Lameness Reduces Overall Herd Performance

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Take Home Messages

- Average prevalence of lameness on North American dairy herds is approximately 25%.
- Lameness causes pain, and results in reduced feed intake, lower milk production and pregnancy rates, inflammation and early embryo loss, and increased culling.
- The economic cost of lameness is on par with that of mastitis.

All recent surveys of commercial dairy herds in North America have found average prevalence of lameness to be on the order of 25%. Those of us who work with multiple herds on a regular basis recognize that there are herds with both high and low prevalence of lameness problems. In the U.S., the negative economic pressure of high lameness prevalence has forced the most severely affected herds from the industry. Regardless, the average prevalence remains higher than desirable for both economic and welfare considerations. This paper will describe the economic consequences of lameness at the herd level.

A variety of mechanisms and effects contribute to the economic losses due to lameness. Lame cows do not eat as much as healthy cows and thus produce less milk or less gain. They may have poor demonstration of estrus or become anestrous. Furthermore, they may be prematurely culled because of low milk production, delayed conception or emergency slaughter. Additionally, lameness is one of the most visible of potential animal welfare concerns that might lead consumers to perceive the dairy industry unfavorably.

To construct a more complete but non-quantitative picture of the losses caused by lameness in a herd consider the following:

- reduced mobility plus pain results in reduced feed intake
- reduced feed intake results in less milk produced and weight loss
- inflammation associated with lesions of lameness is directly linked to poor embryonic development and greater early embryo loss
- reduced mobility diminishes demonstration of estrus
- resulting reduced pregnancy rates lead to longer average days in milk and thus less milk sold per cow per day
- more cows are culled for low production and not being pregnant at lower body condition scores for less money
- reduced pregnancy rates result in fewer replacements available
- with less milk/cow and fewer replacements, more cows must be purchased to meet quota obligations or maintain herd size

Thus, a dairy with lame cows will use its land, labor and feed resources to produce milk less efficiently than one without lame cows. Every dairy has lame cows so the ideal efficiency will not be realized, but the fewer lame cows the more sustainable the business.

Mastitis is commonly considered the most problematic disease for modern dairy production but circumstances across the majority of dairy herds will illustrate that lameness is equal to or greater in impact on profitability. Knowing the cost of common diseases can help dairy farmers and their veterinarians plan treatment and prevention strategies that are likely to improve the profitability of the dairy. If the cost of the problem and the components of that cost are known, it is easier to judge whether allocation of resources can be expected to reduce that cost and return a net profit. Rarely are complete data available from a farm to permit calculation of overall disease costs. This paper evaluates data from published reports, the authors' veterinary practice, and estimates when no data were found for the factors that contribute to the overall cost of common diseases of adult dairy cows. This paper is a portion of a longer report on the cost of the most common diseases of dairy cattle but will focus on lameness. Milk fever, dystocia, retained placenta/metritis, ketosis, left displacement of the abomasum, clinical mastitis, and lameness were chosen since they represent the majority of the clinical conditions of dairy cows. The author recognizes that many of these diseases have nutritional, environmental, or management policy components as inherent risk factors. These are the things that are most amenable to change. The author further acknowledges that there are complex

interrelationships among the disease entities discussed in this report even though they will be ignored during this analysis.

Sources of information for this report were chosen to reflect as closely as possible the current situation on medium to large commercial dairies. Hence, data from some recent surveys and epidemiological studies were excluded since the herd base from which the data were derived was judged too dissimilar from typical commercial dairies. Some estimates from published works were modified with information from our up-to-date herd files (Dairy Comp 305) representing about 11,000 milking cows in large herds in the vicinity of Ithaca, New York. The intent of this analysis is to make the information relevant to veterinarians, consultants, and managers, particularly those serving large free-stall herds. Prices for dairy cows, milk, feed, and labour used in the report were current in Ontario in fall 2016.

