WASHINGTON STATE UNIVERSITY EXTENSION

ag animal health

VETERINARY EXTENSION NEWSLETTER • VOLUME 1, NO.3

Featured Faculty -- Dr. Tom Besser

Dr. Tom Besser, DVM, PhD, has been a faculty member at WSU for many years where he has provided leadership in a number of different areas of the *College of Veterinary Medicine*. Currently, his research in the *Department of Veterinary Microbiology and Pathology* is focused on food and waterborne diseases. "The long-term goal of my research is the development of practical measures to reduce the prevalence of these agents in the animal reservoir as a means of reducing the risk of human disease." In addition to this work, he is a founding faculty member of the new School for Global Animal Health (http://globalhealth.wsu.edu) and has recently published work on multi-drug resistance in Salmonella bacteria and Mycoplasma in Rocky Mountain Bighorn Sheep.
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Antibiotic resistance in *Salmonella:* The role of drug use on the farm

Since the first clinical use of sulfonamides in the 1930's, each new class of antibiotics introduced into clinical practice has been followed by the emergence of resistance to that drug among one or more of the targeted bacteria. Several strategies to prevent or delay the emergence of resistance have been developed, including an emphasis on full treatment regimes, use of combination therapy, rotations of antimicrobial drugs used, and elimination of unnecessary or inappropriate uses. In recent years, some uses of antimicrobial drugs in food-producing animals have been called into question by prestigious organizations such as the American Society for Microbiology, the American Public Health Association, and the American Medical Association. In 2000, the FDA announced its intention to withdraw the license of fluoroquinolone-class drugs for poultry, based on the emergence of fluoroquinolone resistance in *Campylobacter jejuni,* a major cause of food-borne diarrhea with a poultry reservoir, and this withdrawal was accomplished in 2005. Currently, there is a similar concern about the emergence of resistance to extended spectrum cephalosporin (ESC) antimicrobial drugs in *Salmonella,* another major cause of bacterial food-borne diarrheal disease in the USA.

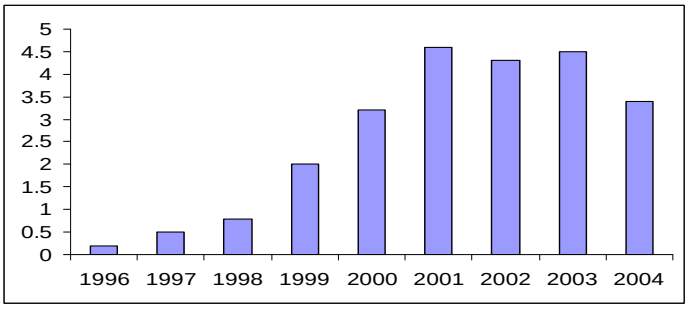


Figure 1. Ceftiofur Resistant *Salmonella* from Human Clinical Cases in the USA, NARMS 2004.

There has been a trend towards increasing incidence of human infection with *Salmonella* strains resistant to ESC, from 0.2% (1996) to 2% (1999) to >4% since 2001. This is of particular concern because the ESC Ceftriaxone is the drug of choice for young children with invasive *Salmonella* infections. ESC resistance in *Salmonella* that infect cattle has also increased in recent years: the proportion of *Salmonella* isolated from cattle at the Washington Animal Disease Diagnostic Laboratory that were resistant to the veterinary ESC drug ceftiofur (marketed under the trade names Naxcel®, Excenel® and Excede®) rose from 0% in 2000 to >40% since 2003. This same trend is also seen nationally and in 2003 >20% of bovine *Salmonella* clinical isolates were ESC resistant, compared to about 10% of chicken *Salmonella* and <5% of swine and turkey isolates. It has been shown that the resistance gene bla_{CMY2} is the most common mechanism of ESC resistance in both cattle and human *Salmonella* in the USA, and that this gene produces similar resistance to both ceftiofur and ceftriaxone.

