



IBIMA

Publishing

mobile

***International Journal of Veterinary Medicine:
Research & Reports***

Vol. 2013 (2013), Article ID 781569, 29 minipages.

DOI:10.5171/2013.781569

www.ibimapublishing.com

Copyright © 2013. Jose Carlos dos Santos Breda, Alisson Morais Giacomeli, Luiz Ernandes Kozicki, Marcio Saporski Segui, Romildo Romualdo Weiss, Ivo Walter dos Santos and Melina Andrea Formighieri Bertol. Distributed under Creative Commons CC-BY 3.

**Temporary Calf Removal and Equine Chorionic
Gonadotropin (Ecg) Administration After Progesterone-
Based Protocol Improves the Reproductive Performance of
Beef Cattle**

Authors

**Jose Carlos dos Santos Breda¹, Alisson Morais Giacomeli², Luiz
Ernandes Kozicki³, Marcio Saporski Segui³, Romildo Romualdo
Weiss⁴, Ivo Walter dos Santos⁴ and Melina Andrea Formighieri
Bertol⁴**

¹Veterinary and Master's Graduate Program in Animal Science

²Veterinarian autonomus

³Veterinarian and Professor at the Pontifical University Catholic of Paraná

⁴Veterinarian and Professor at the Federal University of Paraná

Received date: 19 July 2013; Accepted date: 17 September 2013; Published date: 2 December 2013

Academic Editor: Mrigank Honparkhe

Cite this Article as: Jose Carlos dos Santos Breda, Alisson Moraes Giacomeli , Luiz Ernandes Kozicki, Marcio Saponski Segui, Romildo Romualdo Weiss, Ivo Walter dos Santos and Melina Andrea Formighieri Bertol (2013), " Temporary Calf Removal and Equine Chorionic Gonadotropin (Ecg) Administration After Progesterone-Based Protocol Improves The Reproductive Performance of Beef Cattle", International Journal of Veterinary Medicine: Research & Reports, Vol. 2013 (2013), Article ID 781569, DOI: 10.5171/2013. 781569.

Abstract

This study aimed to evaluate the effects of equine chorionic gonadotropin (eCG) administration and the temporary 48-h calf removal (CR) in a long-term progesterone (P4)-based protocol in suckled Nelore cows. In all, 150 cows were randomly submitted to P4 protocol as follows. At day 0 (d 0), an intravaginal device containing 1.9 g P4 was inserted, and 1 mg estradiol benzoate (EB) was injected intramuscularly (im). On d 8, the P4 device was removed, and cows were im injected 500 μ g of prostaglandin F group 2 alpha (PGF_{2 α}). On the same day, 75 cows (eCGCR group) received 400 IU im of eCG and were separated from their calves for 48 h. The other 75 cows (NoeCGCR group) stayed with the calves and did not receive eCG. On d 10, the calves were returned to the eCGCR group. After 8 days, all the cows were observed for estrus. The ovulatory follicle size was measured using

ultrasonography at the day estrus was detected, and artificial insemination (AI) was performed 12 h later. Pregnancy was diagnosed 35 days after AI. The respective parameters for the eCGCR and NoeCGCR groups were as follows: pregnancy rate, 74.6% and 50.6% ($p < 0.01$); estrus induction rates, 80.0% and 64.0% ($p < 0.05$); ovulatory follicle diameter, 11.3 and 10.5 mm; estrus observation after d 8, 2.1 and 3.5 days ($p > 0.05$). Thus, eCGCR after a long-term P4 protocol markedly improved pregnancy rates and estrus induction.

Keywords: Progesterone, eCG, calf removal, estrus observation, AI, Nelore.

