Individual housing of preweaned calves reduces transmission of infectious diseases as a result of limited physical contact between calves. In addition, individually housed calves are easier to observe which can result in more effective disease treatment. However, individual calf housing results in lack of social contact among calves at an early age and limits their movement. Housing calves in groups allows them to interact with each other and have space to move around and play. In addition, dairy producers are housing calves in groups to facilitate improved labor efficiency and working conditions and to make it easier to deliver higher amounts of milk/milk replacer to young calves.

Feeding calves in groups allows calves to express some natural behaviors that cannot be expressed when they are housed individually, but offers some challenges in relation to maintaining good health, another important aspect of good animal welfare. Good health is achievable in group housed preweaned calves as long as appropriate management and maintenance of equipment are emphasized and implemented.

There has been consistent growth in the upper Midwest US on the number of farms installing automated computerized calf feeders. This paper summarizes some of the findings of a field study conducted recently at the University of Minnesota involving 38 farms with automated calf feeding systems. These types of longitudinal cross sectional studies can provide descriptive information on housing and management practices and by collecting many animal and facility measurements, we can identify factors that are associated with successful use of these systems. This methodology does not provide a direct ‘cause and effect’ connection, but we can identify guidelines and factors that are important and then further investigated by controlled research studies or experimented on the farm.

Some management observations

The following charts summarize some key practices used on the farms we visited. The average number of calves per pen (Figure 1) was approximately 17.6, which is less than the maximum suggested by the dealers (up to 30), and the space per calf was 4.6 square meters (~49 square feet). Average peak milk was 8.3 liters per day and start milk 5.4 liters per day (Figure 2). Calves were placed on the feeder at 5.2 days of age (range of 0 to 14 days; Figure 3); 10 farms placed calves in the group at 0 to 1 day of age. Most of the farms (87%) used positive pressure tubes to improve ventilation in the barn.

Calf health

At each visit, the same trained observer scored calves for health in the youngest and oldest (plus a middle one in larger dairies) pens including attitude, eyes, ears, nose, cleanliness and body condition (n= 10,185 calves). Blood samples were collected from calves younger than 5 days of age to test for serum protein concentration as an indicator of passive immune transfer (n = 985 calves). Body temperature was measured if a calf had an abnormal health score. During five visits in different seasons, milk samples were collected from the mixer and the feeder tube to test for standard plate count (SPC) and coliform count. Figure 4 summarizes the calf health scores for the top 10th and the bottom 10th percentile farms. There was considerable variation among farms, indicating that housing and management factors can definitely influence the success of using these feeding systems. Table 1 summarizes the SPC and coliform counts for the top and bottom farms. Again, there is a lot of variation and some very extreme numbers were detected. The milk/milk replacer fed to preweaned calves should have a standard plate count of less than 100,000 CFU/ml.
Figure 1. Stocking density as number of calves per pen and area per calf

Figure 2. Starting and peak amounts of milk/milk replacer fed

Figure 3. Age calves are introduced to group feeding
Risk factors for abnormal health scores

Our statistical analysis indicated that the following factors are positively associated with abnormal health scores:

- Number of calves per group – the greater the number, the more sick calves
- Space per calf – less space per calf associated with higher number of abnormal scores
- Time to reach peak milk allowance – sooner was better
- SPC on tube samples >100,000 cells/ml – higher counts were associated with higher number of abnormal health scores. Cleanliness is a key for success!

A preliminary analysis of factors associated with mortality rate showed significant relationships with serum total protein concentration (an indicator of passive immune transfer), use of drinking speed provided by the software as an alarm that a calf might be sick, performing navel and between group disinfection, age difference in calf groups and bacteria count in milk/milk replacer.

It was interesting to learn that some producers were not very clear about the need for cleaning the equipment on a routine basis, which resulted in a wide distribution for the quality of the milk/milk replacer fed to the calves across farms. It is extremely important to run circuit and mixer cleaning as recommended by the manufacturer (or more), replace hoses and nipples regularly (biweekly and daily, respectively), use the recommended cleaner to remove biofilms from the surfaces, keep the area around the feeder clean, provide clean and dry bedding to the calves, provide high quality milk, calibrate the equipment to deliver appropriate concentration of nutrients and temperature for the milk, etc.

Dietrich et al (2015) collected milk samples daily for four weeks before and after autofeeder circuit cleaning in 10 herds and showed that circuit cleaning reduced bacteria in milk. However, machines with more circuit cleanings per week had greater counts possibly because circuit cleaning may be loosening bacterial cells from biofilms. Authors recommended a combination of three times per day mixer/heat exchanger cleaning before major feeding times along
with once a day circuit cleaning after major feeding times to reduce bacterial counts in milk. Circuit cleaning involves hand cleaning of the nipple and machine cleaning of the lines and internal workings of the feeder which must be instituted by the operator. The mixer/heat exchange cleaning is automated and involved cleaning of the element used for heating milk if used and the mixer.

Suggestions for making automated calf feeders work

Although more research and on farm observations are still needed, here are some general recommendations for using automated calf feeder systems:

- Excellent colostrum management programs are essential!
- Clean, dry, comfortable bedding and minimum of 40-45 square feet per calf.
- Milk/milk replacer with low bacterial count (less than 100,000 cells/ml).
- Adequate training of calves to use the feeders by gently leading them to the nipple when they are moved into the group housing.
- Stocking rates of no more than 12-15 calves per group, although research has shown that 7 to 8 calves per group is best for good health outcomes. A balance between health outcomes and economics needs to be considered. Larger group sizes are more successful when the age range among calves is narrow.
- Milk allowances range from 1.5 to 3.7 lb of milk solids per calf per day. On a volume basis this amounts to 5.5 to 12 L of liquid per day. Most farms offer 8 L per calf per day as peak amount and start with 4 to 6 L per day. Calves will easily drink 10 L per day.
- Meal sizes of 1.8 to 2.5 L each. Meal size recommendations for younger calves tend to be lower and increase to upper limits by 2 to 3 weeks of age. Calves typically consume their daily allocation in 4 to 6 meals per day.
- When milk replacer is used, powder is diluted with water to approximately 13 to 15% solids. It is important that the feeder is calibrated routinely and all parts kept clean so that powder flows properly and dilution is consistent.
- Cleaning of the equipment and its various components is one of the most important keys to making these systems work successfully. Change/clean nipples daily; change feeder hoses/tubes weekly as minimum.

Conclusions

Automated calf feeders for raising young calves in groups are growing in popularity as producers want more flexible labor management and consumers want animals to have a more natural life. Feeding calves in groups allows calves to express some natural behaviors that cannot be expressed when housed individually, but offers some challenges in relation to maintaining good health, another important aspect of good animal welfare. Good health is achievable when using automated calf feeders to raise pre-weaned calves as long as appropriate management and maintenance of equipment are emphasized and implemented.

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Reference