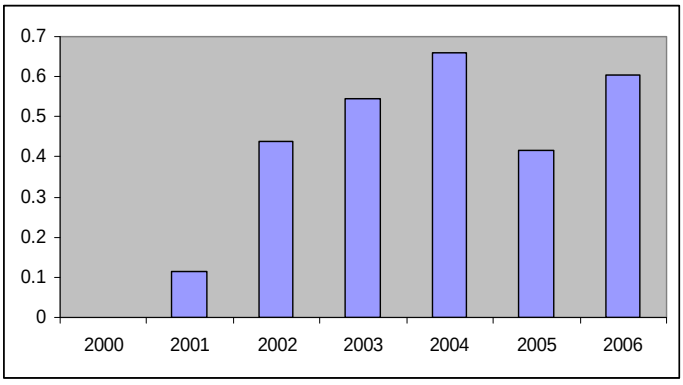


Figure 2. Proportion Resistant *Salmonella* isolates from cattle, WADDL.

How strongly does the use of ceftiofur promote the occurrence of ESC resistant *Salmonella*? In a recently completed study, we compared the amounts of ceftiofur use on 40 Washington dairy farms to 1) the occurrence of ceftiofur resistant *Salmonella* infections on each farm during the previous 3 years, 2) the percent of the normal *E. coli* in the cattle manure that are ceftiofur resistant, and 3) the percent of cattle with ceftiofur resistant *E. coli* in their manure. We found a significant association between ceftiofur use and the occurrence of ceftiofur resistant *Salmonella* infections. *Farms that had experienced ceftiofur resistant Salmonella infections during the previous three years used significantly more ceftiofur (on a per-head basis) during the year of our study compared to farms without ceftiofur resistant Salmonella infection.* However, our study could not determine whether the increased ceftiofur use was the cause (for example, ceftiofur use reducing the normal flora and therefore reducing the resistance of the cattle to *Salmonella* infections), the result (for example, ceftiofur use was increased in response to the diarrheal disease induced by the *Salmonella* infections), or just a correlated factor (for example, if those operators who fail to manage transition rations properly also have a tendency to overuse ceftiofur in an attempt to control the resulting disease).

In contrast, there was no detectable overall relationship between ceftiofur use and the occurrence of resistant *E. coli,* either as a percentage of the normal *E. coli* fecal flora or as a percentage of cows carrying resistant *E. coli.* Ceftiofur use ranged widely among dairies, from zero (on three organic dairies and one conventional dairy) to two dairies that used on average more than 800 mg ceftiofur per head per month. Across all dairies, the average ceftiofur use was less than 200 mg per head per month.

In Summary:

* There is a strong upward trend in extended spectrum cephalosporin resistance of *Salmonella* isolated from livestock and poultry in recent years. Among the food-producing species, cattle isolates have the highest rate of resistance.
* Dairies that had experienced disease due to *Salmonella* resistant to ceftiofur on average used higher amounts of the drug than farms that had not experienced these infections. It is possible that higher ceftiofur use predisposed these farms to outbreaks of resistant *Salmonella* infections.
* The amount of ceftiofur used on farms during the preceding year did not affect the numbers of ceftiofur resistant *E. coli* shed by cattle in their manure on these farms.
* The wide range of use of ceftiofur among the study farms demonstrates that significant reductions of the use of this drug is possible and should be encouraged to decrease the continued selection of resistant *Salmonella.*

By: Dr. Tom Besser, Dept Vet Microbiology and Pathology

What's New at WADDL?

Fatty Liver Hemorrhagic Syndrome in a Backyard Laying Hen

A one year old Australorp laying hen was recently presented to the Washington Animal Disease Diagnostic Laboratory following sudden death. The hen was housed with 19 other Astralorp and Bantam hens in a backyard coop. The hen was necropsied and found to have very pale pectoral muscles, a large internal fat pad, and a large blood clot overlying the liver. The liver was moderately swollen, pale tan, and quite friable (easy to break apart) and two large areas of hemorrhage were found within the liver.

