GROUP FEEDING OF CALVES: AN OVERVIEW

Michael Capel
Perry Veterinary Clinic
Perry, New York

INTRODUCTION

Group feeding of calves has been a popular management tool in Scandinavian countries and New Zealand for many years. Recently it has seen an emergence in Canada (Ontario) followed by an increase in popularity in the US, particularly in the northeast. While there are many benefits to group feeding, it does represent a substantial change from the conventional model. This document will provide an overview of major considerations for group feeding from birth to weaning.

PROVIDE A SOLID FOUNDATION

Colostrum

Passive transfer is essential to the health and well being of the newborn calf. Giving adequate amounts of high quality, clean colostrum in a timely fashion is critical to minimizing neonatal disease and maximizing growth. This is even more critical in group housed situations. Perhaps the largest disadvantage to group feeding calves is the potential for increased disease transmission. For years the industry has trumpeted the importance of isolating preweaned calves to minimize disease transmission, most notably scours and respiratory disease. In group housed facilities it is essential that all calves have a fully competent immune system which can only be obtained by having a sound colostrum harvesting, storage and feeding program. Evaluating the success of this program is equally important. IgG status can be measured in calves by taking blood samples at 2-5 days of age and evaluating for IgG (most expensive) or total protein content (easier and more practical on farm). A goal of >90% of calves with an IgG level >1000 mg/ml or total protein measurements of either 1)Brix refractometer 8.2 or higher, or 2)Serum Total Protein refractometer of 5.2 mg/dl or higher can be achieved with good management.

Maternity pen management

The amount of time spent in the maternity pen and the cleanliness of the maternity pen are also major risk factors for disease in calves. Good management is critical to minimize the amount of time the calves spend on the maternity pen to ensure that this environment is a clean, dry and not crowded at all times.

Dystocia (difficult calvings) can have a major impact on preweaned calf health and mortality. Data from the NAHMS Study 2007 indicates that preweaned mortality nationally is 8.7% for normal births and 25% for difficult births (23). Additionally, other studies have reported that maternal stress has negative impacts on calf mortality, morbidity and welfare (2). The more successful a farm is at minimizing stress in the
prefresh and maternity pens, the healthier their calves will be. Careful training of personnel and monitoring of the maternity pen are key components for lowering the rate of difficult calvings and improving the health of wet calves as they enter the group housing environment.

While it is easy to quickly dismiss the management practices listed above as commonplace or trivial, their importance cannot be emphasized enough. It is imperative that calves get a good start to have success in any management system, especially group housed feeding systems.

**APPROACH TO FEEDING**

**Feed delivery**

Calves can be fed by many different methods including gang feeders, computerized feeders and ad libitum acidified waste milk or milk replacer feeders. Gang feeders, mob feeders and ad libitum systems offer a lower cost method of providing free access of milk to group pens. Mob feeders are common in New Zealand. This system uses a large container with many nipples to allow numerous calves to drink at the same time. Milk is usually fed twice or three times a day in this system but can also be fed free choice. These systems are low cost, easy to put together and easy to use. Other bulk feeding systems involve some reservoir of milk linked to a milk bar or set of nipples that delivers feed to the calves. These systems use a 55 gallon drums or other large container as a reservoir for milk. In the winter time these systems need to be kept warm to improve intakes and prevent the milk from freezing. Heat lamps, portable heaters, insulated boxes, or centralized warm feeding rooms are commonly employed strategies to meet these needs. Computerized feeders offer options when feeding calves. These feeders allow access for multiple feeding per calf each day. They monitor daily feed intake for each calf. Newer generations incorporate half scales which weigh calves daily. These systems allow for different feeding rates within a pen of calves, allowing producers to conduct trials, feed milk replacer and waste milk in the same pen and provide the ability to manage individual animal intakes during the weaning process.

