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Arthrogryposis Multiplex Congenita from a Holstein Friesian Cow

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ABSTRACT

A 3 year old artificially inseminated Holstein Friesian (HF) cow was presented with dystocia on 1st May, 2017 after 273 days of gestation. Rectal examination revealed a calf in transverse presentation with its dorsum towards the cervix. The head was in right ilial position with stiff and fixed flexed forelimbs and hind-limbs. Forced traction of the foetus was unsuccessful and a caesarean section was conducted which led to the exteriorisation of a small foetus with severe contraction of the limb joints, torticolis and lack of muscle development. The calf died shortly after birth and post-mortem revealed a cleft palate. To our knowledge, this was the first reported case of arthrogryposis multiplex congenita in Zambia.

Keywords: Dystocia, calf, congenital, genes

Breeding of ruminants currently involves the use of artificial insemination (AI), multiple ovulation embryo transfer (MOET), *in-vitro* embryo production (IVP) and potentially cloning, as well as the international trade of the germplasm of the elite sires and dams. Therefore, there has been a rapid introduction of many offspring's into several countries within a narrow time frame in attempts to propagate genes linked to economic traits such as meat quality and milk yield. This practice is beneficial for animal production but as all individuals carry defective genes, the rapid propagation of desirable genes is accompanied by the simultaneous occurrence of defective genes (Windsor *et al.,* 2011a).

All breeds of cattle are probably affected by inherited congenital anomalies which are propagated due to specific trait selection. The occurrence of inherited anomalies in some breeds of cattle has become frequent and economically important and thus, veterinarians, animal scientists and cattle breeders should be aware of inherited defects and be prepared to investigate and report animals exhibiting abnormal phenotypes (Whitlock, 2010).

Windsor *et al.* (2011a) and Schild *et al.* (2003) reported that, curly calf syndrome (Arthrogryposis Multiplex) is a disorder that emerged in Angus cattle in 2008 in Australia and the USA, involving congenital contracture and fixation of several joints thus the term multiplex. It has been described in humans and in animals including cattle, lambs, piglets and foals. Kittens and puppies are not usually affected. Full term calves are affected and usually die shortly before or during birth. The calves have markedly reduced birth weight and dystocia is common due to congenital arthrogryposis, scoliosis and torticolis and possibly hydro amnion. Rieger *et al.* (1979), stated that arthrogryposis with associated malformations may be hereditary or a phenocopy of the mutant gene (s) effect produced by unknown factors.

RESULTS AND DISCUSSION

A 3 year old artificially inseminated Holstein Friesian (HF) cow from a herd comprising 2100 HF and 400 HF × Jersey crosses was presented with dystocia after 273 days of gestation. The animals were fed on a total mixed ration (TMR) which involved the mixture of silage, maize bran, rhodes grass, lucerne, cotton cake, molasses, water and trace minerals and vitamins. Rectal examination revealed a calf in transverse presentation with its dorsum towards the cervix. The head was in right ilial position with stiff and fixed flexed forelimbs and hind-limbs. Forced traction of the foetus was unsuccessful and a caesarean section was conducted. The caesarotomy was performed on the standing animal from the left flank. The area of the left flank was prepared and 35 ml of lignocaine in a line block was infused, sedation was done using 0.5 ml of xylazine intramuscularly. A small foetus with severe contraction of the limb joints, torticolis and lack of muscle development was exteriorised. The calf died shortly after birth and post-mortem investigations revealed a cleft palate. The figures below show the abnormalities of the foetus as observed grossly and on post mortem.

In man, it was previously reported by Mayhew (1984) that the infrequent myopathic forms of arthrogryposis were associated with various muscular dystrophies or myotonia and strong hereditary factors. He further stated that hereditary arthrogryposis in domestic animals has been associated with forms of myelodysplasia. However, O'Connor *et al.* (1981), found that arthrogryposis multiplex congenita was a non-genetic disease of early pregnancy, associated with a variety of unfavourable intra-uterine factors as there was no family association with any congenital disorders in the human patients studied. Mayhew (1984), found no cause of the syndrome of the arthrogryposis in a thoroughbred foal corresponding to most reported human cases. Our findings of poorly developed muscle mass (hypoplasia of the limb muscles), torticolis, severely contracted limbs are similar to the findings of Schild *et al.* (2003) and Mayhew (1984); Windsor *et al.* (2011b), in the Murrah Buffaloes and thoroughbred foal respectively. However, our findings oppose those of Kamalakar *et al.* (2016), who did not find any cleft palate, scoliosis or kyphosis in the arthrogryposis calf.

