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Is There a Difference in Morning vs. Evening Cut Hay?

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Before 1995, there was very little research regarding the daily cycling of forage quality and its effects on animal eating behavior and performance. For many years farmers in the Southwest have claimed that hay mowed in the evening was more palatable and their cows performed better by eating it compared to the same hay mowed in the morning. This idea gave rise to questions concerning the diurnal cycling of plants and what effects that cycling may have on animal behavior and how it might be used to benefit animal production. Are there ways to manage the harvest of different forages that significantly improve their quality and value? Can cutting a forage at a certain time of day generate an increase in animal preference, intake, and performance? Research is now beginning to support what was once considered to be an "old wife's tale" and is answering many of these questions.

Cycling of forage quality during the day

Plants, like all living organisms, respond to environmental changes that they experience over time. Light intensity and temperature are the two environmental factors identified as the most important factors that induce changes in plants. The varying amounts of these two factors, results in changes in photosynthesis and respiration. During photosynthesis, plants use light and chlorophyll to convert CO_2 into sugars, which are then temporarily stored as starch. These sugars and starch are called total nonstructural carbohydrates (TNC) and include: starch, fructans, sucrose, glucose, and fructose. TNC is then broken down into energy to be used by the plant by a process called respiration. Photosynthesis only occurs during daylight hours, while respiration can occur both during the day and at night depending upon temperature. During a warm sunny day, plants tend to produce TNC faster than they can use it, resulting in an accumulation of TNC. Once it becomes dark, photosynthesis halts, and the plant begins to respire, metabolize, and use the built-up TNC from the previous photosynthetic period.

The quality of a forage is determined by evaluations of different attributes that can be tested and measured in a laboratory. Nutritionists and farmers may differ on the attributes they see as most important based on their objectives and operation. Nevertheless, total digestible nutrients (TDN), crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), total nonstructural carbohydrates (TNC), and relative feed value (RFV) are typically considered to be important in determining forage quality.

Sugars and starch are the most digestible portion of the plant and are major contributors to TDN. In California, and many other hay markets, energy (measured as TDN) tends to be more highly valued than CP which shows its importance to quality. Higher amounts of TNC have been found in both PM-harvested grass hay and alfalfa, compared to their AM-harvested counterparts. Depending on various environmental conditions, amounts of TNC in forages can fluctuate considerably. Research has shown that by delaying harvest from 9 am to 7 pm on first cutting alfalfa there would be 136 more lbs. of TNC produced per acre (assuming a 2 ton/acre yield). Additionally, they estimate an 81 lb. TNC/acre advantage for PM-harvested fourth cutting alfalfa with a 3/4 ton/acre yield. PM-harvested grass hay is more digestible than AM-harvested, with an increase

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Production Effort Generously Sponsored By MONSANTO

Minimizing Infectious Disease in Baby Calves

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There are many good reasons for every dairy producer to evaluate and consider modifying their calf health program. The cost of dairy replacement heifers should underscore the value of establishing and maintaining high standards for calf health and survival rates. Sick calves incur not only the costs of treatment, but also the long-term costs of reduced growth rates and reduced performance later in life. For some disease problems such as Johne's disease, BVD, and salmonellosis, baby calves can be the primary group to develop new infections and to maintain disease in a herd. It is well worth your time to think about what makes calves sick, and what you can do to decrease disease occurrence rates and death losses.

Birthing problems (dystocia) can have a profound impact on calf health and survival at the time of calving. Beyond the first several days of life, however, the overwhelming causes of calf health problems are infectious disease conditions. The USDA NAHMS Dairy '96 study estimated that scours, diarrhea and respiratory problems accounted for more that 85% of all dairy calf deaths.

The newborn of any species, including dairy calves, are far more susceptible to infectious disease occurrence, on average, than older animals. Educators have long emphasized the critical importance of colostrum in helping the newborn calf resist infection and disease. Efforts to optimally manage colostrum administration are unquestionably very important, and some studies identify this as the single most important aspect of newborn calf health management. Many dairy producers have gotten this message and responded by improving their colostral management.

Unfortunately, this approach only addresses one half of the infectious disease equation. The likelihood that a calf will develop infection depends on the balance between calf resistance to disease and calf exposure to infectious agents. Colostrum management helps the calf's disease resistance. With high exposure, however, even the calf with optimal protection will succumb to disease. It is high time for dairy producers to get more serious about reducing calf exposure or contamination.

