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California Dairy Newsletter

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First Golden State Dairy Management Conference a Success—California Research for California Farmers

Jennifer Heguy, Betsy Karle, Deanne Meyer and Peter Robinson, Conference Steering Committee

The inaugural Golden State Dairy Management Conference is now in our rear view mirror. The objective was to provide information specific for California dairy producers, because dairies here are different. Another goal was to highlight the great research done by the University of California, Division of Agriculture and Natural Resources and other UC players.

The conference began with Corny Gallagher providing the keynote presentation. As Senior Vice President, Food, Ag and Wine Executive, Bank of America, Merrill Lynch, Global Commercial Banking, Corny knows his numbers and markets. Corny provided a detailed analysis of US milk supply and product trends, as well as global markets and opportunities for dairy products. Dr. Joel Karlin, Western Milling economist and Fresno State faculty member, presented information on commodity costs. The presentation was rich with information; good news there, feed grain costs should be lower in the months ahead. Dr. Michael Anderson, Department of Water Resources' State Climatologist, provided a great presentation on our current water situation. We have water now, but he cautioned that when the rains stops, it's looking like a "la niña"—dry through at least fall. Michael also explained why models that are great at predicting weather in other parts of the US don't work so well here. Again, we're California and we're different.

The second part of the morning was a terrific panel presentation and discussion. Dr. Eric Erba, Senior Vice President and Chief Strategy Officer for California Dairies Inc. discussed the milk supply situation and how Co-ops position themselves to maintain milk flow through their plants at as high a price to their members as possible. He explained the challenges for plants to manage seasonal variation while maintaining input, and was clear to state future success will depend on their ability to evolve as a processor and for producers to evolve as well. One thing is certain, the next five years won't look like the last five years. Dr. Jennifer Walker, Director of Dairy Stewardship of Dean Foods presented information about consumer preferences and demands of food suppliers, especially those supplying animal products. Her presentation focused on animal welfare. Treating animals well is the right thing to do; it's important for the cows, and consumers expect good welfare of animals. We were so honored to have had such an elite group of individuals presenting information in our opening session.

The bulk of the conference provided research findings and industry updates on 21 topics ranging from growing forage to reputation management; there was something for everyone. The planning team was pleased to see so many people attend presentations and engage in the question and answer sessions throughout the conference. Our last speaker was John Talbot, CEO of California Milk Advisory Board. John provided an overview of the incredible opportunities in the market for California milk in state, in country and globally. It was great to send folks home on an upbeat note.

You'll be able to read about some of the UC research presented at the conference in this very newsletter (and future editions). We thank everyone who attended, sponsored, and helped us advertise, we couldn't have done it without you. If you heard about the conference and wished you attended, be on the lookout for our 2018 meeting. In the meantime, take a look at our 2016 conference website; we're sure you'll find our conference really did have something for everyone! Website: http://ucanr.edu/sites/CAdairyconference/

Peripheral Spoilage on Exposed Silage Pile Faces: What is the Cause?

Peter Robinson, UCCE Dairy Nutrition Specialist & Nadia Swanepoel, Dept. of Animal Science

Corn silage is an important ensiled crop in most dairy areas. However, spoilage during the ensiled period is an economic loss to dairy farmers. One of the critical points to control spoilage in silage is to limit oxygen entry to silage since it supports growth of aerobic microorganisms and the resulting heat production can lead to silage with degraded nutritional quality, as well as enhanced shrink losses. A relatively simple practice which has gained wide use on commercial corn silage piles is use of a thin inner plastic film with enhanced oxygen barrier (EOB) properties between the silage mass and the main plastic cover.

We related results of a study using 4 corn silage piles in the January issue which showed that pliable polyethylene film (POLY) and EOB silage underlay films had similar impacts on measures of silage deterioration of corn silage pile surfaces prior to opening, or during pile feedout, as well as ~25 inches under the pile surface at the exposed face or in the deep silage mass of the pile. Indeed both underlay films were associated with well-preserved silage with little sign of deterioration.

However, because the surface 20 inches in direct proximity to the exposed face had deteriorated regardless of underlay film used, further investigation was undertaken to determine why it was occurring. The results of this investigation are discussed below.

So how is Peripheral Face Spoilage Occurring?

An ~2,000 ton pile of corn silage was constructed to examine the progression of spoilage into the silage pile from the exposed face during pile feedout, as determined by sampling the silage under the undisturbed plastic cover up to the exposed face in two coring events which separated by face silage removal (Figures 1 and 2).