Introduction

Brazil has the largest cattle herd in the world; however, the productivity levels of these cattle are relatively very low. This is because large number of cows show delayed pregnancy after parturition. This delay ranges to about 100 days or more, resulting in considerable productivity loss. The resumption of ovarian activity is delayed after the postpartum period, and significant percentage of cows become anestrous. Early postpartum anestrus in cattle is a physiological event that causes uterine involution, and the ovaries become more active. Anestrus becomes a pathological event when the anestrus interval exceeds the average range (McDougall, 1994). The duration of anestrus interval is influenced by various factors such as age, race, and environmental and genetic factors (Hopkins, 1986).

Hormone therapy after calving allows greater number of cows to resume estrus and become pregnant in a short period (Baruselli et al., 2004). Reproductive biotechnologies like estrus synchronization (ES) followed by timed AI are auxiliary methods to improve herd productivity. These programs ensure high pregnancy rates (number of pregnant cows/number of synchronized cows) across different places and situations.

Studies evaluating different P4 based protocols show that long-term treatment for spontaneous regression of the corpus luteum (CL) synchronizes estrus (Rajamahendran et al., 2001). Treatments that induce regression of follicles lead to emergence of a new wave of follicular growth, thereby improving pregnancy rates (Bo et al., 2004). Treatment with estrogen (E2) and P4 have been increasingly employed in ES programs in the Brazilian cattle. This treatment involves placing a device containing P4 and

administration of E2 on day 0 (for the emergence of a new wave of follicular growth and prevent persistent follicles), administration of PGF_{2α} (days 7, 8, or 9) after P4 removal, induction of luteolysis, and subsequent application of E2 (0.5 to 1.0 mg) after 24 h or GnRH after 48–54 h for the synchronization of ovulation. Estrogen might act as an agent that synchronizes ovulation by inducing an LH surge by positive feedback of GnRH (Moreira, 2002). Other hormones such as equine chorionic gonadotropin (eCG) (Ereno et al., 2007; Pinheiro et al., 2009; Sá Filho et al., 2010a,b; Marquesini et al., 2013) have been used to stimulate the development of ovarian follicles as well as to synchronize ovulation by using the human chorionic gonadotropin (hCG; Fantini et al., 2004).

Considering the pregnancy rates of national livestock, beef cattle are known to have an interval of 21 months between births

(Zimmer and Euclides Filho, 1997). The calving interval depends of the quantity and frequency of suckling after parturition (Belows and Short, 1994). This prevents the resumption of the pulsatile secretion of LH in the puerperium, which is required to support the final development and maturation of the preovulatory follicles (Williams and Griffith, 1995). In Nelore cows, postpartum anestrus can be more pronounced because of the greater frequency of suckling by calves (average 8 times per day; Cubas et al., 1985). The absence of LH pulsatility in the first 4 weeks postpartum is known to deplete gonadotropin concentrations in the anterior pituitary. After the gonadotropin concentrations are restored, full or temporary weaning (48 or 96 h) increases the LH pulse frequency (; Shively and Williams, 1989; Marquesini et al., 2013) leading to ovulation by the LH surge. Studies on temporary weaning (Pencai et al., 2011) and eCG use postpartum showed improved follicular development in

anestrus cows (Yavas and Walton, 2000; Marquesini et al., 2013). Our hypothesis was that by associating the temporary removal of the calf and eCG administration could improve the pregnancy rate in commercial herd of beef cattle.

This study aimed to evaluate the combined effects of eCG and of 48-h temporary calf removal in order to synchronize estrus and pregnancy rates in lactating Nelore cows.

