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Economic impact of mortality and morbidity from diseases in dairy calves

Impacto económico de la mortalidad y morbilidad por enfermedades en becerras lecheras

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ABSTRACT

Breeding calves is the basis of the success of every dairy production unit. The period immediately after delivery and the first days of life are critical moments for them. The attention to detail during this time can reduce losses due to deaths and reduce the incidence of diseases, mainly diarrhea and pneumonia. The objective of this work was to estimate the economic impact related to mortality and morbidity caused by diarrhea in dairy calves. An observational study was conducted in a population of 510 lactating Holstein calves. The variables that were considered to estimate the cost were: price of dead calf, calf treatment / day, days of treatment. The diseases that were recorded to monitor the health of the calves were diarrhea and pneumonia. A 40.4% and 8.4% prevalence of pups was detected with diarrhea and diarrhea plus pneumonia respectively. Diarrhea and pneumonia affect the health of lactating dairy calves, which generates economic losses due to mortality and treatment to the order of $ 242,000.00 in the population evaluated.

Keywords: calves, diarrhea, pneumonia, development, morbidity, economic impact.

RESUMEN

La crianza de becerras es la base del éxito de toda unidad de producción lechera. El periodo inmediatamente después del parto y los primeros días de vida son momentos críticos para ellas. La atención a los detalles durante este tiempo puede reducir las pérdidas por muertes y reducir la incidencia de enfermedades, siendo principalmente diarreas y neumonías. El objetivo del presente trabajo fue estimar el impacto económico relacionado a la mortalidad y morbilidad causada por diarrea en becerras lecheras. Se realizó un estudio observacional en una población de 510 becerras Holstein lactantes. Las variables que se consideraron para estimar el costo fueron: precio de becerra muerta, tratamiento becerra/día, días de tratamiento. Las enfermedades que se registraron para monitorear la salud de las becerras, fueron diarrea y neumonía. Se detectó un 40.4% y 8.4% de prevalencia de crías con evento de diarrea y diarrea más neumonía respectivamente. La diarrea y neumonía afectan la salud de las becerras lecheras lactantes, lo que genera pérdidas económicas por mortalidad y tratamiento al orden de $ 242,000.00 en la población evaluada.

Palabras clave: desarrollo, enfermedad, manejo, morbilidad, producción.

INTRODUCTION

Successful handling of calves begins with the first supply of colostrum. Calves that receive an adequate amount of colostrum, have high concentrations of circulating immunoglobulins in blood, these are associated with a decrease in morbidity and mortality due to certain infectious diseases, such as septicemia, enteritis, diarrhea and respiratory diseases (Besser and Gay, 1994). Likewise, the reduction of the risk of morbidity and pre-weaning mortality, other long-term benefits associated with the passive transfer of immunity, include the decrease in mortality in the period after weaning, improvement in the rate of gain and nutritional efficiency, reduction of age at first birth, improvement in milk production in the first and second lactation and reduction of waste of heifers during first lactation (Faber *et al*., 2005).

High morbidity and mortality rates in newborn calves are attributed to infectious diseases; the two most frequent that affect calves are diarrhea and respiratory diseases. The calf mortality rate before weaning is 7.8%. Diarrhea and other digestive problems contribute to 56.5% of deaths; respiratory diseases is the second cause of mortality with 22.5% (USDA, 2010).

Digestive disorders in calves are frequent diseases that manifest with diarrhea characterized by liquid and profuse stool, dehydration, wasting, prostration and death (Delgado, 2000). Enteric diseases are common and represent huge economic losses to the livestock, meat and milk industry, as a result of newborn mortality and treatment costs. It is common that neonatal diarrhea is more the result of a combined infection of different enteropathogens (bacteria, viruses, protozoa), than infection with a single agent; *Escherechia coli, Salmonella, Rotavirus, Clostridium,* Giardia and Coronavirus being important. It is worth mentioning that greater losses occur when calves are kept in confinement, where the opportunity for transmission of the causative agents of diarrhea is realized by their accumulation in the environment (Baquero-Parrado, 2008).

These agents affect bovines of all ages, with newborn calves and those under 60 days of age presenting the most enteric disease. It is important to highlight that, although all these pathogens can be primary, epidemiological and laboratory studies have shown that mixed infections are more common than simple infections, in their association with the clinical presentation of the disease. That is why this clinical picture is currently described as Bovine Diarrheic Complex (CDB), and when it affects the newborn, it is called an undifferentiated calf diarrhea. Although there are no statistics for these disorders in Mexico, gastroenteric pathogens are associated up to 25% with calf deaths (Delgado, 2009). The current conditions are forcing the producer to be more efficient in the breeding and development of heifers. This is an area of utmost importance, since what is done today will be reflected in the future; the producer must raise heifers in the most efficient

way to reduce expenses, but without negatively affecting his health and future productivity (Belloso, 2005; González *et al.* 2017).

A reduction in expenses generates a private return or profit; this being the remuneration available to the producer to manage resources and accept a risk (Hernández *et al*., 2016).

