



Behavioral characteristics of calving in Curraleiro Pé-duro cows

H.C.A. Teixeira^{1,2}, P.L.G. Souto^{1,2}, E.A. Barbosa^{1,2}, N.H. Moreira^{1,2}, G. Santos Júnior^{1,2},
A.S. Mariante¹, A.F. Ramos^{1,3}

¹Embrapa Genetic Resources and Biotechnology, Brasília, Brazil.

²University of Brasília, Brasília, Brazil.

Abstract

Studies were conducted to characterize the labor behavior in Curraleiro Pé-duro cows, a locally adapted breed found in the semiarid region of Brazil, which is considered rustic and fertile. Eleven Curraleiro Pé-duro cows were kept in pasture and were observed every 4 h to assess the beginning of birth, and subsequently were constantly monitored until the complete expulsion of the placenta, accordingly to the three different stages of labor. The cows were evaluated according to the following events: staring into the flank (SIF); licking vulva and lifting the tail (LVUT); head-butts to the flank (HF); dripping colostrum (DC); lying down and standing (restlessness; LDS); duration of the first phase (Dur1P); amount of initial contractions (IC); time to onset of appearing of feet (TOAF); duration of calving (DC) and duration time from end of calving till the expulsion of the placenta (DurExpP). The results are presented as mean \pm standard deviation: SIF (4.00 ± 2.37); LVUT (2.38 ± 1.06); HF (1.80 ± 0.45); DC (1.20 ± 0.45); LDS (2.56 ± 1.33); IC (6.00 ± 2.9); Dur1P (71 ± 40 min); TOAF (7 ± 8 min); DC (25 ± 24 min); and DurExpP (228 ± 76 min). These results allow us to characterize the events that precede and accompany the moment of labor in Curraleiro Pé-duro cows.

Keywords: behavior at labor, bovine, conservation, genetic resources, reproduction.

Introduction

The Curraleiro Pé-duro cattle are a Brazilian locally adapted cattle breed descendant from cattle brought by the Portuguese and Spanish settlers, and have a small declining population (Boaventura, 2005). Created at pasture, the Curraleiro Pé-duro cattle are an extremely rustic animal, very well adapted to the harsh environments of the semiarid plains of Northeastern Brazil (Primo, 1992; Mariante *et al.*, 2003; Serrano *et al.*, 2004; Bianchini *et al.*, 2006). The exceptional rusticity of Curraleiro Pé-duro cattle, as well as its reproductive efficiency in dry tropical environments (Teixeira *et al.*, 2011, 2013), and its ability to survive in inhospitable regions of native pastures are features that justify its conservation.

It is widely known that along with the environment and management, studies and investigations of ethological periparturient develop an important role in increasing the productive efficiency (Ramírez *et al.*, 1995; Hafez and Hafez, 2004). The initial events of parturition are important for the determination of the moment in which the animals are entering into labor, allowing to identify if the animals need any assistance (Taverne, 1992; González *et al.*, 2003; Miedema *et al.*, 2011a, b). During a few days to a few hours before calving, cows start to show an initial change in behavior, such as: walking around, lying down and getting up, scraping the ground, licking the flank and vulva, and lifting the tail. These behavioral signs presented by the animals increase 5 to 2 h before parturition (Lidfors *et al.*, 1994).

Restlessness is most often observed as a behavioral change at the time of the birth and has been described as: an increase in the movement of the animal, isolation from the herd, vocalization, lifting and swinging tail, looking at the flank area, making a nest, and eating in small quantities (Houwing *et al.*, 1990; Lidfors *et al.*, 1994). According to Noakes (1996), Senger (2003) and Peter and Jackson (2004), labor is divided into three different stages: in the first, only internal events occur, related to the opening of the cervix for expulsion of the fetus until disruption of chorioallantois membrane and behavioral events mentioned above; in the second stage there is the expulsion of fetus itself; and in the third, after the expulsion, myometrial contractions continue, culminating with the complete expulsion of the placental membranes.

Whereas Curraleiro Pé-duro cows are relatively small when compared to other cattle breeds, they have a great rusticity and adaptability, and are recognized for not showing signs of labor because they are usually hidden in areas of dense forest and at night, so we can only find these animals a few days after labor. Therefore, there is no scientific knowledge about the physiological and behavioral events of the birth of Curraleiro Pé-duro breed. Thus, the aim of this study was to evaluate the behavioral characteristics of the events that concern the parturition of Curraleiro Pé-duro cows, in order to generate scientific knowledge, which would help the Conservation Nucleus of the breed to identify the time of calving and to increase its productive efficiency.

