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California Dairy Newsletter

UC CE

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In this issue…

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Did the Wet Fall Weather Increase Mycotoxin Levels of Your Silage?

P.H. Robinson, CE Specialist, Dept. of Animal Science, UC Davis

Much of California's Great Central Valley received uncharacteristically early rain events this year. Our corn crop for silage is seldom rained on, and, as a result, levels of mycotoxins in California corn silages are typically low, at least compared to most other parts of the USA, and California dairies are seldom concerned with mycotoxins in their corn silage. However, the early rains this year stimulated mold growth in many corn crops prior to harvest, and thus may have increased mycotoxin levels in the resultant corn silage. Should you be concerned?

What are mycotoxins?

Mycotoxins are toxins produced by some molds (fungi) on plants in order to reduce the activity of other molds or bacteria which are on the same crop. There are hundreds of known mycotoxins, all of which are complex chemical structures, although only a few are thought to impact mammals if they are eaten. In addition, as most molds do not produce mycotoxins, the visual presence of molds in a silage, or even high assayed levels of mold spores, should not be presumed to mean that mycotoxins are present – although they might be present.

However molds will always, at least to some extent, reduce silage palatability, and, as they use the most fermentable parts of the crop, reduce its energy value.

Why be concerned about mycotoxins in silage?

Keep in mind that low levels of mycotoxins are present in most silages under most conditions, and cattle frequently consume them in their diets. This is generally not a problem as rumen bacteria are effective in detoxifying mycotoxins in the rumen. However, if a diet is very high in mycotoxins, the ability of the bacterial population to effectively detoxify them may be overwhelmed. If this happens, then mycotoxins escape the rumen, are absorbed from the small intestine, and exert their toxic effects on the animal. If this happens, common symptoms include:

- reduced feed intake and milk production
    - off feeds, ketosis and DA's may increase as a result
- diarrhea will occur in many impacted animals
- swollen vulvas and nipples and vaginal or rectal prolapse
- reduced fertility
- increased incidence of early term abortion

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What are the most common mycotoxins?

The mycotoxins found most frequently, and of greatest concern, are aflatoxin (produced by *Aspergillus* molds), zearalenone, T-2 toxin, deoxynivalenol (DON; a.k.a vomitoxin) and fumonison (produced by *Fusarium* molds) and ochratoxin (produced by *Penicillium* molds). While many others are known to exist, their impacts on animals are largely unknown but not considered to be a problem under most situations. Deoxynivalenol (DON; a.k.a vomitoxin) has been considered to be a key mycotoxin as other mycotoxins are seldom found in silages if DON is absent.

These mycotoxin producing molds are always present on crops in the field (which is where they are produced), and so some level of mycotoxins are always in crops which are ensiled. However, as mold growth is spurred by wet field conditions, this year may be a bad year for mycotoxins in corn silage.

Which animals are most susceptible to mycotoxins?

Because of the ability of the rumen bacterial population to detoxify most mycotoxins, cattle are in general less susceptible to mycotoxin toxicity than non-ruminants such as swine, poultry and humans. However, "at risk" cattle classes are pre-ruminant calves with limited rumen function, cows with sub-optimal rumen bacterial populations (such as fresh cows with low intakes) and cows with high ruminal passage rates (such as high producing cows with high intakes, because the mycotoxins stay in the rumen for a short time). In addition, breeding (and recently bred) cows are more susceptible to mycotoxin toxicity.

How do I know if my silage has unsafe levels of mycotoxins?

Visible molds on silages are an indication that mycotoxins may be present. Thus, if you see molds, you should inform your consulting nutritionist who will take a sample of the suspect silage and send it for analysis. This sample should be from the mixed silage which is actually being added to rations and should be transported to the laboratory quickly, since mycotoxins can be produced after sampling in the presence of oxygen. While most of the main mycotoxins listed above can be chemically analyzed, their assay costs are high, although they seldom approach the costs of animal losses if mycotoxin toxicosis occurs.

