

Healthy calves: From birth to full ruminant

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Abstract

Raising dairy replacement heifers or steers to enter the beef market can be an important economic center for the dairy, but can also be a financial drain. A study done in Wisconsin in 2007 estimated the cost of raising a Holstein heifer to the point of its first drop of milk was in the range of \$1600 to \$2900. In recent years, the cost of purchasing a bred heifer has often been less than the cost of raising one on the dairy. However, many dairies were still able to raise a quality heifer on the farm and manage costs. Many factors contribute to this variability, and every dairy should have a firm grasp on their costs.

Key words: dairy, replacement heifers

Résumé

L'élevage de génisses ou de bouvillons laitiers de remplacement pour l'accès au marché du bœuf peut devenir un pôle économique important dans une ferme laitière mais peut aussi devenir un fardeau économique. Une étude faite au Wisconsin en 2007 a estimé que le coût d'élevage d'une génisse jusqu'à ce qu'elle produise sa première goutte de lait variait de 1600\$ à 2900\$. De nos jours, le coût d'achat d'une génisse gravide est souvent moindre que le coût de son élevage à la ferme laitière. Néanmoins, plusieurs fermes laitières sont capables de produire une génisse de qualité à la ferme tout en maintenant les coûts sous contrôle. Plusieurs facteurs contribuent à cette variation et chaque ferme laitière devrait avoir une bonne idée de ses dépenses.

Introduction

New tools emerge every year to assist the professional calf raiser. The dairy industry has embraced the idea of monitoring solids and total proteins using a refractometer. There are additional technologies using simple, readily available hand-held tools that the industry should evaluate. These tools are generally applied during the costly milk-feeding phase, prior to becoming a full ruminant.

The principal rate-limiting organ of the dairy calf in the first 365 days is the lung. After that period, the reproductive organs and mammary gland emerge as the rate-limiting organs. Said differently, if the professional calf raiser is to optimize lifelong performance, every effort and technology in the first year should be designed to be lung sparing. This manuscript highlights

how the use of new technologies can assist a veterinary practitioner to develop objective data points to direct professional calf-raising.

How Much Does it Cost to Raise a Heifer?

Regional surveys have been conducted to generate the cost of growing a replacement heifer. Consistently, the costs are allocated primarily to feed and secondarily to labor. A dairy will slide up and down the cost scale based on its efficiencies in these major categories. The third category of cost is associated with other expenses such as medicine, housing, and the often overlooked cost of morbidity and mortality. How much does a calf that experiences pneumonia end up costing you if it lives? How much does a calf cost you if it dies at 12 months of age? Numerous spreadsheets have been developed, but they tend to be under utilized.

Factors like feed cost, medicine, and housing are easy to assess. A parameter routinely overlooked is the cost associated with mortality before entering a milk string. A question I frequently ask a dairy producer is "What percentage of your female dairy calves never give a drop of milk? What is an achievable goal?" The corollary is, depending on where they fall out of the pipeline, "How much did they cost you?"

When calves are kept at a heifer ranch that figure is sometimes more attainable, as the dairy producer may have the yardage fee calculated up until the heifer expires or is realized. Until the percentage of calves that never milk is obtained, a true economic cost will be difficult to estimate. Therefore, it is impossible to predict what an intervention to reduce morbidity and mortality is worth.

Population Medicine in the Milk-feeding Phase

The most common error I observe in this phase is practicing individual calf medicine instead of population medicine. Calves are often housed individually, creating a predilection to think in terms of individual treatment. While treatment of the individual calf is still of major concern, true success is achieved when it is combined with population medicine intervention. These interventions are often centered on a vaccine, antibiotic, or a total protein number. If veterinarians could train their minds to temporarily place individual calf medicine on hold while doing a complete systems analysis of a calf rearing operation, huge errors could be avoided.

We have to ask ourselves how operations that have bull calves arrive with 95% failure of passive transfer (FPT) maintain <5% annual death loss. Furthermore, that those calves are traced through a feedyard and achieve high growth rates, low mortality, and grade and yield are very high. The answer is simple: the professional calf raiser has adapted their milk-fed “system” to optimize for the population. If veterinarians want to remain relevant to these operations, the first goal before recommending interventions is to understand the “system”. Two questions to ask are 1) What interventions can truly impact population morbidity/mortality in this system?, and 2) What interventions can reduce morbidity and impact lifelong production?

At the top of any list for decreasing morbidity and mortality is the nutritional program, followed closely by the prescribed veterinary program. However, the veterinary program success is dependent upon a true population medicine approach, and having that approach adhered to by the dairy or calf ranch personnel.

The veterinary sciences technologies routinely used for calf raising include immunology, pathology, and pharmacology, all of which are useful, but the really important discipline for successful calf rearing is epidemiology. Epidemiology is defined as the branch of medicine that deals with the study of the causes, distribution, and control of disease in populations. While other sciences are important to provide a framework, they are only valuable if they are relevant in a population.

A very real example of this is the vaccination program. The science of immunology may provide some insight into the best way to approach herd vaccination. A veterinarian would consider all facets of the discipline and design the protocol. Most of the data a veterinarian would utilize was derived from small studies meant to satisfy criterion to achieve a product label. However, the most important data is an evaluation of the population in the system where the vaccination program was implemented. Because this is not routinely done, immunology discussions prevail on vaccine programs instead of the most appropriate discipline of epidemiology.

A second error would be misapplication of the science of pathology. In the face of an outbreak of respiratory disease, it is common to necropsy animals. A calf is randomly selected and sent for a complete workup. The results are then assumed to be representative of the outbreak, and an intervention implemented based on that result. This approach is just slightly better than a guess.

