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Calf Note #220 – Calf Management in Summer, Part 2

Introduction

This Calf Note is part 2 of the “Management in Summer” series and considers some management strategies we can use to reduce effects of heat stress on young calves.

This is a video Calf Note – to view the video, follow this link:

https://youtu.be/xuuyzP_cRGg

The script for the slides in the presentation are below.

1. Welcome to Calf Notes! My name is Dr. Jim Quigley, author, and webmaster of Calf notes.com. Thanks for stopping by and I hope you’ll find this Calf Note to be informative. This is Calf Note #220, entitled “Calf Management in Summer, Part 2”. In this video, I’ll discuss some practical aspects of keeping calves cool in summer. Ok, let’s get started!
2. In our previous Calf Note, 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 4 parts, moving air, providing shade, bedding types and nutritional strategies.
3. The first approach is to “move air”. Of course, this is an important approach to cooling cows, and it works with calves, also.
4. 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 air flow in summer heat is to raise the back of the hutch with one or several concrete blocks. Research done within Cargill 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.
5. 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 US. 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.
6. 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 won’t have time to discuss the prenatal aspects today.

Postnatal cooling of the calves was achieved with fans and calves were housed in sand bedded pens in an open sided barn with mobile curtains.

7. 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 0700 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 that from about 1800 hours, the temperature of the cooled calves declines more than the non-cooled calves.
8. In this same study, we see that respiration rates, skin temperature and rectal temperatures are all lower in calves that are cooled by fans, which are the white and light gray bars.
9. Finally, we see that cooling calves allowed them to drink more milk (they were offered ?? Liters per day), and calf starter – though starter intake during the 56-day trial was quite low.
10. 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 in a hot environment.
11. Generally, shade improves indications of heat stress when calves are exposed to heat (translucent hutches, 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 two large 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, it is common for temperatures to exceed 40°C on some days.
12. To reiterate the point that 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 US, shows that these hutches without shade can become quite uncomfortable for calves. Note that the respiration rate of calves in the unshaded hutches are much higher than the calves in shaded hutches. The hutches in the photo above were placed under the trees to keep them from becoming too hot. The bottom picture shows similar hutches with a shade to protect the calves.
13. 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 1. Then on days 2 to 5, 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 1 to 4. Note that the THI of unshaded calves reached 86 on day 2 and exceeded 80 on 3 of the 5 days. The right graph shows the production of salivary cortisol, which is an indicator of stress in the calves. Note the dramatic increase in both groups on days 2, 3 and 4, but the increase was much greater in calves that were not shaded.
14. In the final study we'll look at regarding shade, the same European researchers used plastic hutches and shade cloth, as we can see in the photos above to monitor THI and calf

metabolism. Note that the THI of unshaded calves, on day 2 were well above 80, indicating significant heat stress on these calves.

15. We can see that all indicators of stress were elevated when calves were not shaded, but respiratory rate and heart rate increased most dramatically. This probably shows how hard the calf is working to eliminate body heat and keep body temperatures close to normal.
16. Some researchers have tried to cover hutches with aluminum to eliminate heat in the summer or maintain heat in the winter. The results suggest this may not be a good option for eliminating heat.
17. 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. It is the warmest type of bedding, so in the summer, it may be uncomfortable. It also promotes growth of flies more than other types of bedding. The graph at the bottom on the slide shows the temperatures of different types of bedding and wheat straw was the highest. Sand and fine ground stone were coolest, but were also the dirtiest. Rice hulls and wood shavings were cooler and also just as clean, so they make a good alternative to straw. The two graphs on the right also show differences among bedding types. Generally, inorganic sources such as sand and gravel are coolest.
18. Another problem with straw is that it is a favorite of flies. In the summer, flies are a real problem. The research on the left shows the number of house and stable flies in various types of bedding in trials conducted over 3 years. In all cases, straw produced more flies. The picture on the right is a calf in a dome hutch. It is very hot and the specs on the photo are flies. This calf was highly stressed and uncomfortable in this shelter.
19. Let's take a look at nutritional approaches to controlling heat stress in calves
20. First, we'll discuss water. It is by far the most important nutrient in the summer and often the nutrient most neglected. We know that water is always important, but it takes on special importance in the summer. Water intake increases dramatically in heat. Water management becomes more important than ever. It should be offered from d 3 and always thereafter. Make sure it is clean & available - always
21. This is some work I conducted about 20 years ago. We fed over 600 calves with water, milk replacer and calf starter as part of several studies. We measured water intake from the beginning of the study, when calves were about 5 days old, for 56 days. In total we had over 33,000 daily observations of water consumption and these values were regressed on various variables, including daily temperature. You can see in the graph that, if we hold all other variables constant, that water intake increases with increasing temperature. In these studies, calves drank about 2 L of water per day at 15 degrees, but more than 3 L when the temperature exceeded 30 degrees.
22. As temperatures rise and calves increase respiration and sweating rate, moisture loss increases. Calves may become acidotic due to increased panting. Providing electrolytes in an additional feeding is increasingly common practice in the US.
23. Use of electrolytes in an additional feeding can provide calves with additional liquid (water intake), energy and electrolytes to alleviate acidosis. The electrolytes are usually offered between