What are safe dietary levels of mycotoxins?

Keep in mind that there are no totally safe dietary levels of mycotoxins, but there are levels which are generally considered to be safe. In addition, not all mycotoxins have been investigated sufficiently to create 'safe' levels. Nevertheless, some guidelines are:

Aflatoxin

At risk cattle	100 ppb
Other cattle	200 ppb

Deoxynivalenol (DON; a.k.a vomitoxin)

At risk cattle	3 ppm
Other cattle	5 ppm

Fumonisin

At risk cattle	30 ppm
Other cattle	50 ppm

T-2

At risk cattle	50 ppb
Other cattle	100 ppb

Zearalenone

At risk cattle	15 ppm	Other cattle	25 ppm

What can I do if I have an unsafe level of a mycotoxin in my silage?
The silage process itself will not detoxify mycotoxins, which are largely produced in the field, as these are very stable compounds. However, ensiling will dramatically reduce the activity of the molds, at least if oxygen is unavailable. Thus, this would be a good year to practice good silo unloading practices (flat faces, 4 - 6 inch face removal daily, no leftover silage at the end of the day) to prevent molds from growing again once oxygen is available at load out.

Recognize also that the levels listed above are in the total diet dry matter. Thus, if you have a corn silage with 500 ppb aflatoxin which is fed at 20% of diet DM, then its contribution to dietary aflatoxin levels is 100 ppb. This leads to the first, and most common, strategy to limit mycotoxin toxicosis, which is to dilute (feed less of) the infected silage in the diet in order to get the calculated mycotoxin level of the diet down to a safe level. If this is impractical or impossible, many dairies in the Northeast have claimed success by feeding 100 to 200 g/cow/day of sodium bentonite (commonly called bentonite, which is a form of clay), which acts by binding the mycotoxins so that they are inactivated and pass harmlessly through the gastrointestinal tract to be expelled in feces. However, as bentonites originate from many sources, and differ in unknown ways, all bentonites are unlikely to be equally effective in general, and may also not be equally effective against all mycotoxins (which may explain why some Northeast dairies have had success with bentonite and some have not). There are also companies which market mycotoxin binders which likely act similar to bentonite but, as commercially produced products, will be more consistent.

What can I do if I have unsafe levels of several mycotoxins in my silage?
If you have high levels of more than one mycotoxin in a silage, then you have entered uncharted waters, and the guidelines listed above may, or may not, be valid. However, in general, it is recommended that you be conservative with the guidelines when you have significant levels of more than one mycotoxin, and very conservative indeed if you have several. Keep in mind that deoxynivalenol (DON; a.k.a vomitoxin) has been considered to be a key mycotoxin to assay as other mycotoxins are seldom found in silages if DON is absent.

P.H. Robinson is a Cooperative Extension Specialist responsible for dairy cattle nutrition and nutritional management. He can be reached at: (530) 754-7565 (voice) or (530) 752-0172 (fax) or phrobinson@ucdavis.edu (EM) or http://animalscience.ucdavis.edu/faculty/robinson (web).

Preparing the Total Mix Ration (TMR) – What Ingredients Should I Add First?

Noelia Silva-del-Río, UCCE Tulare County

To understand what is the right order of ingredients into the mixer wagon, we must consider the physical properties of the ingredients that affect mixing such as size, shape, density, water absorption capacity (hydroscopy), static electricity and adhesiveness.

Ingredients moisture: Dry ingredients of small particle size will stick to high moisture ingredients such as silage or molasses. Therefore, it is important to properly mix the dry ingredients before adding the wetter ingredients. Just consider the ingredients' order you follow when baking

a cake at home. First, you start with flour because it is added in the largest quantity and it is a dry ingredient. After that, you may add sugar, and finally you add yeast or other dry ingredient incorporated in small amounts. Lastly, you add the sticky ingredients such as oil or eggs.

