



STOCKING DENSITY CAN BE SUBCLINICAL STRESSOR

Sometimes overstocking is necessary. We overstock to build herd numbers for an expansion or to generate more milk per stall and therefore more income during low milk prices. In fact, economic analysis suggests that some degree of overstocking may be optimal to maximize farm profitability. According to DeVries et al., 2016, profit per stall per year is maximized at about 120% stocking density—1.2 cows per available resting or feeding space in a pen.

However, profitability is only one part of the equation. A growing body of research indicates that overstocking can serve as a subclinical stressor. Availability of free-stalls, insufficient feed availability and heat stress have been identified as the top three non-nutritional factors that affect cow well-being, efficiency of production and profitability (Bach et al., 2008; Bava et al., 2012), says Peter Krawczel, associate professor of applied ethology, University of Tennessee.

During the last two decades researchers have sought to identify the effects of stocking density as an isolated stressor. Research has shown that increased stocking density “consistently compromised cow well-being through changes in cattle behavior: increased feeding rate, increased bunk and stall displacements, and decreased lying time,” says Mac Campbell, dairy specialist, Cargill Feed and Nutrition. These changes in behavior often lead to decreased milk yield, lower milk components and milk quality, and increased health issues.

However, the effects of overstocking on commercial dairies are quite varied. While exceptional cow environment and management can mute the potential negative impact of overstocking, in other cases, cow environment and management can multiply the potential negative impact. That’s why stocking density is now being considered as a subclinical stressor.

“The concept of subclinical stressors suggests that the summation of two stressors, such as housing and feeding management, will be greater than either in isolation,” says Krawczel. “A subclinical stressor depletes the animal’s biological resources without generating a detectable change in function, which leaves the animal without the resources to respond to subsequent stressors (Moberg, 2000).” Examples

of subclinical stressors could include overstocking, subclinical hypocalcemia or even uncomfortable stalls. Cows may exhibit changes from a subclinical stressor such as overstocking, but those changes don’t necessarily lead to visible impacts such as lost milk production or impaired health. But when a second stressor is added, the negative effects become evident.

NEW RESEARCH

Research conducted at the Miner Institute evaluated the effects of stocking density with the additional management stressors of low-fiber diets and feed restriction.

Multiparous and primiparous cows were grouped at stocking densities of either 100% or 142% and received a TMR similar in metabolizable protein and energy but with a slight difference (2% of DM) in physically effective neutral detergent fiber/undigested NDF at 240 hours (peNDF/uNDF240). Chopped wheat straw and soybean meal replaced a portion of the hay crop silage in the diet. The higher stocking density increased the amount of time rumen pH was below 5.8 and tended to increase the severity of sub-acute ruminal acidosis (SARA). In addition, there was a trend for an interaction between stocking density and diet, indicating greater SARA when cows were housed at a higher stocking density and fed the lower fiber diet, explains Krawczel. While additional peNDF/uNDF240 led to reductions in SARA at both levels of stocking density, the additional peNDF/uNDF240 was of greater benefit to cows with a higher stocking density.

Eating time and rumination time did not differ among the treatments. However, the percent of time spent ruminating in the freestall decreased as stocking density increased. Since resting and rumination contribute to buffer production, perhaps the shift in location where rumination occurred altered the rate of buffer production, thereby increasing the risk for SARA at higher stocking densities.

In the second study, the effect of stocking density (100% and 142%) with feed restriction was examined. Feed restrictions were designed to represent feeding practices commonly seen on farm—feeding for 0 refusals and no early morning push-up. When looking at rumen pH, results showed that overstocking combined with feed restriction increased the risk for SARA by 6x, says Campbell.

