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Theriogenology
ELSEVIER
Theriogenology 65 (2006) 65–76
www.journals.elsevierhealth.com/periodicals/the

Dissecting why superovulation and embryo transfer usually work on some farms but not on others

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Abstract

Bovine embryo transfer is a well-established commercial industry that is often associated with veterinary practices. Practitioners offering embryo transfer services may possess a very high standard of technical expertise; however, success in the production of embryos and the impregnation of recipients cannot be achieved unless the cattle are healthy and maintained in a well-managed cattle operation. In addition to appropriate gonadotropin treatments of donor cattle, the use of highly fertile semen, known to have been properly stored and handled is required for success. Recipient cattle must be managed with the same attention to detail as donors. Traditionally, PGF has been used for the synchronization of recipients. However, PGF is limited in its effectiveness early and late in the bovine estrus cycle. Recipient estrus synchronization with progesterone releasing intravaginal inserts has been successful and high pregnancy rates have resulted following embryo transfer.

Keywords: Embryo transfer; Cattle; Management; Artificial insemination

1. Introduction

Since bovine embryo transfer became commercialized in the early 1970s, there have been millions of bovine embryos transferred internationally. According to the International

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0093-691X/$ – see front matter © 2005 Elsevier Inc. All rights reserved.
doi:10.1016/j.theriogenology.2005.10.007

Embryo Transfer Society (IETS) Data Retrieval Committee, an average of about 500,000 cattle embryos are transferred annually on a global basis [1]. Although the number of donors collected and embryos recovered are relatively easy to obtain from embryo transfer practitioners, accurate conception rates for transferred embryos are more difficult to acquire. For example, in the USA, many recipients are placed with a bull shortly after embryo transfer and it is only after parturition that it can be determined whether the calves were the result of transferred embryos or natural matings. In the authors' experience, results are seldom reported to the practitioner who transferred the embryos. However, in most well-managed dairy and beef cattle operations, embryo transfer conception rates are routinely determined as a means to measure and improve management practices. Experienced embryo transfer practitioners can usually identify farms where donor females consistently produce high numbers of high quality embryos and where high conception rates are achieved in recipients. Conversely, low embryo production rates and below average embryo transfer conception rates are usually associated with poorly managed farms. In some cattle operations, high numbers of embryos are produced by superovulated donors, but recipient management is suboptimal, or vise versa. The objective of this paper is to identify some of the specific causes, both positive and negative, for these effects. By doing so, inexperienced embryo transfer practitioners and researchers in this industry can understand the complexities of producing acceptable results from donor and recipient females on a consistent basis.

2. Materials and methods

2.1. Farms

The data utilized in this study were collected on farms where the authors conducted commercial embryo transfer procedures. There were no experimental manipulations involved with either donor or recipient cattle. For the comparison of superovulation results and embryo transfer pregnancy rates, two farms were identified on which embryo transfer procedures were conducted by the authors for a period of 2–3 years. Farm A, a cattle program that has been in operation for 25 years, is located in Oklahoma and maintains several hundred head of beef cows on pasture consisting primarily of native grasses. The cattle are supplemented at a moderate level with standard protein-energy-mineral supplements. The authors' experience with embryo transfer on this farm covered a 3-year period. Consistently good results with superovulation and recipient pregnancy rates have been achieved on this farm. Farm B is a beef cattle operation that has only been in business for about 3 years. The management on this farm is also much less experienced than at Farm A. The authors have provided embryo transfer services on this farm for approximately 2 years, which overlapped in time with the service provided to Farm A.

In addition, data on conception rates for cows and heifers bred by AI and a combination of cows and heifers to which embryos had been transferred were provided by managers of other farms with reliable record keeping systems. These farms are Farm A, described above, plus three additional farms designated as Farms C, D, and E.