Figure 1. Coring locations at Coring #1.

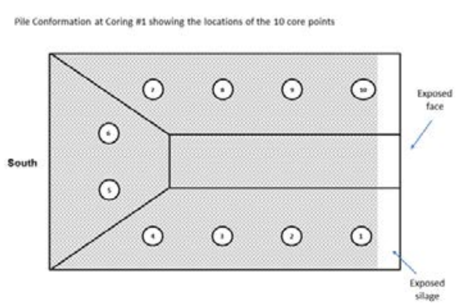
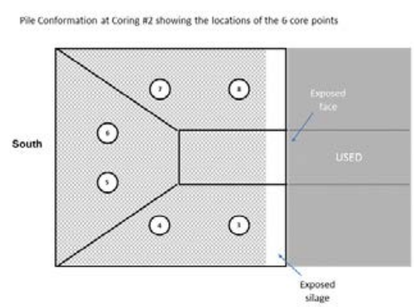


Figure 2. Coring locations at Coring #2.



At the point when the exposed face was ~80 feet from the beginning of the back ramp slope, both sides and the back ramp of the pile were cored to 20 inches in two segments of 10 inches each according to the grid in Figure

1. The pile was re-cored 69 days later using the same procedures, except that some core points no longer existed due to silage removal (Figure 2). Face management at the second coring was similar to that at the first.

At the first coring, the outer (*versus* inner) cores had higher pH, temperature and mold/yeast counts at locations nearest to the exposed face. At the second coring, when four previously cored locations no longer existed due to silage feedout, the outer (*versus* inner) cores had higher pH, temperature and mold/yeast counts at locations nearest to the exposed face – as at the first coring – although these actual core points had no sign of deterioration at the first coring.

In general, silage spoilage was impacted by location and surface depth relative to the exposed face at the first scoring had simply 'migrated' into the pile with pile use.

What Have We Learned?

Surface spoilage during pile unloading was 'moving' with the exposed face such that silage ~24 feet back of the cut edge of the cover plastic had seriously deteriorated in the outer 10 inch core, with no deterioration ~44 feet back of the cut edge of the cover plastic, regardless of coring event.

It is clear that deterioration of corn silage (often visible on the periphery of the exposed face at pile unloading) is primarily a function of its exposure at the face rather than on the surface of the pile while it is under the silage pile plastic cover prior to pile opening.

Silage deterioration at the exposed silage face appears likely to be minimized by increasing speed of exposed face movement over the ground, and/or use of moveable weight lines directly behind the exposed face to limit entry of air to the pile between the plastic cover and silage surface at the face.

Alternative Forages: How does Sorghum Fit into California Dairy Systems?

We've received a grant to look at the viability of sorghum silage in California dairy systems. This summer, we are looking to work with dairies that are growing sorghum for silage. Below you will find the goals and objectives of the project; to make it simple, I've included what we're looking to do in this first year:

We're looking for 20 dairies to participate this summer. This entails:

1. Filling out a sorghum silage management survey – information from field to feed-out
2. Allowing us to come sample at harvest and again sometime during feed-out. We'll be looking at nutritive value, physical characteristics, as well as fermentation characteristics of the silage.

The project's overall goal is to determine the value of sorghum as silage in California dairy farms. Specific objectives are to:

1. Determine water use and water use efficiency of select sorghum varieties grown for silage per unit of feed energy;
2. Evaluate sorghum silage for use by California dairy farms, including cultivar selection, irrigation water allocation, harvest and ensiling practices, as well as the ensiling characteristics and nutrient profile of the silage;
3. Determine quantity of manure nutrients (i.e. N, P, K) that should be applied to a sorghum crop;
4. Conduct a feeding study with lactating cows to determine maximum inclusion rates of the most promising sorghum silages without compromising animal performance and health.

If you are planning on growing sorghum this summer and would like to participate, or would like to learn more about the project, please contact **Jennifer Heguy** at **jmheguy@ucdavis.edu** or **(209)525-6800.**

Spring Water and Nutrient Management in Dairy Corn

Nick Clark, UCCE Kings, Fresno and Tulare & Steve Wright – UCCE Tulare and Kings

Season-long farm management decisions will affect water use efficiency (WUE) of corn. Several decisions such as varietal maturity, planting date, weed control, and soil fertility management need to be made in the context of understanding certain on farm limitations such as irrigation water quality, irrigation system capacity, and seasonal availability of water for other crops. This article will discuss water and nitrogen management decisions which can be made in-crop.