This case is an excellent example of "*Fatty Liver Hemorrhagic Syndrome*" (FLHS) of chickens. FLHS is a sporadic disease of laying hens, and as the name implies, is characterized by diffuse severe liver fat (lipidosis) with secondary liver rupture and bleeding. Most affected birds appear healthy and are often high egg producers prior to death. The severe fatty liver makes the liver friable and predisposed to rupture and subsequent internal bleeding. While the friability of the liver would certainly make the animal susceptible to bleeding following injury, such as might be expected when fighting with another bird, many hens with FLHS develop liver fractures following simply the physical stresses of egg laying.

(http://insight.iinet.net.au/poultry/australorps.html)

Development of severe liver lipidosis depends on consumption of diets containing high levels of energy, though the disease likely has many causes contributing to it. Diets high in chelated minerals (minerals that have been 'bonded' to amino acids or short-chain proteins to improve absorption from the gut) and conjugated linoleic acid (a fatty acid) have been implicated in the development of the disease as has the feeding of diets composed primarily of chopped corn. Limitation of exercise, such as in cage rearing of laying hens, may also predispose hens to the disease. In addition, both endogenous (naturally produced) and exogenous (given therapeutically) estrogens have been shown to increase the incidence of FLHS in chickens. Lastly, while the disease is somewhat sporadic, it is quite possible that genetics play some role in the predisposition to disease development.

Control of FLHS relies primarily on limiting excessive dietary energy. If the disease is found in a large commercial laying facility, a consultation with a poultry nutritionist is warranted. In backyard or hobbyist flocks, consultation with an extension poultry specialist may be helpful. However, simply ensuring that the birds are consuming adequate, but not excessive amounts of diets formulated specifically for laying hens and providing the birds with the opportunity for exercise may be all that is necessary to limit this disease.

By: Dr. Gary Haldorson, Pathology, WADDL

Emergence of Tetracycline-Resistant Campylobacter

Sheep owners and veterinarians have long recognized *Campylobacter fetus* as a major cause of abortions in small ruminants, and that tetracycline was the drug of choice to help control these abortions. However, some interesting new research is soon to be published from Iowa State University and the National Veterinary Services Laboratory (the abstract is reproduced below). In this study, the authors report that tetracycline-resistant *C. jejuni* has now become the predominant type of campylobacter causing ovine abortion. Review of the ovine abortion activity in the Pacific Northwest over the last seven years indicates that this is true in our region as well. Between 2000 and 2003 we had no cases of small ruminant abortion due to either *C. fetus* or *C. jejuni*. In 2004 we began to see abortions with *C. jejuni*, with four documented events. Since then, we have consistently seen *C. jejuni* abortions each spring (and we have had only two *C. fetus* abortions, one each in 2007 and 2008). The *C. jejuni* that we are seeing is also tetracycline resistant, consistent with the report. So far, in 2008, we have isolated tetracycline resistant *C. jejuni* from ovine abortions in WA and OR. Additional molecular work is pending to verify that the strains we are seeing are the same as those reported from other parts of the country.

By: J. Lindsay Oaks, PhD, Microbiology, WADDL

Emergence of a Tetracycline-resistant Campylobacter jejuni Clone 1 Associated with 2 Outbreaks of Ovine Abortion in the United States

O Sahin, PJ Plummer, DM Jordan, K Sulaj, S Pereira, S Robbe-Austerman, L Wang, MJ Yaeger, LJ Hoffman, Q Zhang. J. Clin. Microbiol. doi:10.1128/JCM.00031-08

