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# Assessment of Failure of Colostral Absorption Among Well-Managed Herds Using a Simple Screening Test

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Summary

Failure of calves to ingest colostrum early in life is associated with an increased risk of illness and death. Colostral antibody absorption can be easily estimated with a blood sample collected after the calf is 24 hours old. This study was conducted to determine the proportion of calves born at the four SDSU beef units that were affected with inadequate passive transfer (IPT) as a result of inadequate colostral antibody absorption. Of the 333 calves, 44 were affected with IPT (13.2%). There were significant differences in IPT between units, suggesting that environmental factors unique to each unit may have a role in contributing to IPT. Calves of first calf heifers tended to be affected with IPT in a greater proportion than calves born to cows. Females that required assistance at birth produced calves that were 2.5 times as likely to be affected with IPT as females requiring no assistance (P = .058). Calves born during the late evening hours tended to be at greater risk for IPT compared to calves born in the early morning or during the work day. The incidence of IPT appeared to vary among herds, suggesting that control of IPT is possible.

Key Words: Colostrum, Total protein

## Introduction

Prevention of calf losses represents a major hurdle for beef producers. Nationwide, an average of 8% of calves are reported lost before weaning. Of all these losses, 69% occur within the first 96 hours of life. Dystocia (difficult birth) is the main cause of calf loss followed by health problems, mostly scours and respiratory disease, and then injuries.

Prevention of early calf loss requires attention to many factors, some of which are determined as early as the time of conception. Strategies to minimize calfhood disease have been proposed and attempted. Fundamental to disease control is enhancing resistance to disease. The single most important activity to enhance calf resistance to neonatal disease is ingestion and absorption of an adequate volume of high quality colostrum. Studies suggest that failure to ingest adequate colostrum, which results in failure of passive transfer of antibodies to the calf, may be associated with an increased risk of mortality (3 to 6 times). A recent study from the Meat Animal Research Center (MARC) indicated that calves affected with failure of passive transfer at birth have a higher incidence of illness in the feedlot. This suggests that colostrum may have a long term effect on the immune system and animal health and re-emphasizes its importance.

The goal of this report is to assess the rate of failure of passive transfer in four SDSU beef herds using a screening technique that is inexpensive and presently available to field veterinarians and producers. The data for this report were analyzed descriptively to reveal major trends present at the herd level. These data represent a portion of a larger dataset compiled during the 1996 calving season and other reports will follow.

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## Materials and Methods

The four SDSU beef herds, one located in Buffalo (Antelope Range Station), one in Cottonwood (Cottonwood Research Station), and two in Brookings (Cow-Calf Unit [CCU] and Beef Breeding Unit [BBU]) were utilized. These units represent both intensively managed, winter drylot type operations as well as extensively managed range operations.

To ascertain intake of colostrum, a blood sample was obtained from each calf after it was 24 hours old when absorption of colostrum would be expected to be complete. A total of 333 samples were obtained between February 24, 1996, and April 24, 1996. Either the stock persons at the units (Antelope and Cottonwood) or a student assistant collected blood samples. Blood was collected and placed into vacutainer tubes containing an EDTA additive. Samples were centrifuged, plasma harvested, and stored frozen at $0^0$ F in labeled vials. Calf ear tag number, date, and time of blood sampling was recorded. Other data collected included dam ID, parity, calving ease, date and time of birth, calf sex, and birth weight. Calving ease was recorded on a subjective ordinal scale but for analysis was divided into two categories of either assistance given or no assistance given.

After the completion of the calving season, all plasma samples were thawed and total protein determined using refractometry. Refractometry is a fast, easy, inexpensive, accurate method to determine total protein and can be used on the ranch. Total protein is well correlated with the variable of primary interest, total immunoglobulin (Ig). Unfortunately, at present, direct measurement of total Ig is quite expensive (over $8.00/sample) and is only performed in the laboratory setting.

All data were analyzed using a computer program (EpiInfo 6). Calves were grouped into categories of either adequate passive transfer or inadequate passive transfer based on the total plasma protein obtained from the blood sample taken after 24 hours of age. Literature sources suggest that adequate passive transfer would be expected if calves had plasma protein concentrations at or above 5.8 mg/dl. This was the cutoff point used for the analysis.

## Results and Discussion

None of the study herds had ongoing health problems. Very few abortions occurred prior to the 1996 calving season, and the stillbirth rate was not abnormally high. Aside from some injuries that led to the loss of a small number of calves, there was very low mortality and very few of the calves had a record of treatment for any disease condition early in life.

The overall rate of inadequate passive transfer (IPT) is given in Table 1 and is stratified by unit. There was a significant ($P<.001$) difference between units in the percentage of calves in the IPT group, with a range of 1.9% to 28.3%. Reasons for the pronounced variation among herds is not clear, and relatively little work has been published to quantitate specific factors associated with passive transfer. Possible reasons for the variation in IPT between herds include differences in the parity distribution between herds, degree of calving difficulty, and other management factors.

Calves born to first calf heifers (parity = 1) have been reported to have a threefold increased rate of preweaning death compared to calves born of cows in the same herd. Heifers produce a lower quality colostrum and have less satisfactory mothering skills. Our study tended to suggest that calves born to heifers may have a higher rate of IPT, though the trend was not significant ($P=.44$). With the exception of one unit (CCU), calves born to heifers had a numerically higher rate of IPT than calves born to cows (Table 1). The reasons for the apparent reversal of this trend at the CCU is not clear, and a closer examination of the management of heifers at this unit is needed to determine what procedures were used to limit the incidence of IPT in calves born to heifers.