Pre-plant water and soil nutrition decisions and weed control strategies were discussed in a recent *Field Crops and Nutrient Notes* article (http://cekings.ucanr.edu/newsletters/Field_Crops_-_Nutrient_Notes/), so will not be discussed here, but it should be noted that these decisions have season-long impacts.

In-crop water decisions

Especially important to irrigation management for high yields in corn is irrigation timing. It is known that certain stages of corn's plant growth cycle are more sensitive to the effects of drought stress on yield. Generally, these drought sensitive stages are in the late vegetative to early reproductive phases. Two weeks prior to tasseling and two weeks after silking are the most sensitive stages to drought stress, as this period is highly determinant of grain yield. Earlier drought stress will reduce the vegetative biomass and diminish the plants' ability to draw from deeper soil profile reserves of water since roots will also be less developed. It is also recommended to avoid drought stress during grain fill, however deficit irrigation during this phase is managed in silage corn in order to harvest at around the 50% milkline stage. It has been shown that the highest quality dairy alfalfa silage cuts are usually made in the early part of the year and that alfalfa is highly resilient to summertime deficit irrigation. So, water may be diverted from alfalfa to corn during the summer to ensure an adequate supply for corn. Beware, the opposite is not true, since corn is relatively sensitive to drought stress.

In-crop nitrogen decisions

Dairy operators should work with their PCAs and CCAs to test lagoon water and irrigation well water NO_3–N when either or both are used as irrigation sources in order to properly credit the N fertilizer value and apply it at a rate that is beneficial to the crop – when the crop demands it. Corn uptake rate of N closely matches the pattern for corn uptake rate of water. That is, much less N is demanded in early vegetative stages, but increases rapidly and peaks before tasseling, at which point it will slow during grain fill. Being able to irrigate with lagoon water offers dairy operators an advantage to apply nutrients when the crop needs it. Table 1 shows how to calculate the availability of N from irrigation water and from manure sources. Keep in mind that for dairies that make multiple applications of lagoon water or solids throughout the season, the amount of N that can be expected to mineralize within the first year will likely be 40-70% mineralized within 4-8 weeks after applying.

Table 1. Available Nitrogen Estimator

Irrigation Water	
Calculate irrigation water NO_3-N fertilizer value	Test ppm NO_3-N * 0.23 * inches water applied = lbs NO_3-N applied
Manure	
Mineralized N in lagoon water	40-50% the first year; 15% the second year
Mineralized N in lagoon sludge/slurry; corral manure	20-30% the first year; 15% the second year
Mechanical screened solids	10-20% the first year; 5% the second year

Should I Use Intravenous Calcium to Prevent Subclinical Hypocalcemia?

Ainhoa Valldecabres, VMTRC Researcher, Cedric Blanc, Cal-Poly & Noelia Silva del Río, UCCE Dairy Health Specialist

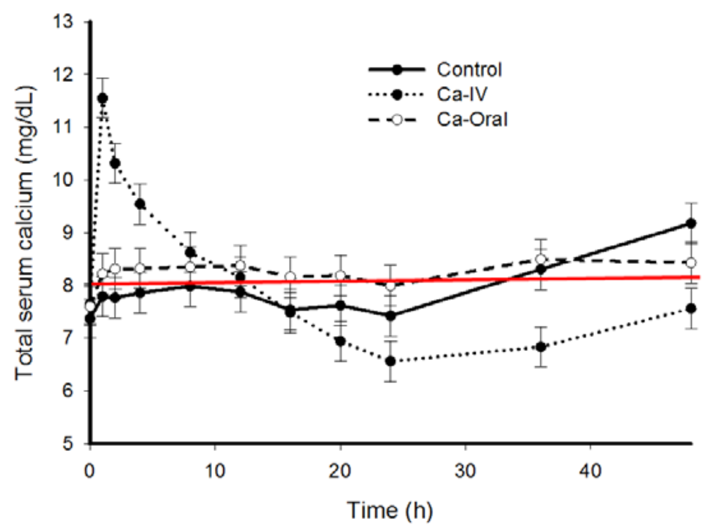
Hypocalcemia is an important postpartum metabolic disease. Although the use of anionic salts as a preventive strategy in prepartum diets has been widely implemented, hypocalcemia remains one of the most important postpartum diseases. In California's Central Valley the prevalence of clinical hypocalcemia when dietary cation-anion difference (DCAD) diets were fed has been reported to be 3%, whereas subclinical hypocalcemia (blood calcium < 8mg/dl) ranged from 14% to 67% for cows in their 2^{nd} to 8^{th} lactation.

