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A NOTE ON THE TIMING OF BIRTH IN BULGARIAN WHITE DAIRY GOAT

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Abstract

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The parturition timing pattern was investigated for a total of 153 does during two consecutive years. During the kidding time in February goats were monitored at an hourly interval throughout 24 hours of the day. Hourly frequencies of spontaneous live births showed a unimodal distribution with maximum kidding between 10:00 and 20:00 h (78.5% of the total). The peak of delivery was between 14:00 and 16:00 h (21.6% of the total birth), whereas the lowest incidences of kidding were observed between 04:00 and 06:00 h in the morning (0.7% of the total birth). There was not any detectable effect of the time of feeding on birth distribution. Frequency of kidding began to increase soon after the morning feeding and decreased sharply after the afternoon feeding. The results suggest that temporal distribution of births corresponding to circadian rhythm and that kidding was concentrated mainly during the daytime hours.

Key words: goat, birth, time, distribution

Introduction

In mammals two types of temporal distribution of delivery have been observed in different species. Parturitions may be uniformly distributed or concentrated during specific periods throughout the day. Different mechanisms are involved in providing a close synchronization of the various perinatal events which are essential for the onset of labor (Currie and Thorburn, 1977), and some environmental factors may also operate on the synchronous triggering of parturition (Alexander et al., 1993).

In domestic, in contrast to wild animals, diurnal rhythm of birth distribution might be affected both by the environmental complex and the management practices employed. Studies in sheep showed that, in general, the birth of lambs was often spread fairly evenly throughout the 24 h period. Variations in the time of parturition depended on the breed of sheep and season of lambing (George, 1969). Lindhal (1964), Younis and El-Gboory (1978) and Aleksiev (2007) found out a tendency for ewes to lamb less frequently during the night time and that more ewes give birth between 09:00 and 18:00 h. Unlike results reported for sheep, some authors noted that kidding in different goat breeds studied usually tend to occur at daytime. (Bosc et al., 1988; Ramirez et al., 1995; Romano and Piaggio, 1999).

The present study was conducted in order to determine the diurnal variation in the time of kidding in Bulgarian white dairy goat kept indoor during the time of delivery.

Materials and Methods

The experiment was carried out in two consecutive years on Bulgarian White dairy goats kept under conventional management system based on pasture rearing in summer and housing in winter when the kidding took place. During the two years the same management practice was employed. The flock was kept in the same barn and offered the similar type of diet, consisting of concentrate, hay and silage. The does were fed twice daily: about 08:00 h in the morning and in the late afternoon and had free access to water throughout the day. All animals were kept together to eliminate any possible pen effect and were moved to individual pens immediately after parturition. Kidding took place during February and so there could not have been any substantial differences in the duration of the photoperiod and other climatic variables during the time of delivery. Does were supervised at an hourly interval during the day and night. The time of birth of the first kid was taken as the time of parturition. The electric light was turned on between 17:00 to 07:00 in the morning. The effect of sex and type of birth of the kids were not considered in this study since almost all does observed delivered twins.

Chi square test was applied for comparison of the diurnal frequencies of kiddings after dividing the day in twelve equal classes of time (STATISTICA, 2001).

Results and Discussion

The data from 153 kidding were collected from natural and spontaneous live births only and the does that needed help during the delivery were excluded from the analysis. The frequency of kidding was calculated for twelve two hour periods according to the time of the day. The temporal distribution of parturition at two hour intervals is shown in Figure 1.

The data obtained evidence that the parturitions were not uniformly distributed and the peak number of does gave birth around midday hours. The time of kidding showed a unimodal diurnal distribution indicating that 78.5 % of deliveries occurred between 10:00 and 20:00 h ($P < 0.01$). The peak of parturitions was achieved between 14:00 and 16:00 h (21.6% of the total birth), while the lowest percentage was detected between 00:04 and 00:06 h (0.7% of the total birth). Moreover, 87.5 % of parturitions occurred between 06:00 and 20:00 h.

The timing of the onset of labor appears to depend on cues derived from both the fetus and the mother (Flint et al, 1986). Studies in sheep and goats identified the sequence of coordinated hormonal signals originating with the fetal brain (Bazer and First 1983) and there was a good evidence of a role of fetal cortisol in controlling parturition (Flint et al 1979). The increase in cortisol level influences the onset of labor through its effect on placental steroidogenesis (Thorburn and Challis, 1979) stimulating placental estrogen synthesis (Flint et al., 1977). Cooke and Knifton (1980) noted that in goat dissolution of the maternal corpus luteum also plays a role in the initiation of parturition.

