COW/CALF CORNER

The Newsletter

From the **Oklahoma Cooperative Extension Service**

October 13, 2006

In this Issue

Passive Immunity in the Newborn Calf Affects Lifetime Performance

Dr. Glenn Selk, OSU Extension Cattle Reproduction Specialist

Passive Immunity in the Newborn Calf Affects Lifetime Performance

By Glenn Selk

Introduction

A successful cow/calf operation requires that a large percentage of cows wean a live calf every year. A live calf at weaning time requires survival of the offspring from birth to weaning. Cattle that are healthy as calves, healthy weaned stockers, and remain healthy throughout finishing, are more productive and much more cost efficient. In addition, healthy cattle that are not repeatedly treated with antibiotics or other therapeutic products will have a higher likelihood of producing a wholesome, high quality carcass with fewer injection site blemishes and no antibiotic or drug residue. As the percentage of cattle needing antibiotics for disease control or prevention dwindles, consumer confidence in the wholesomeness of beef should increase. In a time when vertically integrated alliances are becoming more popular, healthy calves that have strong, natural or acquired disease immunity will become in greater demand.

Passive Immune Status 24 Hours Post-calving and Long-term Health and Performance of Calves

Resistance to disease is greatly dependent on antibodies or immunoglobulins and can be either active or passive in origin. In active immunity, the body produces antibodies in response to infection or vaccination. Passive immunity gives temporary protection by transfer of certain immune substances from resistant individuals. An example of passive immunity is passing of antibodies from dam to calf via the colostrum (or first milk after calving). This transfer only occurs during the first 24 hours following birth.

USDA scientists at Clay Center, Nebraska monitored health events and growth performance in a population of range beef calves in order to identify associations of these factors with passive immune status. Blood samples were collected at 24 hours after calving from 263 crossbreed calves to determine the amount of passive maternal immunity that had been obtained from colostrum. Growth performance and health events in the study population were monitored from birth to weaning, and after weaning throughout the feeding period. The lowest levels of passive immunity were observed among calves that were sick or died prior to weaning. *Calves with inadequate passive immunity had a 5.4 times greater risk of death prior to weaning, 6.4 times greater risk of being sick during the first 28 days of life, and 3.2 times greater risk of being sick any time prior to weaning when compared to calves with adequate passive transfer.* ***The risk of being sick in the feedlot was also three times greater for inadequate compared to adequate calves.*** *Passive immune status was indirectly associated with growth rates through its effects on calf health. Sickness during the first 28 days of life was associated with a 35 pound lower expected weaning weight. Respiratory disease in the feedlot resulted in a .09 pound lower expected average daily gain.* (Wittum and Perino, 1995: Journ. of Vet. Research 56:1149)

Thus, passive immunity obtained from colostrum was an important factor determining the health of calves both pre- and post-weaning, and indirectly influenced calf growth rate during the same periods.

Factors affecting the transfer of passive immunity to the baby calf

There are several factors that influence amount of immunoglobulin that is absorbed by the baby calf. Some of these factors are directly related to the amount of colostrum available from the mother. These factors include: 1) **genetic composition of the dam,** 2) **age of the dam**, and 3) **nutritional status of the dam.**

Certainly it is clear that dairy-influence or high milking beef cows should have a larger volume of colostrum. It is less certain whether the concentration of antibody molecules is the same. In some cases, smaller amounts of colostrum may have higher concentrations of immunoglobulins, helping to offset the difference in total volume. Mature cows consistently give more colostrum than two-year olds of similar genetic makeup. Therefore it is no mystery that calves from two-year old cows are more prone to diseases such as scours than calves from older cows. Cows in better body condition at calving have been shown to impart more passive immunity to their calves. This is most apparent in young cows. Research (Odde, et al. 1986 CSU Beef Research Report) in Colorado found that calves from thin (less than 5 body condition score) had lower amounts of circulating antibodies at 24 hours of age than did calves from heifers that were in adequate to good body condition score (body condition score 5 or 6) at calving.

The timing of colostrum intake by the calf can have a role in the transfer of passive immunity. Research has clearly shown that absorption of the very large antibody molecules must take place in the first 24 hours of life. The intestinal lining of the baby calf undergoes changes (called intestinal closure) that reduce the ability of the gut to absorb the immunoglobulins. In fact, most absorption takes place in the first 12 hours. By the time the calf is 6 hours old, only 66% of the antibodies consumes can be absorbed. When the calf is 12 hours old, less than half of the available antibodies will be absorbed into the blood, and when the calf is 24 hours of age, intestinal closure is nearly complete. Sluggish or weak calves may take a long time to stand, and therefore a long time before looking for the teat to nurse. Any thing that compromises the vigor of the baby calf can have an adverse affect on passive immunity. Another factor shown to influence the transfer of passive immunity includes the shape and size of the udder of the dam. Cows with large pendulous teats and/or with very low udder attachments may be difficult for the calf to locate and get the teat in its mouth to nurse.

Calves that were subjected to a long, difficult delivery often are weakened and slow to rise. In addition, the respiratory acidosis that results from the difficult birth can have an additional negative impact on the gut lining and its ability to absorb. This combination of advancing time and acidosis often means greatly reduced antibody absorption. Colorado State scientists also found greater concentrations of antibodies in the blood of calves born to quick easy deliveries, compared to those born after a long difficult labor and delivery process.

Calves born in very severe weather stress as well as those that have not "bonded" with its mother have both been shown to have reduced absorption capability even if colostrum was available.

Summary

The development of lifetime identification, vertically integrated alliances, and niche “natural” or “organic” markets will heighten the need for calves with highly developed disease immunity.

Management factors that enhance the development of the passive immunity include:

1) Provide proper replacement heifer development programs and adequate pre-calving nutrition for the cow herd to ensure heifers are in a body condition score of 6 and cows are at least in a 5 body condition score at calving.

2) Heifers are bred to bulls that sire low birth weight calves and cows are bred to bulls that sire moderate birth weight calves to reduce the incidence of difficult births.

3) Heifers or cows observed in labor are offered early obstetrical assistance so that the baby calf is not allowed to become extremely acidotic, weakened, and therefore unable to nurse the colostrum or have inhibited immunoglobulin absorption.

4) Baby calves that are born to first calf heifers that have very little first milk or baby calves too weak to nurse naturally are given at least 2 quarts of fresh or thawed frozen colostrum within the

first 6 hours of life and another 2 quarts within another 12 hours.