PUBLICATIONS
1993

FIELD DAY REPORT - 1993

Texas A&M University Agricultural Research and Extension Center at Overton

Texas Agricultural Experiment Station
Texas Agricultural Extension Service

Overton, Texas

May 28, 1993

Research Center Technical Report 93-1

BREED AND SEX OF CALF AND BREED OF COW INFLUENCE COLOSTRAL IMMUNOGLOBULIN PRODUCTION

R. C. Vann, J. W. Holloway and R. D. Randel

Background. Several classes of immunoglobulins (Ig) exist, however, IgG, IgG_1, IgG_2, IgM and IgA are the primary classes of Ig that are found in cattle. The calf is born with negligible levels of immune protection. The bovine transmits Ig exclusively through the colostrum, which predominately contains IgG. Passive immunity in the newborn calf is dependent upon intestinal absorption of colostral Ig during the first 24 hours after birth. Often neonatal calf mortality is associated with failure of passive transfer, as reflected by low serum Ig concentrations.

Research objectives of this project were to: 1) determine factors affecting Ig concentrations in colostrum and 2) determine factors affecting Ig availability in the dam's colostrum. Twenty Brahman (B) and twenty Angus (A) cows were bred to B and A sires to produce ten calves of each of the following breed types: AxA, AxB, BxB and BxA. After parturition, the calf was left with the dam for approximately 30 to 45 minutes or until the calf tried to stand and suckle at which time the cow and calf were separated. The dam was hand-milked at 1 and 12 hours after calving, thus colostrum samples and colostrum weight (g) were collected. An injection of oxytocin was administered (30 IU i.v.) to induce milk letdown. The dam's colostrum samples were frozen at -20C until analyzed using sRID assay techniques.

Research Findings. Brahman cows produced a greater ($P<.001$) volume of colostrum at 1 and 12 h compared to A cows. Angus cows produced colostrum with a greater ($P<.02$) density at 1 and 12 h compared to B cows.

Total Ig concentrations were obtained by addition of IgG, IgG_1, IgG_2, IgM and IgA concentrations. Cows producing crossbred (BxA and AxB) calves had higher total Ig ($P<.003$), IgG ($P<.001$) and IgG_1 ($P<.02$) colostral concentrations at 1 h compared to cows producing purebred (AxA and BxB) calves. At 12 h, cows producing crossbred (BxA and AxB) calves tended ($P<.09$) to have higher total Ig and IgG colostral concentrations compared to cows producing purebred (AxA and BxB) calves. Additionally cows producing crossbred (BxA and AxB) bull calves had higher total Ig ($P<.02$) colostral concentrations at 1 and 12 h compared to cows producing crossbred (AxB and BxA) heifer calves. However, cows with purebred (AxA and BxB) heifer calves had higher total colostral Ig concentrations compared to cows producing purebred (AxA and BxB) bull calves. Higher Ig concentrations could be the result of heterosis from the cow producing a crossbred calf.

Brahman cows had greater (P<.007) total Ig, IgG, IgG_1, IgG_2 and IgA available in colostrum at 1 and 12 h than Angus cows due to increased production of colostrum. Breed of sire and dam and sex of calf all influence colostral Ig in cattle.

Application. Brahman cows had greater availability of Ig compared with Angus cows due to increased production of colostrum. Cows producing crossbred calves had increased colostral Ig concentrations over cows producing purebred calves. These data suggest that heterosis of the fetus may have an affect on colostral Ig concentrations in cattle.

In relation to the amount of colostral Ig available from the cow, the calf absorbs only a small quantity which then appears as serum Ig concentrations. However, there is a positive linear relationship between the amount of colostrum consumed and the corresponding serum Ig concentration in the calf. One important factor in increasing immune protection is to make sure the calf receives adequate colostrum soon after birth.