Tech Seminars

Tech Seminar #04 – Calf Management in Summer, Part 2

My name is Dr. Jim Quigley, author and webmaster of calfnotes.com. Thanks for stopping by, and I hope you'll find this calf note to be informative. This is calf note number 220, entitled Calf Management in Summer, Part Two. In this video, I'll discuss some practical aspects of keeping calves cool in the summer. Okay, let's get started.

In our previous calf note, number 219, we looked at the physiology of heat stress. Now, we'll look at some management strategies to reduce heat stress in young calves. These will be addressed in four parts: moving air, providing shade, bedding types, and nutritional strategies.

The first approach is to move air. Of course, this is an important approach to cooling cows, and it works well with calves, too. Many calves are housed outdoors in hutches, so air movement depends on the type of hutch and whether it contains vents or windows. Even so, one approach to improving airflow and summer heat is to raise the back of the hutch with one or several concrete blocks.

Research done at the Nurture Research Center in New Paris, Ohio, and at Washington State University show that elevating the rear of a hutch will reduce the indoor temperature and improve air quality, indicating greater air turnover inside the hutch. Using fans within barns is also effective. This photo is from the Nurture Research Center at Provimi, North America in New Paris, Ohio in the U.S.

We can see the fans are positioned to move air at the calf's level. These are quite effective, as we can see in the graph. Calves that were cooled had greater starter intake and higher average daily gain compared to those not cooled. Efficiency of growth was also improved, suggesting that cooled calves used less energy for maintenance and were more efficient in growth.

A study in Florida looked at using cooling fans for young calves. This study also evaluated the effects of cooling the dry cows, but we don't have time to discuss the prenatal aspects today. Postnatal cooling of the calves was achieved with fans, and the calves were housed in sand-bedded pens in an open-sided barn with mobile curtains.

Here we can see the body temperatures of calves over a 24-hour period. Similar to the data from the Nurture Research Center, we see that minimum daily temperatures are reached at about 700 hours. Note the difference in temperatures between the cooled calves on the bottom and the calves not cooled, which are consistently above the cooled calves.

Also note from about 1800 hours, the temperature of the cooled calves declines more than those non-cooled calves. In this same study, we see that respiration rates, skin temperature, and rectal temperatures are all lower in calves that were cooled by fans, which are the white and light gray bars.

Finally, we see that cooling calves allowed them to drink more milk and eat more calf starter, although starter intake during the 56-day trial was quite low.

Hutches vary in quality. Better hutches have ridge vents and windows that allow more air movement. Some hutches have no provision for ventilation. Calves in the hutch on the left will be very stressed if they're in a hot environment.

Generally, shade improves indications of heat stress when calves are exposed to heat. For example, translucent hutches or those housed outside. Some trials have shown no response to shade when THI is not high or there is night cooling.

The photos on the right are calf ranches in California. Both invested significant money to put shades over the wooden calf hutches in the Central Valley of California. Though it is usually dry in the summer, it is common for temperatures to exceed 40 degrees C on some days.

To reiterate the point that calf hutches vary in quality, these dome hutches are translucent and permit light and heat to pass through. In the summer, these hutches can become very hot.

The study done in Missouri in the central part of the U.S. shows that these hutches without shade can become quite uncomfortable for calves. Note that the respiration rate of calves in the unshaded hutches was much higher than the calves in the shaded hutches.

The hutches in the photo above were placed under trees to keep them from becoming too hot. The bottom picture shows similar hutches with a shade to protect the calves.

This is a very interesting study conducted in Europe and reported in 2019. The researchers placed calves in hutches, and all were shaded on day one. Then on days two to five, the shades were removed from half the calves.

Average temperatures and high temperatures are here for each day. The first graph shows the calculated THI for calves on each day. THI in both groups were above 78 for at least part of the day on days one to four.

Note that the THI of unshaded calves reached 86 on day two and exceeded 80 on three of the five days. The right graph shows the production of salivary cortisol, which is an indicator of stress.

Note the dramatic increase in both groups on days two, three, and four, but the increase was much greater in calves that were not shaded.

In the final study we'll look at regarding shade, the same researchers used plastic hutches and shade cloth to monitor THI in calf metabolism.

Note that the THI of unshaded calves on day two were well above 80, indicating significant heat stress. All indicators of stress were elevated when calves were not shaded, but respiratory rate and heart rate increased most dramatically.

Some researchers have tried to cover hutches with aluminum to eliminate heat in the summer or to maintain heat in the winter. The results suggest this may not be a good option for eliminating heat.

So what effect does bedding have on heat stress? Well, it turns out it has a big effect. We know that wheat straw bedding is the warmest type of bedding, so in the summer it may be uncomfortable.

The graph at the bottom of the slide shows the temperatures of different types of bedding, and wheat straw was the highest. Sand and fine ground stone were coolest, but also dirtiest.

Rice hulls and wood shavings were cooler and just as clean, so they make a good alternative to straw. Generally, inorganic sources, such as sand and gravel, are the coolest.

Another problem with straw is that it's the favorite of flies. In the summer, flies can be a real problem. In all cases, straw produced more flies.

The picture on the right is a calf in a dome hutch. It's very hot, and the specks on the photo are actually flies. This calf was highly stressed and uncomfortable in this shelter.

Let's take a look at the nutritional approaches to controlling heat stress in calves. First, we'll discuss water. It is by far the most important nutrient in the summer and often the most neglected.

We know that water is always important, but it takes on special importance in the summer. Water intake increases dramatically in the heat. Water should be offered from day three and always thereafter, clean and available at all times.

In studies conducted over several trials, water intake increased with temperature. Calves drank about two liters per day at 15°C, but more than three liters when temperatures exceeded 30°C.

As temperatures rise and calves increase respiration and sweating, moisture loss increases. Calves may become acidotic due to panting. Providing electrolytes in an additional feeding is increasingly common.

Electrolytes provide additional water, energy, and electrolytes to alleviate acidosis. They are usually offered between milk feedings and are never added to milk or milk replacer.

We also need to consider how we feed starter and milk. Heat increases maintenance energy requirements by 20–30%, while starter intake may decline.

Therefore, additional milk feeding may be necessary to maintain growth. Research shows that increased milk feeding improved daily gain and feed efficiency without reducing starter intake.

The final nutritional approach is feed additives. While many products are marketed, there is limited scientific evidence supporting their effectiveness in calves during heat stress.

So, let's summarize our approach to heat stress.

First, moving air: use fans, raise hutches, open windows, and orient hutches to catch prevailing winds.

Provide shade: orient hutches properly and cover translucent hutches.

Bedding: avoid straw in summer; consider sand, shavings, or wood chips.

Control flies: use appropriate bedding and integrated pest management.

Water and electrolytes: ensure ad-lib water and consider electrolyte feeding in high temperatures.

Liquid feed: increase milk feeding to compensate for reduced starter intake.

And finally, feed additives: use cautiously, as evidence in calves is limited.