PRE-WEANING GROWTH AND NEONATAL WEAKNESS IN BRAHMAN CALVES UNDER TROPICAL CONDITIONS

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INTRODUCTION

Although near 75% of world cattle population resides in tropical zones, animal production in these areas is often hampered by low genetic progress, lack of record keeping and reduced availability of scientific information. Studies on factors affecting survival during pre-weaning stages in tropical cattle are limited. Thus, aspects such as neonatal weakness have not been adequately examined. A condition referred as the “weak calf syndrome” was reported in southern USA (Franke et al., 1975a). Although several etiologies have been suggested (Carsten, 1994; Kasari, 1994), causes of such syndrome are still unclear. Given its frequent occurrence in Brahman cattle, genetic factors have been associated with neonatal weakness (Franke et al., 1975a; Landaeta et al., 1997). Neonatal weakness has been suggested as an important cause of calf morbidity and mortality (Landaeta et al., 1997). In Bos taurus beef calves, neonatal weakness has been also associated with poor growth performance (Wittum et al., 1994). Despite its relevance for tropical and sub-tropical livestock, research on this topic in the Brahman calf is scarce. The aim of this study was to analyze factors associated with pre-weaning growth traits and neonatal weakness in Red and Grey Brahman calves.

MATERIALS AND METHODS

Neonatal and pre-weaning growth of 119 Brahman calves (Red Brahman N= 82 and Grey Brahman N= 37) were analyzed using a data that comprised body weight, thoracic circumference and hip-height at birth and 210 d of age, and neonatal health status. Animals were raised in a commercial farm from Zulia State, Venezuela, in a region classified as sub-humid tropical forest.

The herd was managed under a dual purpose system. Cows and calves grazed separately and no other supplement except a mix of minerals was included in the animals diet. Manual milking was performed twice/d (AM-PM) leaving one quarter for the calf. Colostrum intake within the first 12 h after calving was assured. Identification, weight, health status and body measurement were recorded within 24 h of calving. At this time, each calf received a treatment comprising: levamisol 7.5% (2ml, IM), vitamins AD3E (2 ml, IM), and oxytetracycline 50 mg/ml (2 ml, IM). Cows received a prepartum (30-45 d before calving) treatment comprising: vitamins AD3E (500,000 IU, 65,000 IU and 50mg, respectively; 8 ml, IM), levamisol 7.5% (8 ml, SQ), and pneumoenteritis bacterin (8 ml, SQ). A preventive herd health plan for local diseases (e.g., aftosa, leptospirosis) and parasites was in place. The herd was free of Brucellosis and Tuberculosis. Reproductive management involved AI using either frozen semen (from local and imported bulls) or natural breeding with bulls produced by AI but raised on the farm. Calves in this study were sired by a total of fifteen (15) bulls.
Health status at birth was codified using a general clinical evaluation comprising 3 categories: good (no evidence of health problem), affected (unspecific or mild signs of disease, weakness) and bad (obvious health problems). Neonatal weakness was defined as a clinical condition comprising one or more of the following: poor cognitive responses, poor suckling ability, slow mobility, and delay in standing (Landaeta et al., 1997).

The dependent variables body weight, thoracic circumference and hip height at birth and 210-d were analyzed using a model that initially included the independent variables of breed of calf, sex, year, season, parity, weakness at birth, sire within breed, breed of calf x sex, breed of calf x season, sex x sire, and sex x season using ANOVA PROC GLM (SAS, 2000). Association between weakness at birth and variables such season, sex, breed of calf, and sire was tested by Chi-Square using \( P<0.05 \) as the level of significance.

