seem to be worth feeding thin cows to improve carcass quality and meat value. One thought, though, is that reconditioned cows may not become debilitated cows that could potentially become downers.

An Irish study looked at finishing" cull dairy cows using a grass silage and concentrated in four different strategies. In systems with low housing costs, the slower finishing systems (based on forage) were more profitable while at high housing costs, faster finishing was more profitable. Thus, the specific farm circumstances would dicate what kind of feeding program would work best.

There still may be opportunity at individual farms to improve carcass quality and its benefits by feeding out thin cows. One producer in Pennsylvania said: "To get the premium for the beef value, we can either focus on making our culling decisions earlier, or look at doing a feeding program to bring her condition back to a higher value." Maybe he is "more right" in the first part of his statement. Can we make more profitable culling decisions and not have to feed these cows? Or can we set up a system on our own farms to realize some profit? Jury is still out.

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http://pa-bqa.org/CMDocs/PABQA/WhiteCow(WEB).pdf

What's New at WADDL?

Caseous Lymphadenitis of Sheep and Goats

Testing for Caseous Lymphadenitis (CL) is recommended as part of the small ruminant herd biosecurity screen offered through the Washington State University-Washington Animal Disease Diagnostic Laboratory (WSU-WADDL). This infection is a potential health threat to a sheep or goat herd. WSU-WADDL receives numerous inquiries about CL, how to test for it, and how to control the infection in herds and flocks. We have taken some of the most frequently asked questions and presented them along with some short answers.

1. What are the major means of spread of caseous lympadenitis (CL)?

Corynebacterium pseudotuberculosis, the bacterium that causes the disease CL, is spread from animal to animal primarily through contact with material from subcutaneous abscesses (pus) or fomites (inanimate objects) contaminated with abscess material. The organism can survive several months in the soil and environment, remaining a source of infection. Though much less common than visible subcutaneous abscesses, abscesses may also form in the lungs and abdominal organs as a result of spread of the organism within the animal via blood or lymph. When abscesses are present in the lungs, the organism may be transmitted through respiratory secretions (nasal discharge or coughing). In rare cases, C. pseudotuberculosis may be present in the milk. Although CL is not sexually transmitted, it is recommended to avoid natural breeding of animals with abscesses.

2. What tests are available for CL?

There are two testing methods for CL offered at WSU-WADDL: bacterial culture to detect the bacterial organism in abscess material, and serology to detect C. pseudotuberculosis-specific antibodies in sheep and goat blood samples. For animals with visible subcutaneous abscesses, it is best to submit abscess material for culture since this is the most direct and definitive method to diagnose CL in an individual animal. It is recommended that all abscesses be cultured regardless of serology test results. The serological test is the best method of "herd-level diagnosis" (screening herds). WSU-WADDL runs the Synergistic Hemolysin Inhibition (SHI) test, which measures the antibody response to an exotoxin produced by the organism. No CL serological test is sufficiently reliable to confidently detect infection in individual sheep or goats, therefore the serology results for an individual animal test should be interpreted with caution. The SHI test specificity and sensitivity for individual animals may not be high in some herds, however, the prevalence of positive tests within a herd usually reflects the herd prevalence of infection reasonably well.

3. What samples do I submit?

We recommend working with your veterinarian to obtain appropriate samples. Send sample(s) to the lab by overnight mail (FedEx (choose "Standard Overnight" for quickest delivery), UPS, or USPS). For bacterial culture, collect abscess material in a sterile container (red top tube, for example) or with a bacterial culture swab. If an abscess is lanced, be sure not to contaminate the environment (see #4 for more information). Please include ice packs with samples intended for culture. For serology, blood should be collected into a five or ten ml. "red-top" clot tube or serum separator tube. Leave the blood at room temperature for at least 1 hour to allow clot formation. We do not recommend separating the serum from the clot prior to shipment. Ice packs are not required for shipping blood samples.

4. What if the goat/sheep has an abscess?

Until proven negative by culture, all abscesses should be treated as if they were CL. Bacterial culture is the most reliable test for determining the CL status of an animal with abscesses. It is possible for infected animals with active abscesses to test negative on serology due to a delay in antibody production. Many environmental bacteria can cause abscesses via traumatic wounds, but unlike CL these are sporadic and not readily transmitted from animal to animal. Animals with CL abscesses should be quarantined until the abscess has completely healed or be culled. If an abscess is lanced, it should be over a hard surface that can be disinfected (concrete) or thrown away (tarp). If an abscess ruptures in a pasture, the organic material (soil, grass) is contaminated, and the pasture should be rested for at least one month.

5. How long does it take to get CL results?

Serology: CL serum (SHI) tests are generally run once a week. Samples must arrive by Tuesday afternoon for results to be reported on Friday. If samples arrive Wednesday-Friday, they will be held until the next week's run.

Culture: Bacterial cultures for CL are set up on the day received in the lab, and results are typically available within a week.

