Using Technology to Improve Calf Raising

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INTRODUCTION

Raising dairy replacement heifers or steers to enter the beef market can be an important economic center for the dairy. It 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 - $2900. In recent years the cost of purchasing a bred heifer was often 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.

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. This paper highlights using a luminometer to perform sanitation audits and an ultrasound probe for lung ultasonography.

HOW MUCH DOES IT COST TO RAISE A HEIFER?

Regional surveys have been conducted to generate the cost of growing a replacement heifer. Consistently in all these studies, the primary costs are allocated to feed and secondarily to labor. A dairy will slide up and down the cost scale based on their efficiencies in these major categories. The third category of cost is associated with other costs 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 mo? Numerous spreadsheets have been developed, but they tend to be underutilized.

Factors like feed cost, medicine, housing, etc. are easy to assess. A parameter routinely over looked 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.

DECREASING COSTS ASSOCIATED WITH MORBIDITY AND MORTALITY

The two questions to ask are:

1) What are the interventions that can truly impact morbidity/mortality?
2) What are the interventions that 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 truly 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, pharmacology…all 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 idea of a vaccination program. The science of immunology may provide some insight into the best way to approach herd vaccination. A veterinarian would consider all the facets of the discipline and design the protocol. Most of the data a veterinarian would consult was derived from small studies meant to satisfy criterion to achieve a label. However, the most important data would be an evaluation of the population 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 the 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, SCC, 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.

TOOLS TO HELP

Professional calf raisers have been using refractometers to standardize both the colostrum quality and solids administration during the milk feeding phase of calf raising. Checking colostrum quality is a pre-emptive strategy, while checking serum total proteins is a stronger epidemiologic approach. It generates numbers that assess the quality of attempting to achieve a set goal. 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 have made a refractometer part of their daily routine have standardized the amount of solids fed daily. This practice has decreased digestive upsets and led to a predictable, sustainable growth rate.

NEW TECHNOLOGIES: SANITATION AUDITS USING LUMINOMETERS

There are additional new technologies that help us to assess both quantitatively and qualitatively procedures and protocols.

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 if 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 a sanitation audit by routinely checking common points where bacterial contamination can occur is now easily accomplished and would likely reduce fecal-oral contamination in the milk barn.

LUNG ULTRASONOGRAPHY

An additional technology that is developing 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 one key amino acid results in the whole system breaking. That is 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 d, 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 the lung ultrasound in a calf is to look for evidence of pneumonia. On-going 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, acutely, there often won't be changes on ultrasound. More often what is seen on a routine ultrasound are lesions from a pneumonia event that occurred 1 wk, 1mo, or longer prior to the evaluation. Therefore, lung ultrasound provides the producer with the information that this calf previously had pneumonia and she 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

Table1. 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 %**

identify calves that we can predict will have sub-optimal performance. Table 1 summarizes an ongoing study of calves returning from a commercial heifer ranch. The lungs are scored on a scale of 1 - 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 have a high risk (37 %) of never entering the milk string.

In assessing a genomically superior bull calf for stud or a replacement heifer, it is intuitive that prior to selection any calf should have a clean lung field to even qualify for genomic testing. Is it prudent to have a genetic score yet not have the lung capacity to 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 a predictor of productivity and longevity of a dairy cow. Additionally, if a subjective tool (lung ultrasonography) were 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 the new technology of the lung ultrasound 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. While labor and feed will continue to be the key drivers in managing that cost, morbidity and mortality losses are significant. Interventions using sound epidemiology can provide an approach to decrease both the

direct cost of mortality and the indirect cost of lost productivity due to a pneumonia event. The technology of using a luminometer for sanitation audits and also lung ultrsonography to assess program effectiveness are tools for serious consideraton.

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RESOURCES

Babkine, M., and L. Blond. 2009. Ultrasonography of the bovine respiratory system and its practical application. Vet. Clin. N. Am. Food Anim. Pract. 25:633-649.

Braun, U., D. Sicher, and N. Pusterla. 1996. Ultrasonography of the lungs, pleura, and mediastinum in healthy cows. Am. J. Vet. Res. 56:432-438.

Braun., U. , N. Pusterla, and M. Flückiger. 1997. Ultrasonographic findings in cattle with pleuropneumonia. Vet. Rec. 141:12-17.

Flock, M. 2004. Diagnostic ultrasonography in cattle with thoracic disease. Vet J. 167:272-280.

Jung, C., and H. Bostedt. 2004. Thoracic ultrasonography technique in newborn calves and description of normal and pathological findings. Vet. Radiol. Ultrasound. 45:331-335.

Moore, D.A., J. Taylor, M.L. Hartman and W.M. Sischo. 2008. A case study of waste milk quality assessments at a calf ranch. Proc. Am. Assoc. Bov. Prac., Charlotte, NC.

Rabeling, B., J. Rehage, D. Döpfer, and H. Scholz. 1998. Ultrasonographic findings in calves with respiratory disease. Vet. Rec. 143:468-471.

Schroeder, J.W. 2007. Dairy Focus: Know the Cost of Raising Replacement Heifers. NDSU Extension Service (2007-06-28). Accessed 1-31-2014 at: www.ag.ndsu.edu/news/columns/ dairy focus know-the-cost-of-raising-replacement-heifers