

Colorado Dairy News

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Maximizing Vaccination Programs for Organic Dairies

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Both conventional and organic dairies rely on vaccination programs to help prevent infectious diseases in their cattle. However, it could be argued that maximizing every bit of benefit from a vaccination program is even more crucial in organic dairy operations since treatment alternatives are more limited. Vaccination of organic dairy cattle is allowed for certification. But within that allowance, overzealous vaccination programs are discouraged. Thus, it is important that organic dairy producers consider how they can help stimulate an effective immune response and ensure that that immunity is present during the time of greatest risk to their cattle.

First, it must be emphasized sound herd management and husbandry can ultimately have a greater impact on the health of your cattle than any vaccine. Providing clean efficient facilities with adequate shelter will minimize exposure to environmental pathogens as well as minimize environmental climate stress. Don't forget that providing shade and cooling in the summer is just as important as providing protection from wind and rain in the winter. Basic biosecurity and biocontainment practices should be in place and enforced. To prevent the introduction of diseases, all new additions to the herd should be tested for specific pathogens. These may include M. paratuberculosis (Johne's), BVDV, BLV, Strep. agalactia and Mycoplasma bovis mastitis, hairy heel warts, internal GI parasites as well as other diseases. Animals should enter a quarantine pen for a period of at least 3 weeks before being introduced to the rest of the herd to allow them to stop shedding potential infectious viruses or bacteria that may infect other animals.

For herd biocontainment there should be a designated sick pen area. Animals with acute disease should be removed from contact with other animals and placed in the designated sick area for treatment until the disease is resolved. This will help minimize the spread to other animals in the herd. Also, young livestock should not be housed with adult livestock. This will help decrease the spread of pathogens such as M. paratuberculosis (Johne's Disease) to the young animals as well as help minimize the risk of spreading BVDV from a possible PI calf back to pregnant adult cattle. With a little attention and effort, you can clear some specific pathogens out of your herd and prevent that disease.

There are many factors that can affect the type, magnitude, and duration of immune response to a vaccine. Stress in general is immunosuppressive and can potentially decrease the response to vaccination. There are many things that can stress cattle

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Livestock Worker Training Programs

There are two types of training programs available from CSU both spearheaded by Dr. Noa Roman-Muniz. She presently heads up the ILM Bilingual Livestock Worker Training Program and organizes The Dairy Management Program in Spanish (DMPS) offered through CSU's Animal Science Department. Both programs are described in depth on the ILM website under current news and producer information at www.cvmbs.colostate.edu/ilm/proinfo/workertraining.html.

1) Bilingual Dairy Worker Training Seminars offered by CSU-ILM are customized seminars for individual dairies to train workers on current issues and problem areas. The livestock worker training tools currently offered include guidelines for necropsy techniques, diagnostic sample collection for common diseases, dairy parlor personnel (milker) workshops, calving management, foot care and lameness diagnosis, sick cow evaluation, and heat detection / reproductive management.

2) The Dairy Management Program in Spanish (DMPS) is offered by CSU's Animal Science Department and taught

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Standard Operating Procedure: On-farm Diagnosis and Initial Treatment of Lameness

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****Simplicity and clarity are essential to developing treatment protocols
for lameness****

I. Diagnosis

Evaluation of foot swelling: Since the hoof capsule is rigid and incapable of marked expansion, lay personnel should be instructed to examine the tissues at and immediately proximal to the coronet for evidence of swelling. To facilitate detection of swelling of the foot, lame animals should be moved, if possible, from areas of deep grass or mud onto a packed surface. Heavily soiled feet should be cleaned. Digital swelling can be readily visualized from behind the animal by comparing the distance between the dewclaws of the affected foot to that of unaffected feet. Because the dewclaws are loosely anchored in the soft tissues, they are spread further apart in the swollen foot versus the non-swollen feet. Also, when the affected foot is viewed from the rear, the width of the heel bulbs can be compared to determine if the swelling is more severe in one digit than the other.

Is the affected foot swollen?