Ingredients density Heavier ingredients will sink and lighter ingredients will float. Corn silage is 33% denser than alfalfa silage, and the mineral mix can be 2 or 3 times denser than the protein or grain mix. Low density ingredients with long particle length, such as hay, should be added first followed by high density ingredients of small particle size that will sink.

The different physical properties of the ingredients included in the cow's ration makes it very difficult to obtain a uniformly mixed ration, especially using the simple auger design of most mixer wagons. Many dairy producers use manufactured feeds from feedmills or prepare their own premixes to ensure that grains, protein mix, byproducts, minerals, and feed additives are mixed correctly. Interestingly, in a study conducted to evaluate the mixing uniformity of manufactured premixed, it was found that only 50% of the samples had an acceptable coefficient of variation (CV) of less than 10%; however, 20% of the samples had a CV higher than 30%. Comparing the equipment used on farm vs in feed mills, we could assume that on-farm premixes are even less uniform than those from feed mills. The implications of premixes with high CV is that cows may not be eating the same proportion of ingredients in each mouthful, and some expensive ingredients (i.e. heavy minerals) may not be uniformly distributed throughout the feedbunk.

Mixing forages with grains, protein mixes, byproducts, minerals, and feed additives is an even greater challenge. Depending on the brand and type of the mixer wagon, the manufacturer will recommend the most desirable ingredients' order to prepare the TMR. Most vertical mixer wagons allow the incorporation of unprocessed hay that should be added as first ingredient, but the mixing time should be carefully controlled to ensure that the particle length is not excessively reduced. Although the horizontal mixer auger wagons equipped with knives also allow for the incorporation of unprocessed hay, the uniformity of mixing may be better when hay has been previously processed.

If there are no manufacturer's specifications available, the following protocol should be considered:

1. Long hay that needs to be processed.
2. If further processing of forages (hay or silage) is not desired, add first grains or premixes followed by those ingredients that are incorporated in small amounts such as minerals and vitamins.
3. Forages that do not need to be processed.
4. Liquids should be the last ingredients.

However, only after conducting several on-farm trials with different ingredient sequences could we recognize the most desirable order of ingredients to obtain a uniformly mixed ration.

A dairy producer approached me with the following question – ***"All my hay is chopped. If I add hay as the first ingredient in the TMR, I end up overprocessing it. However, if I add it last, it floats and does not mix. What I should do?"***

The hay mixing problems described by the dairy producer could be resolved by:

- Decreasing the chopping action of the mixer by taking out some knives. However, if the mixer is used to prepare other rations, this might not be a practical solution.
- Increasing hay's density by: 1) soaking it with water or molasses, or 2) pre-mixing it with wetter ingredients like silages.
- Preparing a premix with all the TMR ingredients but hay. Adding hay as the first ingredient and then the premix.

Pneumonia in Dairy Cattle

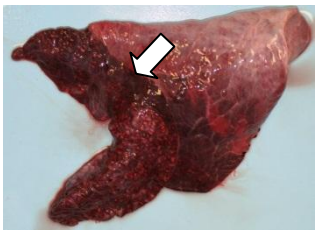
Dr. Pat Blanchard, California Animal Health and Food Safety Laboratory

Submissions to the California Animal Health and Food Safety Laboratory for respiratory infections in dairy cattle, particularly calves from 1 day to 5 months of age, increase during the fall and winter months. There are three main categories of lung infections seen in cattle.