Our findings are, in general, in accordance with those obtained in other works with dairy goats. The pattern of the diurnal distribution of kidding established in our study differed to some extent from that found by Bosc et al. (1988) and Ramirez et al. (1995) in dairy goats, and by Romano and Piaggio (1999) in Nubian goats grazed on pasture during the day and kept under natural light conditions. In all aforementioned investigations the deliveries occurred mainly between 09:00 and 15:00 h with a peak at noon whereas in the present work most of the does gave birth between 10:00 and 20:00 h with a peak between 14:00 and 16:00 h. The established differences may be due to the farm routine, kidding season and breeds used in different studies which contributed to some alterations in the diurnal rhythm of birth labored spontaneously. The results showed that in the case of this study, having almost controlled environments in the barn, there was some shift in parturitions to the late afternoon and early evening compared to other studies on goats. There is growing evidence that circadian rhythmicity and reproduction are interconnected (Boden and Kennaway, 2006) and that the fetal circadian system may play a role in determining the hours of birth (Seron-Ferre et al., 1993). In ro-

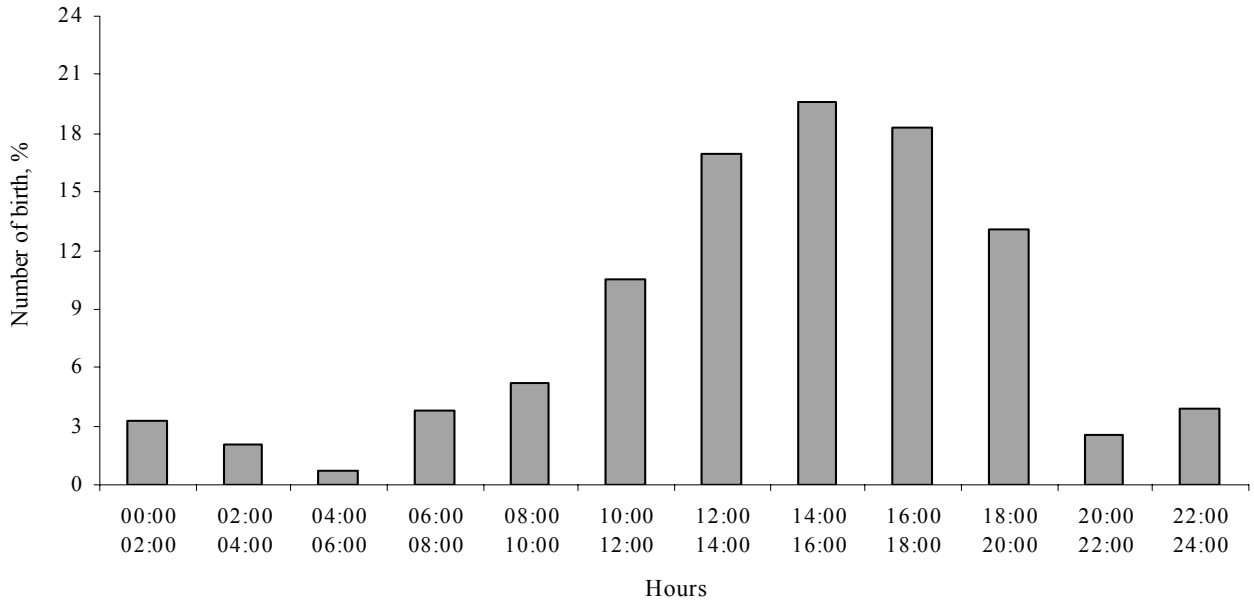

Fig. 1. Distribution of birth at two hour periods in Bulgarian White goats

dents the fetal trigger may established the day on which birth will occur, while a maternal signal, possibly related to the photosensitive phase of an endogenous rhythm, determines the appropriate hour during that day (Flint et al., 1986). Yellon and Longo (1988) also pointed out that photoperiod shifts resulted in alteration in the timing of delivery.

The exact hour of delivery can also be influenced by the time of feeding in ruminants. Cobb and Gonyou (1982) working with Hampshire, Suffolk and Rambouillet breeds of sheep stated, that the diurnal pattern which exists for lambing time may be modified by feeding time. Simonetta et al. (1991) remarked that feeding regime altered the fetal plasma cortisol concentration. In one-daily fed ewes after 135 days gestation plasma cortisol peaked at 11:00 h in the ewes and at 13:00 h in the fetuses while in multi-fed group there was no significant variation in the plasma concentrations of cortisol. These findings may be the possible explanation of the effect of feeding regime on the onset of parturition. In the present study it was not found any detectable effect of the time of feeding on birth distribution. Frequency of kidding began to increase soon after the morning feeding while shortly after the afternoon feeding it showed a sharp decrease.

The similar temporal patterns of spontaneous births recorded by different authors in various breeds and environmental conditions showed a concentration of the parturitions during the midday hours independently of farm routine. The results suggest that birth process is precisely regulated and determined by the interplay of many exogenous and endogenous factors and that circadian rhythm corresponded closely to the temporal distribution of the onset of labor. Considering the synchronization of fetal maturation and birth and activation of the uterotonic mechanisms Jenkin and Young (2004) noted that the initial mechanism for the timing of birth is encoded in the fetal genome and is closely linked to, and activated when, certain prerequisite developmental events have occurred in the fetus.

Conclusion

Hourly frequency of spontaneous live births showed a unimodal distribution with maximum kidding during the day and the lowest incidences in early morning.

The peak of parturitions occurred in the afternoon. The time of feeding had no effect on the time of kidding. The results suggest that temporal distribution of births corresponding to circadian rhythm and that kidding was concentrated mainly during the daytime hours. The establishment of the diurnal pattern of births may have practical implications contributing to a more effective distribution of manpower during the kidding season when a close attention to does is indispensable.

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