Generalized swelling of the digit above the coronary band, involving the pasterns and fetlock and extending proximally for a variable distance, is commonly seen in cases of footrot and deep sepsis of the digit. If detected early, footrot is characterized by digital swelling and sole ulcers are not.

Is the swelling symmetrical or asymmetrical?

In our experience, dairy personnel frequently assume that all lame cattle with swollen feet are suffering from footrot; after examination by the herd veterinarian, a variable proportion of these animals have been determined to have deep sepsis of the digit. To differentiate between these two disorders, envision an imaginary line that begins in the interdigital space and extends up the foot, bisecting the foot into its two digits along the longitudinal (axial) midline. Because **footrot** begins in the interdigital skin, the swelling of soft tissues above the coronary band is usually **symmetrical relative** to the longitudinal (axial) midline of the foot. **Asymmetrical swelling of the foot** is usually seen in cases of **deep sepsis of a digit**. The majority of swelling is located on the side of the affected digit; in other words, the affected foot is asymmetrical swollen relative to the longitudinal (axial) midline of the foot. As stated above, the affected foot can also be viewed from the rear, and the width of the heel bulbs compared; deep sepsis of a digit is characterized by appreciable widening of the heel on the affected side. The reason for these findings is simple: The diseased bones, joints, and associated soft tissue structures are not located on the axial midline; therefore, the associated soft tissue swelling is greatest over the affected digit. While visible soft tissue swelling may be minimal in cases of septic osteitis of the third phalanx, swelling and erythema of the soft tissues above the coronary band is usually severe in cases of septic arthritis of an interphalangeal joint.

No Generalized Swelling:

Causes of lameness that do not typically result in generalized swelling of the foot include uncomplicated cases of digital dermatitis (hairy heel warts), interdigital dermatitis, sole ulcers (pododermatitis circumscripta), laminitis, subsolar abscesses, white line disease, and injuries or diseases of the limb above the digit.

II. Protocols for treatment

On many large dairies in the authors' region, herd personnel are taught by the attending veterinarian to identify, record, and properly treat lameness conditions. The criteria for each diagnosis should be clearly described and discussed with herd personnel. The authors have developed treatment protocols to guide detection and direct treatment of these common digital disorders. Particularly for antimicrobial therapy, the duration of treatment should be evidence-based and clearly defined. Cattle that fail to respond as expected within the defined treatment period can then be scheduled for veterinary examination. Because many of the farm workers in our region are more fluent in the Spanish language than in English, provision of bilingual protocols is necessary. On occasion, producers request flow charts with photos of example lesions to clarify the decision-making process for lay personnel. On some operations, each diagnosis is coded for easy entry into computerized herd health data systems; a code for lameness due to unknown causes is always included in such records systems to facilitate identification of the animal for prompt veterinary examination. In addition, lameness records are regularly reviewed by the herd veterinarian to monitor trends over time in lameness incidence, diagnosis, and treatment response rates. Digital cameras facilitate capture of both still and video images of problematic or unique cases for review with the herd veterinarian. We recommend that the herd veterinarian regularly examine acutely lame animals as well as longer-lasting, problematic cases with herd personnel, so that diagnosis and treatment issues can be discussed on a regular basis. Ultimately, well-defined treatment protocols should reduce the number of animals administered inappropriate antimicrobial drugs for inappropriate periods of time.

Summary

The rules of thumb that form the basis for our lameness treatment protocols are summarized as follows:

1. Causes of lameness can be categorized according to the likely presence or absence of visible swelling of the soft tissues of the foot.
2. Because interdigital necrobacillosis is centered in the interdigital skin, early cases are characterized by swelling that is symmetrical relative to the longitudinal (axial) midline of the foot.
3. Deep sepsis of the digit is characterized by swelling that is asymmetrical relative to the longitudinal (axial) midline of the foot.
4. On-farm lameness treatment protocols should include an expected deadline for resolution – once the deadline is reached, if the animal has not recovered, the veterinarian should be consulted.
5. Cattle that become lame from digital wounds should be scheduled for prompt veterinary examination.

Standard Operating Procedure: Plan for Ammonia Reduction?