6. What does a positive or negative blood test mean?

The serology test is best used as a screen to find out if a herd or flock has been infected, rather than to diagnose an individual animal with CL. An individual animal positive CL serology test does not necessarily mean an animal is infected with C. pseudotuberculosis or has CL. Furthermore, the test cannot distinguish between natural exposure and vaccination, therefore vaccinated herds may test positive. Nonetheless, herds with a high proportion of animals with positive SHI tests are very likely to contain C. pseudotuberculosis infected animals, whereas herds with few or no SHI positive animals may represent little risk of CL introduction. Animals within a positive herd are at risk for developing abscesses, and the herd should be monitored for visible subcutaneous abscesses. Titers in an individual animal do not correlate well with risk of abscess development. A negative serologic result on an individual animal does not definitively rule out infection by C. pseudotuberculosis. The confidence in a negative result is enhanced if most or all herd mates also test negative.

7. How often should I test my animals by serology?

When acquiring new animals, testing the herd of origin (10 or more animals) is the preferred approach to determining the status of the new additions. If testing the herd of origin is impossible, new additions should be quarantined and tested twice (30 days apart) before introduction into the negative herd. Testing only the new additions provides less confidence in negative tests than does testing the herd of origin. The frequency for testing an established herd or flock should be based on previous test results, eradication strategies, and the risk of exposure to other herds or flocks.

8. Is there a vaccine available?

There is a vaccine available for use in sheep. Currently, there is no licensed vaccine labeled for use in goats. Both the safety and efficacy of CL vaccines have been unacceptable in goat trials. If a herd or flock is vaccinated, then serologic screening is no longer a useful method for detecting natural infection. Vaccinated herds may test positive on the blood test (serology).

9. How can I manage CL positive animals on my farm?

Because CL is a chronic infection, efforts should be directed toward preventing spread to uninfected animals. The first step is to identify infected animals within a herd or flock, which can be done through a combination of palpation for external abscesses, with confirmation by bacterial culture (see #3), and serological screening. Animals with CL abscesses should be quarantined until the abscesses have completely healed or be culled. Serological screening can assist in determining the prevalence of CL within a herd. Frequency of screening should be based on the prevalence within the herd (from previous herd tests) and the risk of outside exposure (level of biosecurity for new animals

entering the herd, and animals attending outside events). Animals with signs of respiratory or wasting disease in a known CL positive herd or flock should also be quarantined, as these may be signs of abscesses in the lungs or abdominal organs. Any animals dying of respiratory or wasting disease should be necropsied by a veterinarian, and any abscesses cultured, to identify the cause of death. Flock owners should purchase and disinfect their own shearing equipment to prevent introduction of CL from outside farms, and be sure to disinfect feed bunks and stanchions, which may become contaminated by abscess material. Keep new additions in a separate pen until either the herd of origin tests negative, or the animals test negative on two tests 30 days apart. See #6 for more information on testing new additions.

10. Is it okay to drink raw milk containing C. pseudotuberculosis?

Human infections with this bacterium are rare, but when found are often associated with occupational exposure to sheep and goats. Drinking raw milk is a potential source of human infection. There are other more serious zoonotic pathogens (infectious agents transmitted from animals to humans) that are regularly transmitted to humans through raw milk. Consult your veterinarian regarding the public health hazards of consuming raw milk.

11. Biosecurity Screen

We recommend the screen below for establishing the status of a herd, new animals entering the herd and animals producing milk for human consumption. This screen includes caprine arthritis and encephalitis (CAE), Johnes disease, caseous lymphadenitis and brucellosis. Tests are priced individually. Additionally, Q-Fever testing is recommended, and may be required in your area, for animals producing raw milk for human consumption. Please keep in mind that it is not possible to test for every pathogen potentially transmitted to humans through raw milk, and that negative tests do not guarantee raw milk is safe or pathogen-free.

Costs of the tests:

	In-State	Out-of-State
Caprine Arthritis Encephalitis	$4.20	$6.30
Johne's Disease	$4.20	$6.30
Caseous Lymphadenitis	$6.30	$9.45
Brucella	$4.20	$6.30

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If you have further questions, please call the main WADDL office at 509-595-9696 and ask to speak with the consulting microbiologist. By Dr. Kenitra Hammac, Dr. Jim Evermann, and Dr. Tom Besser

WSDA Corner by Dr. Leonard Eldridge, State Veterinarian

USDA Animal Disease Traceability Rule

The United States Department of Agriculture (USDA) recently published a proposed rule regarding traceability for livestock moving interstate that will establish minimum official identification and document requirements. Under the proposed rule, unless specifically exempted, livestock would have to be officially identified and accompanied by an Interstate Certificate of Veterinary Inspection (ICVI)

or other forms of documentation as agreed upon by animal health officials in the shipping and receiving state. The current interstate regulations for horses, sheep, goats, swine and poultry will change very little; cattle are the initial target species in this rule.

