University *of* California
Agriculture and Natural Resources

California Dairy Newsletter

Vol. 9, Issue 2   April 2017

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UC Dairy Needs Assessment Underway

University of California Cooperative Extension dairy advisors are looking for input on the desired direction of our research and extension programs. In March 2017, California dairy producers were mailed a double-sided, one page survey, and a self-addressed and stamped return envelope. An optional link was provided to complete the survey online. Thank you to the folks who submitted surveys – we appreciate your feedback.

The survey was designed to take less than 5 minutes of your time. If you haven't returned your survey, we are still collecting responses. If you cannot find your survey, please email your local dairy advisor (or closest advisor) and we will provide a link to the online survey. We thank you for your continued collaboration with the University of California, and look forward to working with you in the future.

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Research Roundup:
Prevalence of *Salmonella* in Cull Cows in California

Betsy Karle- UCCE Dairy Advisor, Northern Sacramento Valley

Cull dairy cows have long been identified as a critical food safety control point as they account for approximately 18% of the ground beef supply in the United States. *Salmonella* is one of several potential food safety concerns and previous studies have reported that between 9.6 and 93% of cull cows could be shedding *Salmonella*, depending on a wide range of factors. However, data specific to California and our unique management systems have been missing until now. Researchers from the University of California, Davis and the California Animal Health and Food Safety Laboratory set out to determine the prevalence of *Salmonella* in cull dairy cows in California's Central Valley and to understand what factors affect the likelihood of cows testing positive for the bacterial pathogen.

The researchers sampled 249 cows from four freestall and three drylot dairies, once per season from Spring 2014 through Winter 2015. Information about the management practices and reason for culling the cows was recorded. Overall, only 3.42% (9) of the cows were positive for any *Salmonella* species, lower than reported in previous studies. The prevalence ranged from a low of 1.97% up to 7.11% between the seven dairies, and all dairies had at least one positive sample throughout the study period. When the data set was analyzed, a statistical difference between the seasons was not apparent, but a closer look revealed some interesting trends. In four of the seven herds, the sampled cows only shed *Salmonella* during the summer sampling period. Though a statistically significant difference wasn't clear, the data do suggest that this tendency for more positive *Salmonella* samples may be related to heat stress and a more conducive (warm and moist) environment for bacterial growth, given the increased use of water for cow cooling during hot Valley summers. Of the management practices that were evaluated, none rose to the top as clearly responsible for a higher or lower *Salmonella* prevalence.

While it may be tempting to rest on our laurels and proclaim that California doesn't have a *Salmonella* problem in cull cows, it's important to remember that the current study involved a small convenience sample of California dairies, and that further research is needed to tease out management practices significantly associated with Salmonella shedding. The study dairies implemented excellent animal health management practices and thorough treatment protocols, which likely contributed to the lower than previously reported prevalence. The primary reason for culling cows in this study was due to low milk production and reproductive issues, so the majority of the cows sent to market were healthy overall. *Salmonella* is much more prevalent in cows that are visibly sick, but it often manifests asymptomatically, especially in mature cows. Contamination of feed commodities, rodent and bird activity and seasonal management practices are all important factors to consider as *Salmonella* and a plethora of other pathogens are primarily transmitted via the fecal-oral route. Attention to the possibility of increased prevalence in Summer is warranted, making management practices during this season especially important.

The full text of this research is accessible at https://peerj.com/articles/2386/.

Aboud, O. A., Adaska, J. M., Williams, D. R., Rossitto, P. V., Champagne, J. D., Lehenbauer, T. W., Atwill, E. R., Li, X., Aly, S. S. (2016). Epidemiology of *Salmonella* sp. in California cull dairy cattle: prevalence of fecal shedding and diagnostic accuracy of pooled enriched broth culture of fecal samples. *PeerJ, 4*. doi:10.7717/peerj.2386.

California Sorghum Silage at Harvest: Practices and Nutrient Profile

Jennifer Heguy - UCCE Dairy Advisor, Merced, Stanislaus & San Joaquin, J.P. Martins – UCCE Dairy Advisor, Tulare & Kings & Deanne Meyer – UCCE Livestock Waste Management Specialist

In summer of 2016, sorghum for silage was sampled at harvest on 16 San Joaquin Valley dairies to determine forage quality and current management practices. Herd size of participating dairies ranged from 320 to 5,500 milking cows (median = 2, 013), with harvested sorghum acreage ranging from 42 – 574 acres (median = 188).