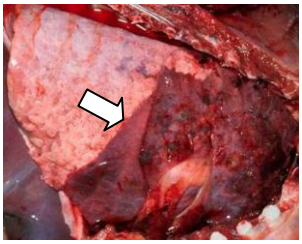
1. Bronchopneumonia

Occurs from inhalation of bacteria or viruses into the lung. This type of pneumonia usually affects the front and lower parts of the lung. Bacteria, particularly *Mannheimia*, *Pasteurella* and *Mycoplasma*, are the most commonly found infectious agents in this type of pneumonia. Other bacteria can also be found, including *Histophilus*, *Arcanobacterium*, S*treptococcus* and *Bibersteinia*, but they are less common. Outbreaks of this type of pneumonia that does not respond well to antibiotics may have a viral component. Bovine respiratory syncytial virus (BRSV) is the most common virus found in pneumonia cases in calves. On occasion a dairy may experience an outbreak of IBR, but use of intranasal vaccines has reduced the frequency of finding this virus in calves.

On some dairies and calf ranches, calves will exhibit head tilts and droopy ears; this is due to infection of the middle ear with the same bacteria found in the lung of these calves. The bacteria can be found in the deep nasal cavity and spread from there to the lung and up the eustachian tubes to the middle ear as is common in children with repeated ear infections. When the infections become chronic in the ear, the earlier bacteria like *Mannheimia* and *Pasteurella* disappear, and *Mycoplasma bovis* remains. The pus from the infection can eat away at the bone around the middle ear, causing permanent scarring and loss of hearing. A study done at CAHFS Tulare a number of years ago found a high incidence of middle ear infections in calves with pneumonia where only a low percent were reported to have droopy ears or head tilts. This indicates that most middle ear infections clear up when the calf is being treated for pneumonia, but some persist and lead to clinical signs.



Bronchopneumonia (arrow)



Bronchopneumonia (arrow)

Salmonella interstitial pneumonia

2. Interstitial pneumonia

Occurs most often due to Salmonella Dublin (aka *Salmonella* group D1 or *S. Dublin*). This bacteria spreads to the lung through the blood, so it affects all the lung lobes equally. The lung may fail to collapse, appear wet and heavy with small hemorrhages compared to bronchopneumonia, where part of the lung is hard (like liver) and sinks in water. *Salmonella Dublin* is a cattle-adapted Salmonella type, and adult cows can carry and shed it in their milk or feces. In addition, calves may harbor it in the intestine or lymph nodes, and when their colostral antibody drops between 1-3 months of age, the bacteria spreads to their lung, liver and spleen, causing disease. Typical calves with *Salmonella Dublin* are between 3 weeks to 4 months of age, have a fever, increased respiratory rate, may have difficulty breathing, decreased appetite, look depressed and may have diarrhea. These calves often have a history that they do not respond well to antibiotics. The poor response is because antibiotics used are often intended to treat pneumonia due to bacteria like *Pasteurella* or *Mannheimia* which are very sensitive to

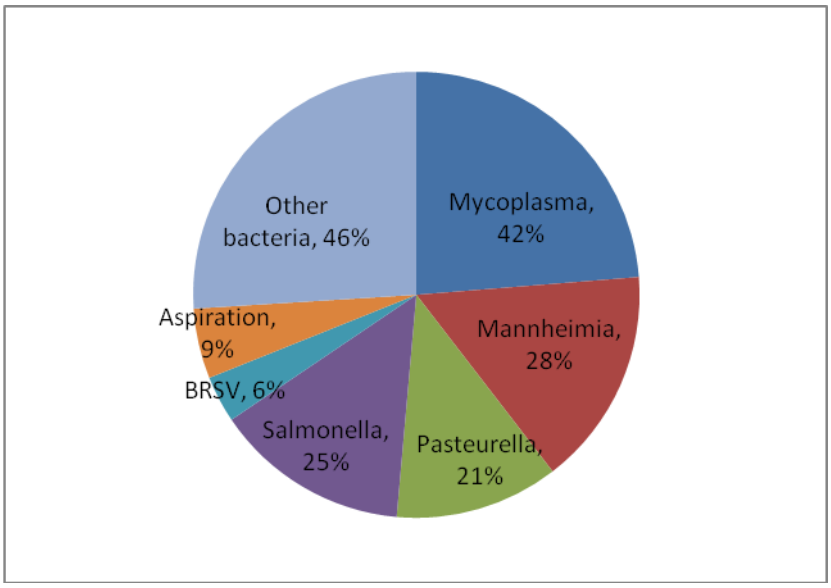
the antibiotic, whereas *S. Dublin* is not as sensitive, so the antibiotic does not maintain adequate levels in their blood long enough to kill the *Salmonella*.

