Feedlot rumen development from new calf to finish ration and working to avoid digestive disease as a veterinarian

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Abstract

Mitigating digestive mortalities begins when new cattle arrive. The proportion of U.S. feedlot mortalities attributable to digestive diseases accounts for 19.5% to 28.4% of all mortalities. Veterinarians provide a key role in the health and husbandry of cattle feeding operations. It is important to not overlook certain aspects of cattle feeding such as water, rest and food for newly received cattle. Water plays a crucial role in an animal's physiology/homeostasis. Rest from a stressful event, such as transportation, should be addressed prior to processing. A general industry recommendation for rest after transportation is one hour of rest for every hour of transportation. Food in the form of good-quality long-stem hay must be provided at arrival along with fresh water. The next phase is transitioning cattle to a high-grain diet. The transition period typically lasts around 28-45 days, which coincides with the highest risk period for bovine respiratory disease (BRD). Proper management during the transition phase relies on bunk management, reading the cattle, monitoring the weather and proper communication between personnel working with and/or feeding the cattle. Failure in one or more of these areas will likely result in undesirable returns.

Key words: feedlot, health, nutrition

Introduction

There are roughly 30-32 million beef cattle in the United States and approximately 15 million are placed on feed throughout the U.S. annually.[5] Cattle are typically raised on pasture as calves and finished out in confined feeding facilities on grain-based diets to optimize gain and growth for human consumption. Getting cattle from a forage-based diet to a finishing grain diet involves many factors (ex. animal's nutritional status, location/travel, disease burden, weather) and disruption in the process can lead to unintended health consequences for the animal and cattle feeder. Meyer and Bryant (2017)[2] reported that digestive disease accounted for 19.5%-28.4% of all feedlot mortalities, the majority of which were feedlot bloat. The transition period also coincides with the greatest risk for bovine respiratory disease (BRD). The major metabolic disease of concern during transition is typically acidosis (grain overload or overload) and sub-acute acidosis (sub-acute ruminal acidosis, SARA). Acidosis or sub-acute acidosis is a condition where cattle consume a large amount of highly fermentable carbohydrates, and the rumen microbial population metabolizes those carbohydrates to volatile fatty acids and creates the by-product of lactic acid. When a cattle's ruminal pH drops below 5.2 (acidosis), the animal is at a high risk for the cascade of disease events. The objective of this presentation is to identify areas where veterinarians can help producers optimally transition newly received cattle to finishing diets while avoiding detrimental health consequences.

Receiving cattle

Receiving cattle to a feeding operation should address three major animal needs: water, feed and rest.[4] Water is often one of the most overlooked nutrients for living creatures. Providing adequate, clean, fresh and cool water should be one of the first priorities for cattle feeders. Cattle will typically enter receiving pens and travel the parameter to familiarize with their new surroundings. For cattle that are unfamiliar with an automatic waterer, producers keeping an open float to simulate the sound of running water to gain an animal's attention is a common practice. Cattle can drink 3 times their normal dry matter intake (DMI) during normal conditions and can drink up to 5 times their DMI during heat stress periods.[4] Things to consider as a veterinarian: are the waters easy to access? i.e., can shorter cattle reach the water? How often are waters cleaned at the feeding operation? During heat periods, how many linear inches are available for cattle to access water, and what is the flow rate? Can the supply keep up with demand? Cattle will typically increase their water consumption after their first eating period. This can cause a large demand on the water system of a facility. Cattle may have access to water, but the flow cannot keep up with demand causing water deprivation to some of the cattle population. In situations where cattle refuse to eat offered feed, especially when previous feed call has been consumed, the waterer should be investigated for stray voltage. Cattle will often act scared and reluctant to the water. Caution should be used when investigating stray voltage on automatic waters. The author recommends using a voltage meter or shutting off the electricity to the water. Voltage meters can detect stray voltage in the water without risking harm from electrical shock. If stray voltage is detected, shut off power to the water and have a professional determine the root cause and fix the issue.

A rest period from transport also needs to be established. While in transport, cattle lack the opportunity to lay down and rest as part of their normal behavior. Therefore, cattle producers should incorporate an ideal environment of rest to accommodate newly received cattle. Ideal environments should include dry, clean areas for cattle to lay down. During inclement weather, proper bedding material should be available for animals. An industry rule of thumb is 1 hour of rest for each hour of transport.[6] Animals being transported are deprived of both food and water for potentially long periods of time. Allowing access to food in the form of long-stem hay is necessary for both animal and rumen microbial needs. Currently there are many options available to deliver hay to pens either on the slab or in a bunk. Cattle can also benefit by delivery of starter (low-energy) rations top-dressing hay in the bunks. Top dressing can help train cattle that have not had complete rations or known as "bunk-broke cattle."