Sorghum type included brown midrib (n = 11) and grain (n = 5). Sorghum was ensiled in piles (n = 12) and bags (n = 4), and split evenly between dirt and concrete/gravel surfaces. Ten consecutive truckloads of chopped sorghum were sampled and composited at the time of ensiling. Wet chemistry analysis was performed by a commercial laboratory. Delivery rate of the 10 truckloads of sorghum ranged from 12 to 78 minutes (median = 40), with all dairies utilizing custom harvesting services.

There was no difference in nutrient composition between grain and forage type sorghum. Table 1 includes nutrient composition of the harvested sorghum (all samples). For comparison purposes, table 2 includes nutrient composition of 21 corn silage samples taken at harvest in 2014. Sorghum was lower in starch and NFC (non-fibrous carbohydrates), with higher ADF & NDF concentrations than sampled corn. Ash content of harvested sorghum ranged from 9 to 22%, with an average of 12%. Ash is essentially soil content in the feed, so on average, for every 100 lbs of sorghum silage dry matter fed, 12 pounds of dirt will be incorporated into the ration. For comparison, California corn silage typically runs around 6% ash.

Table 1. Nutrient composition of sorghum harvested for silage (n=16)

		% of DM						
	DM	**CP**	**ADF**	**NDF**	**Starch**	**NFC**	**Ash**	**NDFD 30, %NDF**
Average	28.7	9.5	34.6	49.7	10.9	25.3	12.2	48.6
Median	28.4	9.7	34.9	50.4	9.6	27.4	11.8	50.5
Minimum	23.2	5.7	30.4	44.9	1.9	14.4	9.2	35.1
Maximum	34.6	11.7	40.2	55.3	22.5	35.6	21.5	60.3
STD	3.3	1.8	3.1	3.8	6.7	6.0	2.9	7.8

Table 2. Nutrient composition of corn harvested for silage (n=21)

	% of DM				
	CP	**ADF**	**NDF**	**Starch**	**NFC**
Average	7.7	25.1	41.8	29.2	43.7
Median	7.8	25.5	42.6	28.3	43.1
Minimum	6.2	20.2	35.2	23.3	36.6
Max	8.8	28.3	46.7	36.7	50.7

Sugar cane aphid (SCA), which colonizes sorghum, was identified in the south San Joaquin Valley during the 2016 growing season. When comparing the nutrient composition of sugar cane aphid infested samples with non-infested samples, SCA caused significant decreases in starch and NFC, with higher crude protein, ADF and ash content. Further interactions were seen between SCA and sorghum type, with decreased starch content in grain varieties.

<u>Take-home thoughts:</u>

Advantages of sorghum for silage include decreased seed costs, decreased fertilizer needs, and potential for water savings. Unfortunately, the quality of sorghum harvested in 2016 varied greatly. We'll have more information summarized on sorghum quality and chopping parameters in the July newsletter.

- Sugar cane aphid more than likely impacted sorghum quality in 2016. Talk with your crop consultant and be on the lookout for this invasive pest in 2017.
- Plan before harvest. What animals will receive sorghum silage and what is the optimal chop length, stage of harvest, etc.? 2016 particle separator results indicate very coarsely chopped, long particles that may be sorted in total mixed rations.
- Sorghum is not corn; the quality of samples in 2016 show lower levels of starch

and NFC, with higher fiber content than typical corn silages. Talk with your nutritionist to best determine how to incorporate sorghum into your feeding system.

Is Your Heat Abatement System Ready for Summer?

J.P. Martins, UCCE Dairy Advisor, Tulare & Kings Counties

With summer approaching, it's a good time to determine if your heat abatement system is ready to keep cows cool and comfortable to avoid problems with heat stress. High-producing lactating dairy cows generate a lot of heat, and are sensitive to high ambient temperatures. Dairy cows are considered comfortable in temperatures between 40 and 70^{o}F. As temperature rises above 70^{o}F, cows are not able to lose heat to the environment, increasing core body temperature. To decrease body temperature, cows undergo some physiological and behavioral changes, which negatively affect productivity, health, and cow-comfort, resulting in economic losses.

During heat stress, cows significantly decrease feed intake, which causes a substantial drop in milk production. Heat stress also negatively affects reproductive performance. One way to evaluate your heat abatement strategies is to compare milk production and reproductive performance (21-day pregnancy rate, heat detection rate and conception rate) of your herd during the cold season to last year's hot season. If there is a significant decrease in milk production and reproductive performance, you may be able to make some modifications to your heat abatement strategies and reduce the impacts of heat stress.

