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# Strategy to improve the parturition ability in crossbred recipients implanted with embryos produced *in vitro*.

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**Abstract.** The aim of this study was to evaluate the synchronization rate, ease to parturition, calves viability and retained placenta rate for Nellore recipients treated with triancinolone (TRI) + dexametasone (DEXA) + PGF<sub>2</sub>α (d-CLO). Hundred-ninety-four crossbred recipients (½ Nellore/ ½ Caracu) were divided into two groups (TRI, n = 97; Control, n = 97) and observed from 285 to 292 days of pregnancy. On Day 285, animals from Group TRI received 1mg/60 Kg of BW/IM of triancinolone (Retardoesteróide<sup>®</sup>, Hertape Calier Saúde Animal S/A) followed of association of 25mg of dexametasone (Caliercortin<sup>®</sup>, Hertape Calier Saúde Animal S/A) and 150µg of D-cloprostenol (Veteglan<sup>®</sup>, Hertape Calier Saúde Animal S/A) on Day 292. Animals from Control received injections of saline solution in same days. TRI had higher synchronization of parturition than Control (79.4% vs. 19.5, respectively; P < 0.05), as well TRI had lower assistance of parturition. No differences were observed for assistance of parturition comparing the born weight and gender of calves. TRI had lesser placenta retained than Control (11.4% vs. 25.8%, respectively; P < 0.05). In short, this strategy of induction resulted in better conditions of assistance and quality of parturition, decreasing the placenta retained in Nellore recipients implanted with embryos produced *in vitro*.

**Keywords:** triancinolone; parturition induction; placenta retention.

## Introduction

Strategies aimed at increasing the productivity of cattle have been the focus of several studies in recent years, mainly related to timing of reproductive events and genetic gains in greater speed and range (Christenseng, 1991; Church and Shea, 1977; Hasler, 1995; Lohius, 1995; Ruane and Thompson, 1991; Bergmann and Penna, 1999). Brazil stands out in this industry, since the 800.000 cattle embryos produced in the world, 17.6% *in vivo* and 48.5% *in vitro* embryos were performed in this country (Mapletoft, 2006; Viana and Camargo, 2007).

Despite the advantages, between 5-10% of the calves produced *in vitro* can be somewhat difficult birth due to excessive birth weight, prolonged gestation, perinatal mortality, among other fetal disorders (McDiarmid, 1983; Horta, 1999; Farin et al., 1992; Arnold et al., 2008). Bo et al. (1992) reported that these changes are still unknown, but induction of parturition can be an interesting tool to prevent problems of care and prolonged pregnancies (Davis et al., 1979; Villarroel and Lane, 2010). However, Barth et al. (1981) and

Lewing et al. (1985) reported that the association of short-acting glucocorticoids and PGF<sub>2</sub>α resulted in high rates of retained placenta when compared to spontaneous birth.

By another hand, the use of long-acting corticosteroids may result in a lower rate of retained placenta (Barth, 2006), as reported by Nasser et al. (1994) that observed 13% of retained placenta with association of TRI + DEXA + d-CLO. In another study evaluating different doses (1mg/60kg of BW or 1mg/100Kg of BW) and time of injections (280 or 285 days) of TRI during pre-induction of parturition, Rezende et al. (2009) observed similar results in all treatments. Retained placenta occurred in 8.9% for animals that received 1 mg of TRI/60Kg of BW and 13% in Group that received 1 mg/100 Kg of BW. In addition, BÓ et al. (1992) reported that injection of opticortenol (OPT) seven days before induction with DEXA + d-CLO had lower placenta retained than group that receive only DEXA + CLO.

The aim of this study was to evaluate the synchronization rate, ease to parturition, calves viability and retained placenta rate for Nellore recipients treated in pre-induction with triancinolone

(TRI) followed with association of dexametasone (DEXA) + PGF<sub>2</sub>α (d-CLO) versus animals without induction of parturition.

