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Total blood protein as an indicator of colostrum sufficiency and morbidity in dairy calves

Abstract

Total blood protein measured in calves between 1 and 7 days of age is a good indicator of the sufficiency of colostrum intake and level of immunity passed to the calf. This measurement can be used to improve calf management strategies and thereby calf performance. Total blood protein concentrations are associated with immunoglobulin absorption in the neonatal calf, which can impact calf morbidity and mortality. Blood protein >5.5 g/dl indicates sufficient immunoglobulin absorption, and blood protein <5.0 g/dl indicates insufficient absorption. Insufficient immunoglobulin absorption increases the risk of calf morbidity and mortality. The dry cow health program, proper collection, and management of colostrum help ensure that quality colostrum is available for the newborn calf. Proper colostrum administration and low-stress calf management also ensure maximal immunoglobulin absorption. Timing of colostrum intake affects total blood protein concentrations. The calf's ability to absorb immunoglobulins is reduced significantly 12 hr after birth. Therefore, it is critical to administer colostrum during the first few hours of life. Total blood protein can be used to determine if the calf has absorbed sufficient immunoglobulins from the colostrum.; Dairy Day, 2000, Kansas State University, Manhattan, KS, 2000;

Keywords

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TOTAL BLOOD PROTEIN AS AN INDICATOR OF COLOSTRAL SUFFICIENCY AND MORBIDITY IN DAIRY CALVES

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Summary

Total blood protein measured in calves between 1 and 7 days of age is a good indicator of the sufficiency of colostrum intake and level of immunity passed to the calf. This measurement can be used to improve calf management strategies and thereby calf performance. Total blood protein concentrations are associated with immunoglobulin absorption in the neonatal calf, which can impact calf morbidity and mortality. Blood protein >5.5 g/dl indicates sufficient immunoglobulin absorption, and blood protein <5.0 g/dl indicates insufficient absorption. Insufficient immunoglobulin absorption increases the risk of calf morbidity and mortality. The dry cow health program, proper collection, and management of colostrum help ensure that quality colostrum is available for the newborn calf. Proper colostrum administration and low-stress calf management also ensure maximal immunoglobulin absorption. Timing of colostrum intake affects total blood protein concentrations. The calf's ability to absorb immunoglobulins is reduced significantly 12 hr after birth. Therefore, it is critical to administer colostrum during the first few hours of life. Total blood protein can be used to determine if the calf has absorbed sufficient immunoglobulins from the colostrum.

(Key Words: Blood Protein, Colostrum, Calves, Morbidity.)

Introduction

Dairy producers have to deal with many factors related to rearing baby calves. Colostrum management is one of them. Many producers attempt to increase the efficiency of their farm enterprise. When time traditionally spent in calf management is re-allocated to other areas of the farm, calf health and performance may be impacted negatively. However, colostrum management, including quality and timing of the first feeding of colostrum, is vital. It is well documented that administering an acceptable quality and quantity of colostrum within the first few hours of a calf's life greatly increases its level of immunity. Calves with sufficient colostrum intake are less likely to experience morbidity than calves with insufficient intake.

Colostrum management on some dairies includes commingling of first-, second-, and third-day colostrum into one tank. Because first-day colostrum has the highest concentrations of immunoglobulins, the pooling practice results in a diluted mixture that may be inadequate to meet the calf's immunoglobulin requirements. Colostrum <50 mg/ml (measured by a colostrometer) should not be given to calves during the first 12 hr of life, because the amount of immunoglobulin is likely to be inadequate. By measuring total blood protein from individual calves, producers can determine accurately the amount of immunoglobulin absorption ($r = 0.88$) passed

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from colostrum to the calf, thus, evaluating the level of passive immunity. Our objective was to review recent research concerning the use of total blood protein as an indicator of colostrum sufficiency and morbidity in dairy calves.

Review of Research

One method of testing the level of immunity passed to the calf is to measure serum total protein (TP). This is done by collecting blood from a jugular vein of a calf between 1 and 7 days of age. The blood is centrifuged, and the serum is analyzed for TP using a refractometer calibrated for this purpose. Refractometry provides rapid and inexpensive results and is useful for monitoring passive immunity status.

Study results have shown that the relationship between the level of serum TP and morbidity and mortality of the calf is non-linear. One study reported that calves with TP concentrations >6.5 g/dl had the least level of risk, whereas calves with TP <5.0 g/dl were 3 to 6 times more likely to experience health problems, death, or both. A much greater reduction in risk was observed when TP increased from 4.0 g/dl to 5.0 g/dl than when it increased from 5.5 g/dl to 6.5 g/dl. The hazard mortality ratio was a constant value from birth to 6 mo. This ratio indicates that low concentrations of TP were

associated with high mortality throughout that entire period. Data collected from another group show similar results; the lowest risk for morbidity and mortality was detected in calves with TP >5.5 g/dl. Calves with concentrations of 5.0 g/dl to 5.4 g/dl showed a very slight increase in the risk of morbidity and mortality with the highest risk resulting from TP <4.0 g/dl. Therefore, we recommend maintaining TP >5.5 g/dl in calves for decreased risk of subsequent health problems.

These results cannot predict which calves will get ill or die and which calves will not. Some calves with TP >6.0 g/dl will experience health problems or die, but not at the rate of calves with lower TP concentrations. Serum TP is a useful and practical means of assessing immunoglobulin absorption in the neonatal calf. However, one also must pay special attention to all factors associated with rearing calves. Following proper herd health programs is important to help ensure the best performance. Herd health programs should be tailored for the individual dairy and address the problems of that dairy. Solving the problems of low quality colostrum, as well as those in the timing and amount of colostrum administered, will not eliminate neonatal morbidity and mortality. However, it is an essential step in helping to ensure more adequate, healthy, replacement heifers for the future.