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Monozygous twinning in cattle: A case study

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Abstract

Monozygous twinning occurs infrequently in cattle and likely accounts for relatively few twin births in the dairy cattle population. But, in present case a monozygous twinning of Sahiwal calves were observed in Barka Chumba village located in Mandu Block of Ramgarh district, Jharkhand. The body weight of the calves was found to be approximately 70 kg at 12 months of age. The calves were having poor growth and body condition. The overall health of the cow was also poor and the body weight of the cow was approximately 350 kg. The cow was having history of retained placenta and ketosis. Cows calving twins as well as the calves born as twins are at higher risk for health-related problems compared to non-twinning herdmates. To reduce the twinning in cow strategy has to be adopted to investigate the factors responsible for twinning in dairy cattle and to develop and test the efficacy of practical strategies for identifying and managing cows carrying twins.

Keywords: Monozygous twin, sahiwal calves, sahiwal cow

Introduction

Cattle are a monotocous species meaning that, under most circumstances, a successful pregnancy results in the birth of one calf. Occasionally, however, the reproductive process in cattle, as with many other monotocous species, results in the birth of twins. Twinning in dairy cattle is an undesirable trait that reduces the overall profitability of a dairy operation through negative effects on cows calving twins as well as on calves born as twins^[7]. In contrast, in some beef cattle production systems, twinning is considered a desirable trait that can enhance the overall profitability of the production enterprise by increasing weaned calf weight produced per cow^[3, 5]. Twinning in the dairy cattle population appears to be increasing over time^[14]. The report of monozygous twinning in cattle from India is very scanty. Thus, the findings were reported for academic interest and further study.

Twinning in cattle

Twinning in cattle can be classified into two types: monozygous twinning and dizygous twinning. Each ovarian follicle contains a single oocyte or egg that is expelled from the follicle into the oviduct after ovulation where it awaits fertilization. A zygote is the single cell that forms after an oocyte is fertilized by a sperm. Thus, twins that arise from fertilization of one oocyte that subsequently cleaves and forms two embryos during development in utero are termed monozygous twins, whereas twins that arise from fertilization of two oocytes during the same estrous cycle are termed dizygous twins.

Monozygous twinning

Monozygous twins, commonly called identical twins, are genetically and phenotypically identical and therefore are always of the same sex. Although mathematical estimates of monozygous twinning rates in dairy cattle range from 7.4%^[6] to 13.6%^[19] of all twin births or less than 0.3% of all births, these estimates seem high considering the frequency of double ovulation (which would result in dizygous twins) in the dairy cattle population^[8]. Thus, monozygous twinning occurs infrequently in cattle and likely accounts for relatively few twin births in the dairy cattle population.

Dizygous twinning

Dizygous twinning accounts for most twin births in dairy cattle^[6, 13]. Dizygous twins can be the same or opposite in sex and are no more alike phenotypically or genetically than siblings from the same sire and dam born during separate gestations, because dizygous twins arise from ovulation of two follicles during the estrous cycle.

Consequences of twinning

Positive impacts of twinning in cattle: In some beef cattle production systems, twinning is considered a desirable trait that can enhance the overall profitability of the production enterprise by increasing weaned calf weight produced per cow [3, 12].

Negative impacts of twinning in cattle: Economic analyses conducted in the United States [1] and Great Britain [5] to the dairy enterprise. The transition period is a challenge for dairy cows, twinning and non-twinning alike, and the metabolic and physiologic changes that occur during this time represent the greatest health risk for the cow during her productive life. Cows calving twins as well as the calves born as twins are at higher risk for health-related problems compared to non-twinning herdmates.

Factors associated with twinning birth

Genetics: Heritability and repeatability estimates for twinning rate are low, 0.08 and 0.09 per cent, respectively [11, 20].

Breed: In general, the twinning rate for most beef breeds of cattle is less than 1% [18]. By contrast, epidemiologic estimates of twinning in the dairy cattle population are greater than that of beef cattle and range from 2.5 to 5.8% [21].

Season: Although many studies have shown seasonal effects on the incidence of twinning, others have failed to show such a trend [9]. For example, seasonal increases in twinning have been reported to occur from April to September in Holland [16] and from May through June in Saudi Arabia [19], whereas no seasonal effect was detected in a study of dairy cattle in North America [15].

Parity: Twinning in dairy cattle increases with parity, ranging from 1% for first parity to nearly 10% during later parities [21].

Case study

In August 16, 2019 a field level survey on animal health status was conducted in the Barka Chumba village located in Mandu Block of Ramgarh district, Jharkhand and a case was investigated with a key farmer named Mr Satyendra Prasad Kushwaha regarding twin birth of a cow (Fig. 1). On interrogation and spot verification it revealed that a crossbred Sahiwal cow has given birth of twin calves in the month of September, 2018. The cow was inseminated with Sahiwal semen. The observation and clinical study revealed that both the calves were identical twin and both were female calves. Thus it was referred as monozygous twin. The body weight of the calves was approximately 70 kg (Fig. 2.) at 12 months age. The calves were having poor growth and body condition. The overall health of the cow was also poor and the body weight of the cow was approximately 350 kg. The cow was having history of retained placenta and ketosis.



Fig 1: Monozygous twin calves with dam



Fig 2: Monozygous twin calves

Discussion

Twinning reduces reproductive performance by increasing average days open and services per conception during the subsequent lactation [16]. Cows calving twins are at greater risk for many reproductive disorders including retained placenta, dystocia and metritis [4, 10], as well as metabolic disorders including displaced abomasum and ketosis [16, 17]. In present case also the cow was suffering from retained placenta and ketosis. Incidence of abortion, stillbirth, neonatal calf mortality, and reduced birth weight are greater among twin compared with singleton calves, probably due to reduced gestation length and increased incidence of dystocia among cows calving twins [2, 4]. The decrease in replacement heifers per twin pregnancy arises from increased neonatal calf mortality for calves born as twins and a skewed gender ratio resulting in more homozygous male twins than homozygous female or heterozygous twins [19].

Conclusions

Twinning in the dairy cattle population has increased over time and, if this trend continues, the dairy industry must be prepared to cope with the negative effects associated with twinning. Few studies have dealt directly with management strategies directed specifically for cows carrying twins. Further research is needed to investigate the factors responsible for twinning in dairy cattle and to develop and test the efficacy of practical strategies for identifying and managing cows carrying twins.

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