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Colorado State University*

Ammonia used to be considered only as a nuisance odor emitted by dairies and other livestock operations. Now, ammonia is known to react with atmospheric nitric and sulfuric acids to form fine particulate matter (known as $PM_{2.5}$), which is a major contributor to smog production. This fine particulate matter is of concern because it has numerous important human health effects. It can penetrate deep into the lung tissue, contributing to asthma, bronchitis, and other lung diseases, and has also been linked to heart attacks and strokes. In addition, when ammonia is converted to $PM_{2.5}$ it becomes more mobile and can travel longer distances to affect populations and/or be re-deposited to the ground through rainfall or dry deposition. Nitrogen deposition in Rocky Mountain National Park has resulted in increased soil and water N levels, which can cause changes in plant species and eutrophication. So ammonia is not just a nuisance anymore; it can have serious human health and mountain ecosystem impacts,

Regulations concerning ammonia emissions are likely to be developed in the future.. There are practices that you can use to be pro-active and reduce ammonia emissions now, and more are in development. If you use a combination of BMPs, dairies can reduce ammonia emissions by 65-70% (Powell, 2006).

Best management practices (BMPs) can be utilized to reduce ammonia emissions. Since the production facility, manure storage and treatment areas, and sites where manure is applied to land are all major sources of ammonia emissions, ammonia BMPs should be chosen in each of the areas of nutrition, production site management, manure storage and treatment, and land application of manure.

Nutrition BMPs focus on precision feeding, the practice of providing the animals what they need and no more. Overfeeding protein has been shown to increase ammonia emissions from both monogastrics and ruminants, so take care to avoid this practice. Analyzing feeds regularly is a useful BMP for precision feeding since feed contents are quite variable. Phase feeding is a commonly used practice for meeting livestock nutrient needs without exceeding them. By dividing the herd by growth stage and productivity, more precise diets can be fed that meet animal needs while minimizing ammonia losses to the air. These practices can also save you money! Experiments in Switzerland (Kulling et al., 2001) found dramatic reductions (up to 76%) in ammonia emissions from laboratory simulations of manure storage from dairy cows fed reduced protein in the diet. The milk production of 68 lbs/d was maintained in the low protein diets by supplementation of a commercially available 'bypass methionine'. A recent study by Misselbrook et al. (2005a) showed that reducing crude protein in dairy diets reduced ammonia emissions when manure was applied to land. Lower crude protein diets reduced urinary urea-N levels thus leading to less ammonia loss from land application. Therefore, nutritional changes continue to reduce ammonia emissions during manure storage and land application.

In pens, dust control BMPs will help to reduce ammonia loss by decreasing the airborne $PM_{2.5}$ potential. Frequent manure harvesting combined with pen moisture management can be very effective in minimizing dust. Watering the pens, especially those areas with low activity and low moisture, is an

effective BMP. Another recent study compared ammonia losses from dairies using different bedding types (Misselbrook and Powell, 2005). Sand bedding reduced ammonia loss by over 50% as compared to chopped corn stalks and composted manure, and chopped straw and pine shavings had intermediate ammonia losses.

BMPs for manure storage and treatment can also be helpful to reduce ammonia loss to the air. Reducing storage time reduces N loss to the atmosphere by reducing the reaction time. Covering manure stockpiles and lagoons, and keeping stockpiles dry also reduce N emissions. Aerobic lagoons and anaerobic digesters are also known to conserve nitrogen. The crust that sometimes forms naturally on dairy lagoons was recently measured to reduce ammonia emissions by up to 50% (Misselbrook et al., 2005b). Bedding type continues to have an impact if solid manures are composted; wood chip bedding results in much lower nitrogen loss to the air than straw bedding during the composting process (Hao et al., 2004).

When manure is applied to land, BMPs continue to play an important role in reducing ammonia emissions. Incorporation of manure immediately after application is critical to retaining nitrogen in the soil. Slurries should be injected and drop nozzles could be used for sprinkler irrigation to reduce “air time” and minimize ammonia losses.