Currently, there is a lot of pressure on cattle breeding programmes to introduce elite sires, the majority of which are direct descendants of former elite sires, frequently resulting in large numbers of defective progeny which could cause dystocia (Windsor *et al.*, 2011; Gentile & Testoni 2006). In our case, dystocia was caused by the congenital arthrogryposis, scoliosis and torticolis and was corrected by performing a

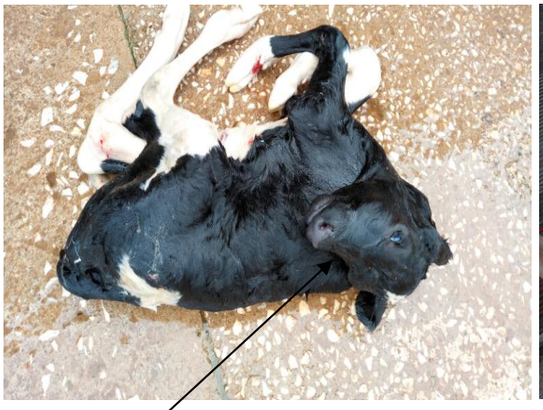

Fig. 1: Note the twisting of the neck

Fig. 2: Note the fixed flexed limbs

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Fig. 3: Note the severely contracted joints with poorly developed muscle mass

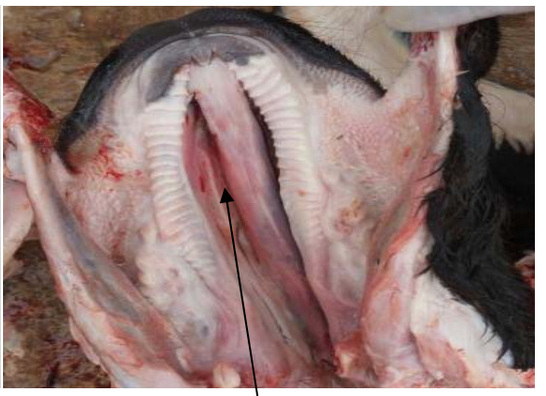

Fig. 4: Note the cleft palate

caesarotomy. Economic losses accrue due to losses of the dam either due to complications of surgery or cows that become downers due to dystocia and cows are usually culled from the herd. Edwards *et al.* (1989), found that most ewes giving birth to lambs with arthrogryposis syndrome died due to dystocia. They further found that all lambs were delivered at term and were still-born and in most multiple births, all or most siblings were affected. Furthermore, economic losses accrue due to foetal losses before or after birth. In our case, the calf died immediately after birth.

Schild *et al.* (2003), analysed the breeding records of the Murrah buffalo herd and found results which suggested that congenital arthrogryposis in the Murrah buffaloes was a disease genetically transmitted by an autosomal recessive trait. The results of Schild *et al.* (2003), are in agreements with several reports recorded in cattle (Windsor *et al.*, 2011; Gentile & Testoni 2006). Russell *et al.* (1985), found that the calves that were affected with the arthrogryposis syndrome had a common sire and thus suggesting an autosomal recessive mode of inheritance. Although the exact etiological factor could not be traced out, the present abnormality might be due to autosomal recessive gene with complete penetrance in the homozygous state, nutritional deficiencies, ingestion of toxic plants like *Lupine, Veratrum, Astragalus, Nicotiana* sp. (at 40-70 days of gestation), chemicals and drugs (Kamalakar *et al.*, 2016). Windsor *et al.* (2011), stated that the congenital defects in cattle are usually, but not always reported to animal investigators. The recognition of new recessively inherited disorders can be difficult during the initial spread of the defective allele and initial cases may be confused with existing disorders and not properly investigated. Gentile & Testoni (2006), reported that by the time the gene frequency is sufficiently high for the large numbers of defective progeny to be of concern to breed societies, the disorder is likely to have become well-established in the breed. Therefore, selective breeding should be conducted if animals with bad traits are to be eliminated.

CONCLUSION

The diagnosis of recessively inherited disorders should be done on farms in order to enable control or elimination of carrier to carrier mating and prevention of further homozygous affected individuals. Most heritable bovine foetal anomaly investigations are done by academicians without the help of private practitioners and producers leading to many of inherited disorders of cattle to go undiscovered. Therefore, future anomalies must be reported, appropriate samples collected and preserved and pedigree information made available by private

practitioners and producers in collaboration with those in academia if control or elimination of animals with bad traits is to be achieved so as to attain optimal production in both dairy and beef enterprises. To our knowledge, this was the first reported case of arthrogryposis multiplex congenita in Zambia.

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