In a normal day, lactating dairy cows spend about 12-14 hours lying down, 5 hours feeding, and 2.5 to 3.5 hours milking. Cooling cows during these three main activities should be the focus of your heat abatement strategy. Cooling considerations for the housing area, holding pen, and water troughs are presented.

<u>Housing Area</u>

It is important to have shaded resting areas and feed lines in open lots. Since cows are lying down most of the day, and cows accumulate heat when they lay down, heat stressed cows will reduce resting time. The open lot resting area should have 38 to 48 square feet of shade area per mature dairy cow. Use fans to keep fast moving air (6 mph or greater) in this area. Portable wind meters are affordable and can be used to measure air speed. In free stall barns, measurements should be taken in several stalls at the cows' head level when they are lying down. Air speed varies depending on several factors such as fan type, size, and potency. Space between fans should be determined by air speed. If fans are too far apart, some areas or stalls might not be getting the appropriate air velocity. Dirty fans and improper belt tension and alignment can also reduce the efficiency of fans. Fan blades should spin freely by hand. Fans also need to be angled towards the stalls (30^{o} angle) and not parallel to the celling. The current recommendation is to set fans to turn on (and keep running) when temperatures reach 68 ^{o}F.

Evaporating water from the cows' body surfaces is the most efficient way to remove heat from cows; fans over the feedlines and holding pen will maximize cooling after soaking the cows. Soakers should be activated every 15 minutes at 68^{o}F, every 10 minutes at 75^{o}F, and every 5 minutes at 85^{o}F or above. Soaker run time will vary depending on the type, size of nozzle, and water pressure. Note the time that is necessary for your nozzle to soak the cows' backs, and set your nozzle run time based on your notes. If nozzles are running for too long, water will drip from cows' backs (wasted water). It takes approximately 0.2 gallons of water per cow to soak the back of the cow. The distance between nozzles should be close to the diameter of the water spray produced by the nozzle (normally 6 to 8 feet). The objective is to reach all cows in the feed line. Make sure soakers are working properly and clean nozzles with vinegar (or other solutions) to remove particles and calcium build up before summer heat begins.

Holding Pen

Although cows spend only a few hours of the day at the holding pen, this area is critical because cows are crowded, and there is no air exchange. This is the area that cows experience the most heat stress, and one of the most important strategies is to reduce time spent at the holding pen. Fans should start running at temperatures of 65 °F and above. It is also important to measure air velocity in different areas of the holding pen. Air speed in the holding pen is recommended to be around 6 mph when cows are present. As in the resting area, number of fans and distance between fans should be based on air speed and depends on the type of fan used, holding pen area and maximum number of cows. Soakers should be on every 10 min at 68°F and every 5 minutes at 75°F or above, with run time depending on the nozzle specifications (as in the housing area).

Drinking Water

Ensure adequate amounts of clean drinking water are available to maintain hydration and avoid milk production losses during Summer. Almost 87% of milk is composed of water, making it a vital dietary requirement. Water consumption increases about 1.5 pounds for each 1°F increase in temperature. Water availability should meet the daily needs of lactating dairy cows and peak demand. Hence, it is important to ensure adequate linear water space per cow. A great strategy is to add extra waterers on the return lane from the parlor since cows drink most water right after milking. Use the following formula to calculate the required tank perimeter: group size x .15 x 2 = tank perimeter in feet.

Take-home message:

If you haven't done so already, now is the time to start thinking about your heat abatement strategies, and make modifications to your system. It's also a great time to check existing fans, nozzles, water lines, etc., and make any necessary repairs before consistent high temperatures are upon us. Studies have shown that heat stress during the dry period reduces milk production in the subsequent lactation, so cooling dry cows should also be a priority this summer.

Do Your Annual Report Numbers Make Sense?

Christine Miller, Graduate Student & Deanne Meyer, UCCE Livestock Waste Management Specialist

Central Valley dairymen prepare an, often enormous, Annual Report for the Regional Water Quality Control Board. Annual Reports contain information on nitrogen (N) and phosphorous (P) applications to cropland. If this information is accurate, it can help improve both crop and manure management on the dairy. How do you know if your report is accurate?

Often, the nutrient of primary concern is N. Dairy producers want to ensure that as much manure N as possible is used by crops. Otherwise, crop growth may be stunted and manure N can end up polluting air or water resources. However, it is difficult to tell if N application numbers make sense, because the amount of N lost to the air varies. You can perform a simple check with the manure P numbers in your Annual Report to see if your manure N numbers are accurate.