3. Aspiration pneumonia

It is observed after a calf or cow inhaled fluid, feed or milk into their lung. This can occur from a misplaced esophageal feeding tube used to provide calves with milk, colostrum or electrolytes. Also, when calves are very weak from diarrhea or a prolonged birthing, they may have a poor swallow reflex, so fluids placed in their mouth (milk or colostrum) may accidentally enter the trachea, settling in the lung. A number of calves with aspiration pneumonia may have only one side of the lung affected, and this suggests they were lying down perhaps on one side when the aspiration occurred so the foreign material settled in the lower lung. In cows, aspiration can occur when they are intubated for treatment of metabolic or digestive problems, and we also rarely see cows that have aspirated rumen contents into their lungs during a roll and tack procedure to correct a displaced abomasum. If calves display signs of pneumonia in the first few days of life or shortly after being intubated, aspiration pneumonia should be suspected. The bacteria found in these lungs are the common ones found in the environment like coliforms, streptococcus and like environmental mastitis are not considered infectious but rather opportunistic infections.

Selecting the best antibiotic to treat a bronchopneumonia, particularly when the one of choice does not seem to be working, requires taking samples from untreated calves early in the infection before secondary bacteria move in. Having your veterinarian sample the deep nasal cavity via a guarded deep nasal swab can be a valuable means to determine which bacteria may be causing the pneumonia. A second swab can also be used to screen for IBR, BVDV, BRSV and bovine coronavirus by PCR method. Bovine coronavirus testing, however, does not distinguish the respiratory virus from the common diarrhea strain. Unguarded nasal swabs often result in overgrowth, the normal bacteria found in the front of the nose making it very difficult to identify important pneumonia causing bacteria. Interstitial pneumonia associated with *Salmonella Dublin* often results in the death of some calves so submission of dead calves or lung and other tissues from dead calves, can also be valuable to determine what might be causing the pneumonia signs. However, dead calves with bronchopneumonia that have been sick and treated for a long time often do not provide the information desired, as they will have scarred lungs with abscesses, so the bacteria and viruses that started the pneumonia are no longer present.

Working with your veterinarian to select appropriate animals for testing is a valuable means to ensure the causative agents are identified so appropriate treatments and vaccinations are used to prevent and resolve pneumonia outbreaks.



Breakdown of common agents found in 130 pneumonia cases from Oct-Dec 2011

Noises, Vibrations, Stray Voltage, Electromagnetic Fields and Dairy Cows

Alejandro R. Castillo, UCCE, Merced County

It is expected that in this twenty-first century, both developed and developing countries will be consuming more energy from electricity for production and transportation. Electrical and hybrid technologies have been introduced to reduce or mitigate the emission of harmful air pollutants. California dairy farms are required to comply with air quality regulations that mandate that all stationary and transportable internal combustion engines greater than 50 bhp, including emergency back-up generators, shall be replaced with electric motors (San Joaquin Valley Air Pollution Control District, Rule 4702). Because of the increasing use of electricity in transportation systems (trams, trains, and hybrid cars), the issue of electromagnetic fields has arisen. In the near future, dairy animals might be exposed to new and/or different environmental effects, like noises, vibrations, stray voltage, and electromagnetic fields. The goal of this article is to summarize technical information related to these effects on lactating dairy cows. The peer reviewed papers and technical articles used may be requested from the author.