Clinical and subclinical hypocalcemia have been associated with dystocia, retained placenta, metritis, endometritis, displaced abomasum, mastitis and decreased fertility. Based on data from the University of Wisconsin, the cost of this disease was estimated at $91,625/year for a 2,500 cow herd when clinical and subclinical hypocalcemia was 3% and 34%, respectively. Since there are no cow-side diagnostic tools to identify subclinical hypocalcemia, prevention is an important goal of transition cow programs. Postpartum calcium supplementation, administered intravenously (IV), orally and less frequently subcutaneously, is a strategy implemented on dairies to prevent subclinical hypocalcemia. However, calcium blood levels are influenced by the route of administration.

What happens to blood calcium levels after oral or IV calcium supplementation?

At UC Davis, we enrolled 33 multiparous crossbred cows (Jersey × Holstein) to evaluate the implications of giving IV Ca as a prophylactic strategy for hypocalcemia (Blanc et al., 2014, JDS). Cows were fed anionic salts in close-up diets and they were assigned to: **control** (receiving no calcium supplementation), **IV calcium** (Ca-IV; 500 ml of 23% Ca gluconate), or **oral calcium** (Ca-Oral; 2 Ca boluses 12 h apart) treatments. Treatment administration started within 6 h after calving. Blood samples for total serum calcium analysis were collected from calving to 48 h postpartum.

We observed that blood calcium spiked shortly after IV administration and it was higher than control cows or cows given oral calcium up to 4 h post-treatment. However, calcium levels rapidly declined and bottomed out at 24 h. Calcium levels were lower for cows given IV calcium compared to cows given oral calcium (at 20, 24 and 36 h postpartum) and control cows (at 36 and 48 h postpartum). It is likely that the initial spike in blood calcium downregulated calcium mobilization resulting in a temporary subclinical hypocalcemia.



Supplementation with IV calcium doesn't seem to have a positive effect on postpartum subclinical hypocalcemia prevention. Other routes of calcium administration might be more desirable. However, more research is needed to evaluate the impact of postpartum calcium infusions on health and production by IV, oral and subcutaneous routes.

Jumpstart Your Calves

Betsy Karle- UC Cooperative Extension Dairy Advisor- Northern Sacramento Valley

Calves- they're not easy to raise and we don't get any payback for at least two years. They get sick easily and take abundant resources, especially time and money, to rear into productive contributors to the herd. Are they worth all this effort? Research indicates that they are, indeed. A recent comprehensive review article by Soberon & Vam Amburgh (2013) concluded that level of investment in calves does make a difference in the future productivity of our herd. Numerous studies have quantified payback, showing significantly more milk production in the first lactation and an earlier age at first calving. Following is a review of some of the steps to success for raising healthy calves.

Colostrum

We all know that an adequate amount of good quality colostrum is vital to the short and long term health of a dairy calf. Yet the failure of passive transfer of immunity through colostrum in dairy calves across the nation is pushing 20%. Why are 1 in 5 calves still not getting what they need from colostrum? Data from a study we conducted throughout California indicate that only 33% of dairies consistently test colostrum quality before feeding (Love et al. 2016). Another 8% test colostrum sometimes, but that leaves a solid 59% that can't be sure that the colostrum they are feeding is up to par. In a Tulare, CA study, Williams et al. (2014) found that colostrum quality can be highly variable on a single dairy. Training and established procedures are vital to ensure the best quality colostrum is being fed to calves. Timing is also key. Recent data at the national level (NAHMS 2016) reveal that the majority of dairies are feeding two quarts of colostrum at the first feeding. By the time feeding number two rolls around, gut closure may be imminent, resulting in the failure of passive transfer of immunity. In a positive trend, a recent Northern California study (Karle et al. 2015) indicated that about half of dairies feed the full recommended four quarts of colostrum in the first feeding, giving calves a better chance to effectively absorb the appropriate level of colostral antibodies.

Plane of nutrition

We feed calves an assortment of liquid diets- from waste milk to a wide variety of milk replacers to saleable milk. As with colostrum, we need to consider the quality of the product we are feeding our investment. Survey data we collected throughout the state indicate that over half of dairies are feeding waste milk to calves, but only 29% of dairies pasteurize. Are we sure that unpasteurized waste milk is safe for our youngest calves? Quality of commercial milk replacers is also important to consider. Calf raisers should critically evaluate the formulation that is most appropriate for their calves, keeping in mind that cow's milk is about 27-30% protein on a dry matter basis and a calf will suckle about 5 times per day, given the choice. It's worth evaluating if a higher protein replacer and/or adding a third feeding would be beneficial to your calves.