Using the Science of Epidemiology

Having strong epidemiologic support for a program requires tools for monitoring and assessing efficacy. It

is rare to find a dairy today that is not using a surveillance software package to monitor reproduction, milk production, somatic cell count, or a plethora of herd-level parameters. At the same time, it is not the norm for the same level of monitoring to be applied to calf raising. The industry must begin to adopt strong, computer-based and electronic ID technology or continue to be influenced by other factors outside of sound epidemiology. The number one deterrent in making informed population medicine decisions on modern calf-raising facilities is the quantity and quality of data capture and surveillance systems.

Tools to Help in the Milk Feeding Phase

Professional calf raisers have been using refractometers to standardize both the colostrum quality and solids administration during the milk feeding phase of calf raising. A study using a very simple tool like a refractometer demonstrated huge variation in milk solids found in waste milk. The caloric intake of a baby calf would necessarily fluctuate at the same rate as the solids content of the diet. Calf raisers that utilize a refractometer routinely have standardized the amount of solids fed daily. This practice has decreased digestive upsets and led to a predictable, sustainable growth rate.

Use of a refractometer has also led to many conversations between veterinarians and calf raisers in the milk-mixing bar. Topics include milk replacer vs whole milk, total calories fed, availability of water and appearance of the starter’s quality. The refractometer’s value is not just the objective measurement; rather it may be more important that it creates teachable moments.

New Technologies: Sanitation Analysis Using Luminometers

There are additional new technologies to help assess procedures and protocols both quantitatively and qualitatively. A luminometer is a hand-held instrument used in many industries, but frequently in the food industry. It is a rapid assessment of critical areas to determine whether bacterial contamination is present. Using a luminometer to assess hygiene at critical control points is rapid and accurate. A calf raiser can now routinely assess the hygiene programs for keeping nipples, bottles, buckets, milk valves, or any surface free of contamination. Performing routine checks by a veterinarian has added merit. There is always some level of subjective interpretation, even when strong data is generated. A veterinarian is uniquely trained to give that subjective interpretation, and should take ownership in the application of this tool. In the end, the goal is to reduce fecal-oral contamination in the milk barn.

Lung Ultrasonography

A developing technology to assess many aspects of calf raising is lung ultrasonography. Nutritionists understand that all the right proteins must be provided for a balanced ration. The absence of 1 key amino acid results in the whole system breaking, referred to as the rate-limiting amino acid. The same concept applies to the bovine system. The rate-limiting organ in the female dairy calf in the first year is the lung. The lung is the most likely organ to become diseased and break the whole system of growth and health. After the first 365 days, then the uterus and mammary gland share center stage. Lung ultrasonography allows an objective, rapid, non-invasive survey of our calf raising system.

What can one Learn from Lung Ultrasonography?

The purpose of lung ultrasound in a calf is to look for evidence of pneumonia. Ongoing research indicates that consolidation can be picked up very quickly after experimental infection, and is more reliable than a fever or any respiratory scoring system. However, there often won't be changes on ultrasound in acute pneumonia cases. More often lesions from a pneumonia event that occurred 1 week, 1 month, or even earlier are what is seen during routine ultrasound examination. Therefore, lung ultrasound provides the producer with information that this calf previously had pneumonia, and has not fully recovered from the disease. Lung ultrasonography allows us to generate epidemiologic evidence for the success of our vaccination and treatment programs, as well as to identify calves that we can predict will have suboptimal performance. Table 1 summarizes an ongoing study of calves returning from a commercial heifer ranch. The lungs are scored on a scale of 1 to 4, where 1 is the least amount of lesions seen and 4 is the most extreme. While the data is still being generated, the trend is that calves with significant lesions (lung score 4) have a high risk (37%) of never entering the milk string.

When assessing a genomically superior bull calf for stud or a replacement heifer, it is intuitive that prior to selection a calf should have a clean lung field even to qualify for genomic testing. Is it prudent to have a favorable genetic score, yet not have the lung capacity to

Table 1. Summary of lung score (1 = least, 4 = most) and disposition of calves from a commercial heifer ranch.

Lung score	Total number	% total	Sold/died	% sold/died
1	103	40.1	9	8.7
2	81	32.0	11	13.5
3	42	16.6	4	9.5
4	27	10.7	10	37.0

perform? This technology is now in the implementation phase in many bull stud enterprises and on progressive dairies.

There are likely additional uses for the data generated from lung ultrasonography. It is an easy, non-invasive, rapid diagnostic technique using equipment that most veterinarians already have on their truck. As research continues, lung ultrasound scores can be predictors of productivity and longevity of dairy cows. Additionally, if a subjective tool (lung ultrasonography) is utilized to assess lung quality from the contract heifer raiser, the industry could transition from a yardage model to a quality model. It is time for the industry to consider the contract heifer-raiser model where the professional calf raiser is incentivized for quality and not quantity.

Respiratory disease has been a challenge to the dairy industry for decades. Using lung ultrasound technology facilitates an accurate, objective impact evaluation of vaccinations, treatment protocols, and management changes. Armed with real epidemiologic data, decisions can be made to move forward with sound strategies to prevent and minimize pneumonia.

Conclusions

Raising a heifer to her first drop of milk has a significant economic cost. Frequently, the most expensive phase is the milk feeding phase. While labor and feed will continue to be the key drivers in managing that cost, morbidity and mortality losses are significant. Interventions using epidemiology can provide an approach to decrease both the direct cost of mortality and the indirect cost of lost productivity due to respiratory disease. Emerging technology provides veterinarians with "teachable moments" with professional calf raisers. These technologies are easily applied during the milk feeding phase on a population basis.

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Suggested Reading

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