There are numerous ways to improve the hygiene of the calf environment, which fall under the general category of biosecurity management. Following are some of the specific steps that every dairy producer can implement:

First, dams should be placed into clean, dry, individual calving pens at the time of delivery, to minimize the likelihood of calf contamination with infectious agents being shed by infected cows. Ideally, the dam should be healthy and free of current infection, but if she is shedding disease agents, at least the individual calving pens can decrease the likelihood she contaminates calves other than her own.

Many infectious diseases can spread from dams to newborns. Therefore, the time of separation of the calf from the cow can have an impact on the transmission of these diseases. According to the Dairy '96 survey, only 13% of operations separated newborn calves from the dams within one hour of birth. Twenty-five percent of operations separated the calves beyond 12 hours after birth. Fifteen percent of operations allowed calves to stay with their dams more than 24 hours. Other studies have shown that the longer the time before removal of the calf, the greater the likelihood of calf disease.

Also in the Dairy '96 study, thirty percent of operations failed to wash teats and udders before colostrum was collected for administration to the calves. Approximately 55% of operations used the calving area as a hospital area for sick cows. Fecal contamination is a common means for spread of many enteric infections. Therefore keeping sick cows out of the maternity pen, and cleaning the udder before milking are important hygienic measures.

Colostrum administration can help protect calves from disease, but can also help spread disease in some circumstances. Just like milk sold commercially, colostrum should be promptly chilled (or frozen) if it is not immediately fed to calves. Leaving colostrum or waste milk warm encourages the growth of bacteria, such as Salmonella, and can serve as a primary means of infecting calves.

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Learning Spanish: The Four Week Crash Course

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I didn't always speak Spanish. My first veterinary job was in Chino, California where I had ample opportunity to learn Spanish in the field. I remember in vivid detail the day I decided I would learn to speak Spanish: I was alone with a fresh cow in the middle of a dry lot maternity pen, carefully cleaning a prolapsed uterus before replacing it. At that moment one of the employees stopped by to check on me, and I waved him over to help. He stood to one side of the down cow, holding the tail. There was no conversation, of course, because neither of us knew the others' language. Just then, as I lifted the uterus into my arms, the cow began struggling to stand up. I had a vision of the cow's womb falling to the ground as she leaped to her feet and took off across the dry lot, uterus flapping in the breeze. Cradling the uterus, I cried to Enrique, "Sit on her back!" but sadly to no effect. In desperation, I vigorously patted the cow's back, attempting to convince him that this was an irresistibly comfortable spot where he simply MUST sit down at once. At last, in utter exasperation at my failure to communicate, I dropped the uterus in the dirt and climbed up on top of the cow, pointing and illustrating to Enrique exactly what I intended.

If you've spent any amount of time working on Western dairies, you've surely had something similar happen to you at one time or another. This was a moment of clarity, during which I decided to make a conscious effort to learn the basics of the Spanish language. I didn't have any lofty goals of mastering the language: I merely wished to be able to communicate with simple phrases as needed.

The best way to learn Spanish is to immerse yourself in the language by living in México for 4 weeks, studying in a classroom situation at least 5 days a week. Living in México will force you to communicate in Spanish every day, asking directions, riding the bus, and rubbing elbows with the locals. Be sure to stay with a family, or with other serious students. You will waste your money if you stay in a hotel or apartment by yourself, not venturing out to speak Spanish except for classroom time. It's best to take all 4 weeks at once, but you could also do two 2-week trips if necessary. Four weeks may sound like a long time, but remember: you will be able to use this knowledge for the rest of your life! Speaking from experience, and from listening to others who have studied in Mexico, these four weeks will honestly fly by before you know it.

Spanish classes at your local community college may be beneficial, but realize that you will ONLY speak Spanish during those few hours a week that you are sitting in the classroom, unless you are very self-disciplined. In my opinion this should be a last resort, if you decide that traveling to México is impractical, and that you are unwilling to "teach yourself" at the dairy.

Choosing a school in México will be easier if you first make a list of your preferences. Answer these questions, then get online and start hunting! Good luck!

1) What size town do you want to live in?
2) What type of extracurricular activities do you enjoy (museums, sightseeing, hiking, swimming, etc.)?
3) What time of year will you likely go?
4) Which climate do you prefer?
5) Do you want to live with a family, or with other students?
6) What class size do you prefer?
7) What age of students do you want to study with?
8) How many days a week can you tolerate sitting in a classroom?
9) Would you prefer to have _ day of class and _ day of activities?
10) How will you use your Spanish (work, travel, other)?