I don't mean to alarm you with yet another concern, but ammonia emissions regulation is likely. Decisions made now could ease your compliance later. We'll keep you up-to-date so you can choose BMPs that are appropriate for your operation.

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- Misselbrook and Powell, 2005. *J. Dairy Sci.* 88:4304-4312.
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Important Dates:
Mark Your Calendar

April 26th - 30th, 2006: Dairy Tour Trip - Chicago, Illinois. Visit DMI, CME, Fair Oaks Dairies, Boss Dairies, Kasbergen Dairy, and meet with DFA's Leadership. More information e mail: <w.wailes@colostate.edu>.

May 1, 2006: State FFA Dairy Judging Contest: Greeley, Colorado. More information contact the State FFA Office or Dept of Animal Sciences at CSU.(970-491-6672)



**Integrated
Livestock
Management**

Colorado Dairy News

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A Message From Your Extension Dairy Specialist.....

Colorado dairy producers have the right to be proud. According to the 2005 national milk production statistics, Colorado milk production for the year 2005 compared to 2000 was up +22%. At the same time, Colorado improved in the ranking of the fifty states to number 16 in total milk production. Colorado gained 7.5% over 2004 production numbers. U.S. milk production during 2005 increased 3.5% compared with 2004, achieving a record 177 billion pounds. Total production has increased by 9.4 billion pounds over the past five years (2005 versus 2000), an actual gain of 5.6%.

2005 Per Capita Milk Production: The U.S. average Per Capita Milk Production is 597 pounds. Colorado is producing 503 pounds per capita compared to California at 1,040 pounds. The 597 pounds is the total annual U.S. per capita consumption on a milk equivalent basis. The highest state on a per capita basis is Idaho, which produces 7,110 pounds.

Along with the impressive gains made by the Colorado dairy industry, there is a lot of interesting dairy related activity at Colorado State. I'd like to encourage you to take advantage of the livestock worker training programs available. To date these programs have emphasized dairy worker training. A list of seminars scheduled for the rest of the year is on page 3 of this newsletter. On-site training programs are also available. Detailed information about the worker training program is available on the ILM website at <<http://www.cvmb.colostate.edu/ilm/proinfo/workertraining.html>> or by calling Dr. Noa Román-Muñiz (970) 297-4106.

This issue's Best Management Practice for Ammonium written by Dr Jessica Davis evolved from a day long program presented by the Departments of Soil and Crop Science and Animal Science. The conference framed the challenges associated with air quality around livestock operations, the evolving EPA regulations, and described the on-going research efforts conducted by CSU faculty. Look for more information in this important area in future issues.

William R. Wailes,
Colorado Extension Dairy Specialist

Commodity Price Quotes

| By-Product Feeds | Price/Ton Spot Market | Price/Ton Future Months |
|-------------------------|----------------------------------|------------------------------------|
| Bakery Waste | \$95.00 | NQ |
| Hominy | \$95.00 | \$90.00 (April-Sept) |
| Dried Distillers Grains | \$117.00 | \$109.00 (April-Sept) |
| Corn Gluten Feed | \$105.00 | \$105.00 (April-Sept) |
| Wheat Midds | \$105.00 | \$88.00 (April-Sept) |
| Canola | \$145.00 | \$147.00 (April-Sept) |
| Whole Cotton Seed | \$172.00 | \$178.00 (April-Sept) |
| Soy Bean Meal 48% | \$200.00 | \$205.00 (April-Sept) |
| Soy Bean Hulls | \$95.00 | \$98.00 (April-Sept) |

These price quotes are for delivery at Greeley, Colorado.

(Vaccinations, continue from page 1)

including social stress, climate stress, environmental stress including frequent housing changes, changes in the availability and type of feed or water, and impatient or aggressive animal handling. The goal should be to maintain a stable living environment with minimal intervention and changes.