Disease definitions were:

- milk fever (MF): abnormal behavior or weakness requiring treatment with calcium from 2 days before to 5 days after calving
- dystocia (DYS): calving that requires assistance
- retained placenta/metritis (RP): failure to expel the placenta within 24 hours of calving, or metritis characterized by malodorous uterine discharge, fever, and inappetance
- ketosis (KET): reduced appetite accompanied by ketonuria in the first 3 weeks of lactation
- clinical mastitis (MAST): grossly abnormal milk with or without systemic illness
- left displacement of the abomasum (LDA): abomasum displaced dorsally and to the left of the rumen diagnosed by simultaneous auscultation and percussion
- lameness (LAME): limping or reluctance to move due to painful conditions of the digit(s)

Diseases cost producers through direct effects in extra labor for treatment, veterinary fees, and drugs. Treatments may require discarding milk because of drug residue. Diseased cows may produce less milk than expected due to reduced feed consumption, resulting in indirect costs through lost potential income. Diseases occurring early in lactation may lead to a delay in or failure to conceive. Cows may be culled directly or indirectly as a consequence of disease (via low milk production or delayed conception) and some cows die of the diseases being considered.

Cost Calculations

Replacement of dead cows was assigned a cost of $2800. Cows that are culled involuntarily were given a slaughter value of $1.20/kg live weight and an average weight of 700 kg for a selling price of $840. Replacement heifers were valued at $2800, so a replacement costs $1900. This replacement cost is based on current cash accounting methods and does not offset the cost of the replacement with her future income potential. A better method of calculation might consider the net present value of the sick cow had she not become diseased and her current value as a marketable cull. The result of our method is probably an overestimation of the cost of culling but does capture the upper limit of this cost and was chosen for the convenience of calculation. Veterinary fees were taken from published reports or estimated from a $20 stop charge and $150/hour. The entire veterinary visit was assumed to be for treatment of the single sick cow considered in the analyses. Veterinary costs are reported as time or professional fees and do not include medications. These assumptions for veterinary fees will result in overestimation of the likely actual costs for veterinary services but represent a reasonable upper limit. Drug costs for treatment of specific diseases were not available for most diseases under consideration. Typical costs for the medications required were estimated from the retail value of the appropriate drugs from national distributors or from our pharmacy. Labor costs for treatment of sick cows were calculated from estimates of the extra time required to perform the tasks of segregation, restraint, and therapy. Farmer's labour was valued at $15/hour. Milk not available to sell because of drug residues was considered available for calf feeding at half the market value of $0.40/l. Milk not produced due to illness was assumed to occur secondary to reduced feed intake. Feed costs were set at $0.30 per kg dry matter (DM). Feed intake above maintenance yields 2.5 liters of milk per kg DM consumed (NRC, 2001). Thus, the opportunity cost of milk not made is $0.80/l less the marginal feed cost per liter of milk produced ($0.30/2.5 = $0.12) or $0.68/l. Delay in conception beyond the herd goal was assigned the value of $3.00 per day with no additional costs assessed for reproductive inefficiency.

Lameness incidence is described in a number of reports based on veterinary treatments or recall of farmers. Both of these methods underestimate the true incidence of painful conditions of cattle digits. Whitaker et al. (1983) worked with good data from 185 herds in England and Wales and recorded an average incidence of 25% in a 12-month period in 1981-82 based on first treatments. Of these cases, veterinarians treated 6% and farmers treated 19%; 1.4% were culled without treatment. The incidence by herd ranged from 2 to 55%. Thirteen Dutch herds served by a university herd health program had a lactational incidence rate of 9 to 49% during a 3-year observation period. Veterinary treatment rate for lameness in 1821 British herds was 5.5% of 136,800 cows during the year 1977.

Prevalence of lameness is much more commonly reported than incidence in research publications. A cross sectional survey at a single time point is relatively inexpensive to collect in comparison to actual incidence. What is not easily understood about any given study of prevalence is the complex interrelationship between incidence and prevalence. With efficient detection and treatment, the prevalence of lameness may be low in an example herd compared to another with identical incidence but high prevalence due to poorer detection and delayed treatments. The costs of lameness are primarily linked to incidence but will be increased for the average case by delay in intervention.