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In both studies, overstocked cows prioritized lying over feeding. Cows at a stocking density of 142% would often return from the parlor and lie down in the freestalls instead of eating. These results reinforce earlier research and help demonstrate that lying down is highly prioritized by dairy cows. Research by Gomez and Cook, 2010, showed that, on average, cows spend roughly 11.9±2.4 hours/day lying down, 4.3±1.1 h/d feeding and 2.7± h/d milking. When cows are allowed to meet their natural time budgets, health and production are improved. Overstocking can prevent that.

LOOKING FORWARD

Research in this area is ongoing. Stocking density can be a subclinical stressor that magnifies the effect of another stressor to compound the result. Yes, from a purely economic standpoint overstocking can help maximize profit per stall. But, it also carries a cost. By recognizing the additional stressors that may be present on farm, producers can take steps to minimize the potential negative consequences and better maintain animal health and productivity.

The first step is realizing that overstocking is a subclinical stressor. If you choose to overstock, it is critical to evaluate management and cow environment to further reduce other stressors that may become magnified when cows are overstocked. Examples of changes that can help lessen the effect of overstocking include: feeding a higher peNDF/uNDF240 diet, increasing feeding frequency, increasing feed push up, grouping cows and first-lactation heifers separately, maintaining well-groomed and comfortable stalls and using heat-abatement strategies. If you decide to increase your stocking density in pens, look around your farm to determine what other stressors could interact with overstocking to result in unanticipated problems.

If you would like to learn more on this topic, please see "Interaction of Stocking Density, Cow Comfort, and Productivity: Effects on Lactating Cows" from the 5th International Symposium on Dairy Cow Nutrition and Milk Quality and "Stocking Density and the Feeding Environment" presented at the 2016 Cornell Nutrition Conference for Feed Manufacturers.

HAPPENINGS

Market Insight for Your Operation



STEVEN JOHNSON
On-Staff Merchandising
Expert, Landus Cooperative

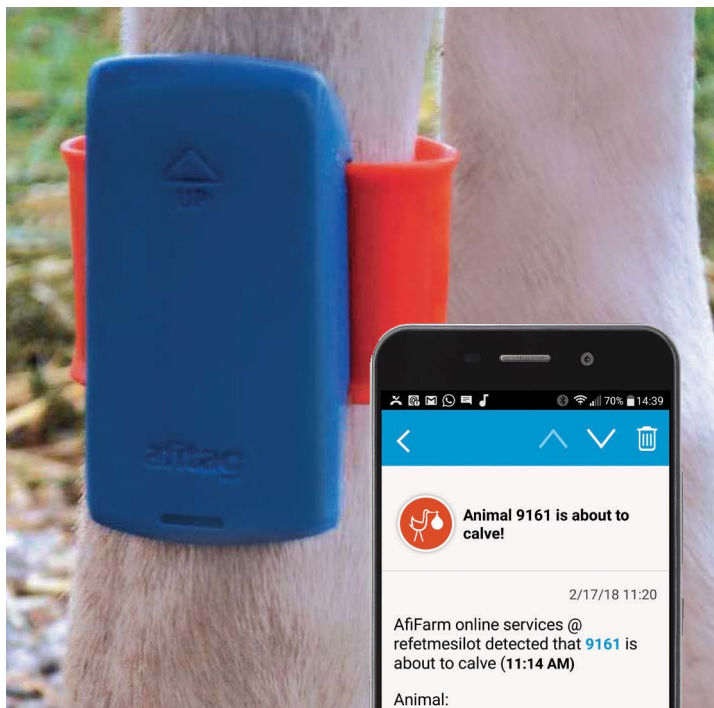
Are you paying attention to what China's doing? Do you understand how Argentina's drought impacts soybean prices? Do you find USDA reports confusing?

Understanding input costs is no simple task. The globalization of commodity markets means your operation can be impacted by events on the other side of the globe. Need help wading through all the information? We've got your back.

The Dairy Nutrition Plus product line, manufactured by Landus Cooperative, is supported by a team of grain marketing advisors ready to help you wade through all the questions. And, each week our on-staff merchandising expert, Steven Johnson, shares his market insights on the Dairy Nutrition Plus website.