Nutrition also has a major impact on immune responses. The primary dietary nutrients that impact the immune system are energy, protein, zinc, selenium, copper, Vitamin E and Vitamin A. While Colorado is generally considered a selenium sufficient region, we commonly see deficiencies in copper and zinc. Appropriate attention should be made to vitamin and mineral supplements in the feed. If you are uncertain of your vitamin and mineral status you can work with your veterinarian to test blood or liver tissue samples to ensure that nutritional requirements are being met. Proper energy balance is best evaluated by monitoring the body condition score of cattle. Animals that are too thin or too fat have decreased immune responses. Lastly, there is increasing evidence that subacute rumen acidosis can suppress immune responses. Periodic evaluation of rumen fluid pH in select lactation groups can help monitor this so that appropriate changes to the ration can be made.

It is critical that vaccines be administered in a manner that will maximize their ability to prevent disease. One of the first considerations is whether to use a killed or modified live vaccine. Some of the newly released killed and modified live vaccines from a variety of biological companies have undergone significant improvements over the last decade. New virus isolates, higher antigenic loads, and better adjuvants have been incorporated into several of these vaccines. You should review the vaccines that you are currently using with your veterinarian to determine if you are using one of these newer products. The differences between the immune response to killed and modified live vaccines are becoming less pronounced. Both types of vaccines typically give excellent humoral antibody responses. Modified live vaccines are still generally believed to provide better cytotoxic immunity which is important for viral infections but not as important for bacterial infections. Some of the modified live vaccines can now also be used in pregnant cattle if the cattle have been vaccinated by the same product within a year. Thus, the decision to use a modified live or killed vaccine now depends more on your management and when you want to vaccinate to maximize protection for a specific disease.

As a general rule of thumb, modified live vaccines initially take 2 weeks to provide an effective immune response and killed vaccines take up to 5 weeks from the first dose. Booster responses can be seen within 1 week for both vaccines. Remember that killed vaccines generally require 2 doses to obtain an appropriate immune response. Failure to give these two initial doses of a killed vaccine in the interval recommended on the label can result in a lower or possibly even a failed immune response. If these vaccines do not properly immunize on the first attempt, they may not provide adequate response on later boosters as well. Maternal colostrum antibody interference can still affect the response to both modified live and killed vaccines. For young calves, there seems to be a window between 1-3 weeks and again after 5 weeks of age when the calf will respond best to vaccination. While there is evidence of eliciting some cell mediated immunity and memory when young calves are vaccinated, it is still important to make sure that you vaccinate all calves again at 4-7 months of age and also one month prior to breeding replacement heifers.

Developing a strong immune response to vaccination is a complex process. By paying attention to your management, the nutrition of your animals, the timing of your vaccination program, and the type of vaccine used you can help maximize the benefit of this tool in raising healthy cattle.

(Training, cont from pg 1)

at a central location approximately every 3 months. Past DMPS Programs included Feeding Management (June 05), Supervision, Safety, & Training (September 05), Reproduction & Fresh Cow Health (November 05) and Parlor Management (March 6).

The 2006-2007 DMPS Schedule:

May 06 - Calf Rearing.

June 06 - Calving Management.

August 06 - Feeding Management

**November 06 - Supervision,
Safety & Training**

February 07 - Reproduction

**May 07 - Fresh Cow Health &
Lameness**

August 07 - Parlor Management

November 07 - Calf Rearing

Dr. Noa Román-Muñiz performed a worker safety training study as the focal point of her Master's project on adult education in the dairy workforce. Worker safety comprises a significant objective of these educational programs, with the ultimate goal being to train dairy workers to perform their assigned tasks in a more skillful, effective, efficient, and safe manner. Emphasis on safe methods of performing the tasks demonstrated and safe application of the skills taught would be of obvious benefit to both the worker (reduced injury and fewer work days lost to injury) as well as to the producer (reduced worker compensation and reduced worker turnover). Thus, as young, untrained workers gain entry-level employment in the Colorado dairy industry, a combined livestock production education and safety education initiative enable them to 1) increase their value to prospective employers, 2) enter dairy employment with greater general knowledge of livestock health and production, possibly limiting employee turnover due to poor performance, and 3) perform high-risk tasks such as milking, moving cows and bulls, and drug administration with greater efficiency, skill, and personal safety, thereby reducing injury claims. The sessions are conducted in both English and Spanish.