You want to check that most of the P excreted by the herd is recovered in managed manure. Because P is not lost to the air, all the excreted P should leave the production area in exported or land applied manure. Look through your last Annual Report. First, locate the values that estimate the P excretion in your herd. Compare the P excretion values with the amount of P removed from the production area in liquid or solid manure (applied to cropland or manifested off-site). Expect P in managed manure to be around 100% of excreted P because P is stable during manure storage.

This calculation was performed with the numbers in the 2012 Annual Reports of 60 Central Valley dairies. The results are shown in Figure 1, with the amount of P recovered in exported or land-applied manure presented as a percent of the nutrient excreted. Many dairies did not hit their recovery target for P. In many cases, the recovery percent is far above or below the target. This suggests that some manure—and thus the nutrients it contains—is not being accurately accounted for.

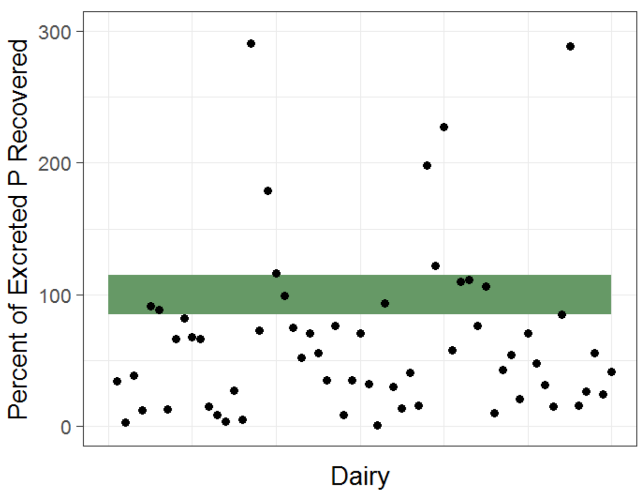

Figure 1. Plot showing the percentage of excreted Phosphorous that was recovered in exported or land applied manure on 60 Central Valley Dairies in 2012. The recovery target region is in green.

<u>Things to consider if your own calculations for P recovery are far above or below 100%:</u>

- Make sure all numbers (herd population and manure data) are entered correctly in the Annual Report. It is easy to put a decimal point in the wrong place or select the wrong unit.
- Check all your lab reports for results that look different or odd.

- Make sure all manure exports and application events are entered.
- Evaluate how manure samples were collected. A composite of many grab samples will better represent your solid manure and provide more representative data.
- Evaluate your sample preservation methods (that samples are kept cold) and that samples are delivered quickly to the lab.
- Be sure scales and flow meters are properly installed and calibrated to measure the amount of manure applied or sold.
- Identify if there is any stockpiled manure retained at the dairy.
- Keep your agronomist informed of any modifications you identify to improve your P recovery data. This may require that your Nutrient Budget be modified. Ultimately, good P recovery data is useful to you in accounting for P applications to your crops.

Attention to Spring Sampling Pays Off

Deanne Meyer, UCCE Livestock Waste Management Specialist

It's that time of the year - clocks are set forward and harvest is on top of us. Remember to review your Sampling and Analysis Plan BEFORE crops are harvested and manure is land applied. It's critical to have good estimates of nutrients applied to crops and removed from fields. The calculation used to determine nutrients applied to or removed in crops requires input of quantity and nutrient content.

Precisely tracking quantity of material applied and documenting this is important. Also, taking a representative sample, preserving it correctly (usually on ice or chilled) and delivering it to the laboratory near immediately (within 24 hours) is essential to receive useful and valid nutrient composition data.

As a recap, you should have sampling protocols for solid and liquid manure, plant tissue, irrigation water, and soils. Review your protocols and follow them. Solid manure and plant tissue sample collection should rely on collecting many grab samples from the same source and mixing them thoroughly to subsample the composite sample. Liquid manure samples should be collected directly into the container without overtopping. The sample requires refrigeration between collection and delivery to the laboratory. This type of sample should be delivered to the lab well under 24 hours after collection. Irrigation water sources should be sampled into the container going to the lab. Like liquid manure, this sample should be placed on ice. Soil samples need to be kept dry and be delivered to the laboratory soon after collection.

One composite sample of crop material should be taken from each field where manure was applied. Liquid manure should be sampled quarterly when this source is used in irrigations. Solid manure should be sampled twice annually. Irrigation water sources need to be sampled annually during the irrigation season. Soil samples need to be taken on 20% of fields, annually.

A good representative sample is essential to closely track nutrient applications to and removals from fields. The results from representative samples are critical for your Annual Reporting and equally as important to general crop management (nutrient application efficiencies).

University of California Cooperative Extension

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April 2017

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