³Corresponding author: alexandre.floriani@embrapa.br

Received: September 19, 2014

Accepted: September 15, 2015



Material and Methods

The experiment was performed at the Sucupira Experimental Farm, which belongs to Embrapa Genetic Resources and Biotechnology. This experimental farm is located southwest of the city of Brasília, DF (15°52'-15°56'S and 48°00'-48°02'W), Brazil, with altitudes ranging from 1,050 to 1,250 m. The climate is Köppen Aw, indicating dry winter and rainy summer.

Eleven Curraleiro Pé-duro cows kept in maternity paddocks of approximately 2,500 m², with water and minerals *ad libitum* and were observed every 4 h for 30 min, to assess the beginning of birth, and subsequently were constantly monitored until the complete expulsion of the placenta, accordingly to the three different stages of labor, described by Noakes (1996), Senger (2003) and Peter and Jackson (2004).

The animals were observed by trained personnel to assess the behavioral events at a mean distance of approximately 10 m from maternity paddocks (previously to the beginning of the experiment, it was observed that at this distance the human presence did not influence the behavior of the animals). The calving occurred in the months of November and

December of 2010, and observations began ten days before the expected delivery date, taking into account the timing of artificial insemination and the average length of gestation of both *Bos indicus* and *Bos taurus*.

The cows were evaluated for the first stage of labor, according to the events: staring at the flank, licking vulva and lifting tail; head-butts to the flank; dripping colostrum; lying down and standing (restlessness), and duration of the first phase.

During the second stage of labor (calf birth itself, with rupture of fetal membranes), we evaluated: amount of initial contractions, time to onset of feet appearing; duration of calving. In the third stage the duration time from end of calving till the expulsion of the placenta was evaluated.

Results

The results of the observations of behavioral events of the first stage of labor of Curraleiro Pé-duro cows are presented as Mean \pm SD of frequency of observations in Table 1. The results of the average time duration of the three phases of labor are presented in minutes of duration of behavioral events on Table 2.

Table 1. Mean \pm SD of frequency of observations of behavioral events of the first stage of labor of Curraleiro Pé-duro cows, in which N represents the number of animals showing these events being observed every 4 h until the start of first phase and subsequently by constant monitoring.

Events	N	Frequency
Staring into the flank	11	4.00 \pm 2.37
Licking vulva and lifting tail	8	2.38 \pm 1.06
Head-butts to the flank	5	1.80 \pm 0.45
Dripping colostrum	5	1.20 \pm 0.45
Lying down and standing (restlessness)	9	2.56 \pm 1.33
Amount of inicial contractions	11	6.00 \pm 2.9

Table 2. Average Time \pm SD in minutes of the duration of behavioral events of the three different phases of labor of CurraleiroPé-duro cows observed every 4 h until the start of the first phase, and then by constant monitoring.

Events	Time (min)
First phase of labor	
Duration of the first phase	71 \pm 40
Second phase of labor	
Time to onset of appearance of feet	7 \pm 8
Duration of calving	25 \pm 24
Third phase of labor	
Duration time to end of calving till the expulsion of the placenta	228 \pm 76

Discussion

The results of the observations of behavioral events for the first stage of labor presented by Curraleiro Pé-duro cows (Table 1) found in this experiment are rarely found in the literature, as staring at the flank, head-butts to the flank and dripping

colostrum (Wehrend *et al.*, 2006). Even though behaviors such as lifting tail and licking vulva, and lying down and standing (restlessness) are present in several studies in the literature (González *et al.*, 2003; Miedema *et al.*, 2011a, b), the reported results show an enormous variation among breeds and environments where the cows are at the time of delivery. Bueno *et al.*



(1981) observed that in pregnant cows as well as in pregnant mares, the movement of lifting up the tail is longer than those observed when the animals are defecating and urinating, which may be related to the initial myometrial contractions and fetal movements (Bueno *et al.*, 1981; Noakes, 1996; Hafez and Hafez, 2004). Moreover, the authors also observed that these movements of lifting tail decrease 24 h before calving and increase again at 8 to 6 h before calving (Bueno *et al.*, 1981).

Therefore, behavioral statements such as staring at the flank, head-butts to the flank, and licking vulva and long-term lifting tail, are behaviors directly related to the identification of the time of initial labor of Curraleiro Pé-duro cows, and are related to the fetal kinetics and uterine contractions, since they were observed in at least eight of the eleven cows tested (Table 1).