Websites to get started:
http://spanish.about.com/library/weekly/aa102898.htm (common questions answered)
http://spanish.about.com/cs/spanishlanguages1/ (list of schools in México)
http://www.amerispan.com/study_spanish/ProgramCountryDetail.asp (list of schools in México)
http://www.learn-spanish-language.com/Spanish_schools_mexico.htm (links to schools, dictionaries, CD's)
http://www.wunderground.com/global/MX.html (Current weather report, major Mexican cities)

(Hay, continued from page 1)

of *In vitro* true dry matter disappearance (IVTDMD) of 1.5-1.9% in the PM-harvested hay. IVTDMD data for PM and AM-harvested alfalfa have not yet been published.

Most forage scientists agree that the cell wall and protein component probably change very little over the day, while sugars and starch increase due to photosynthesis. The increase of TNC would lower the percentage of plant matter composed of fiber, minerals, and crude protein which would consequently reduce the proportion of ADF, NDF, and CP. Research in California and North Carolina found that ADF and NDF are lower in alfalfa cut in the late afternoon to evening. There is also evidence of lower ADF and NDF in evening cut tall fescue.

Animal Preference and Performance

Livestock have an ability to make a decision on which forage or forages to consume when multiple options are available. Animals will also consume more of a "preferred" forage, and therefore increase their dry matter intake (DMI). In a preference trial with cattle, sheep and goats it was found that all three species preferred PM-harvested fescue grass hay over AM-harvested grass hay. Intake rates for sheep and goats were significantly higher for PM-harvested grass hay and cattle had a significantly higher DMI for the PM-harvested grass hay.

Dairy cattle have shown a positive effect on performance due to PM-harvest alfalfa. In a production test, dairy cattle fed a TMR containing 40% PM-harvested alfalfa compared to AM-harvested alfalfa, increased their DMI by 8% and produced 8% more milk. In England, dairy cattle under a strip grazing management produced 8% more milk when the fence was moved after the PM milking (4 pm) instead of the AM milking (6 am).

Management and Application

From an economical standpoint, a forage producer and livestock producer would have to be convinced that higher TNC forage would return a profit. In most cases, a forage producer could change the hours that he/she operates the swather without causing an increase in cost or labor. In some smaller operations where manpower may be limited, this change may result in some additional cost to the producer, which would have to be made up in additional revenue gained from the change. Some situations would require the additional investment for proper lighting on swathers to harvest at night. If there is little additional cost, all of the evidence would suggest that hay producers could take advantage of PM-cutting.

When it comes down to how much a PM-harvested forage is worth vs. AM-harvested forage, it takes convincing the livestock producer of the value of the premium quality forage. If a hay grower is dealing with a dairyman who thinks that TDN and RFV are most important, he or

(Hay, continued from previous column)

she may be able to sell this additional value. One study estimated that a 1% decrease in ADF is worth $10-15/ton at today's hay prices for premium quality alfalfa hay.

(Calf management, continued from page 2)

Bacteria in milk can originate directly from the udder, or from environmental contamination. Studies have shown that waste milk typically contains more bacteria than colostrum or bulk tank milk. All waste milk fed to calves should be pasteurized to help decrease the likelihood of disease transmission. An alternative is to use milk replacer, but replacer can also be contaminated if appropriate hygienic measures are not followed during preparation. Similarly, all feeding and mixing equipment should be regularly and thoroughly sanitized just like milking equipment.

Calves should be individually housed for the first weeks of life, preferably until weaning. The calves should be separated by a minimum of 4 feet, but preferably 10 feet between calves. Hutches should be washed and sanitized before arrival of a new inhabitant.

Workers and calf feeders should follow good personal hygiene procedures. All personnel handling calves should traffic and work from the youngest to the oldest calves. Fecal contamination of the hutch environment, vehicles, clothing, and the workers themselves should be avoided.

Producers should combine these hygienic/biosecurity measures that decrease exposure to infection, with colostrum management that improves disease resistance, in order to maximize the benefit of both sets of procedures. Following these simple rules can greatly enhance calf health.

Western Dairy News *is published as a service to the people interested in the health and welfare of the western dairy industry. Archives of this publication may be found at http://animalscience-extension.tamu.edu/dairy/wdn/wdn.html*

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