Campylobacter infection is one of the major causes of ovine abortions worldwide. Historically, Campylobacter fetus subsp. fetus was the major cause of Campylobacter associated abortion in sheep; however, there has been a trend that Campylobacter jejuni is increasingly associated with sheep abortions. We examined species distribution, genotypes, and antimicrobial susceptibilities of abortion associated Campylobacter isolates obtained from multiple lambing seasons on different farms in Iowa, Idaho, South Dakota, and California. We found that C. jejuni has replaced C. fetus as the predominant Campylobacter species causing sheep abortion in the U.S. Most strikingly, the vast majority (66 of 71) of the C. jejuni isolates associated with sheep abortion belong to a single genetic clone as determined by pulsed field gel electrophoresis, multilocus sequence typing, and the cmp gene (encoding major outer membrane protein) sequence typing. In vitro antimicrobial susceptibility of these isolates to the antibiotics that are routinely used in food animal production was determined using the agar dilution test. All of the 74 isolates were susceptible to tilmicosin, florfenicol, tulathromycin and enrofloxacin, and 97% were sensitive to tylosin. However, all were resistant to tetracyclines, the only antibiotics currently approved in the U.S. for treatment of Campylobacter abortion in sheep. This finding suggests that feeding tetracycline for the prevention of Campylobacter abortions is ineffective and other antibiotics, instead of tetracyclines, should be used for the treatment of sheep abortions in the U.S. Together, these results indicate that a single tetracycline-

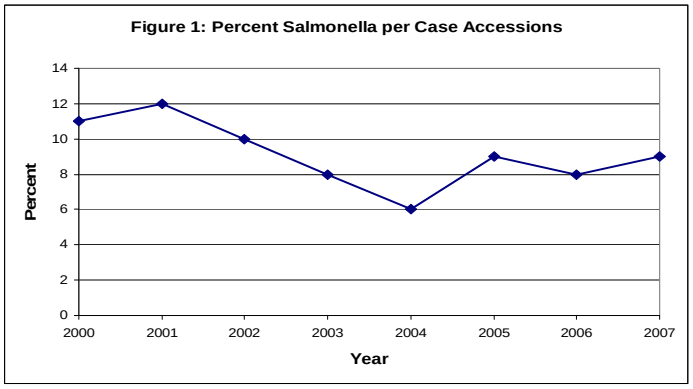
resistant C. jejuni clone has emerged as the major cause of Campylobacter-associated sheep abortion in the U.S.

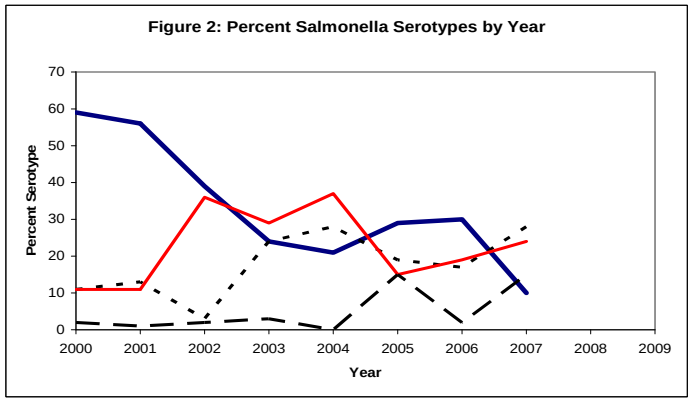
Research Notes

Salmonella trends in Pacific Northwest, 2000-2007

Salmonellosis continues to be a significant cause of bovine disease, primarily in dairy herds. WADDL has been monitoring the number of cases of salmonellosis in regional herds, as well as the primary serovars responsible for problems.

The total number of salmonella cases has shown a decreasing trend between 2000 and 2007: there were a total of about 120 diagnoses in 2000, compared to only about 70 in 2007. However, when corrected for the total number of laboratory accessions for evaluation of enteric disease, this trend appears less significant: a total of about 11% of the submitted samples were positive for salmonella in 2000 and about 9% in 2007 (Fig. 1). These data can be interpreted in at least two ways: It is possible that there were fewer disease outbreaks with signs consistent with salmonellosis in recent years, and therefore fewer accessions, consistent with a real decrease in Salmonella incidence. Alternatively, perhaps in recent years some practitioners are relying more on alternative diagnostic methods (e.g., using other laboratories or relying more on clinical signs alone), in which case the incidence of salmonellosis may not have changed at all. This uncertainty is a common problem with assessing trends by clinical submissions ('passive surveillance').