**Type of feed**

Group housed calf feeding facilities can be adapted to feed a variety of liquid feed sources. Whole milk, hospital milk and transition milk, and milk replacer are commonly used on farms. Non-saleable whole milk is an excellent, economical liquid feed source for calves (7, 11). There are some important management considerations when feeding non-saleable milk. First, the milk should be evaluated on a frequent basis for total solids content. Depending upon farm and the composition of the hospital pen, significant variation in the total solids content of hospital milk is possible (16). This variability can lead to a liquid feed product of poor nutritional value. Secondly, milk should be pasteurized and or acidified to help reduce bacterial load. Pasteurization is a very common and important tool for reducing the bacterial load of non-saleable whole milk. Though the process does not sterilize milk, pasteurization can lower the bacterial load of milk by a 4 or 5 log reduction (4-5 decimal places or taking a sample at 100,000
bacteria per ml to 10 bacteria per ml). Acidification has also been used on farm to achieve this goal. Milk and milk replacer can be acidified with citric acid, propionic acid or formic acid. Currently, using formic acid to acidify milk or milk replacer is not approved by the Food and Drug Administration. Citric acid is commonly used as an acidifier in milk replacers. The goal of feeding an acidified product is to improve its stability and shelf life by inhibiting bacterial growth. This provides a management and labor efficient feed source while minimizing pathogens and increasing average daily gains (1, 3). Though commonly recommended, no solid data exists to support feeding acidified feed over conventional feed when fed at similar rates (8). However, the management flexibility provided through control of bacterial growth and the extended shelf life of the acidified milk have made it a very common practice in calf programs.

Feeding Rates

Feeding larger volumes of milk to calves in a labor efficient way is without question one of the major benefits of group feeding calves. Numerous studies have shown the benefit of increased feeding rates over the conventional 8-10% of body weight per day of liquid feed. When fed free choice, calves will drink 8-12 L per day and have significantly improved growth rates (10). Increase growth rates during the preweaned period have been shown to have positive downstream effects on milk production, resulting in as much as 2500 lbs more production during the first lactation when compared with cohorts who were limit fed under a conventional system. This effect has been shown in both milk replacer feeding programs (20) and whole milk programs (6, 15, 19). Calves on a high plane of nutrition have improved feed efficiency, better average daily gains and lower expression of disease when challenged with cryptosporidium as compared to those on a conventional plane of nutrition (17). Feeding calves a higher plane of nutrition during the preweaning period has became a superior management tool that improves the health of calves on farm and improves opportunities for future production.

GROUPING STRATEGIES

Calves housed in groups experience numerous social benefits including decreased responses to restraint, increased play and competitive success (5). They are also much less reactive to new experiences in their environment (4). Despite the social benefits of groups housing, there are several important considerations when setting up group pens. These factors include the age of calves when they move into group pens, the size of the pens, and how calves will be moved into and out of the group pens. Weak calves and calves who do not suckle well do not succeed in group housed systems. It is important to wait until calves are drinking aggressively before moving them into a group. This usually occurs by day 3 of life. Group size is dictated by facilities and feed delivery systems. Computerized feeding systems can handle up to 100 calves per computer feeder, leading to larger group sizes. In contrast, research suggests that the ideal group size to maximize growth and minimize disease is 6-9 calves (21). Another important criterion influencing group size revolves around how long it takes the dairy to fill a pen of calves. Groups of calves should be kept similar in age and as a stable
population with no continuous addition of calves once the pen is filled (14). Calves in groups that are similar in age show increased growth rates and decreased disease rates. Pens should be filled within 7-10 days to minimize this age variation. Keeping a steady population within a group is also critical minimizing the spread of disease. Once a pen is filled, that population should remain stable. Once weaned, the entire pen should be moved out. Though tempting to leave smaller or weaker calves behind, this practice will increase the spread of disease and have a negative impact on the new calves coming into the pen. It is strongly discouraged.

FACILITIES

Facility design is integral to the health of calves. Major considerations for facility design include size, ventilation, drainage and labor efficiency (feed delivery, bedding, cleaning, calf handling). Calf pens should be designed to provide a stocking density 30-35 sq ft. per preweaned calf. This recommendation is very important and is often forgotten as farms outgrow facilities and begin crowding pens more. Incidence of respiratory disease and average daily gains usually suffer when pens become overcrowded.

Ventilation

Traditional naturally ventilated barns with curtain sidewalls and an open center ridge vent are a very popular design for housing cattle. These barns function well as the heat of the animals housed in the barn rises and creates an updraft. This concept is called thermal buoyancy. Warm moist air, ammonia, and other gases in the barn rise and escape out the center ridge vent while fresh air is drawn in through open eaves on the sides or through open sidewalls. Preweaned calves lack the ability to generate enough heat for this type of ventilation to occur. As a result, this type of ventilation does not work as well for calf barns. Positive pressure ventilation tubes have gained immense popularity in recent years and are successful at reducing the incidence of pneumonia when designed and constructed properly. These systems consist of an inlet fan that draws fresh air in from the outside and delivers it the length of the barn through a properly sized tube. The tube is constructed with numerous holes along its length, all set at the proper diameter and angle to deliver fresh air at the level of the calf. These systems are usually designed to deliver 4 air changes per hour and are suitable for ventilation 3 seasons of the year. They are not adequate for moving enough air for heat abatement in the summer and supplemental systems may be needed to provide this level of cooling. Negative pressure ventilation systems are more difficult to design and operate, though they have some popularity as they are often cheaper and easier to construct.