Cows are exposed daily to a variety of high intensity noises such as pumps, electric motors, etc. A wide range of studies have been conducted concerning noise effects on animals, including jet aircraft noise before milking. Responses by animals would be expected to vary with noise type, level, time, and frequency. The sound threshold expected to cause a behavioral response by animals is 85 to 95 dB. Changes in some blood composition parameters were described with 97 dB. General noise at 105 dB reduce milk yield, rate of milk release, and feed intake by dairy cows. In a Swiss survey, noise and vibration together were studied on 50 dairy farms during milking to investigate effects on somatic cell count (SCC). The analysis indicated that SCC values increased with increasing vibrations, whereas noise did not affect SCC. Apparently, noise levels in this survey were lower compared to the threshold indicated previously. No correlation between vibration and noise was observed. In the same Swiss study, 12 milking parlors (9 herringbone, 2 autotandem, and 1 side-by-side) were modified to reduce vibrations. Modifications included: (1) putting the vacuum pump on rubber supports, (2) using rubber tubing to connect the vacuum pump to the exhaust and the main conduit, (3) installing regulatory buffer tanks between the pumps and the conduits, (4) installing buffer tanks between the main conduit and the pulsator, (5) using absorbing ducts to install all tubes and tanks, and (6) connecting the pulsators with

elastic and dampening tubes. As a result, the SCC dropped on all 12 farms that had modified their milking systems to reduce vibrations.

Leakage of current from electrically powered machines can lead to undesirable electrical phenomenon called stray voltage, which is defined as a small voltage (<10V) measure between two points that can be simultaneously contacted by an animal. For several years, stray voltage was considered a possible factor impairing production. A recent meta-analysis of stray voltage on dairy cattle combining results from 22 independent studies was published. The study indicated that production was not affected by exposure to contact current at levels of 3 mA or lower for exposures of up to 21 days or 4 weeks. The authors of this meta-analysis also concluded that the overall weighted mean for first behavioral response to current was 4.0 mA. This is in agreement with other studies where no overall decreases in feed and water consumption or milk production occurred below 4 V across an animal body or a body current of 4.0 mA. In conclusion, the possibility of animal production losses increases when the amount of current that can flow through the animal body is more than 4 mA (60 Hz).

A high speed train is being planned to cross the Central Valley of California and the heart of the agricultural area in Merced County. A high speed train is a source of noise, vibration, and electromagnetic fields (California High-Speed Train Final Program EIR/EIS, http://www.cahighspeedrail.ca.gov/). Apparently, no effects of noise and vibrations have been described and /or studied on dairy animals. The World Health Organization and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) have published recommendations for an exposure limit value for low-frequency electromagnetic fields and microwaves to protect people against nerve stimulation and body heating, respectively. To this respect, a recent Australian study has been published. The authors carefully analyzed the information published in several countries and measured electromagnetic fields strengths of the Australian transportation systems. The magnetic field strength was measured at different points inside the moving train, trams, and hybrid cars. The results seem to be compatible with the evidence of laboratory studies on the biological effects that are found in the literature; nonetheless, the results are lower than those levels recommended by the ICNIRP. The authors also indicated that there is much speculation and still not sufficiently investigated impact of existing transportation systems (tram, train, hybrid vehicle, and high-speed maglev lines) on the environment, specifically on biological tissue that is exposed over a long period.

References upon request

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EQIP On-Farm Energy Program Now Available

NRCS has a new type of funding available through EQIP which is called the 2012 On-Farm Energy Initiative. This funding is available to all types of farming operations, including dairies.

This program will provide cost-share for on-farm energy audits. The on-farm energy audits, which are offered as EQIP Agricultural Energy Management Plans, must be conducted by certified technical service providers. Producers who have had an on-farm energy audit conducted that meets or exceeds the criteria of an EQIP Agricultural Energy Management Plan may apply for technical and financial assistance to implement the audit's recommendations through this program.