## Methods

The experiment was performed in northern Brazil during 2009 and 2010 years. Animals were maintained in pasture regimen (*Brachiaria brizantha* cv. *BRS Piatã*) with salt supplement (Fosbovi Reprodução<sup>®</sup>, Tortuga Nutrição Animal, Pecém-CE/Brasil) and water *ad libitum*. The females remained in maternity paddocks with area of 2.42 hectares each, with a maximum of 5 recipients. Hundred-ninety-four crossbred (½ Nellore / ½ Caracu) heifers were divided into two homogenous groups according to paternity and weight (average = 459 kg), and after ultrasound exams (Aloka 500 – Aloka Co. Ltd., Tokyo, Japão) to determine the fetal genre: TRI (n = 97) received 1mg/60 Kg of BW/IM of triancinolone (Retardoesteróide<sup>®</sup>, Hertape Calier Saúde Animal S/A) on Day 285 followed of association of 25mg of dexametasone (Caliercortin<sup>®</sup>, Hertape Calier Saúde Animal S/A) and 150µg of D-cloprostenol (Veteglan<sup>®</sup>, Hertape Calier Saúde Animal S/A) on Day 292; Control (n = 97) received injections of saline solution in same days.

All animals were observed at a distance from 285 to 292 days of pregnancy evaluating parameters as described by Rezende et al. (2009): a) Interval between pre-induction (triancinolone injection) to parturition (days). The parturition was considered the interval between placenta disruption until complete expulsion of the calf (Davis et al., 1979; Lewing et al., 1985; Bó et al., 1992; Rasmussen et al., 1996); b) Interval between induction (DEXA + d-CLO) to onset of parturition. Parturition occurred until day 294 (72h after last injection) were considered synchronized (Bó et al., 1992; Lewing et al., 1985); Nasser et al., 1994); c) Assistance of parturition – no assistance (0) or with assistance, independent of the degree of this intervention (from simple pull of the calf, so surgical procedure, cesarean section or fetotomia); d) Evaluation of calf after parturition – body weight, viability and assistance after birth. Calves were considered non-viable (1) or viable (0) according to stand on end within two hours after birth (Davis et al., 1979; Bó et al., 1992; Nasser et al., 1994). The calves were weighed within 24 hours of birth, and only exceptionally after the first suckling (Costa et al., 2007). Calves that did not rise within two hours received help to suck on the recipient or given colostrum by stomach tube. Thus, the calves were classified as non-assisted (0) or assisted (1) according to the need for human intervention; e) Retained placenta was considered when there was no expulsion after 24 hours of birth (Barth et al., 1981; Bó et al., 1992; Nasser et al., 1994; Rasmussen et al., 1996; Hay and Kim, 2005; Rezende et al., 2009).

## Results

Data showed that had higher synchronization of parturition for TRI than Control (Table 1 - p<0.05), demonstrating improve on ability of parturition after injection of TRI. In general, TRI had average of 33.8 hours between inductions to parturition. Control had lower previously than TRI on birth, once synchronization of parturition rate was approximately of 20%.

The results for parturition assistance and placenta retained rate were better to TRI than Control (p<0.05 - Table 2).

No difference was observed between weights of calves for TRI and Control (38.3 Kg vs. 39.0 Kg, respectively; p>0.05), as well in genre (38.9 kg vs. 37.7 Kg - p>0.05). The genre of calves did not influence the parturition assistance rate.

The synchronization parturition rate observed in present study were similar reported by Rezende et al. (2009) that observed 80% of birth until 24 hours after injections of DEXA+CLO, demonstrating that the protocol of induction resulted in high previously of parturition period. Both experiments reported good viability of calves on parturition, but Rezende et al. (2009) had high rate of calf assistance.