Salmonella enterica serotypes Typhimurium (Group B), Dublin (Group D), Newport (Group C2) and Montevideo (Group C1) remain as the most prevalent isolates in our region, accounting for 68-83% of infections. The percentage of Typhimuriums has shown a marked decrease between 2000 and 2007, when they went from about 59% to 10% of the isolates (Fig. 2). This is in part due to the disappearance of the highly virulent DT104 strain of Typhimurium, which is good news. Unfortunately, in this time period there has been an increase in the percentage of Dublins, Newports (in particular the epidemic, ceftiofur-resistant strain), and Montevideos (Fig. 2).

Our data suggest that more aggressive biosecurity and other control measures are needed to decrease the problem of bovine salmonellosis. More information about control and the on-the-farm epidemiology of Salmonella can be found at: http://www.vetmed.wsu.edu/courses-jmgay/FDIUHerdSalmonella.htm

By: J. Lindsay Oaks and Tom Besser

Making Decisions for Market Dairy Cows

Recent events at the Hallmark-Westland slaughter plant in southern California brings our attention again to decisions associated with dairy cattle that we market to slaughter. On small farms, up to 15% of the income can be derived from these market cows and bulls. On larger farms, the proportion is likely less than 5%, but still a significant dollar figure. At stake is this income but also the potential loss of the market for those animals. Are there things we can do to retain that market and capture value?

Every animal leaving the farm represents a potential market and has value. We developed a decision tree that should be used every time a cow, bull, steer, or calf is evaluated for culling. The decision tool we propose could help gain optimum value while protecting public health and securing future market advantage.

If a producer is considering sending an animal to market:

- **Does the animal qualify to be used for the highest value market -- human food?** Human food must come from healthy animals, be wholesome, and be free from ***violative residues*** for drugs or other chemicals. If the animal is sick, has a fever, or has been recently treated with drugs or other chemicals that require a withdrawal period, it does not meet the standards for human food.
- **Does the animal require medical treatment to return to health?** If there is a reasonable chance that additional or new medical treatments could return the animal to health while protecting the animal's well-being, prevent suffering, and at a cost-effective price, therapy can be instituted. Creation and implemention of a *treatment plan* , in consultation with a veterinarian, could be designed to return the animal to a healthy state. Need to monitor progress and prevent animal suffering.
- **Is the animal's body condition adequate for market demand and premium price?** Not too thin *(BCS 1)* or too fat *(BCS 5)?* Will it produce poor *yield*, require excessive *trim*, have poor *color*, provide poor *flavor,* or fail to *grade* which would result in less than optimal value to the buyer?
- **Can you apply any management strategies such as rest, improved nutrition, or other non-medical approaches to improve the product while protecting the animal's well-being?** Options might include feeding to improve the animals finish ***grade***, providing a non-competitive pen to assure adequate feed and water intake, moving to a dirt corral to improve footing, etc.
- **Has the animal received any injections, infusions, oral or topical medication? Mus meet or exceed drug withdrawals.** Carefully determine withdrawal periods for all products used. Consider extending withdrawals for animals that have been sick, dehydrated, off-feed, or are otherwise abnormal even though label directions were followed. The herd veterinarian and FARAD could be consulted for additional information.
- **Have you used any *extra label drugs*?** Drugs used in combination with others, or given by routes or in dosages not defined on the label, are considered an extra-label use and require longer *withholding times* to be determined by the prescribing veterinarian. Consult with your veterinarian on appropriate extended withholding times to assure a product free from violative residues.
- **Is there any other value you can add to your animal to increase its current value and to secure new markets?** Possibilities include: certification for quality assurance and that animals from your farm are only injected in specific areas of their body to decrease potential for blemishes.
- **Are there any lower value markets (not intended for human consumption) that can use the products from this animal without causing animal suffering? If no other markets are available:** Humanely euthanize the animal and dispose of carcass (bury, render, incinerate, depending on local environmental requirements). **If other markets exist** proceed to take advantage of other options while protecting your market reputation and animal well-being. Sell the animal to one of these lower value markets and protect your high value markets from unwholesome products

Herd removals are at maximum value if marketed in good condition and the meat is safe and wholesome, and the sale of this animal will protect and enhance future markets for these products. Identify the best market option to provide optimal value and sell. Be sure your cattle are identifiable to your farm to encourage future markets for your animals.