In this context, these features can be used in the Conservation Nucleus of the Curraleiro Pé-duro cattle as ethological events that predict that the animal is going into labor, thus allowing the correct maintenance of the parturient and the product.

Regarding the observation of events related to restlessness, Ramírez *et al.* (1995) reported these behavior events as: lying down and standing, grunting, looking at the flank and making movements with the head, and scraping the ground. The authors also report that such behavioral events indicate that the animals are experiencing restlessness due to the onset of labor, due to the high frequency in which these events were observed. In this experiment, although these behaviors have been observed in the majority of the animals, their frequency was not high (Table 1), probably because the Curraleiro Pé-duro cows present few behavioral signs of labor, a feature that may be associated with the condition of these animals which have undergone natural selection (Mariante and Cavalcante, 2006) and therefore seek to give birth unnoticed to protect the offspring from potential predators.

Furthermore, Houwing *et al.* (1990) observed a large increase in the events of restlessness over a period of about 3 h before the exact time of birth in cattle. In goats, Lickliter (1985) observed a 72% increase in behaviors related to restlessness, such as scraping the ground, lying down and standing and moving the head, a few hours before the birth itself. Furthermore, Proudfoot *et al.* (2009) observed that animals that developed dystocia had a higher amount of events of restlessness 24 h before labor, when compared to animals with normal labor, which may be related to pain and discomfort (von Keyserling and Weary, 2007; Mainau and Manteca, 2011), which was not observed in this experiment, given the fact that no animal showed dystocia.

Therefore, as well as related behaviors with the kinetic fetal and uterine contractions, ethological events linked to restlessness, like head-butts to the flank, and lying down and standing, can be used as behavioral events that indicate the onset of parturition of Curraleiro

Pé-duro cows. However, they must be used with caution, as the frequency in which these events occur is low and may go unnoticed.

In cows, birth usually occurs between 30 min to 4 h from the appearance of allantocorium until the complete expulsion of the fetus (Mainau and Manteca, 2011). The occurrence of a calving longer than 4 h demonstrates the occurrence of dystocia (Noakes, 1996). The Curraleiro Pé-duro cows showed an average duration of 25 min of calving (Table 2), and the cow that presented the shortest duration of labor took only 9 min to give birth, while the one that presented the longest duration took 1 h and 36 min. The average length of calving of just 25 min can demonstrate how easy it is for these animals to give birth, perhaps due to their small size and the small size of the newborn, which may be caused by the natural selection that occurred along the last 500 years (Mariante and Cavalcante, 2006). It is possible that they had to calve quickly to avoid being caught by predators in the region where the breed developed.

After calving, the abdominal contractions cease, though the myometrial contractions remain, however, they are less frequent and more regular (Noakes, 1996). Due to this fact, the complete expulsion of the fetal membranes may extend for a period ranging from 1 to 12 h (Morrow, 1986; Senger, 2003; Peter and Jackson, 2004), in which delays over 12 h for complete release of fetal membranes are characterized as retention of the placenta (Peter and Jackson, 2004). In this experiment, the Curraleiro Pé-duro cows had average time to expel the fetal membranes of 228 min (Table 2), which corresponds to 3 h and 48 min, again showing a short time for expulsion of the fetal membranes, probably related to how easily these animals can give birth.

The results found in this experiment allow to characterize the events that precede and accompany the moment of birth in Curraleiro Pé-duro cows, and may in the future be used as a reference for other locally adapted cattle breeds, for which there is little information on calving behaviour, due to their reduced population numbers. Since the majority of these locally adapted breeds are under the threat of extinction, information about their reproductive characterization may serve as a basis for the implementation of management strategies that may increase the fertility rates on the Conservation Nuclei. Under the conditions of this experiment, Curraleiro Pé-duro cows showed few obvious signs of onset of labor and had ease calving, as evidenced by the short time to the complete expulsion of the fetus.

References

Bianchini E, McManus C, Lucci CM, Fernandes MCB, Prescott E, Mariante AS, Egito AA. 2006. Body traits associated with heat adaptation in naturalized Brazilian cattle breeds. *Braz J Agric Res*,



41:1443-1448.