Prevalence of lameness in 17 herds in Wisconsin and Minnesota was 14% in summer and 17% in spring. The range by herd was 0 to 30% in summer and 2 to 33% in spring. With the increase in incidence of digital dermatitis since these reports appeared, some herds now have treatment rates over 170% per year. The author believes that lameness is now the second most common clinical condition overall, and the most common condition in some herds. Treatment rates by veterinarians, farmers, and hoof trimmers was 55% in a survey of 37 British dairies, and in the data of our clinic averages 38%. Few animals die but some are so disabled that they are not salvageable. The author estimates that 2% of lame cows are disposed of without salvage value. Lame cows are often culled for apparent low production or reproductive failure. In 13 Dutch herds, cullling attributed to lameness was 9% of cases. In 185 British herds lameness was given as the reason for culling 6% of lame cows. In a retrospective case control study of 427 lame cows in 17 British herds, the lame cows had a 10% higher cull rate than non-lame herd mates. Culling for LAME was chosen to be 12% based on the data from our clinic.

Veterinarians examine and treat about 30% of lame cows in our practice but this is probably atypical. The authors estimate that veterinarians treat 5% of LAME cases nationwide. The typical time for treating lameness is 0.35 hours. Farmers or hoof trimmers treat the remainder of LAME cases with an average investment of 0.5 hours. Some cases of lameness require drug therapy and others require supplies such as bandages or hoof blocks. The average drug and supply cost for a LAME case is estimated at $20. Milk discard for some treatments (5% of cases) is for 10 days at 25 kg for a total average discard of 250 kg. Milk not made due to LAME was estimated by DeLuyker et al. (1991) at 110 kg and by Kossaibati and Esselmont (1997) at 130 kg for 90 British herds. Research in our group has estimated milk loss of about 270 kg from data collected in 1995, and 420 kg from data collected in 2006. Delay in conception occurs for cows with LAME in early lactation. The delay was 10 days for LAME before 35 days in milk (DIM), 30 days for LAME between 36 and 70 DIM, and an average delay of 11 days for all LAME cases including cows pregnant when lame. Dutch cows in 13 herds lame at any time in lactation conceived 7 days later than non-lame herdmates, and in 21 herds, 9 days later. Lame cows in 17 British herds conceived 14 days later than

controls. Costs and diseases used for the report are shown in Tables 1 and 2, respectively.

Table 1. Categories of cost and net contribution to the cost of an average case of lameness (2016 Ontario market values)

	Ave Effect	Cost, $
Death, %	2	56
Cull, %	12	96
Milk loss, liters	424	288
Milk discard	30	12
Repro days	13	39
Labor, hours	0.5	6
Vet and drug	30	30
	Total	$527

Table 2. Common diseases of adult dairy cows with average incidence and average cost per case from the above cost model

DISEASE	%/yr	$/case	$/100 hd/yr
Mastitis	40	322	12,886
Lameness	20	528	10,556
LDA	3	611	1,221
Ketosis	9	280	2,516
Rp/Metritis	14	394	5,520
Milk fever	4	321	1,283
Dystocia	17	284	4,824

No herd has exactly this cost per lame cow. If the proportion of claw horn disease among lame cows is high the value will be higher, and if digital dermatitis is the dominant cause of lameness the cost will be significantly lower. Regardless of the mixture of causes for a herd, lowering the incidence will reduce the cost to the herd. This model of cost calculation may overestimate some categories and underestimate others, but the order of magnitude of costs for each of the diseases is believed to be correct. This analysis does fail to capture the overall inefficiency of milk production that lameness causes. Higher overall replacement rates and longer average DIM both significantly reduce net income from dairy farming. Prevalence of lameness can be reduced by prompt discovery and appropriate treatment of

lame cows, but greater profit will be made by correcting risk factors that result in lower incidence of lameness.

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