For a decision-tree format of these questions, see http://dairybeef.ucdavis.edu/section6_2.htm

By: Dale Moore, DVM, PhD and Don Klingborg, DVM

Porcine Circovirus 2: Is it causing disease in my herd? Should I vaccinate my pigs?

Porcine circovirus-associated diseases (PCVAD) affects pigs between 5 and 20 wks of age. The "Fundamental Clinical Signs" (Harding 2004) include: Wasting, Difficulty breathing, Enlarged lymph nodes, Diarrhea, Paleness, and Jaundice (yellowing of skin). The average age of pigs showing clinical signs is about 9 weeks and the latest age is about 16 weeks. The virus (PCV2) is probably found in all herds but the associated disease appears to depend on other factors such as: Coinfections with other other agents of disease, Immune status and Vaccination, Host susceptibility, Age, Gender, Genetics and some unknown factors.Porcine Dermatitis and Nephropathy Syndrome

(PDNS) May be seen 'early' in the progression of PCVAD in a herd and may imitate Classical Swine Fever which is a (foreign animal disease not found in this country).

The amount of virus (viral load) appears to correlate with the severity of the disease. When PCVAD first hits a herd, there are sudden high losses, wasting in growing pigs, with no perceptible clinical signs seen earlier in the herd. It takes about 16-24 months before the herd returns to 'normal'.

How is PCV2 diagnosed? By the presence of the clinical signs of wasting, respiratory disease, large lymph nodes, the presence of the hallmark PCV2 microscopic lesions of 'Lymphoid depletion' (cells of immunity) and the demonstration of PCV2 in the lesions -- in the lymphoid tissues and other tissues (lung, intestine, liver etc).

Improving neonatal pig husbandry can reduce the development of clinical signs**.** Enhanced colostrum uptake will help because maternal antibodies to PCV2 are protective. They provide protection to the finisher but, on average, are gone by 7 weeks. It is recommended to NOT cross-foster piglets after 24 hours. For grower/finishers, all in-all out is recommended as well as minimizing 'Stress' such as minimizing mixing and moving of pigs and decreasing pig density/pen. Buildings and vehicles can be disinfected with Virkon-S®. Because of the importance of coinfections to the development of clinical disease, reduce or eliminate PRRS virus, SIV/Mycoplasma and determine if Parvo present in tissues along with PCV2.

If faced with a disease outbreak, general control measures include:

- Early identification and treatment of sick pigs
- Remove pigs that don't respond to treatment
- Aggressively treat bacterial infections
- Ensure appropriate ventilation/temp in barns
- Increase feeder/waterer space
- Increase Vitamin E / Selenium in barns with PCVAD
- Use 'enhanced diets' (plasma proteins in diets of slow growing pigs

Should you vaccinate the pigs? Although there is some controversy surrounding vaccination, it results in a dramatic reduction in deaths (7% vs. 17% in one study), improvement in growth (20lbs heavier and fewer lightweight pigs at market) and an overall benefit of $8.68/pig (with vaccinations at 5 and 7 wks). However, if vaccinating, the full vaccine dose absolutely recommended and two doses better than one. Maternal antibodies interfere with the vaccination response so timing of the vaccination is also important. IF YOU HAVE PCV Associated Disease in the herd, it is recommended that you vaccinate or if you are suspicious of PCV disease, you may wish to vaccinate if the costs of vaccination are not too high.