Additional information including application deadlines is available on the NRCS website:
http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/?&cid=stelprdb1046252
http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046337.pdf Program Fact Sheet

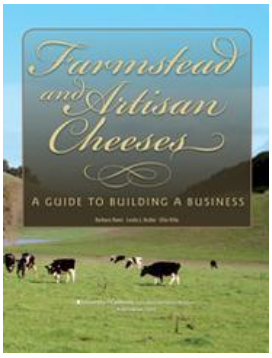
If interested, please contact your local NRCS office.

Quadruplet Heifer Calves Born in Glenn County

Mike Karle, DVM

Cow 5026 had quadruplets on December 6, 2011. All four heifer calves were born alive, healthy and at term without assistance. This is the cow's third time calving - the first two times she had single calves. The cow did not have any hormones before or after getting pregnant, and was artificially inseminated with non-sexed semen from a natural heat. She likely released three oocytes from her ovaries which were fertilized, one of which then split, producing two calves out of the four which are identical genetically. Hair samples were taken from the cow and all four calves and sent to the Veterinary Genetics Lab at UC Davis and were confirmed to be all related. The odds are amazing. According to Veterinary Obstetrics and Genital Diseases (Roberts, 1971), the odds of a cow having quadruplets are 1:700,000. The odds of having all four calves born alive are 1:11.2 million, and the odds of all four being born alive and all one sex are 1:179.2 million! Congratulations Zuppan Dairy!

UC Just Published a Great New Resource Titled, Farmstead and Artisan Cheeses: A Guide to Building a Business



There is nothing like taking fresh, sweet milk and turning it into a lovely wheel of nutty, aged Gouda or a wonderful, tangy chèvre with herbs—but can you make a living as a cheesemaker? Navigating the start-up of any business is hard work, but cheesemaking has its own special challenges. While many other publications address cheesemaking itself, this new manual walks you, as a beginning cheesemaker, through the steps necessary to decide if cheesemaking as a business is right for you.

Chapters cover:

- Evaluating your resources
- Building a business plan
- Plant layout and design
- Designing your marketing strategy
- Risk management
- Regulations

Buy it at: http://anrcatalog.ucdavis.edu/Items/3522.aspx

Dairy Heat Stress Road Show

April 6, 2012

University of California-Davis Veterinary Medicine Teaching and Research Center
18830 Rd. 112, Tulare, CA

AGENDA

Morning Session 10:00—12:15

Heat Stress in California: Implications and Opportunities
Dr Noelia Silva-del-Rio – University of California Davis, Veterinary School.

Cooling Strategies During Heat Stress
Dr. Pete Hansen, Distinguished Professor—University of Florida

Strategies to Improve Reproduction During Summer
Dr. Todd Bilby, Associate Professor—Texas A&M AgriLife Research and Extension

Catered Lunch

Afternoon Session 12:45—2:45

Nutrition Programs for the Heat Stressed Herd
Dr. Jose Santos, Associate Professor—University of Florida

Economics of Heat Stress: Implications for Management
Dr. Albert DeVries, Associate Professor—University of Florida

Discussion and Wrap-up

For more information, Dr. Noelia Silva-del-Rio, Tulare, CA 559-684-3313 or nsilvadelrio@ucdavis.edu

Dairy Herdsman Short Course

April 17 - 19, 2012
University of California-Davis Veterinary Medicine Teaching and Research Center
18830 Rd. 112, Tulare, CA

The purpose of the Short Course is to provide the people who do the actual work on the dairy the opportunity to receive information about the latest technology and training in all aspects of dairy management.

Registration fee is $280. Fees for companies and/or dairies with more than one participant will be $280 for the 1st participant and $260 thereafter. Students will be charged $220. Registration for individual days is also available. No registration at the door will be accepted. **There is translation for Spanish speaking attendees.**

To register on-line and pay by credit card: http://ucanr.org/2012herdsmanshortcourse

For more information contact Gerald Higginbotham, UCCE Dairy Advisor at (559) 675-7879, Ext 209.

California Dairy Newsletter

February 2012

Carol Collar, Farm Advisor