Material and Methods

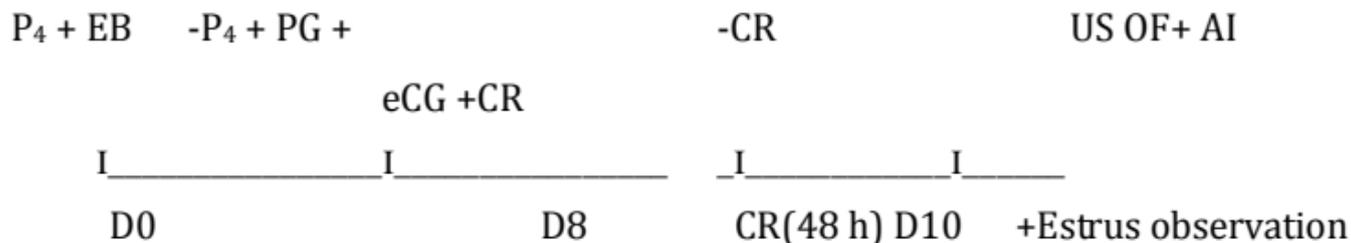
A total of 150 Nelore cows' pluriparous and suckled were used for present study. The cows were provided *Brachiaria decumbens*, *Cynodon* spp., and mineral salt *ad libitum*. The body condition score was 3.0 (1 = thin to 5 = obese). In the seventh week postpartum, ovaries were examined by ultrasound. The

following criteria were used for anestrus: cows without CL and ovarian follicles smaller than 7.0 mm (Borges et al., 2004). All cows were submitted to progesterone protocol: day 0 (d 0), an intravaginal device containing 1.9 g of P4 (CIDR; Intervet Schering-Plough, SP, Brazil) was inserted, and 1 mg estradiol benzoate (EB; Estrogin-Farmavet, SP, Brazil) was injected im. On d 8, the P4 device was removed, and cows received 500 μ g im of PGF_{2 α} (Ciosin, MSD, Brazil). On the same day, 75 cows (eCGCR group) received 400 IU im of eCG (Folligon, MSD, Brazil) and were separated from their calves for 48 h. The other 75 cows (NoeCGRC group) remained with the calves and did not receive eCG. On d 10, the calves were returned to the eCGCR group. After d 8 of the protocol all the cows were observed visually for estrus for 1 h each in the mornings, noon, and afternoons. Cows in estrus were kept separately and inseminated after 12 h. Just before AI, the diameter of the biggest follicle was measured by

ultrasonography (Ultrasound, Aloka SSD 500; probe 5.0 Mhz, Fujihira Industry Co. Ltd., Tokyo, Japan). Pregnancy was diagnosed 35 days after AI. The animals that did not show estrus within 5 days after P4 removal and PGF_{2α} administration were considered as unresponsive to the protocol.

Protocols of the eCGCR and NoeCGCR groups respectively,

eCGCR (=75 animals)

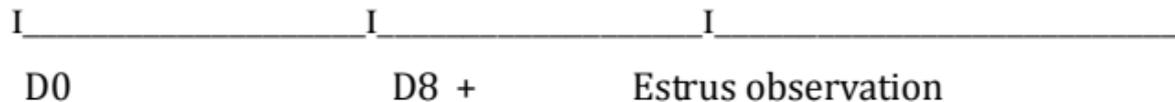


NoeCGCR (=75 animals)

P₄ +EB

US OF+ AI

-P₄+PG



P₄= 1,9 g of progesterone (CIDR, Intervet Schering-Plough, SP, Brazil); EB=estradiol benzoate 1 mg, Estrogen Farmavet; PG=cloprostenol, 500 µg, Ciosin, MSD, Brazil; eCG=equine chorionic gonadotropin, Folligon 400 UI, MSD, SP, Brazil; CR=temporary 48-h calf removal; OF= ovulatory follicle; US=ultrasound.

Statistical analysis

The experiment was carried out as a completely randomized design. The analysis of variance (ANOVA) was used for comparisons of means ($\bar{x} \pm s$). Differences in the groups were conducted using the SAS System for Windows (SAS Institute Inc., Cary, NC, USA, 2003). Differences were considered significant at $P < 0.05$.

Results and Discussion

The results are shown in Table 1.

Please see table 1 in the PDF version

Different letters in columns indicate significance being (a:b= $P < 0.05$ and (c:d $P < 0.01$)

Data calculated under ANOVA, Tukey Test – SAS 2003.