While it is easy focus on removing moist air and gases from manure, urine and bedding, it is important to minimize dust particles in the environment as well. Extremely dusty environments from mechanized bedding systems or other causes can have a negative impact on respiratory health, making it difficult for a calf’s normal defense mechanisms to clear pathogens.
Bedding and floor surface

Adequate volumes of clean dry bedding are essential for calves. Calves are prone to cold stress, drafts and cannot handle wet environments. Sufficient bedding for calves to nest in has been shown to be one of the major factors in reducing the incidence of pneumonia in preweaned calves (13). Calves fed a higher plane of nutrition consume more water and produce more urine than traditionally fed calves. This creates a wetter environment requiring significantly more bedding or improved drainage. Careful consideration should be given to the slope and drainage of the calf pens in order to minimize bedding costs and improve calf health.

WEANING STRATEGIES

There are many options to consider when designing a weaning strategy. Many of these options will be dictated by the facility and feed delivery system in place on the farm.

Transition to Solid Feed

Ensuring that calves are eating an appropriate amount of starter grain (2 lbs/day) has been a common recommendation. This is easy to achieve in conventional twice or three times daily feeding systems because as calves grow, their energy and protein demands typically grow as well. This increase outpaces the nutrition supplied by traditional feeding strategies, providing an incentive for calves to make up the difference through starter grain. In ad lib or high volume liquid feed systems, calves meet their needs through liquid feed alone. This leads to low levels of starter intake and potentially a very rough transition. Calves with poor starter intake at weaning experience higher disease rates and either lower average daily gains or an actual loss in body weight during the transition period (18, 23).

Duration of weaning process

While one of the benefits of group housed calves is higher liquid feed intakes, one of the downsides is the decrease in starter intake during the weaning and transition period. As stated above, dairy calves fed high volumes of milk have lower starter intakes while on that higher plane of nutrition. Abrupt weaning of these calves with lower starter intake relates to weight loss during the weaning and transition process and can negate some of the additional growth that was gained by increased milk feeding in the first place (12, 22). Gradually decreasing milk intake over a period of 10 days allows calves to slowly increase starter intake and results in a smoother transition with continued growth (12, 24). This smoother transition also leads to less disease during the post weaning period, specifically respiratory disease and coccidiosis.
Method of weaning

The method of weaning is dependent upon the feed deliver system that is in place. Ad lib bulk feeders do not have the ability to monitor and regulate individual animal milk feeding rates. In this system the entire pen must be weaned at the same time. One way to achieve this would be to gradually decrease the amount of milk provided to the calves on a daily basis. In this system, the larger stronger calves out compete the smaller calves for the limited amount of liquid feed resulting in abrupt weaning for the small calves. This is an undesirable outcome. Another popular technique is to slowly dilute the milk with water over time but provide the same total volume of liquid to the pen. In this system, all calves are weaned slowly at the same time as they will become physically full after a meal. All calves will get the same diluted milk and therefore roughly the same proportional level of nutrients. Computerized feeding systems allow for a much more precise control of the weaning process. These systems allow for a great flexibility in the feeding plan, giving the producer the ability to regulate the amount of liquid feed being delivered to the calves and the amount of time that level of feed will be provided. For example, a producer could choose to feed calves 12 L of milk for 35 days, and then step them down from 12-6 L of milk over the next five days, 6-2 L of milk over the next 5 days and then 2- 0 L of milk over the final 5 days. This program would wean all calves at 50 days and allow for a 15 day gradual weaning process.

CONCLUSIONS

There are many considerations when designing a group housed feeding system for dairy calves. The advantages of these systems include a reduction in labor required for feeding, bedding and cleaning calves, improvement in socialization of calves and increased ability to handle competitive environments, and greater ease in providing a higher plane of nutrition. Disadvantages include the potential for increased contagious disease transmission, a change in mindset and management approach to identifying weak and sick calves, and a difficult environment for weaker calves. While not for every producer, group housed feeding systems have been extremely successful in raising healthy, quality calves with the potential for improved lifetime performance.
REFERENCES


