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# Different doses of equine chorionic gonadotropin on ovarian follicular growth and pregnancy rate of suckled *Bos taurus* beef cows subjected to timed artificial insemination protocol

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## ABSTRACT

This study evaluated the effect of different doses of eCG (control, 300 or 400 IU) administered at progesterone (P4) device removal in suckled *Bos taurus* beef cows undergoing a timed artificial insemination (TAI) protocol. A total of 966 cows received a P4 insert and 2.0 mg intramuscular estradiol benzoate at the onset of the synchronization. After 9 days, P4 insert was removed, and 12.5 mg of dinoprost tromethamine and 1 mg of estradiol cypionate were administered, followed by TAI 48 hours later. Then, the cows received one of three treatments as follows: control (n = 323), 300 (n = 326), or 400 IU of eCG (n = 317). A subset (n = 435) of cows in anestrus had their ovaries evaluated using ultrasound at the time of P4 removal and at TAI. Data were analyzed by orthogonal contrasts (C): C1 (eCG effect) and C2 (eCG dose effect). Estrous occurrence (control = 53.7%, 300 IU = 70.6%, and 400 IU = 77.0%) and pregnancy per artificial insemination (control = 29.7%, 300 IU = 44.8%, and 400 IU = 47.6%) were improved by eCG treatment (C1; P = 0.0004 and P < 0.0001, respectively). Furthermore, the cows receiving eCG presented larger follicles at TAI (control = 13.5 ± 0.3 mm, 300 IU = 14.0 ± 0.2 mm, and 400 IU = 15.1 ± 0.3 mm; P < 0.0001; C1). However, there was no effect of eCG dose on any response variables studied (C2; P > 0.15). In conclusion, the eCG treatment administered at the time of P4 removal increased the occurrence of estrus, the larger follicles at TAI, and pregnancy per artificial insemination of suckled *B. taurus* beef cows. Despite the greater occurrence of estrus in noncyclic cows receiving 400 IU of eCG, both eCG doses (300 and 400 IU) were equally efficient to improve pregnancy to artificial insemination.

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## 1. Introduction

In pasture-based cow–calf production systems, high pregnancy rates at the beginning of the breeding season

(BS) are critical for herd profitability. As a result, reproductive programs, such as synchronization of ovulation for timed artificial insemination (TAI), have been increasingly incorporated in cow–calf operations focusing on enhancing pregnancy rates at the beginning of the BS [1–5]. Among the available hormonal therapies that allow the use of TAI, the estradiol (E2)-plus-progesterone (P4)-based

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synchronization protocols have been successfully used to control follicular dynamics and luteal life span to synchronize ovulation, enabling the TAI [3,6,7]. Currently, these P4-plus-E2-based synchronization protocols are widely used and represent the main commercial hormonal treatment for TAI of postpartum beef cows in South America [1–5].

Postpartum anestrus beef cows have insufficient pulsatile release of LH to support the final stages of ovarian follicular development and ovulation [8], limiting the efficiency of TAI programs [5,7,9]. Exogenous P4 increases LH pulse frequency during and after treatment, inducing ovulation [10]. However, despite progesterin-induced postpartum cyclicity, there are some situations with high incidence of anestrus, typically observed in grazing suckled beef herds, so that the efficiency of such treatment could be compromised [1,11]. Thus, gonadotropins, such as the eCG, have been included in the synchronization protocols for TAI aiming to improve ovulation and pregnancy rates [3].

The eCG glycoprotein is a long half-life molecule produced by the cells of the endometrial cups in pregnant mares [12]. It has both FSH- and LH-like activity owing to its ability to bind to both FSH and LH receptors, located at the granulosa and theca cells [13], stimulating ovarian follicular growth and ovulation in cattle [12]. The administration of eCG at P4 removal is an efficient alternative to increase ovulatory response and pregnancy rates after TAI programs in *Bos indicus* [4,9,14,15] and *Bos taurus* [16–18] suckled beef cows.

The traditional dose of eCG used for both *B indicus* and *B taurus* suckled beef cows is 400 IU [9,16–19]. However, recent reports indicate that, at least for suckled *B indicus* beef cows, the dose of 400 IU of eCG could be reduced to 300 IU without compromising pregnancy results [4]. In addition, other studies reported the satisfactory efficiency of the administration of 300 IU of eCG on the improvement of the final dominant follicle growth, ovulatory and pregnancy outcomes of suckled *B indicus* beef cows [14,15]. However, *B indicus* cows have subtle differences in their reproductive physiology, such as greater sensitivity to exogenous gonadotropins, compared to *B taurus* breeds [20–22]. Marquezini et al. [23] failed to find any improvement on pregnancy per artificial insemination (P/AI) after administering 200 IU of eCG in *B taurus* suckled beef cows

synchronized with a GnRH-plus-PGF2 $\alpha$ -based TAI protocol. Therefore, because of the relative high cost of the eCG treatment in relation to the cost of the entire TAI protocol, finding the minimal effective dose of eCG for suckled *B taurus* beef cows could help reduce costs of TAI programs and deserves further investigation.