Administration of eCG in acyclic dairy cows previously treated with P4 has been recommended (Pinheiro et al., 2009, Bryan et al., 2013; Marquezini et al., 2013) since FSH and LH can induce ovarian follicle development and ovulation (; Yavas and Walton, 2000). The present study evaluated the effects of eCG treatment along with 48-h calf removal after an 8-day P4 protocol in suckling Nelore cows. Nelore cows in anestrous postpartum were submitted to AI after estrus observation, resulting in a pregnancy rate of 74.6% and 50.6% in the eCGCR and NoeCGCR groups, respectively ($P < 0.01$). Our results were better than those obtained by Belloso et al., (2002) who performed a similar experiment in *Bos indicus* primiparous cows under anestrous

conditions. They submitted the cows to P4 protocols with fixed-time artificial insemination (TAI) and TW (temporary weaning) for 96 h (G1) and with eCG (G2) achieving conception rates of 61.5% and 67.7%, respectively. Similarly, in another study, Marquesini et al., (2013) used eCG after 7 days of intravaginal P4 and observed increased dominant follicle (DF) diameter at the TAI, but there was no influence on the pregnancy rate of *Bos taurus* beef cattle. Sá Filho et al., (2010 b) observed improvement in pregnancy rates when eCG was used along with PGF administration using a controlled internal drug-releasing device and CR. Our results (PR) can be assigned the cows were inseminated after the visible estrus. Protocols combining progestin, eCG, and temporary removal of calves are important tools that can be used to synchronize estrus (; Meneghetti et al., 2001; 2009; Sá Filho et al., 2010b). Others studies using eCG, with or without TW, did not yield consistent results. Temporary calf

removal, with or without eCG administration, did not significantly alter the pregnancy rates in TAI by suckling Nelore cows (Pinheiro et al., 2009) or in *Bos indicus* heifers (Butler et al., 2011), emphasizing that these authors employed fixed-time artificial insemination (FTAI). Vasconcelos et al., (2009) showed that the temporary removal of calves increased the estrus rate and improved reproductive performance in Angus × Nelore crossbred anestrus cows; estrus induction was observed even in cows with a DF having a size of less than 7 mm. This corroborates the results of the present study, indicating the reason for the difference between the eCGCR group and NoeCGCR ($p < 0.05$) on the visible manifestation of estrus. Our hypothesis was that the association of eCG and CR could exert beneficial effects, because eCG would induce the development of ovarian follicles and ovulation in lactating dairy cows previously treated with progesterone (Yavas and Walton, 2000) and the CR would

increase the frequency of LH pulses up to the final follicle maturation and ovulation (; Kawashima et al., 2008).

Regarding the size of ovulatory follicles (OFs) on the AI day, Meneghetti et al., (2001) suggested that the temporary removal (48 h) of calves resulted in increased size of the DF and ovulation rate in anestrus Nelore cows compared to the cows that remained with calves. In the present study, the diameter of OFs was larger, but not statistically significant, in the treated group than in the control. Our data are in agreement to those obtained in Nelore cows by Borges et al., (2003) who reported that the diameter of OFs was 11.0 mm, which is very close to the diameter found in our study (11.3mm; table 1) and different from that reported by Ferraz et al., (2009) (9.1 mm). This difference could be assigned to the difference in body condition score.

In conclusion, the use of eCG + CR after a long-term P4 protocol yielded better results and improved pregnancy rates and estrus induction.

References

Baruselli, O.S., Reis, E.L. & Marques, M.O.(2004). The use of hormonal treatments to improve reproductive performance of anestrus beef cattle in tropical climates. *Animal Reproduction Science*, 82-83: 479-486.

Belloso, E.S., Portillo Martinez, G., De Ondiz, A., Rojas, N., Castillo, G.S. & Ramirez Iglesia, L.(2002). Improvement of reproductive performance in crossbred zebu anestrus primiparous cows by treatment with norgestomet implants or 96 h calf removal. *Theriogenology*, 57: 1503-1510.

Bellows, R.A. & Short, R.E.(1994). Reproductive losses in beef industry. In: Fields, J.M. & Sand, R.S. Factors affecting calf crop. Boca Raton: CRC Press :109-133.

