Available online at www.sciencedirect.com
SCIENCE DIRECT
Theriogenology
Theriogenology 65 (2006) 77–88
www.journals.elsevierhealth.com/periodicals/the

Superovulation and embryo transfer in *Bos indicus* cattle

Pietro S. Baruselli [a,*], Manoel F. de Sá Filho [a], Claudiney M. Martins [a], Luiz F. Nasser [a], Marcelo F.G. Nogueira [b], Ciro M. Barros [b], Gabriel A. Bó [c]

[a] *Departament of Animal Reproduction, FMVZ-USP, Rua Prof. Orlando Marques de Paiva, 87, CEP 05508-000, Sao Paulo-SP, Brazil*
[b] *Departamento de Farmacología, Instituto de Biociências, UNESP, Botucatu-SP, Brazil*
[c] *Instituto de Reproducción Animal Córdoba, Universidad Católica de Córdoba, Córdoba, Argentina*

Abstract

Compared to *Bos taurus* breeds, *Bos indicus* breeds of cattle present several differences in reproductive physiology. Follicular diameter at deviation and at the time of ovulatory capability are smaller in *B. indicus* breeds. Furthermore, *B. indicus* breeds have a greater sensitivity to gonadotropins, a shorter duration of estrus, and more often express estrus during the night. These differences must be considered when setting up embryo transfer programs for *B. indicus* cattle. In recent studies, we evaluated follicular dynamics and superovulatory responses in *B. indicus* donors with the objective of implementing fixed-time AI protocols in superstimulated donors. Protocols using estradiol and progesterone/progestrogen releasing devices to control follicular wave emergence were as efficacious as in *B. taurus* cattle, allowing the initiation of superstimulatory treatments (with lower dosages of FSH than in *B. taurus* donors) at a self-appointed time. Furthermore, results presented herein indicate that delaying the removal of progesterone/progestogen-releasing devices, combined with the administration of GnRH or pLH 12 h after the last FSH injection, results in synchronous ovulations, permitting the application of fixed-time AI of donors without the necessity of estrus detection and without compromising the results.

Keywords: Superstimulation; Embryo transfer; *Bos indicus*; Fixed-time AI; Ultrasonography

* Corresponding author.
E-mail address: baruselli@usp.br (P.S. Baruselli).

0093-691X/$ – see front matter © 2005 Elsevier Inc. All rights reserved.
doi:10.1016/j.theriogenology.2005.10.006

1. Introduction

Bovine embryo transfer has been applied widely around the world. This technology increases the number of offspring obtained from donors with high genetic value and is used to disseminate desirable genetics around the world. In Brazil and in other tropical countries, there has been an increasing demand to multiply the genetics of valuable *Bos indicus* females. However, there are important differences in the physiology and the reproductive behavior between *B. indicus* and *Bos taurus* cattle that can affect the efficiency of superstimulation programs. Traditional superstimulation protocols have some limitations: (1) necessity of handling and detecting estrus to establish the ''base heat'', (2) inability to start superstimulatory treatments at the optimal time of follicular development, (3) necessity to detect estrus to determine time of AI, (4) high variability in embryo production per donor, and (5) 20–30% of unresponsive donors that do not produce embryos.

2. Factors that influence superovulatory response

Variability in superovulatory responses after gonadotropin treatments continues to be the greatest problem for commercial embryo transfer [1–3]. Individual variation in superovulatory response has also been observed in Nelore cattle using a ''cross-over'' experimental design [4]. Numbers of CL, ova/embryos and embryos suitable for freezing varied significantly among donors. A recent study involving high producing Holstein cows in a ''cross-over'' experimental design in a tropical environment also reported significant individual variation in the number of follicles >8 mm in diameter at the time of estrus and in the number of CL at the time of ova/embryo collection [5].

In the conventional protocol for superstimulation, gonadotropin treatments are initiated during mid-cycle (8–12 d post-ovulation). This approach presents difficulties because it requires estrus detection prior to initiation of gonadotropin treatments, and because there is a great individual variation in the day of emergence of the second follicular wave. These difficulties can adversely affect superovulatory responses [3].

Several studies have demonstrated the importance of initiating gonadotropin treatments at the time of follicular wave emergence. The absence of a dominant follicle at the beginning of treatment increased the efficacy of the superstimulatory treatments [3,6]. Nasser et al. [7] obtained a higher superstimulatory response when gonadotropin treatments were initiated on the day of follicle wave emergence than when treatments were initiated 1 or 2 d later. Therefore, alternatives to control follicular wave emergence at random stages of the estrus cycle, without necessity to detect estrus to establish a ''base heat'', would facilitate management of *B. indicus* donors, and possibly increase the efficiency of embryo transfer programs in cattle of Zebu breeding.

3. Control of follicular dynamics for superstimulation

Mechanical (follicle ablation) [8] or pharmacological (GnRH) [9], LH, hCG or estradiol plus progesterone (P4) [10,11] methods of controlling follicular wave emergence have