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Comparison between two estradiol-progesterone based protocols for timed artificial insemination in blocks in lactating Nelore cows

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ABSTRACT

The aim of this study was to compare the use of artificial insemination in time blocks (Artificial Insemination Blocks, AIB) using an 8 and 9 d estradiol-progesterone based protocol. In this experiment, lactating Nelore cows (n = 253) were subjected to two estradiol-progesterone based TAI protocols. On the morning of Day 10 (8d group, n = 124) or Day 11 (9d group, n = 129), cows were examined by ultrasonography to evaluate the diameter of the preovulatory follicle and were inseminated once at one of the following time points, according to the diameter of the preovulatory follicle (POF): Block 0 (POF ≥ 15 mm, TAI 0 h after conventional TAI), Block 1 (POF 13.0–14.9 mm, TAI 6 h later), Block 2 (POF 10.1–12.9 mm, TAI 24 h later), and Block 3 (POF ≤ 10.0 mm, TAI 30 h later). The pregnancy per AI (P/AI) did not differ between 8d and 9d groups (P > 0.05). Considering only multiparous cows, however, P/AI tended to be greater in the 8d (64.1%) than in the 9d group (49.3%; P = 0.08). Cows from the 9d group tended to have a larger POF than cows from the 8d group (P = 0.07). In conclusion, these results provide evidence that there is no difference between 8d or 9d protocols when using the AIB technique. Use of the 8d estradiol-progesterone based protocol, however, tended to increase pregnancy in multiparous cows.

1. Introduction

Artificial insemination (AI) is one of the main techniques used worldwide to disseminate desirable genetics among beef and dairy herds (Bo et al., 2016) and the development of timed AI (TAI) protocols contributed to the widespread use of the AI technique. In Brazil, semen commercialization increased 300% between 2000 and 2011 due to use of TAI (ASBIA, 2011). Data collected from the 2015 breeding season suggest that the number of cattle involved in TAI programs was about 10,000,000 in Brazilian commercial herds (Bo et al., 2016).

Since the first report of the Ovsynch (Pursley et al., 1995) and estradiol-progesterone based protocols (Bo et al., 1994), estrous synchronization programs have been modified to improve fertility response of inseminated cows. However, only small improvements in the fertility of cows occurred when TAI protocols were used (Bo et al., 2016; Day, 2015; Meneghetti et al., 2009; Sa Filho et al., 2010, 2013; Whittier et al., 2013). The most used protocol for Nelore cows maintained in tropical areas consists of an intravaginal progesterone insert, estradiol benzoate (EB) to induce synchronous ovarian follicular wave emergence, prostaglandin F2a analogues (PGFs) to induce luteolysis, and an ovulatory stimulus using an ester of estradiol (benzoate or cypionate). This estradiol-based protocol and its modifications provided satisfactory fertility in commercial Brazilian herds, independent of breed (*B. indicus*, *B. taurus*,

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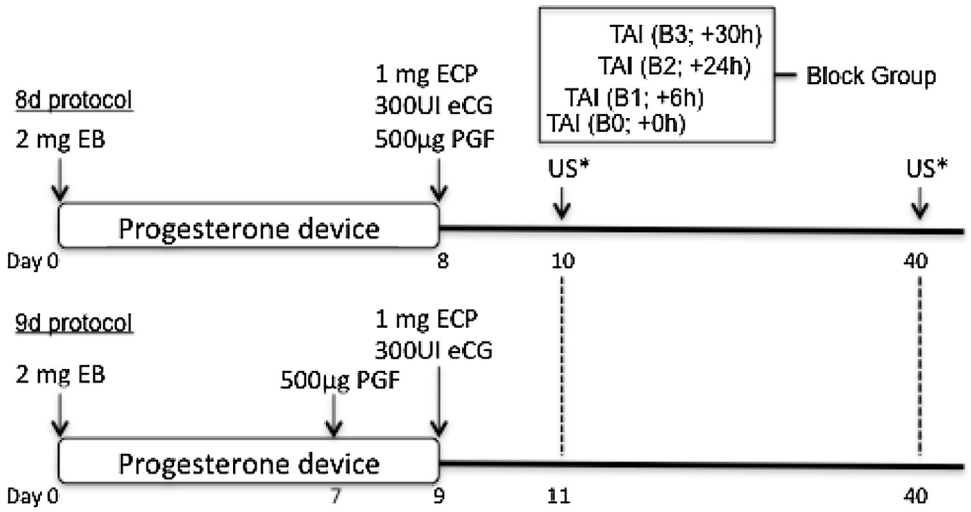