Starting on feed

Cattle being started on feed should be offered good-quality long-stem hay along with their starter ration for the first 3-5 days or until cattle are consuming the starter ration at approximately 1% of their bodyweight (BW) on a dry matter (DM) basis. Hay can be discontinued when all cattle are coming to the bunk and eating starter diet. Literature supports an established goal of getting cattle to eat 1.5% of BW by 2 weeks on feed to minimize loss in performance and minimize health detriments.[4] Alfalfa-mixed hay can also be offered in the beginning, but caution should be addressed due to a potential risk of frothy bloat development. This can be mitigated by limiting total hay offered for consumption to <1.5% of BW. Adequate bunk space should be provided and will range depending on manager and type of cattle. Younger cattle typically are given more bunk space to avoid crowding and encourage eating behavior. Typical bunk space for calves can range from 12-18 linear inches per animal (30.5-46 cm). Older or larger cattle that are bunk broke are typically fed with 8-12 linear inches of bunk space per animal (20.3 to 30.5cm).

Equally important, some general knowledge of feed stuff should be exercised. Ration balancing is beyond the scope of this presentation, and one should seek further educational material if interest is desired. Rations are built to meet and/or exceed an animal's nutritional needs which are based on the animal's predicted gain and dry matter intake. The typical components that comprise a ration (total mixed ration [TMR]) are carbohydrate, protein, roughage/fiber and supplements. Grains typically make up the carbohydrate portion of a ration. In the Midwest, corn is the most common source grain/carbohydrate used in feedlot rations. Wheat, barley and sorghum are also used in feedlot rations as carbohydrate sources depending on location of the feeding operation. The cereal grains will commonly go through some sort of processing method to increase their utilization and efficiency. Depending on the grain type and processing method, the overall energy content can vary, which can influence risk of ruminal acidosis.

In the past, urea was commonly used as a protein source due to its efficiency of providing nitrogen to the rumen microbial population. The advent of ethanol has brought co-products/by-products to feedlot rations as the primary source of protein in diets. The crude protein of rations is typically 13% or higher of the DMI for calves, and can be reduced to around 11-12% for more mature cattle. Crude protein is comprised of ruminally degradable protein (RDP) and rumen non-degradable (undegradable) protein (RUP). Protein is necessary for proper microbial growth for a healthy rumen population (RDP) and for individual animal growth (RUP).

The forage component of rations is typically some type of hay. Calves may require more good quality grass hay compared to older animals and can be transitioned over time to a lower quality forage such as corn stover. Silage can be used as both an energy source and a forage source. Silage used with calves should be cautioned. Calves are typically reluctant to consume silage especially if no prior exposure due to its taste.

The supplements of a ration are commonly formulated to comprise approximately 2% of the total DM. Supplements, at least for this presentation, include vitamins (A, D and E), minerals (macro and micro minerals) and drugs added and will be formulated in this portion of the ration.

For optimal consumption, the ration should be formulated around 75% total DM. Using a higher DM creates a ration that's too dry for optimal consumption, and can create sorting issues. Rations below 70% DM can run the risk of spoilage and create potential refusals. Water can be added to a ration to create the optimal as-fed DM content. In my experience, order of placement in the mixer can also impact quality of delivered ration. Typically, grains and supplements are added first, followed by forage, and finally distiller's grains. This allows the higher energy portions of the rations to be mixed longer and the weight and consistency of the distiller's grains will help bind all particles together, ultimately creating a more uniform distribution at delivery and a decrease in sorting (in my experience).

Step-up diets: Transition phase and bunk reading

The transition phase is the period of getting cattle from their starter ration (number one ration) (50-65% concentrate) to their finisher ration (80-90% concentrate). Moving cattle too fast increases the risk of acidosis or sub-acute ruminal acidosis. This can set cattle up for disturbances in feed intake across the feeding period leading to poor performance. A good understanding of bunk management is key to stepping cattle up appropriately while minimizing health impacts on performance. Bunk management practices have been developed by scoring bunks by the amount of feed remaining in the bunk at feed call to keep cattle at consistent intakes. It is best practice to call feed (read the bunk) at the same time each day. Feed intake is typically managed by bunk reading. The South Dakota Bunk Reading System was developed on a 0 to 4 scoring scale. A bunk scoring a 0 (also considered a slick bunk) has no feed remaining with visual lick marks on the bunk. Some systems have a 0.5 category or "crumbles", meaning that there are crumbs left in the bunk, but most feed has been consumed and the bunk bottom can be easily visualized. A bunk score of 1 indicates a small amount, but uniform layer of feed across the length of the bunk line. A bunk score of 2 refers to 25-50% of previous feed delivery remaining. A bunk score of 3 indicates that greater than 50% of previous feed offering remaining and a bunk score of 4 translates to virtually untouched. As indicated previously, a bunk score of 4 would lead one to investigate potential water issues, especially if cattle have a history of adequate feed consumption. Previous literature showed that cattle with properly managed intake had greater DMI, which translated to greater average daily gain and gain-to-feed (F:G) ratios.[3] Additionally, data showed that cattle on the South Dakota bunk management had a 10% lower F:G ratio, which increased profits $19.33 USD per animal (in 1993) keeping all factors equal between feeding operations. Whereas, the author reported that an increase of 10% F:G decreased returns $26 USD per animal.[3] Lastly, when increasing feed delivered, any increase in the amount of feed called should be kept to 0.5 lbs per animal or less and consistently consumed for a minimum of 2 days before the next increase.