Handling Lameness Problems in Dairy Herds

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Lameness remains a major cause of disease and economic loss on dairies. Sole ulcer (pododermatitis circumscripta), white line disease, subsolar abscesses, and interdigital necrobacillosis (footrot) are common digital disorders that, if not treated promptly, can progress to create infection of bone, synovial structures, tendons, and ligaments of the digit. These deeper structures may also become infected from solar puncture wounds, lacerations, avulsion injuries of the hoof, and progression of subsolar abscesses deeper into the foot. Infection of these structures has been termed generalized digital sepsis, or, for the purposes of this discussion, deep sepsis of the digit.

Obviously, it is preferable for medical and/or surgical intervention for lame cattle to occur prior to the establishment of deep sepsis of the digit, simply because treatment options for deep sepsis are more radical and expensive. In cases of deep sepsis of the digit, antimicrobial therapy alone does not usually elicit a cure. It is possible that necrosis of infected tissue and the resultant loss of blood supply prevent effective concentrations of antimicrobials from reaching all areas of bacterial colonization. Thus, digital amputation or digital salvage procedures involving debridement, drainage, and lavage of infected structures is usually required for resolution of lameness. Amputation of the digit may not be the best treatment option if the animal is heavy, maintained on range, or intended for long-term (> 18-24 months) productivity.

Many livestock owners choose to make the initial diagnosis of digital disorders, with varying degrees of accuracy, and to initiate treatment on premises. Treatment often consists of antimicrobial therapy, either alone or combined with analgesic therapy, corrective trimming, and limited surgical intervention (e.g. paring out of sole abscesses). While some treatment failures are inevitable, the results from studies indicate that some problematic cases of lameness are treated for lengthy periods of time prior to the initiation of aggressive surgical treatment. Another question arises: What went wrong in these cases? Was the diagnosis inaccurate, resulting in ineffective treatment being applied? Was the diagnosis accurate, but was the affected animal identified too late in the disease course to head off deep sepsis?

In an effort to reduce the number of such problematic lameness cases, the authors recommend that protocols for diagnosis, treatment, and recording of common digital disorders in cattle be established on dairies. Treatment protocols allow the producer and veterinarian to track the incidence of specific digital disorders, perform periodic, evidence-based reviews of treatment response rates, and monitor the dosing and administration procedures for antibiotics and analgesics on the ranch or dairy. Cases that fail to respond to protocol-based treatments can be more readily identified for veterinary examination, thereby facilitating early decisions for treatment or marketing of the animal and potentially limiting application of futile treatments. Improvement in animal welfare, more judicious use of antimicrobials, and reduction in treatment costs are additional, potential benefits. Without treatment guidelines, lay personnel may simply attempt therapy with a variety of antimicrobials or topical remedies, often enabling progression of disease through inadequate or inappropriate therapy. Please see the accompanying insert for further discussion of diagnosis and treatment of dairy cow lameness protocols.

National Milk

Production Statistics

Total Milk Production: Between 2000 and 2005 Colorado improved in the ranking of the fifty states to #16 in total milk production. Colorado gained 7.5% over 2004 production numbers, whereas U.S. milk production increased in 2005 only 3.5% compared with 2004, achieving a record 177 billion pounds. Total production has increased by 9.4 billion pounds over the past five years (2005 versus 2000), an actual gain of 5.6%.

The top ten states are:

1. California
2. Wisconsin
3. New York
4. Pennsylvania
5. Idaho
6. Minnesota
7. New Mexico
8. Michigan
9. Texas
10. Washington
15. Vermont
16. Colorado

2005 Per Capita Milk Production: The U.S. average Per Capita Milk Production is 597 pounds. The 597 pounds is the total annual U.S. per capita consumption on a milk equivalent basis. The highest state on a per capita basis is Idaho, which produces 7,110 pounds. Colorado is producing 503 pounds per capita compared to California at 1,040 pounds.

2005 Per Cow Production Ranking:

1. Washington
2. Arizona
3. Colorado
4. Idaho
5. Nevada
6. Michigan
7. California
8. New Mexico
9. Iowa
10. Kansas