The proposed rule recognizes the following devices for cattle as official identification: Animal Identification Number devices (840 tags); National Uniform Ear tagging System tags (silver and orange metal tags with the state code); and Location-Based Number (an official premises identification number with a unique herd management number). Other forms of identification agreed upon by animal health officials in the state of origin and state of destination include, but not limited to, brands, tattoos and breed registry certificates.

Current interstate movement regulations require individual identification of sexually intact cattle (breeding animals) over 18 months of age. The new proposal will also require **individual identification on all dairy, rodeo and show cattle regardless of age**. There is to be a phase-in of official identification requirements for beef cattle less than 18 months of age over time. It is unclear to me how soon that will be put into effect.

The rule provides some identification requirement exemptions, such as a commuter herd agreement (pasture to pasture permit), beef cattle less than 18 months of age (feeder cattle) and movement of cattle from your originating ranch that may cross through another state and then back to a location in the originating state.

The proposed rule also has a provision to prevent retagging an animal with a similar official device. For instance, if an animal has a USDA-issued silver tag, application of a second silver tag will not be permitted. The rule does allow for an ICVI to have an attached listing of official identification numbers, but there are numerous conditions on what the listing must contain which could present difficulties for veterinarians scanning and downloading livestock Radio Frequency Identification Devices information electronically.

States, working closely with local producers, will be responsible for implementing a traceability system that will achieve national traceability performance standards on livestock movements within the state. Each state must develop a three-year roadmap to implement the new regulations. David Hecimovich, WSDA's Animal Identification Program Manager, is working hard on compiling the road map requirements for Washington. Washington's road map has two directions; one using the WSDA Unified Divisional Information System (UDIS) that uses all the existing information we have available today. My office has spent many years developing UDIS at the direction of the livestock advisory committee established by the legislature in 2006. The second direction is a federal system and is being considered as a result of parts of the cattle industry changing the reporting system developed for UDIS. At present the proposed changes leave unacceptable gaps in the information provided and the federal system that is being developed by USDA will be used instead if there is not a satisfactory agreement brought forward. The federal system merely tracks individual identification tags and is a step backwards from UDIS; however that will be a decision by the cattle industry as a whole on which direction is taken.

Certificate of Veterinary Inspection

In the hustle and bustle of a veterinarian's busy day, it is easy to overlook the accurate completion of a Certificate of Veterinary Inspection (CVI). This certificate, however, is more than just another piece of paperwork that is necessary when animals enter Washington; it is a legal regulatory document important for protecting the health of our animals, our food source and the public.

Washington receives numerous noncompliant CVIs each month. We send violation letters to the issuing accredited veterinarian on how to correct the noncompliance. The ten most common oversights/omissions on noncompliant CVIs are: missing entry permit numbers, missing Equine Infectious Anemia (EIA) test date for equines, outdated Equine Infectious Anemia test date for

equines (Washington requires negative EIA within 12 months of entry); lack of dates on CVI's, CVI's not received in a timely manner (more than 30 days late); incomplete veterinarian information, incomplete name & address of shipper and/or receiver (Washington requires a physical address); lack of Official Identification for livestock, incomplete livestock vaccination information, and illegible information.

Veterinarians should review CVI's for accuracy and completeness before issuing. As the United States Department of Agriculture (USDA) moves forward with the new accreditation requirements, repeated issues of noncompliant CVI's may jeopardize a veterinarian's participation in the National Veterinary Accreditation Program. I ask for your patience when your veterinarian takes a few extra minutes to fill out a CVI and requests additional information that was not asked for in the past.

Continuing Education

Veterinarians

Academy of Dairy Veterinary Consultants Spring Meeting April 13-14, 2012. Dr. Jose Santos, Nutrition and Reproduction Specialist, University of Florida, will be the featured speaker. Location – Northern California. (Specific location TBA later) Contact Dr. Dale Moore for more information. mailto:damoore@vetmed.wsu.edu

E coli Updates: Current Perspectives on Cattle, Produce, and Human Health – Videos from the November 8, 2011 Webinar Now available online!
http://extension.wsu.edu/vetextension/ecoliconference/Pages/default.aspx

Producers

North Central Idaho Grazing Conference January 10, 2012, Lewiston, ID. To learn more visit: http://county.wsu.edu/asotin/calendars/Lists/Events/Attachments/184/2012_Jan10GrazingConfBrochure.PDF

Lameness, Hoof, and Leg Issues in Dairy Cattle Webinar January 12, 2012, 12pm Central Time. To learn more visit: http://www.extension.org/pages/29156/upcoming-dairy-cattle-webinars

2012 Country Living Expo & Cattlemen's Winter School January 28, 2012, Stanwood High School, Stanwood WA. http://skagit.wsu.edu/countrylivingexpo/ Contact WSU Skagit County Extension Office at 360-428-4270

DairyBeef: Maximizing Quality and Profits at http://dairybeef.wsu.edu . See the Residue Avoidance Video – in English and Spanish.

4-H Leaders

"Providing clean and comfortable environments to optimize livestock health and wellbeing. *Volunteer Leaders* Online Educational Program http://vetextension.wsu.edu/programs/4-H/index.htm

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