Feed delivery: Timing and frequency

Cattle are creatures of habit and feeding them consistently at the same time every day will accommodate their nature. Inconsistencies of feed delivery timing can lead to inconsistencies of DMI. Swings in DMI lead to an increased the risk of SARA/overload by overloading the rumen with rapidly fermentable carbohydrates. For the transition phase, there are 2 common methods adapting cattle to a finisher diet: the step-up and two-ration

blend methods. The step-up method feeds one ration at a time and transitions by decreasing the amount of fiber and increasing the amount of grain. Typically, rations are changed every 4-7 days from the cattle's beginning ration to their final ration. The two-ration blend method uses only 2 rations (the first and final ration) throughout the transition period. Cattle are fed a proportion of each ration and the proportion is adjusted to get cattle on the final finishing ration. The two-ration blend method cuts down on the number of rations the mill must make every day, which helps gain some logistical efficiency. Regardless of type of transition, if cattle are getting fed at the same time each day, they will adapt to their feeding situation. The number of times feed is delivered can vary for many reasons. As an industry, cattle are typically fed twice a day. This allows for cattle to get 2 fresh meals a day and a more consistent feed intake, which should allow for better performance. Some operations feed 3 times a day to capitalize on consistent feed intake through multiple feed deliveries. However, not every feeding operation has the capability to feed cattle twice a day and will resort to a once-a-day feeding schedule. When considering a once-a-day feeding schedule, 2 major considerations need attention: 1) Can the amount of feed properly fit in the feed bunk and is there enough bunk space for cattle to eat? Over filling feed bunks will encourage wastage of feed. Inadequate bunk space could limit number of cattle at the bunk when fresh feed is delivered, and potentially cause DMI issues. 2) Will the manager still maintain appropriate feed bunk management? Many cases where feeding once a day has gotten cattle producers in feeding detriments have been during times of increased workload on their end (such as harvest or planting season). From personal experience, cattle on a hot finishing diet fed once a day have an increased risk of bloat and pen death potential when not managed appropriately. High heat periods will stress cattle and throw off timing of feed consumption due to thermoregulation. Typically, cattle will thermoregulate late in the evening/early morning and consume most of their diets just prior to dawn. The swings in consumption can lead to opportunities for high loads of highly fermentable carbohydrates, leading to risk of SARA or acidosis/overload. Good managers will foresee these events and begin to acclimate their cattle either by slowly changing the timing of feed delivery or decreasing the energy content or amount delivered of the ration.

Fecal scoring

Once an understanding of feed delivery and intake management have been demonstrated, the whole process can be evaluated from the back end of the animal. Caretakers are monitoring cattle very closely for BRD during the transition period. Training personnel to look at fecal scores is also beneficial on overall pen health. Walking through cattle and evaluating the consistency and color of feces provides real time data for veterinarians, nutritionist, producers and caretakers. Fecal scoring systems have been established to evaluate the consistency of feces from animals consuming feeds. Large amounts of undigested carbohydrates can make their way to the lower gastrointestinal tract causing localized disturbances and giving a viscous, gray bubbly appearance on the pen floor. Fecal scoring systems are commonly based on a 1 to 5 scale.[1] When large amounts of cattle are scoring 2 or less, increasing feed delivery should discouraged. A fecal score of 3 is generally accepted as a healthy gastrointestinal system of adequate plane of nutrition intake. Fecal scores of 5 (rarely seen in feedyards), indicate the potential of low levels of protein in diets, more common in range cattle when forage has gone dormant. Other things to consider when evaluating pen feces would be the appearance and frequency of blood, mucosal plugs and odors. Finding large amounts of blood could indicate other disease problems within the pen. Top differentials that should come to mind when blood is found in feces would be coccidiosis, injury (temperature prob trauma), bovine viral diarrhea virus (BVD) and salmonellosis. Proper early identification of these metabolic problems can help mitigate pen-wide issues.

Summary and conclusions

Success in cattle feeding relies on getting cattle properly started on feed and transitioned to grain diets by providing good welfare practices, husbandry and adequate nutrition. Goals for all cattle producers are first to adequately get cattle to eat by providing rest and optimal feed. The second goal should be to transition cattle to a finishing (high-concentrate) diet while keeping DMI as consistent as possible in an appropriate timeframe. Pushing cattle too hard or fast can cause undesired consequences for both the producer and animal. It is just as important to understand your cattle as much as the nutrition being provided to gain optimal success.

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