Producers have access to more data than ever before. Understanding the impact of complex global issues on agricultural markets can feel abstract and daunting. That's why Steven and the grain marketing team at Landus Cooperative make it their job to aggregate complicated information and translate it into something meaningful for you.

You can access Steven's weekly commentary at <http://www.dairynutritionplus.com/Knowledgebase/Market-Insight>.



Photos courtesy of AfiMilk

FROM THE MATERNITY PEN

Get Calving Alerts

Technology options are plentiful these days. Monitoring devices that can track rumination time, cow activity and the onset of calving are all available to dairies. The latest tool, calving monitors, send real-time alerts when the onset of labor is detected.

An experiment to test the efficacy of the AfiTag II for calf monitoring was reported in the *Journal of Dairy Science* 100, Supplement 2 (185). The system detects changes in a cow's rest and activity, such as those that occur at the onset of stage 1 labor, and sends an alert to a smartphone. If calving is prolonged, the system will send a second alert.

In the study, calving alerts generated by the system were compared to actual calving times recorded by the four participating Israeli dairies. All cows were fitted with a leg tag upon entering the close up pen. During the study more than 230 calving alerts were monitored. Results include:

- Tags were equally effective at detecting labor when placed on the front or rear leg.
- The average time from detection alert to calving was about two hours.
- More than 80% of the alerts were received within four hours of calving.

The calving alert system has been integrated into the AfiAct II cow monitoring system and is now available worldwide. Alon Arazi, veterinarian on the AfiMilk research team, says producers using the calving alert system report that the primary benefits include being able to provide early intervention in difficult births and providing prompt attention to the newborn calf and dam which ensures all calves gets fresh colostrum quickly.

The results suggest that real-time calving alerts can be a useful tool to help dairies detect calving events and provide appropriate, timely care. Several calving detection tools are now commercially available. Do the research to determine which is right for your dairy.

CONSULTANTS CORNER

Cows Need Cooling During Entire Dry Period



GEOFF DAHL

University of Florida

Heat stress at any time during the dry period compromises milk yield in the next lactation. That's what new research from the University of Florida shows.

Our latest study evaluating heat stress during the dry period sought to determine if heat stress during the early or late dry period had an effect on cow performance. Four groups of cows were compared: cows cooled the entire dry period, cows cooled during the first three weeks of the dry period and then exposed to heat stress until calving, cows exposed to heat stress during the first three weeks of the dry period and then cooled until calving, and cows exposed to heat stress the entire dry period. Cooling treatment included shade, fans and soakers. Heat treatment was shade only. All cows were dried off 45 days before expected calving date.

Rectal temperature and respiration rates for cows subjected to heat stress for any length of time were elevated, and dry matter intake (DMI) declined compared to cooled cows. The DMI of cows exposed to heat stress and then to cooling recovered after the switch. Heat stress at any time during the dry period reduced gestation length (273-275 days) compared to cooled cows (277 days).

After calving, milk production was monitored for 140 days. Cooling during either early or late dry period improved milk production during the first three weeks of lactation only. Cows cooled during the entire dry period had increased milk, fat, protein and lactose yield for the entire 140 days monitored. Average milk yield for cooled cows was 94.6 lbs/day. That's a milk production increase of 10 to 11 pounds per day compared to cows that were subjected to heat stress at any time during the dry period.

This new research demonstrates that cows need cooling during the entire dry period. The body of evidence on the importance of cooling dry cows continues to grow. Listed below are seven reasons why you should invest in cooling for dry cows.