A cost is a resource that is used to obtain a specific objective. The system of accounting for operating costs allows generating information about the essential productive and administrative activities carried out by companies in their productive cycle, quantifying and classifying expenses according to the interest of the owners or investors; such as the cost per unit produced, the destination of the expenses and the comparison with the product of the sale (Trejo and Floriuk, 2010).

Related to the total costs of raising a calf from birth to 4 months of age, under a farm raising system averaged US $ 442.97, with a variation range of plus or minus US $ 37.42 (Elizondo and Vargas 2015).

Replacement animals are estimated within 15-20 percent of total milk production costs. The replacement of heifers is rated as the second or third largest component in production costs, after feeding, and possibly in labor in most dairy stables. These costs vary from stable to stable and may have extreme differences, due to the varying levels of management. The costs in heifers are influenced by a variety of situations. Ranches with high levels of morbidity and mortality have increased costs (Heinrichs, 2001).

The objective of this work was to estimate the impact, related to the mortality caused by diarrhea in dairy calves.

MATERIAL AND METHODS

The study was carried out from February 20 to April 30, 2016, with a population of 510 animals, in a dairy stable in Torreón municipality of Coahuila, which is located in a semi-desert region of northern Mexico, at a height of 1140 m.a.s.l; between parameters 25 ° 30´ and 25 ° 45´ and the meridians 103 ° 20´ and 103 ° 40´ W (INEGI, 2009).

The variables that were considered to estimate the cost were calf price at birth, calf treatment/day and days of treatment. Diarrhea and pneumonia were the diseases that were recorded to monitor the health of the animals. Registration was made from birth, up to 45 days of life. Classification of pups with diarrhea was performed by observing stool consistencies; normal stool corresponds to healthy offspring, and calves with semi-pasty to liquid feces were sick offspring. In relation to the classification of pneumonia, the young with nasal secretion, tearing, cough and temperature rise above 39.5 °C, sick breeding was recorded; if it did not present the above, it was considered a healthy offspring.

The calves received a 4-liter milk substitute (Hi-bloom®), each liter was prepared with 125 g of powdered substitute mixed in 875 ml of water; a completely homogenized mixture was offered and in a single shot in the morning 07:00 h at a temperature of 39 °C; this was supplied until weaning of the animals, which was performed at 45 days of life. Water was available for free access from the second day of age. In addition, it was supplemented with starter concentrate with 22% crude protein (PC) freely available, from the third day of life.

The statistical analysis of the growth and presence of diseases was performed by means of an analysis of variance, and the comparison of means was carried out by the Tukey test. Analyzes were performed using the Olivares-Saenz statistical package (2012). The level of significance with a value of $p < 0.05$ was used to consider statistical difference.

RESULTS AND DISCUSSION

Table 1 shows the mortality and morbidity in lactating calves caused by diarrhea. Health studies in calves before weaning in the United States of North America, reported diarrhea morbidity of 23.9% and 27.2% during the first 8 weeks of life (USDA, 2008).

Calf mortality is a major economic and welfare concern in dairy farms around the world (Mee, 2008). As expected, interest is growing in characterizing the incidence and risk factors associated with calf mortality to develop reduction strategies (Cuttance *et al*., 2017).

Table 1. Morbidity and mortality with diarrhea event in lactating Holstein calves.

Variables		Percentage	Cost Treatment $	Cost per event $
Total calves with diarrhea event	206	100%	67.00	13,802.00
Mortality	32	15.5%	5,000.00	160,000.00
Average days in treatment	4.03		67.00	270.00
Minimum of days in treatment	1		67.00	
Maximum days in treatment	18		67.00	
Total $				174,342.00

In relation to morbidity and mortality of lactating calves caused by diarrhea and pneumonia (mixed infection), (Table 2). Due to their poor immune capacity, in the period close to birth,

the offspring are more vulnerable to infections; In addition, other elements such as insufficient consumption of colostrum, poor cleaning, variations in the weather or other causes that trigger a stress situation, can decrease the defense system predisposing to the enteropathogenic condition, and in turn to mixed infections (Muktar *et a*l., 2015).

Table 2. Morbidity and mortality with diarrhea event plus pneumonia (mixed infection) in Holstein calves in lactation.

Variables		Percentage	Cost Treatment $	Cost per events $
Calves with diarrhea + pneumonia event (mixed infection)	43	100%	148.00	6,364.00
Mortality	12	28%	5,000	60,000.00
Average days in treatment	8.18		148.00	1,210.64
Minimum of days in treatment	1		148.00	
Maximum days in treatment	27		148.00	
Total $				67,574.64

CONCLUSIONS

Under the conditions in which the present study was developed, it can be concluded that diarrheal and pneumonic diseases affect the health of lactating dairy calves. A 40.4% and 8.4% prevalence of offspring with diarrhea and diarrhea event plus pneumonia were detected, respectively, which generates economic losses due to mortality and treatment at the order of $ 242,000.00 in the population evaluated. It is important to conclude that economic losses due to disease-generated mortality can be increased, because, out of 510 calves, 249 recorded a disease event that could increase mortality rates. Therefore, it is suggested to carry out other investigations in relation to the pathogens that cause diseases in the calves and the resistance to antibiotics by them, and thus reduce economic losses.