Bó, G.A., Cutaia, L. & Reis, L.(2004). El uso de tratamientos hormonales para mejorar el desempeño reproductivo en ganado de carne en anestro en climas tropicales. In: *Simposio Internacional de Reproducción Bovina*, 1., Barquisimeto. Anais... Barquisimeto, 2004 :125-137.

Borges,A.M., Torres, C.A.A., Ruas, J.R.M., Rocha Junior, V.R., Carvalho, G.R. & Fonseca, J.F.(2003). "Características da Dinâmica Folicular e Regressão Luteal de Vacas das Raças Gir e Nelore após Tratamento com Cloprostenol Sódico". *Revista Brasileira de Zootecnia*, 32(1):85-92.

Borges,A.M.; Torres, C.A.A,; Rocha Júnior, V.R; Ruas, J.R.M.Ruas.; Carvalho, G.R.; Marcatti Neto, A. and Carvalho, B.C. Follicular development in Gir breed cows (*Bos indicus*) treated with buserelin acetate or human chorionic gonadotrophin during the postpartum period. *Revista Brasileira de Zootecnia*, 33(6): 21-26, 2004.

Bryan, M.A., Bó, G., Mapletoft, R.J. and Emslie, F.R.(2013). “The use of equine chorionic gonadotropin in the treatment of anestrus dairy cows in gonadotropin-releasing hormone/progesterone protocols of 6 or 7 days”, *Journal of Dairy Science*, 96(1):122-131.

Butler, S.A.A., Atkinson, P.C., Boe-Hansen, G.B., Burns, B.M., Dawson, K. & Bo, G.A.(2011). “Pregnancy rates after fixed-time artificial insemination of Brahman heifers treated to synchronize

ovulation with low-dose intravaginal progesterone releasing devices with or without eCG". *Theriogenology*, 76: 1416-1423.

Cubas, A.C., Mancio, A.B. & Lesskiu, C.(1985). "Efeito da amamentação controlada sobre a eficiência reprodutiva de vacas de corte no sul do Paraná". *Revista Brasileira de Zootecnia*,14: 247-255.

Ereno, R.L., Barreiros, T.R.R., Seneda, M.M., Baruselli, P.S., Pegorer, M.F. & Barros, C.M., (2007). "Taxa de prenhez de vacas Nelore lactantes tratadas com progesterona associada à remoção temporária de bezerros ou aplicação de gonadotrofina coriônica equina". *Revista Brasileira de Zootecnia*, 36 (5): 1288-1294.

Fantini Filho, J.C., Kozicki, L.E. & Souza, F.P. (2004). "Induction of accessory Corpus luteum by human chorionic gonadotropin

(hCG) and the relationship with progesterone concentrations in cattle". *Archives of Veterinary Science*, 9 (1): 115-120.

Ferraz, H.T., Oliveira Filho, B.D., Gambarini, M.L., Viu, M.A.O., Lopes, D.T. & Rezende, L.C. (2009). "Desenvolvimento folicular e ovulação de fêmeas nelore (*Bos taurus indicus*) sincronizadas". *Arquivos de Zootecnia*, 58 (Supl. 1): 585-588.

Hopkins, S.M.(1986). "Bovine anestrus diagnosis, treatment and prevention of reproductive diseases in small and large animals", W.B. Saunders, Toronto :247-250.

Kawashima, C., Kida, K., Matsuhashi, M., Matsui, M., Shimizu, T. & Matsunaga, N. (2008). "Effect of suckling on the reproductive performance and metabolic status of obese Japanese Black cattle

during the early postpartum period". *Journal Reproduction and Development*, 54:46-51.

Marquesini, G.H., Mercadante, V.R., Olson, K.C., Jaeger, J.R., Perry, G.A., Stevenson, J.S. & Lamb, G.C. (2013). "Effects of equine chorionic gonadotropin on follicle development and pregnancy rates in suckled beef cows with or without calf removal". *Journal of Animal Science*, 91(3):1216-1224.