Thus, the aims of the present study were twofold: (1) to evaluate the impact of eCG treatment administered at P4 removal and (2) to verify the effect of decreasing the eCG dose from 400 to 300 IU on ovarian follicular growth and pregnancy results in suckled *B taurus* beef cows. In addition, the present study was designed to evaluate the impact of occurrence of estrus and the ovarian follicle size at TAI on the likelihood of pregnancy of synchronized cows. Our hypotheses were that, in suckled *B taurus* beef cows submitted to a P4-plus-E2-based TAI protocol, (1) eCG increases the rate of final dominant follicle growth, the occurrence of estrus, and P/AI and (2) the reduction of the eCG dose from 400 to 300 IU decreases its positive effect on studied variables.

## 2. Materials and methods

### 2.1. Herd and animal management

This experiment was conducted during the 2014/2015 spring–summer BS at five commercial beef farms located in three distinguished regions of Rio Grande do Sul State, Brazil. A total of 966 suckled *B taurus* beef cows were enrolled in the study. On the first day of the synchronization protocol, the body condition score (BCS) was  $2.77 \pm 0.02$  on the basis of a 1- to 5-point scale (1 = emaciated, 5 = obese) [24]. The cows were maintained in a native pasture, with free access to water and mineralized salt. All animal handling procedures in this trial followed general guidelines for animal welfare. Information regarding the cow breed (*B taurus* or crossbreed), parity (primiparous or multiparous), BCS at the beginning of the TAI protocol, and breeding group within each farm location is shown in Table 1.

### 2.2. Reproductive management and experimental design

Suckled beef cows, between 40 and 70 days postpartum, were blocked by parity and BCS, and within each block,

**Table 1**  
Descriptive analyses according to farm location.

Regions of state	Farms	Breeding groups	No. of cows	Multiparous, % (n)	Crossbreeds, % (n) <sup>a</sup>	Mean BCS (1–5 scale)	Cyclicity, % (n)	Estrus, % (n) <sup>b</sup>	P/AI, % (n) <sup>c</sup>
Southwest	A	1	57	35.1 (20)	47.4 (27)	2.61 $\pm$ 0.02	17.5 (10)	63.2 (36)	29.8 (17)
	B	2	146	47.3 (69)	100 (146)	3.10 $\pm$ 0.07	14.0 (6)	60.3 (88)	37.7 (55)
	C	3	145	72.4 (105)	100 (145)	2.92 $\pm$ 0.03		52.4 (76)	33.1 (48)
Center-west	D	4	132	100 (132)	22.7 (30)	2.61 $\pm$ 0.03	20.5 (27)	75.8 (100)	52.3 (69)
		5	91	100 (91)	22 (20)	2.69 $\pm$ 0.03	18.7 (17)	62.6 (57)	55.0 (50)
		6	122	100 (122)	18.9 (23)	2.82 $\pm$ 0.03	24.6 (30)	60.7 (74)	41.8 (51)
		7	82	100 (82)	0 (0)	2.83 $\pm$ 0.03	31.7 (26)	70.7 (58)	53.7 (44)
Southeast	E	8	66	78.8 (52)	100 (66)	2.92 $\pm$ 0.04	28.8 (19)	77.3 (51)	24.4 (16)
		9	71	67.6 (48)	98.6 (70)	3.10 $\pm$ 0.04	9.9 (7)	81.7 (58)	32.4 (23)
		10	54	79.6 (43)	100 (54)	2.94 $\pm$ 0.04	18.5 (10)	90.7 (49)	37.0 (20)
Overall			966	79.1 (764)	60.1 (581)	2.82 $\pm$ 0.01	21.2 (152)	67.0 (647)	40.7 (393)

Abbreviations: AI, artificial insemination; BCS, body condition score.

<sup>a</sup> Proportion of crossbred cows.

<sup>b</sup> Occurrence of estrus between progesterone insert removal and timed artificial insemination (TAI).

<sup>c</sup> Pregnancy per AI (P/AI) 30 days after TAI.

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