

## Original Research Article

## Puberty Induction and Fixed-Time Artificial Insemination in Super Precocious Heifers

João Victor Souza de Jesus<sup>1</sup>, Iran Matos Malta Pereira<sup>1</sup>, Franklin Roosevelt Dantas<sup>1</sup>, Leonardo Campos Almeida<sup>1</sup>, Talles Cota da Cruz<sup>1</sup>, Virgilio Zoppi Lemos<sup>1</sup>, Clairton Marcolongo Pereira<sup>1\*</sup>

<sup>1</sup>Faculty of Veterinary Medicine, Centro Universitário do Espírito Santo (UNESC), Colatina, Brazil

\*Rua Fioravante Rossi, 2930 - Bairro Martinelli - Colatina-ES

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**Abstract:** Physiologically the female bovine is considered non-seasonal polyestric. The beginning of the estrous cycle occurs when the female enters puberty, however, the age at which estrus begins is variable. There are specific protocols for inducing puberty in super precocious heifers that favor reproductive efficiency in the herd, increasing estrus and conception rates. Therefore, the aim of this study was to evaluate puberty induction and fixed-time artificial insemination in super precocious heifers from a farm in southern Bahia. For this, 334 F1 heifers, crossing Aberdeen Angus with Nellore had puberty induced by the administration of injectable progesterone, reproductive vaccine CattleMaster Gold® and Fosfosal® and after twelve days, estradiol cypionate was administered. Finally, artificial insemination for a fixed time is performed. It was observed that the conception rate of the animals that participated in the experiment carried out was 69,76% of initial pregnancy in their first pregnancy diagnosis, while in the second evaluation the result was 67,06% of pregnant animals, consisting of a loss embryonic 2,7%. Thus, a satisfactory result of the association between puberty induction and fixed-time artificial insemination was observed. Further studies comparing this protocol with the conventional technique are needed to verify the best approach.

**Keywords:** Estrous cycle, puberty induction, FTAI, progesterone, heifer, insemination.

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## INTRODUCTION

Physiologically, the female bovine is considered non-seasonal polyestric, with its cycles being separated by 21 days (Benites *et al.*, 2011). The onset of the estrous cycle occurs when the female enters puberty, however, the age at which estrus begins is variable, depending on environmental and genetic factors, such as breed and nutritional status (Ball *et al.*, 2006). However, the average age observed for bovine females to enter puberty is 12 months (Aiello, 2001).

There is evidence that the use of progesterone increases reproductive efficiency in the herd, increasing estrus and conception rates, whether or not associated with ovulation induction. The purpose of using progesterone is to enable the exogenous manipulation of ovarian activity, as well as follicular control, allowing the synchronization of estrus and the implementation of a Fixed-Time Artificial Insemination (FTAI) program, whose objective is to induce cyclicity

in cattle in anestrus, eliminate the perception of heat, reduce the spacing between births, increasing the number of calves born (Godoy *et al.*, 2010).

In recent years, several hormonal protocols have been used to induce puberty in bovine females (Vogg *et al.*, 2004). Such protocols are based on the association or not of hormones, such as gonadotropin-releasing hormone (GnRh), chorionic gonadotropins (hCG and eCG), in addition to progestins and/or progesterone, estrogens and prostaglandins (Silva *et al.*, 2018).

Although there are, as mentioned, genetic and environmental principles related to the onset of puberty, considering nutritional management, environmental issues and the genetics of breeders, aiming at adaptive breeds for rusticity and precocity, the objective of this study was to evaluate the induction of puberty and artificial insemination for fixed time in super precocious heifers from a farm in the south of Bahia.

## MATERIALS AND METHODS

This is a prospective study that took place on a property in the extreme south of Bahia in which puberty induction protocols were carried out, initiated on November 18, 2020 in a flock of 334 F1 heifers, crossing Aberdeen Angus with Nelore, nulliparous, with an average weight of 295.6Kg and an average of 14 months of age. On December 20, 2020, the heifers were inseminated by the FTAI technique. The bull used for the crossing was of the Nelore breed with high Expected Difference in Progeny (EDP) for the probability of precocious calving (3p), a characteristic that indicates sexual precocity, with a greater capacity of the bull to produce females.

In addition, 24 days before starting the FTAI protocol, 2ml injectable progesterone (P4) Sincrogest® was administered simultaneously with the CattleMaster Gold® reproductive vaccine and the 10ml Fosfosal® supplement. After 12 days of P4 application, estradiol cypionate ECP® 0.25ml was administered, which contributes to the induction of puberty.

On the first day of the FTAI protocol, a progesterone implant in heifers (CIDR®) was

introduced. 2 ml of estradiol benzoate (Gonadiol®) and 1.5 ml of prostaglandin (Lutalyse®) were also applied. On the seventh day after the beginning of the protocol, the implants were removed and, again, the application of prostaglandin (Lutalyse®) was performed, doubling the dose to 3 ml, together with estradiol cypionate (ECP®) at a dosage of 0.25 ml. On the ninth day after the beginning of the protocol, the batch of heifers presented heat in the morning, thus, insemination was carried out at the time of heat. To obtain the related data, two gestational diagnostic tests were performed, the first on January 20, 2021 and the second on May 3, 2021.

## RESULTS AND DISCUSSION

It was observed a conception rate of the animals that participated in the experiment of 69,76% of initial pregnancy in their first pregnancy diagnosis, while in the second evaluation the result was of 67,06% of pregnant animals, consisting in an embryonic loss of 2,7%. This demonstrates that the technique used has good pregnancy rates in super precocious heifers. Reproductive data and numbers of animals are detailed in Table 1.

**Table-1: Average of reproductive indices, containing initial and final pregnancy, numbers of animals and embryonic losses**

Reproductive Indices	Total	
	Absolute	Relative (%)
Total heifers	334	100
1 <sup>st</sup> Gestational Diagnosis	233	69,76
2 <sup>nd</sup> Gestational Diagnosis	224	67,06
Embryonic Losses	9	2,69
Non-pregnant heifers in the 1 <sup>st</sup> Gestational Diagnosis	101	30,23
Non-pregnant heifers in the 2 <sup>nd</sup> Gestational Diagnosis	110	32,93

It is noteworthy that in order to use this technique, the cost and benefit for the producer must be evaluated. The cost must be favorable and adjusted to the reality of the herd, because when this technique is used inappropriately, it compromises production costs, harming the results and consequently the investment and making the procedure unfeasible (Pfeifer *et al.*, 2009).

The vast majority of hormonal protocols use P4 associated with an estrogen, in order to synchronize the appearance of a follicular wave and ovulation (Baruselli *et al.*, 2012), as it was used in this work. The effects of estradiol help the action of P4, justifying its association and thus improving the accuracy of synchronization (Godoy *et al.*, 2010).

Based on the work carried out, a satisfactory result of puberty induction along with fixed-time artificial insemination was observed. Further studies

comparing this protocol with the conventional technique are needed to verify the best approach.

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