CITED LITERATURE

Baquero-Parrado JR. 2008. Diarrea neonatal indiferenciada: consideraciones sobre su prevención en campo. *Veterinaria y Zootecnia*. 2(2):59-68. ISSN 2011-5415.

Belloso VT I. 2005. Cría y desarrollo de vaquillas lecheras. Memorias de DIGAL. Día Internacional del Ganadero Lechero. Delicias, Chihuahua, México.

Besser TE, Gay CC. 1994. The importance of colostrum to the health of the neonatal calf. Department of Veterinary Microbiology and Pathology, Washington State University College of Veterinary Medicine, Pullman. *Vet Clin North Am Food Anim Pract*. 10(1):107-117. https://doi.org/10.1016/S0749-0720(15)30591-0

Cuttance EL, Mason WA, McDermott J, Laven RA, McDougall S, Phyn CVC. 2017. Calf and replacement heifer mortality from birth until weaning in pasture-based dairy herds in New Zealand. *J. Dairy Sci.* 100:8347-8357. http://www.sciquest.org.nz/node/140372

Delgado GR. 2000. Diarrea de las terneras en bovinos Holstein de la Comarca Lagunera. Memorias del IX Congreso Nacional de la Sociedad Mexicana de Patólogos Veterinarios, A.C. Gómez Palacio, Dgo. Pag. 44-45.

Delgado GR. 2009. Enfermedades digestivas en las becerras lactantes. 9º Congreso Internacional de MVZ Especialistas en Bovinos. Torreón Coahuila. Pag. 1-10

Elizondo-Salazar JA, Vargas-Ramírez AM. 2015. Determinación del costo de la crianza de terneras desde el nacimiento hasta el destete en una lechería comercial especializada. *Revista Nutrición Animal Tropical*. 9(2):1-10. ISSN: 2215-3527.

Faber SN, Faber NE, McCauley TC, Ax RL. 2005. Case Study: Effects of colostrum ingestion on lactational performance. *Prof. Anim. Scientist*. 21:420-425. https://doi.org/10.15232/S1080-7446(15)31240-7

González AR, González AJ, Peña RBP, Moreno RA, Reyes CJL. 2017. Análisis del costo de alimentación y desarrollo de becerras de reemplazo lactantes. *Revista Mexicana de Agronegocios*. XXI (40):561-569. ISSN1405-9282. https://www.redalyc.org/jatsRepo/141/14152127005/index.html

Heinrichs J. 2001. Análisis económico para programas eficientes de reemplazo de vaquillas. Memorias de DIGAL. Día internacional de ganado lechero. Delicias, Chihuahua México . https://extensión.psu.edu>abalisis-econo

Hernández MJ, Rebollar RA, Mondragón A, Guzmán SE, Rebollar RS. 2016. Costos y competitividad en la producción de bovinos de carne en el sur del Estado de México. *Investigación y Ciencia*. No 69:13-20. ISSN: 1665-4412.

Instituto Nacional de Estadística y Geografía (INEGI). 2009 Prontuario de información geográfica municipal de los Estados Unidos Mexicanos. Francisco I. Madero, Coahuila

de Zaragoza. Clave geoestadística 05009. Disponible en: http://www3.inegi.org.mx/rnm/index.php/catalog/20.

Mee JF. 2008. Prevalence and risk factors for dystocia in dairy cattle: A review. *Vet. J.* 176:93-101. doi: 10.1016/j.tvjl.2007.12.032.

Muktar Y, Gezhagne M, Biruk T, Dinaol B. 2015. A review on major bacterial causes of calf diarrhea and its diagnostic method. *J. Vet. Med. Anim. Health*. 7(5):173-185. doi: 10.5897/JVMAH2014. 0351.Article Number: 31D529A52229.
ISSN 2141-2529

Olivares-Sáenz E. 2012. Paquete de diseños experimentales. FAUANL. Versión 1.1. Facultad de Agronomía Universidad Autónoma de Nuevo León. Marín, N. L., México.

Trejo GE, Floriuk GF. 2010. Costos de producción del becerro. Boletín informativo. Fideicomisos Instituidos en Relación con la Agricultura. 9. www.fira.gob.mx/InfEspDtoXML/abrirArchivo.jsp?abreArc=3678

USDA. 2008. Dairy 2007, Part III: Reference of dairy cattle health and management practices in the United States, 2007. USDA-APHIS-VS, CEAH, Fort Collins, CO. #N482.0908.

USDA-NAHMS. 2010. Dairy 2007, Heifer calf health and management. Practices on U.S. Dairy operations. USDA: APHIS: VS, CEAH. Fort Collins, CO. #550.0110.