The differences between units in the percentage of the herd that was first calf heifers did not explain the overall variation in IPT that was observed. Applying a standardized rate of IPT to each unit for calves born to heifers (16.7% or .167 IPT calf/calf born) and to calves born to cows (12.6% or .126 IPT calf/calf born)

Table 1. Incidence of calves born with Inadequate Passive Transfer (IPT)

| | Unit | | | | | | | | Overall |
|---|---|---|---|---|---|---|---|---|---|
| | Antelope | | BBU | | CCU | | Cottonwood | | Overall |
| | N[1] | % | N | % | N | % | N | % | % |
| Parity 1 | 6/23 | 26.1 | 0/0 | – | 1/11 | 9.1 | 1/14 | 7.1 | 16.7 |
| ≥2 | 11/76 | 14.5 | 15/53 | 28.3 | 9/67 | 13.4 | 1/89 | 1.1 | 12.6 |
| Overall[2] | 17/99 | 17.2[ab] | 15/53 | 28.3[a] | 10/78 | 12.8[bc] | 2/103 | 1.9[d] | |

[1]N = Number with IPT/total females in group.
[2]Percentages with different superscripts differ ($P<.05$) by individual (2x2) Chi square testing.

multiplied by the number of heifers and cows in each unit would give an "expected" or standardized herd rate of IPT. If the standardized rate of IPT equaled the observed rate in each herd, then the herd differences in IPT were due solely to differences in the parity distribution (percentage of heifers vs cows) between herds. Table 2 gives the results of the standardization. The parity distribution between herds did not explain the observed rate of IPT. This suggests that there were other factors at work in determining the overall rate of IPT between the production units.

Table 2. Standardization of rate of IPT

| | Unit | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Antelope | | BBU | | CCU | | Cottonwood | |
| Parity | N[1] | sIPT[2] | N | sIPT | N | sIPT | N | sIPT |
| 1 | 23 | 3.8 | 0 | -- | 11 | 1.8 | 14 | 2.3 |
| ≥2 | 76 | 9.6 | 53 | 6.7 | 67 | 8.4 | 89 | 11.2 |
| Expected total IPT[3] | | 13.4 | | 6.7 | | 10.2 | | 13.5 |
| Actual total IPT[4] | | 17 | | 15 | | 10 | | 2 |

[1]N = Number of animals in parity group at respective location.
[2]sIPT = standardized IPT. Calculated as N • .167 for parity 1, N • .126 for parity ≥2.
[3]Expected total IPT = sIPT for parity 1 and parity ≥2.
[4]Actual total IPT from Table 1.

Other studies would suggest that a greater difference in IPT between heifers and cows should have occurred. Examining the difference in IPT in parity 1 vs parity ≥2 animals in the three units that included first calf heifers (Antelope, CCU, and Cottonwood) resulted in an incidence of IPT of 8/48 (16.7%) in first calf heifers and 21/232 (9.1%) in cows. Excluding the BBU data from the comparison in IPT between parity groups is appropriate, since the BBU had no parity 1 animals. Though not significant ($P=.17$), exclusion of BBU data suggested that first calf heifers were 1.8 times as likely to have a calf affected with IPT compared to cows. This result represents a more appropriate description of the association between IPT and parity group and agrees more closely with other studies.

Calving ease can have an important influence on viability of the calf, ability to nurse shortly after birth, and ultimately on passive transfer. Dividing the data into animals that calved unassisted versus assisted indicated that females that received assistance at calving had calves that were 2.5 times as likely to have IPT as those not requiring assistance (P=.058). In order to save as many calves as possible, management to avoid IPT in assisted calves should be implemented shortly after birth. This may include hypersupplementation with colostrum, intravenous or oral fluids, or other supportive care.

The time of birth may have an impact on IPT. Calves born at night may be unobserved for several hours. These data suggest a tendency for calves born between 5 p.m. and midnight to have nearly twice the risk of IPT as do calves born in the day (8 a.m. to 4 p.m.) or early morning (midnight to 8 a.m.; P=.16).

Those calves born between 5 p.m. and midnight may be observed only casually until the next morning, since most of the night check concentrates on finding and assisting cows that are calving. Therefore, those calves born in the early evening may be 12 hours or more old before they are carefully observed to confirm nursing. Though the trend in our dataset was not significant (P=.16), it may be worthwhile for producers to monitor calves born between 5 p.m. and midnight to determine if they should modify their management procedures for calves born during this time period.

In summary, IPT was not uncommon in these well managed beef units. Despite IPT, direct calf losses have been low. However, in at least one unit, over 15% of calves have required therapy for some condition (primarily respiratory disease) that have occurred in the period prior to weaning. This study will continue to gather data on the health events of these calves throughout the production cycle. Passive transfer is easily measured and can be a useful objective criterion to assess calving time management. Some studies suggest IPT rates of over 20% may be expected in beef herds. Our data suggest that there is considerable variation in IPT rates between herds, and that IPT can be reduced to very low levels. Producers should consider monitoring their herds for IPT, for as few as 15 randomly drawn calf samples can be used to detect herds with a prevalence of IPT of ≥20%.

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