Time for Technology

"Light " is the Third "Freedom" of the CowSignals Diamond

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In previous issues, we introduced the "CowSignals" concept and the philosophy that low stress management of the dairy herd provides cows with the "six freedoms of the pasture" illustrated in the "CowSignals diamond". These "freedoms" are unrestricted access to feed, water, light, air, rest and space. Every farmer trouble shooting their own dairy facilities and management and every advisor doing so for a client, brings their own set of biases to the situation. Applying the mantra of "feed, water, light, air, rest and space" to every assessment prevents tunnel vision and ensures every aspect of meeting the needs of the cow is given consideration.

The CowSignals Diamond can help identify weak spots in management

As the days of October and November are getting shorter, this is a good time of year to think about the importance of light to the heath and productivity of the cows. Research studies conducted 10 to 15 years ago showed that with proper attention to lighting it is very easy to get 2 to 3 liters more milk per cow. The lighting strategy needed to achieve this is fairly simple to apply in most barns, but in my experience less than a quarter of the dairy barns I visit are getting this job done correctly.

The recommended light regime for milking cows and also for growing heifers is to provide 16 hours of light at an intensity of at least 15 foot candles (160 lux), followed by 8 hours of darkness with a light intensity of less than 5 foot candles (54 lux). Research has shown that growing heifers respond to this by growing more mammary tissue resulting in more milk after calving. Milking cows have been shown to produce enough more milk to pay for the electricity and pay back the entire investment in lights and timers in less than a year. Any electrician worth his salt can do a lighting plan to tell you what lights are needed to provide the recommended 160 to 200 lux, and nearly all new barns set out to provide that. Yet even in barns that are just 5 or 6 years old I often find the lighting is no longer up to snuff. Fly poop on the fixtures has reduced light output, fly poop on the ceiling has reduced light reflection and the metal halide and high pressure sodium lights that were so common until a few years ago, both decrease their light

output gradually over time. Management of the 16 hour day length also gets neglected when timers break or no adjustments are made for changes in natural day length.

Unfortunately our eyes are of little value in assessing light intensity. Because our eyes compensate by adjusting the size of the pupil to let in more or less light, we don't realize the vast difference between the 5000 foot candles we are exposed to outside on a sunny day and the 20 foot candles in a well lit room. I have been told that light intensity in a barn is okay if it is "good enough to comfortably read a newspaper by", but I can read a newspaper at 3 foot candles and that is well below the threshold for a photoperiod response in cows.

The only answer I can offer to properly evaluate barn lighting is to measure it with a light meter. I bought mine on the internet for $80 and I encourage dairy producers to do the same. Perhaps your vet or feed supplier can provide one but unless they work nights, they won't be there when it needs to be used. Taking measurement in several places in the barn after dark with the barn lights on and also with them off two or three times per year is the only way to be sure the light intensity is still adequate. When taking measurements I hold the meter about 3 feet off the floor, on an angle similar to the placement of the cow's eye to give a true picture of the light entering her eyes.

Many barns also fail the darkness test because too many lights are left on during the 8 hour dark period. Contrary to popular belief, cows do not need light to find the feed manger or the water trough or freestall, nor do they need light to find the robotic milking stall, but they do need the nightly period of darkness to stimulate milk production. If you need to observe or handle cows during this dark period, for example when managing a calving pen, red incandescent bulbs with 7 to 10 watt output hung 20 to 30 feet apart will provide enough light to see without messing with the photoperiod effect.

One aspect of the photoperiod effect that is sometimes difficult to apply is the recommended practice of providing a shorter day length during the dry period and the last 60 days before first calving for heifers. Several studies have shown that this is an important part of getting the cows to respond to lengthening of the day at calving time. If these cows are in the same barn as the milking cows, the timed lighting over the milking cows should be directed away from the dry cow area. Some of this research was done with 16 hours of darkness and 8 hours of daylight for dry cows, and if it is practical to offer that, it could prove beneficial. But in most modern well ventilated barns, there is no practical way to shorten the day beyond natural day length, so just keeping the dry cows out of the supplemented light area is the best we can do.

But the need for good lighting doesn't just start and end with photoperiod effects. The people working in the barn need enough light to do a good job of observing the cow signals that are critical to management. In general, the 10 to 15 foot candles

recommended is also enough for that but in areas where you need to observe more closely, such as the milking parlour, the handling chute and the calving pen, I recommend a light intensity of 25 to 30 foot candles. Ideally both at the chute and in the parlour, some of that light should be mounted lower and directed on the udder and belly area. The quality of light is also important. Although mercury vapour and high pressure sodium lights are very economical, they are notorious for providing poor colour rendition. In the world of CowSignals, the difference between blood and manure on a cow's tail is critical but very difficult to see with this type of lighting. Working in a well lit barn is always more pleasant than a dark and dingy one. Happy people will make cows happier as well, and very likely the cows also prefer a well lit living area.

Good natural light in a handling area makes for a more pleasant working environment. These areas also need better artificial lighting than the rest of the barn.

But cows do not appear to be very fussy about the type of lighting. LED, T8 fluorescent and metal halide all offer viable options that vary in their suitability, cost and power consumption, but at the right intensity, all are acceptable to cows.

With more light, cows also show stronger heat signs. For early morning heat detection, set the timer that supplements natural light so that barn lights come on a half an hour before you arrive. Then make observation for heats your first task of the day and you will see activity you otherwise miss.

Ideal lighting systems include a timer and light sensor. For example, the timer turns the lights on at 6 am, a half hour before the start of morning chores. A sensor over rides the timer and shuts the lights off when the light level outside is high enough to provide 15 foot candles inside from natural sunlight. The sensor cuts out the over ride when natural light outside is insufficient to provide 15 foot candles inside, and the timer shuts the lights off at 10 p.m.

On bright sunny days, cows in freestall barns with open side walls and cows on pasture will shun the bright light, probably mostly to avoid the heat associated with the sunlight. When building new, I like to orient barns with the gable ends north west and south east, partly to catch the prevailing south west wind on the open side on hot days, but also to

minimize the penetration of the afternoon sun. To increase natural light in the barn in winter, light panels in the south or southeast gable end and ridge ventilation designed to admit natural light can compensate for the lower light penetration through the curtained side walls. barns built this way will require fewer hours of supplementary light thereby reducing electrical costs.

Barns with light panels in the ridge and gable ends require fewer hours of supplementary lighting.

Like people, cows need to adjust their eyes to changes in light intensity. When the areas cows travel in include sudden transitions from bright to dark or vice versa, this can be very upsetting, especially when they are being herded or chased. Shading the bright areas with more overhang at the eave, or coarse shade cloth on the top of the wall of the link to the parlour and extra lighting in the dark spots, can overcome some of these problems. I have seen situations where cow traffic around milking parlours has been vastly improved with better, more uniform lighting.

When proper barn lighting results in happy, healthy cows, the other outcome will be happy farmers, and that is the ultimate goal of the CowSignals concept.