By: John R. Wenz, DVM MS, FDIU

FDIU Notes

Swollen necks in kid goats

We recently investigated a herd problem that involved the death of kid goats at 1-2 weeks of age. Many of the kids were born with a symmetrical swelling in the upper neck area. The swelling was confirmed in one kid that died at one day of age to be due to enlarged thyroid glands or goiter (see image below).

(Knife points to enlarged thyroid glands of a goat kid.)

Goiter is the result of either an iodine deficiency or the presence of goiterogens (compounds that interfere with dietary iodine uptake such as those found in the seeds of kale and other *Brasica spp.*). Often adults in an iodine deficient herd will be normal, though reproductive parameters may decline. However kids will be born with goiter and are typically either stillborn or very weakborn and die shortly after birth.

An important differential to consider when presented with ventral cervical swelling in kid goats is thymic enlargement. This condition has been described as "milk neck" and is believed to be a benign enlargement of the thymus associated with milk feeding. Kids with thymic enlargement are otherwise normal, in contrast to those born with goiter.

Prevention of goiter involves provision of iodine in a mineral mix or iodized white salt (NaCl). Weekly application of 1ml of 7% tincture of iodine (hard to get these days) during gestation was adequate to prevent goiter in nutritionally deficient goats. Dabbing tincture of iodine in the inguinal area of affected lambs and kids has been advocated, though its efficacy is questionable.

By John Wenz, DVM, MS, FDIU

WSU BVD Project

The **BVD Control and Eradication Project** is a joint effort of WSU Extension, Veterinary Clinical Sciences, Animal Sciences and the Washington Animal Disease Diagnostic Lab (WADDL) funded through WSU Extension's Issue-focused Teams Initiative. Working with herd veterinarians, the program will facilitate implementation of infectious disease control Best Management Practices and subsidized herd testing for BVDV persistently infected animals to control and ultimately eradicate BVDV from Washington's cow-calf herds.

The project focuses on ranch assessment, subsidized testing for BVD-Persistently Infected cattle, and practices to prevent disease transmission.

Herds should enroll and be tested before their next breeding season! For more information contact: Dr. John Wenz (509)335-0773

Email- BVDCEP@vetmed.wsu.edu or go online: www.vetmed.wsu.edu/BVDCEP

Ag Animal Health Continuing Education

Veterinary Extension Website

Veterinary Medicine Extension has a new website with links to activities within the unit. You can find it at: http://vetextension.wsu.edu/

Academy of Dairy Veterinary Consultants

The Academy of Dairy Veterinary Consultants (ADVC) is a group of dairy veterinarians who meet twice a year to discuss current issues in dairy herd health and dairy performance. Founded in California in the early '80s, the group has expanded to practitioners primarily in the West but members come from states as far away as Massachusetts.

Spring Meeting: The next meeting of the ADVC will be held at the **Montvale Hotel** in **Spokane, WA, April 25-26, 2008**. Dr. Ynte Schukken, Director of the Quality Milk Promotion Services, at Cornell University, will be the featured speaker. The topic is: **"MASTITIS UPDATES AND INVESTIGATIONS"**

Fall Meeting: SAVE THE DATE! The Fall 2008 Academy meeting will be held **November 7-8, 2008**. The topic is: **"DEVELOPING THE STANDARDS FOR CALF-REARING VETERINARY PRACTICE AND CONSULTATION".**

For ADVC Membership and registration, contact Bill Sischo: mailto:wmsischo@vetmed.wsu.edu or (509) 335-7495 or Dale Moore: mailto:damoore@vetmed.wsu.edu (509) 335-7494.

Producer Education Meetings:

Beef Quality Assurance -- May 10, 2008. STOCKLAND LIVESTOCK EXCHANGE**,** Davenport WA. For more information, please contact the WSU Lincoln County Extension office at (509) 725-4171, or visit: http://lincoln-adams.wsu.edu/agriculture/toms-topics.html

2008 WA State Sheep Producers Convention is going to be hosted by the Whitman County sheep producers in Pullman, October 31 – November 2, 2008. http://www.wssp.org/index.htm

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