- Boaventura VM.** 2005. *Gado Curraleiro: relação dos criadores e aspectos gerais da raça.* Goiânia: Sebrae-GO. 80 pp.
- Bueno L, Tainturiere D, Ruckebusch Y.** 1981. Detection of parturition in cow and mare by a useful warning system. *Theriogenology*, 16:599-605.
- González M, Yabuta AK, Galindo F.** 2003. Behavior and adrenal activity of first parturition and multiparous cows under a competitive situation. *Appl Anim Behav Sci*, 83:259-266.
- Hafez B, Hafez ESE.** 2004. Reproductive behavior. In: Hafez ESE, Hafez B. *Reproduction in Farm Animals.* 7th ed. Baltimore, MD: Lippincott Williams & Wilkins. pp. 293-306.
- Houwing H, Hurnik JF, Lewis NJ.** 1990. Behavior of periparturient dairy cows and their calves. *Can J Anim Sci*, 70:355-362.
- Licklitter RE.** 1985. Behavior associated with parturition in the domestic goat. *Appl Anim Behav Sci*, 13:335-345.
- Lidfors LM, Moran D, Jung J, Jensen P, Castren H.** 1994. Behavior at calving and choice of calving place in cattle kept in different environments. *Appl Anim Behav Sci*, 42:11-28.
- Mainau E, Manteca X.** 2011. Pain and discomfort caused by parturition in cows and sows. *Appl Anim Behav Sci*, 135:241-251.
- Mariante AS, Cavalcante N.** 2006. *Animals of the Discovery: domestic breeds in the history of Brazil.* 2nd ed. Brasília, DF: Empresa Brasileira de Pesquisa Agropecuária. 274 pp.
- Mariante AS, McManus C, Mendonça JF.** 2003. *Country report on the state of animal genetic resources: Brazil.* Brasília, DF: Embrapa Recursos Genéticos e Biotecnologia. 92 pp.
- Miedema HM, Cockram MS, Dwyer CM, Macrae AI.** 2011a. Behavioral predictors of the start of normal and dystocic calving in dairy cows and heifers. *Appl Anim Behav Sci*, 132:14-19.
- Miedema HM, Cockram MS, Dwyer CM, Macrae AI.** 2011b. Changes in the behavior of dairy cows during the 24 h before normal calving compared with behavior during late pregnancy. *Appl Anim Behav Sci*, 131:8-14.
- Morrow DA.** 1986. *Current Therapy in Theriogenology.* 2nd ed. Philadelphia, PA: W.B. Saunders. 1143 pp.
- Noakes DE.** 1996. Parturition and the care of parturient animals. In: Arthur GH, Noakes DE, Pearson H, Parkinson TJ. *Veterinary Reproduction and Obstetrics.* 7th ed. Philadelphia, PA: W.B. Saunders. pp.141-170.
- Peter GG, Jackson MA.** 2004. *Handbook of Veterinary Obstetrics.* 2nd ed. Saunders. 320 pp.
- Primo AT.** 1992. El ganado bovino iberico en las Americas: 500 años después. *Arch Zootec*, 41:421-432.
- Proudfoot KL, Huzzey JM, von Keyserlingk MAG.** 2009. The effect of dystocia on the dry matter intake and behavior of Holstein cows. *J Dairy Sci*, 92:4937-4944.
- Ramírez A, Quiles A, Hevia M, Sotillo F.** 1995. Behavior of the Murciano-Granadina goat in the hour before parturition. *Appl Anim Behav Sci*, 44:29-35.
- Senger PL.** 2003. Placentation, the endocrinology of gestation and parturition. In: Senger PL. *Pathways to Pregnancy and Parturition.* 2nd ed. Redmond, OR: Current Conceptions. pp.304-325.
- Serrano GM, Egito AA, McManus C, Mariante AS.** 2004. Genetic diversity and population structure of Brazilian native bovine breeds. *Braz J Agric Res*, 39:543-549.
- Taverne MAM.** 1992. Physiology of parturition. *Anim Prod Sci*, 28:433-440.
- Teixeira HCA, Nascimento NV, McManus C, Egito AA, Mariante AS, Ramos AF.** 2011. Seasonal influence on semen traits and freezability from locally adapted Curraleiro bulls. *Anim Reprod Sci*, 125:56-61.
- Teixeira HCA, Mariante AS, Nascimento NV, Driessen K, Ramos AF.** 2013. Protocols with different time of progesterone exposure on superestimulatory response and embryo production of locally adapted Curraleiro Pé-duro cows. *J Anim Sci Adv*, 3:261-269.
- von Keyserling MAG, Weary DM.** 2007. Maternal behavior in cattle. *Horm Behav*, 52:106-113.
- Wehrend A, Hofmann E, Failing K, Bostedt H.** 2006. Behavior during the first stage of labor in cattle: influence of parity and dystocia. *Appl Anim Behav Sci*, 100:164-170.
-