Fig. 1. Experimental design used for suckled cows treated with 8d or 9d EB-CIDR based TAI protocol.EB, estradiol benzoate; eCG, equine chorionic gonadotropin; ECP, estradiol cypionate; PGF, prostaglandin; TAI, timed artificial insemination; US, ultrassound examinations

or crossbreds). The 8d and 9d estradiol-progesterone based protocols were described previously by Baruselli et al. (2004) and Meneghetti et al. (2009), respectively, and are recognized as the most used protocols for TAI in lactating Nelore cows in Brazil. Currently, such TAI protocols result in pregnancy rates per AI (P/AI) that range from 40% to 60%, therefore, new alternatives to increase fertility of cows submitted to TAI programs are necessary. Recently, a technique known as AI in time blocks (Artificial Insemination Blocks, AIB) was developed in attempts to increase fertility with use of estradiol-progesterone based protocols for TAI (Pfeifer et al., 2015). The use of AIB protocols resulted in a P/AI of 60% in lactating Nelore cows. Because the AIB technique was developed to be used in 8d estradiol-progesterone based protocol, there are questions if the same blocking system for time of AI would be effective with use of 9d protocols. Based on these considerations, the objective of the present study was to compare the P/AI for cows inseminated in time blocks based on size of the largest follicle using an 8d and 9d protocol.

2. Materials and methods

The Committee for Ethics in Animal Experimentation from the Embrapa approved all of the procedures performed in the experiments described in this manuscript (Protocol F02.2014).

2.1. Animal treatments

Lactating beef cows (*B. indicus*, Nelore; $n = 253$) from one commercial beef farm in Rondônia – Brazil, were used in this study. All cows were maintained on *Brachiaria brizantha* pasture and given mineralized-salt and free access to water. Cows were treated according the experimental design depicted in Fig. 1. The TAI protocols were initiated between 30 and 60 d postpartum. Cows were randomly divided into two groups according to the protocol of TAI. The 8d group ($n = 124$; 60 primiparous and 64 multiparous cows), received 2 mg of estradiol benzoate (Sincrodiol®, Ouro Fino, Cravinhos, Brazil) i.m., and an intravaginal progesterone device (Sincrogest®, Ouro Fino, Cravinhos, Brazil) to synchronize time of follicular wave emergence on Day 0. The progesterone device was removed and cows were given 500 µg of cloprostenol sodium (Sincrocio®, Ouro Fino, Cravinhos, Brazil) i.m., 1 mg of estradiol cipionate (SincroCP®, Ouro Fino, Cravinhos, Brazil) i.m., and 300 IU of eCG (Sincro eCG®, Ouro Fino, Cravinhos, Brazil) i.m. on Day 8. Cows in the 9d group ($n = 129$; 60 primiparous and 69 multiparous) were treated using the same protocol on Day 0 as cows in the 8d group. Cows of this group, however, were injected with 500 µg of cloprostenol sodium i.m. on Day 7 and the progesterone insert was removed on Day 9 along with the injection of 1 mg of estradiol cipionate i.m., and 300 IU of eCG i.m. On the morning of Day 10 in the 8d group, and of Day 11 in the 9d group (08:00 a.m.), the diameter of the pre-ovulatory follicle (POF) was assessed by ultrasonography (SIUI CTS-900, linear probe with 5 MHZ, Guangdong, China) and cows from both groups were subsequently divided based on the size of the POF in the manner previously described by Pfeifer et al. (2015). Cows from both groups were inseminated once at one of the following time points, according to the diameter of the POF, as described previously (Pfeifer et al., 2015): Block 0 (POF ≥ 15 mm, TAI 0 h after conventional TAI), Block 1 (POF = 13–14.9 mm, TAI 6 h after conventional TAI), Block 2 (POF = 10.1–12.9 mm, 24 h after conventional TAI) and Block 3 (POF ≤ 10 mm, TAI 30 h after conventional TAI).

Further ultrasonic examinations were performed 30 d post-TAI to assess pregnancy status. Visualization of the embryonic vesicle and detection of the embryo were the positive criteria for determining pregnancy.