- 1. Milk yield.** Cows that experience heat stress during the dry period produce 8 to 10 pounds less milk per day than cows cooled during the dry period.
- 2. DMI.** Heat stressed cows eat less.
- 3. Cow health.** During the dry period, heat stress reduces antibody response to vaccination and white blood cell proliferation is lower. This impacts a cow's ability to respond to pathogens. Research also shows these cows have lower innate immune responses in early lactation compared to cooled herdmates.
- 4. Reproductive performance.** When examining the seasonal effect of when cows are dry we discovered that cows dry during the cooler months of the year have better reproductive performance. Our study showed that cows dry in the cooler months (December to February) had fewer services to pregnancy and fewer days open compared to cows that were dry during the hotter months of the year (June to August).
- 5. Calf performance.** Calves born to heat-stressed cows are lighter and shorter at birth and remain that way through the first 12 months of life compared to calves born from cooled cows. Calves heat-stressed in utero also have lower apparent efficiency of IgG absorption. In addition, more calves born from heat-stressed cows leave the herd due to illness before puberty than calves born from cooled cows.
- 6. Heifer performance.** Calves from heat-stressed and cooled cows reach puberty at the same age. However, calves born from heat-stressed cows require more services to achieve pregnancy and produce about 10 lbs/day less milk in their first lactation than herdmates born from cooled cows.
- 7. Economic impact.** In the U.S. alone, the economic impact of just lost milk production from not cooling dry cows is \$810 million annually.



BEYOND BYPASS

De Novo Fatty Acids May Indicate Rumen Health

Milk analysis tools that can provide actionable data for dairy farm managers; that's what Cornell University researcher David Barbanò's team has been working on. Their results indicate that the level of de novo fatty acids (FA) in milk can be used as a barometer of rumen health and rumen function.

The de novo milk FA (C4 to C14) are synthesized in the cow's mammary gland using acetate and butyrate formed from rumen fermentation of fibrous feed, Palmquist et al., 1993. De novo FA indicate the efficiency of forage utilization.

In a two-year study with Holstein and Jersey cows, researchers found a correlation between the level of de novo FA contained in milk and cow performance. Of the three types of FA found in milk, de novo FA were the most closely correlated to the fat and protein concentrations. As the level of de novo FA increased, so too did milk fat and protein concentrations. In addition, several management factors were related to de novo FA synthesis.

- Cows with less bunk space, <18 inches, had lower levels of de novo FA and therefore lower fat and protein test.
- Higher stocking density, >1.1 cows/stall, was related to lower de novo FA content and lower fat and protein test.
- Higher average ether extract in the ration led to lower de novo FA content of milk.
- Higher levels of peNDF (26.8% vs. 21.4%), as a percent of dry matter, was common for high de novo FA herds.

In a second study, high de novo Holstein herds (26.0% de novo FA) were compared to low de novo Holstein herds (23.8% de novo FA). High de novo herds had higher fat test, 3.98% vs. 3.78%; and higher true protein, 3.19% vs. 3.08% than lower de novo herds which resulted in more income in the farms studied. In herds averaging 67.4 lbs/day of milk, the increased fat and protein resulted in a gross income difference of \$9,125 for fat and \$6,935 for protein per 100 milking cows per year.

To learn more on this topic, please see the paper "New Milk Analysis Technologies to Improve Dairy Cattle Performance."



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QUALITY CORNER

DCAD Is Not One Size Fits All

Negative-DCAD diets work. But, there can be different degrees of application of this nutritional practice, and all can yield good results.

If you are struggling with an extreme approach, your success may lie in a simpler approach.

1. Work with your nutritionist to implement a more moderate DCAD program.
2. Aim for urine pH values between 6.0–7.0, and monitor less frequently than an extreme approach would require. With moderate DCAD, urine pH values may vary more from cow to cow. That's okay. You just want the majority of prepartum cows within that range.
3. Reap the benefits of a simple, safe approach to DCAD.

DCAD success looks different for every farm. And it should. Some dairies have success with a more extreme approach, but others struggle with the increased intensity of management needed to pull it off. Decades of research have proven that a moderate level of DCAD—yielding urine pH values between 6.0–7.0—not only works, but is safe.

Contact our team today if you're interested in learning how SoyChlor can fit into your approach to DCAD.