Environment

Keeping calves in a comfortable environment sets them up to be successful by reducing their exposure to pathogens. Wet and dirty bedding harbors a plethora of disease causing organisms and the more diseases that a calf has to fight off, the fewer energy reserves she has to dedicate to growth and production. A wide range of individual calf housing systems are used throughout the state and each dairy should select the most effective and efficient model for their operations and manage it well. Make accommodations as needed by age or season to provide the best environment for the calf at a particular time. For example, housing that allows cooling airflow in the summer may need to be generously bedded in the winter to maintain positive energy balance. In our Northern California study, we observed an increased prevalence of respiratory disease in group-housed pre-weaned calves. Each additional calf in a pen was associated with an 8% increase in BRD. Group housing can be an effective system for pre-weaned calves, but our data indicate that animal health should be closely watched.

While we don't see immediate economic return from pre-weaned calves, they truly are the future of our herds and we can be confident that quality calf management will eventually pay dividends. As we increasingly understand the potential of these young herd members using genomic data, it becomes even more important to invest in their success from the get-go. It is an investment that will surely pay off down the road.

Manure—What's the Concern About its Carbon

Deanne Meyer, Livestock Waste Management Specialist, UC Davis

When most people think about manure management they think about acre feet of liquid manure that will be irrigated onto a crop to provide nutrients for the growing crop. Or they think about solid manure and the loads of material that will be removed from corrals or separators/basins and hauled to fields. Let's take a step back and think about the manure cycle in order to identify ways to enhance any decision making needs on individual farms.

Remember in junior high school when you first heard about photosynthesis? In the presence of light, plants convert carbon dioxide and water into carbohydrates and oxygen. And so the carbon cycle used in dairy farms begins. These carbohydrates are used by plants to produce plant roots, stems, leaves, flowers, fruits and seeds. The plant, or some component of it, is harvested and finds its way to dairy diets. Plant parts are incorporated into animal diets and the carbon ends up in milk, a growing fetus, body mass (animal weight gain), manure, or is emitted to the atmosphere. In the process of eating and ruminating, animals emit carbon dioxide (just like we do when we breathe), methane and other compounds. The methane is produced by rumen microbes as they manage free hydrogen in the rumen. Manure, once excreted is handled either in a wet form through a liquid/slurry system or a drier form (solids from corrals or a separator/basin). Liquids/slurry storage systems in CA are predominantly anaerobic (oxygen is absent) and behave similarly to animal rumens where carbon dioxide and methane are primary end products. Some intermediate products of metabolism include volatile organic compounds (VOC) and these may or may not be released from liquid storage systems.

Carbon dioxide losses to the atmosphere can be incorporated back into plant material through photosynthesis. Methane emissions are classified as a greenhouse gas and State legislation has us on target to reduce these emissions. Volatile organic compounds may react with oxides of nitrogen (emitted from combustion engines) in the presence of sunshine to form ozone. Ozone is one of our criteria pollutants at ground level (in the air we breathe) with health effects.

Getting and maintaining manure in a dry form reduces both methane and VOC emissions. However, getting it to the dry form may result in losses of ammonium (plant available nitrogen) and other compounds, including VOC.

Use of manure treatment technologies.

First, identify what you expect the technology to accomplish (job description) before you ask any questions about the technology. There are many management practices identified by the San Joaquin Valley Air Pollution Control District that theoretically reduce the emissions of VOC when used appropriately. If you want a technology that removes solids from a liquid waste stream there are many different types and they all function a bit differently. If this is your focus---carefully evaluate your bedding source, amount used and particle size length. Experience shows us that particle length of different bedding sources varies, making separators function markedly differently. Alternatively, if you want a technology that reduces the amount of carbon you emit to the atmosphere from your manure treatment/storage area, then perhaps you're considering an anaerobic digester or a pyrolysis unit. Anaerobic digesters (microbial) and pyrolysis units (thermal) decompose manure carbon in the absence of oxygen to methane and carbon dioxide (anaerobic digestion) and biochar or gases (pyrolysis). Keeping either of these technologies functional long term on commercial dairy/feedlot operations has had varying successes.

Carefully identify the job description and expectations (manure function, employee labor, etc.) of any new management practice or technology you consider for your facility. Do your due diligence with air and water regulatory agencies **before** considering purchase and installation.