milk feedings, though some farmers may offer in the cooler part of the evening. Electrolytes are NEVER added to whole milk or milk replacer.

24. We also need to think about how we feed starter and milk. As calves expend more energy to defend their body temperature, they use more energy, increasing their maintenance energy requirement. Some researchers suggest the increase may be 20 to 30%. Therefore, knowing that starter intake may decline, we should consider feeding additional milk to give the calf enough energy to maintain adequate growth.
25. This is the Florida study wherein calves were cooled with fans or not cooled. We can see the cooled calves consumed more calf starter from 3 to 8 weeks of age, but especially from 6 weeks. This difference in intake could have important effects on rumen development and the calf's ability to respond to weaning.
26. This research shows the effect of heat on growth and intake in calves in central Europe. These calves were raised normally, but during the second period (the red bars in the graph), the farm experienced a heat wave. During the heat period, there were 66 days of THI > 72 and 26 with THI >78. We can see that gain declined, water intake increased dramatically, and starter intake declined compared to the previous period.
27. This recent study by Rivas et al shows that additional feeding during heat stress can be beneficial. We can see the temperatures and humidity during the trial. Calves were fed a CON level of 0.55 kg per day of a 20/20 milk replacer; an intermediate level of 0.66 kg/d of replacer or a high level of 0.77 kg per day of the same 26/17. Calves were weaned on day 56. We can see that additional milk feeding had a positive effect on daily gain and feed efficiency and did not reduce starter intake.
28. The final nutritional approach to helping calves during heat stress is by using additives. There are a wide number of products that propose to support calves during heat stress, but there is actually very little data available in the scientific literature to support the claims.
29. Many feed additives used for COWS during heat stress are designed to support rumen function, such as live yeast. Still others try to support gut health and minimize the effects of "leaky gut" that can occur during heat stress. Unfortunately, we don't have a lot of information on whether leaky gut occurs in calves, at what THI and what are the effects on metabolism. Therefore, at this moment it is difficult to recommend specific additives for calves during heat stress.
30. So. Let's summarize our approach to heat stress: **MOVE AIR:** Use fan indoors; Raise back of hutches; Hutch windows open; Face hutches to catch shade. **PROVIDE SHADE:** Orient hutches to provide shade during the day; Translucent hutches must be covered. **BEDDING:** Straw is warmest type of bedding. Consider shavings, wood chips, sand; ensure adequate drainage and calf comfort. **CONTROL FLIES:** Summer flies are a large stress to most calves; Straw bedding promotes most flies; Sand, shavings reduce flies
31. Consider fly bait, in-feed fly control; Have an integrated pest plan. **WATER and ELECTROLYTES:** Water intake increases considerably in the heat; Ad lib water is essential; Consider feeding 2 L electrolytes midday when daily high temperatures are >30°C. **LIQUID FEED:** Heat reduces or delays dry feed intake; Maintenance ME requirements increase; Increase

liquid feeding will help calves until starter feed increases. **FEED ADDITIVES:** Consider strategic feed additives, remember, additives for cows may not work the same in calves

32. Calves experience heat stress. There is no doubt. However, with the right kind of management we can reduce effects and maintain good growth and development.

Written by Dr. Jim Quigley (27 September 2020)

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