The high weight of calves observed in present study were similar to the findings by Marcondes et al. (2000), Gasparelli et al. (2009) and Rezende et al. (2009) that evaluated more than 60.000 birth of Nellore calves produced *in vitro*. The mechanism of increase of weight on birth remains unknown, even if there are old efforts to clarify this fact as *large offspring syndrome* reported by Hasler (1996) or Fecteau et al. [36] and Horta et al. [28]. In addition, Wagtendonk-de Leeuw Van et al. (2005) related similar findings in dairy calves, being 47.1 kg to calf produced *in vitro*, 42.7 kg by artificial insemination and 43.4 kg by embryo transfer and, consequently, high rate of problems on birth and calf death for calf produced *in vitro*.

The placenta retained rate decreased when animals were treated, being similar to 13.8% reported by Nasser et al. (1994). These results suggested that the injection of long-term corticoids improve the ability and synchronism for partum in bovine (Rezende et al., 2009).

Placental expression of enzymes 17α-hydroxylase and 17,20-lyase at mid-gestation result in the increase of the estrogen synthesis (Conley and Assis Neto, 2008) and this event accompanies the early fetal adrenal glands activation. Once activated, the adrenal glands synthesize corticosteroids. The increase of endogenous ACTH secretion stimulates the adrenal cortisol to produce sex steroids, which results in negative feedback on the gonadotropic hormones. With the increase in cortisol plasma concentrations, the PGF<sub>2</sub>α and estrogen concentrations increase, resulting in luteolysis, uterine contractility and consequently favoring parturition.

**Table 1.** Ability of parturition of Nellore recipients implanted with embryos produced *in vitro* that received TRI (n = 97) or saline solution (n = 97) for induction of parturition.

Parameters	TRI	Control
Parturition occurred from 285 to 292 days	13.4% (13/97)	8.2% (8/97)
Parturition occurred from 292 to 294 days (synchronized)	79.4% (77/97) <sup>a</sup>	19.5% (19/97) <sup>b</sup>
Parturition occurred after 294 days	7.2% (7/97) <sup>a</sup>	72.1% (70/97) <sup>b</sup>

<sup>a,b</sup>Values followed by letters in the same row are significantly different ( $p < 0.05$ )

**Table 2.** Comparison between TRI and Control on parturition assistance, calf assistance, calf viability and placenta retained rate of Nellore recipients implanted with embryos produced *in vitro*.

Parameters	TRI	Control
Parturition assistance	23.7% (23/97) <sup>a</sup>	45.3% (44/97) <sup>b</sup>
Calf assistance	11.4% (11/97) <sup>a</sup>	34.0% (33/97) <sup>b</sup>
Calf viability	92.8% (90/97)	87.6% (85/97)
Placenta retained rate	11.4% (11/97) <sup>a</sup>	25.8% (25/97) <sup>b</sup>

<sup>a,b</sup>Values followed by letters in the same row are significantly different ( $p < 0.05$ )

Progesterone is metabolized by the enzyme 20 $\alpha$ -hydroxysteroid dehydrogenase which converts corticosterone and cholesterol metabolites. Days before parturition, this mechanism reduces the current progesterone. According to Madore et al. (2003), this enzyme catalyzes the synthesis of PGF<sub>2</sub> $\alpha$ , consequently, starting the preparation for parturition. Therefore, the synchronization using only PGF<sub>2</sub> $\alpha$  did not reduced the placental retention rate.

Similar results were observed when only estrogen was used. Hoffmann et al. (2001) reported that estrogen from maternal plasma, regulated by steroid sulphatase (StS), had high concentration in cotyledons. Thus, the increase of expression in StS results in increase of the cholesterol or pregnenolone extraction from maternal blood, indicating influence at synthesis of steroids from placenta (Greven et al., 2007).

The reduction of retained placenta can also be observed in association of estrogen and relaxin. Kindahl et al. (2007) reported better softening in cervix and relaxation of the partum canal associated to release of PGF<sub>2</sub> $\alpha$ .

## Conclusion

The data showed that injection of 1mg/60 Kg BW/IM of TRI at 285 days of pregnancy, followed of association with DEXA + PGF<sub>2</sub> $\alpha$  at 292 days, improved the synchronization of births being the calves presenting good viability, and decreased the frequency of parturition assistance and placenta retained.

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