RESULTS AND DISCUSSION

Body weight at birth (BW) and adjusted to 210-d. As with other studies in zebu cattle (Arango and Plasse, 1994; Vargas et al., 1999), male calves in our study were heavier than females (31.6 ± 0.9 vs 28.5 ± 0.8 kg, respectively; \( P<0.002 \)). Weak calves tended to be lighter than normals (29.0 ± 1.1 vs 31.2 ± 0.6 kg, respectively; \( P<0.06 \)) and variation of BW due to sire within breed (\( P<0.03 \)) was also found. The heaviest and lightest BW according sire within breed were 35.3 ± 1.5 to 26.4 ± 4.8 kg for Red Brahman and 31.5 ± 2.2 to 28.8 ± 2.7 kg for Grey Brahman, respectively. No differences in BW were found between Red and Grey Brahman calves (30.5 ± 1.0 vs 29.7 ± 0.8 kg). Parity was not an important source of variation. The effect of calf gender on BW has been attributed to a prolonged gestation length by male fetuses (Roberts, 1971) and their extended exposition to testosterone (Bellows et al., 1993). With regard the tendency of neonatal weakness to reduce BW, at this stage, we do not have explanation on how it may occur. Although reports of neonatal weakness in Bos indicus are available (Franke, 1975a; Barboza et al., 1995; Landaeta et al., 1997), scientific information on the biology of this condition is limited. Variation of BW due to sire within breed has been previously reported in Bos indicus breeds (Arango and Plasse, 1994; Carvalheira et al., 1995). Association of sire, frame size, and breed with BW has also been reported (Vargas et al., 1999; Arango and Plasse, 1994). Beyond the genetic factors, differences in BW have been associated with a relationship between sire, calf genotype and pre-partum oestrone sulphate (E\(_2\)SO\(_4\)) concentration (Ferrel, 1991; Zhang et al., 1999). Lack of association between parity and BW is not an uncommon finding in Bos indicus purebred or crossbred cattle (Plasse et al., 1994; Chase et al., 2000). Under tropical conditions, first parturition typically occurs after 3 years of age. Thus, we speculate that heifers calving at this age have nearly reached a mature weight and stature. Therefore, limitations imposed by nutrient partitioning and uterine environment on fetal growth are reduced (Maarof and Arafat, 1985; Holland and Odde, 1992). At 210-d, male calves were heavier than females (124.7 ± 3.2 vs 111.1 ± 3.4 kg, respectively; \( P<0.0007 \)), calves born during dry season were heavier than those born during rainy season (122.5 ± 3.4 vs 113.3 ± 3.1 kg, respectively; \( P<0.05 \)) and calves weak at birth were lighter than normals (113.0 ± 4.1 vs 122.0 ± 2.6 kg, respectively; \( P<0.05 \)). Parity influenced W210 (\( P<0.05 \)). No differences (\( P>0.05 \)) in W210 were found between Red (118.7 ± 7.8 kg) and Grey Brahman calves (120.9 ± 5.0 kg). The effect of calf gender on weaning weight have been largely reported. Hence, no discussion will be offered in this regard. A seasonal effect on W210 is not a rare finding in the tropics (Plasse et al., 1994; Carvalheira et al., 1995). In our study, the seasonal effect on W210 may be due to the prolonged rainy season and the swampy predisposition of soils in this region which make pastures to be more available during dry than...
during rainy season. Likewise, calves which born weak were 9 kg lighter at 210-d than normal calves. Difference of 24 kg in W210 was found in Bos taurus beef calves comparing born weak and normal calves (Wittum et al., 1994). The impaired suckling ability, limited colostrum consumption and reduced immunity of newborns might be reasons for differences in W210 between normal and weak born calves. The effect of parity on W210 has been reported (Arango and Plasse, 1994). Because the nutritional demand for growth decreases as a cow matures, an increase in udder development and milk yield occurs (Franke et al., 1975b; Short et al., 1994). If not milked, this increase in milk is expected to be translated into greater calf weight gain. However, in our study, the association of increased W210 with parity did not follow a clear pattern. Reports evaluating the effect of parity on pre-weaning growth in tropical dual purpose systems are contradictory (Vaccaro et al., 1991; Isea, 1995). Such contradictions may be due to a combination of factors that include management of milking, environment, maternal milk production and early grazing ability of calves.

Neonatal Weakness (NW). Thirty percent (30%) of calves in this study were classified as weak at birth. However, after 1-2 weeks of supportive care these calves eventually became normal. Red Brahman calves had greater (32.6%, 29/86; P<0.005) occurrence of NW than Grey Brahman calves (21.2%, 7/33). Association (P<0.005) of NW and sire was found since most weak born calves were sired by 3 of the 15 bulls in this study. All of these bulls were housed in AI centers. Five calves sired by these 3 bulls died during the perinatal period: one due to dystocia, another due to a congenital malformation (cleft palate) and three others due to weakness sequelae. No association was found between NW and season of birth, or parity of dam. In addition, at 210-d, calves weak at birth had smaller thoracic circumference (106.6 ± 1.8 vs 114.9 ± 1.1 cm; P<0.004 cm) and were shorter at hips than normals (89.1 ± 1.2 vs 96.5 ± 0.7 cm; P<0.001).

Occurrence of NW have been reported in Brahman cattle (Franke, 1975a; Landaeta et al., 1997) or as a problem inherent to Bos indicus cattle (Carstens, 1994). We speculate that inbreeding might be related to the occurrence of NW. Tropical herd management practices perpetuate the risk of inbreeding due to lack of records (Arango and Plasse, 1994) and the fashionable use of bulls and breeds (Landaeta et al., 1997). The association of NW and sire observed in this study reiterates the probability of a genetic component in this condition. Dystocia has been pointed out as an important cause of NW in calves (Kasari, 1994). However, dystocia is unfrequent in Bos indicus cattle (Elzo et al., 1990; Bellows et al., 1993). Hypothermia, dam teat size, starvation, metabolic defects, congenital defects and prematurity have been suggested as factors associated with NW (Hentges and Morantes, 1985; Stanko et al., 1992; Ogata et al., 1996; Carsten, 1997; Kasari, 1994; Zhang et al., 1999). Despite these reports, the etiology of NW remains unclear. Poor sucking ability of weak calves may lead to inadequate colostrum intake. Thus, the most frequent causes for calf losses; poor immune-competence, subsequent illness (gastro-respiratory diseases), starvation, and other secondary causes may have NW as the underlying cause.

CONCLUSION

The high incidence of NW and its association with decreased calf growth suggest that it could be a major underlying cause of calf morbidity, mortality and economic losses. Costs associated with medical assistance and treatments to recover a weak born calf and its subsequent depressed performance should be considered. The observed association between NW, breed and sire confirms the need for a close scrutiny of records in order to identify bulls and linages
within the breed that may be responsible.

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Session 02. Breeding ruminants for meat production

Communication N° 02-70