McDonald, S. Postpartum anestrus in the pasture grazed New Zealand dairy cows. *Thesis*. Department of Veterinary Clinical Sciences, Massey University, 247p. 1994.

Meneghetti, M., Vilela, E.R. & Vasconcelos, J.L.M. (2001). "Efeito da remoção dos bezerros nos folículos dominante e na taxa de ovulação ao primeiro GnRH em protocolos de sincronização em

vacas Nelore em anestro”. *Revista Brasileira de Reprodução Animal*, 25 (3): 286-288.

Moreira, R.J.C. (2002). “Uso do protocolo Crestar® em tratamentos utilizando benzoato de estradiol, PGF2alfa, PMSG e GnRH para controle do ciclo estral e ovulação em vacas de corte”. [Dissertação de Mestrado]. 62p. Piracicaba, São Paulo – Brasil: ESALC.

Pencai, F.W., Kozicki, L.E., Costa, C.E.M.P., Silva, N.L., Molleta, J.L. & Motta, J.B.O.(2011). “Indução ao estro pós puerperal em bovinos mestiços de corte mediante emprego de diferentes protocolos de amamentação”. *Veterinaria e Zootecnia*.18 (1): 53-62.

Pinheiro, V.G., Souza, A.F., Pegorer, M.F., Satrapa, R.A., Ereno, R.L. & Trinca, L.A. (2009). “Effects of temporary calf removal and eCG

on pregnancy rates to timed-insemination in progesterone-treated postpartum Nelore cows". *Theriogenology*. 72: 179-189.

Rajamahendran,R., Divakar,J., Ambrose,J., Small,A.(2001). Synchronization of estrus and Ovulation in cattle. *Archiv Tierarztz.*, 44 (Special Issue): 58-67.

Sá Filho, M.F., Ayres, H., Ferreira, R.M., Marques, M.O., Reis, E.L., Silva, R.C., Rodrigues, C.A., Madureira, E.H., Bó, G.A.& Baruselli P.S. (2010). "Equine chorionic gonadotropin and gonadotropin-releasing hormone enhance fertility in a norgestomet-based, timed artificial insemination protocol in suckled Nelore (*Bos indicus*) cows". *Theriogenology*, 73(5):651-658.

Sá Filho, O.G., Dias, C.C., Lamb, G.C. & Vasconcelos, J.L.M.(2010). "Progesterone-based estrous synchronization protocols in non-

suckled and suckled primiparous *Bos indicus* beef cows”. *Animal Reproduction Science*. 119(1-2):9-16.

Shively, T.E. & Williams, G.L. (1989). “Patterns of tonic luteinizing hormone release and ovulation frequency in suckled anestrous beef cows following varying intervals of temporary weaning”. *Domestic Animal and Endocrinology*, 6: 379-387.

SAS. Statistical Analysis System. SAS/STAT Users guide. Cary, NC, USA: SAS Inst., Inc., 1999.

Vasconcelos, J.L.M., Sá Filho, O.G., Perez, G.C. & Silva, A.T.N. (2009). “Intravaginal progesterone device and/or temporary weaning on reproductive performance of anestrous crossbred Angus x Nelore cows”. *Animal Reproduction Science*, 111: 302-311.

Willians, G.L. & Griffith, M.K.(1995). "Sensory and behavioural control of gonadotrophin secretion during suckling-mediated anovulation in cows". *Journal of Reproduction and Fertility*.(supl) 49: 463-475.

Yavas, Y. & Walton, J.S. (2000). "Induction of ovulation in postpartum suckled beef cows: a review". *Theriogenology*, 54 : 01-23.

Zimmer, A.H. & Euclides Filho, K. (1997). "As pastagens e a pecuária de corte brasileira. In: Simpósio Internacional sobre Produção Animal em PASTEJO", 1997, *Anais...* Viçosa, MG: Universidade Federal de Viçosa, :349-379.