Repro Tracks

▶ by **Bill Beal,** *beef cattle reproductive physiologist, Virgina Tech*

Embryo transfer success

The success of bovine embryo transfer (ET) depends on establishing and maintaining pregnancy in recipients receiving an embryo seven days after estrus. Failure to establish pregnancy or embryonic death resulting in embryo loss reduces the pregnancy rate following ET. Higher embryo quality and methods to improve embryo viability can reduce embryonic loss and increase the success of embryo transfer.

Breeder question No. 1

We contract with several commercial recipient herds, and the herd owners have complained about higher pregnancy losses following ET. Is there a higher rate of embryo loss following ET, and what percentage of embryo loss should be considered "normal?"

Response: Concern among contract recipient herd owners about embryonic losses is not unusual. Establishing and maintaining pregnancies is the lifeblood of a contract recipient herd where owners are paid for weaned calves.

Unfortunately, there has not been a well-designed study to examine embryonic loss in cows that become pregnant after ET. However, we have transferred more than 700 frozen/thawed embryos into cows in the Virginia Tech research herd since 1999 and pregnancy-checked those cows at approximately 18 and 58 days after transfer (Days 25 and 65 of pregnancy). The pregnant recipients were then allowed to carry calves to term.

A retrospective look at the pregnancy rates after transfer, as well as the calving data, provides an unbiased estimate of embryo loss following ET. However, the data is limited to only one herd (see Table 1).

Data from the Virginia Tech herd indicate that embryonic loss was greatest, 22%, when low-quality embryos were transferred to recipients. Note that 69% of the embryonic losses (33 of 48) occurred between Days 25 and 65 of pregnancy. Hence, it is expected that, regardless of embryo quality grade, more embryonic death should be expected to occur early in pregnancy.

The greatest expense of using ET is the cost of maintaining recipients.

Loss of an ET pregnancy at any stage is costly to the contract herd owner; however, the earlier in the breeding season the loss occurs, the greater the likelihood that a recipient having lost a pregnancy will become pregnant to another embryo transfer or to breeding. Consequently, for recipient herd owners using a fixed-length breeding season, embryonic losses early in pregnancy are costly, but "late" embryonic losses are devastating.

The overall rate of embryonic death following embryo transfer in the Virginia Tech research herd was 15%. That was higher than should be expected in an average contract recipient herd, because many of the recipients received poor-quality, frozen embryos as part of the research.

Poor-quality embryos (Grade 3) are rarely used in contract recipient herds. Therefore, the "normal" rate of embryonic loss after Day 25 of pregnancy in most contract recipient herds should be equal to or less than that reported for excellent- and fair-quality (Grade 1 and 2) embryos.

Frankly, these numbers are frightening to contract recipient herd owners or for breeders maintaining their own recipients. The greatest expense of using ET is the cost of maintaining recipients. Recipients that lose a pregnancy escalate the cost per pregnancy in an ET operation. Therefore, the cost of embryo losses must be factored into the economic cost/benefit analysis of using ET, especially by contract recipient herd owners.

Table 1: Pregnancy rates and embryonic loss, by embryo quality grade, following transfer of frozen/thawed embryos, Virginia Tech

	No. pregnancies			
Embryo quality	25 days	65 days	Calves born	Embryo loss*
Excellent (Grade 1)	160	146	143	11% (17/160)
Fair (Grade 2)	66	60	57	14% (9/66)
Poor (Grade 3)	101	88	79	22% (22/101)
Total	327	294	279	15% (48/327)

*Embryo loss between Day 25 and term.

Breeder question No. 2

I have heard of ET practitioners using a product called "Embryo Armor" to increase pregnancy rates. I "Googled" the Internet and found a web site for the company that sells the product, but I still don't understand how it works. Their ads claim it will increase pregnancy rates by 10%. Is this product legitimate, and how much does it cost?

Response: Embryo Armor™ is a prostaglandin receptor antagonist that is marketed by Ultimate Genetics. The product is added to the fluid used to flush embryos from the donor. The active compound is reported to block the binding of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) to embryonic cells, thereby protecting the embryo from the detrimental effects of $PGF_{2\alpha}$ released during manipulation of the uterus.

Earlier work by researchers at the University of Tennessee demonstrated that exposure to $PGF_{2\alpha}$ decreased the viability of embryos. $PGF_{2\alpha}$ can be released by manipulation of the uterus of a donor during embryo collection or by the recipient during the process of embryo transfer.

Several researchers demonstrated that blocking the release of $PGF_{2\alpha}$ in recipients at the time of transfer improved pregnancy rates. The theory behind the use of Embryo

Armor is that, rather than blocking the release of $PGF_{2\alpha}$ from the donor or recipient, it protects the embryo from the effects of $PGF_{2\alpha}$ during collection or transfer.

Ultimate Genetics has released pregnancy data from more than 1,500 recipients that received an embryo collected with or without Embryo Armor treatment. Pregnancy rates were 10%-16% higher when embryos were transferred after being collected with the product in the collection fluid. The improvement occurred regardless of the stage of embryo development (morula or blastocyst) or whether embryos were frozen and thawed or transferred fresh.

The results reported following use of Embryo Armor are exciting. However, it has to be pointed out that the only results reported to date, although from a well-designed experiment, have been from an in-house study. Use of the product by private practitioners began in fall 2007. While use in the field will not be in controlled experiments, the amount of data collected by many practitioners using the product will serve as an independent analysis of the effectiveness of the product.

The cost per embryo collected will depend on the collection methods used by individual practitioners and by the superovulation response of individual donors. However, when I checked with two practitioners using the product they estimated the cost to their clients to be between $60 and $90 per donor collected, which translated to a cost to the client of $10 to $15 per embryo collected.

Editor's Note: *Bill Beal is a beef cattle reproductive physiologist at Virginia Tech. He conducts research involving estrus synchronization, artificial insemination, embryo transfer and the use of ultrasound technology. This column is designed to provide answers to questions about reproductive management commonly posed by commercial and purebred breeders. If you have questions or comments related to the reproductive management of cows or bulls, e-mail them to Beal at wbeal@vt.edu or mail them to him at the Dept. of Animal & Poultry Sciences, Virginia Tech, Blacksburg, VA 24061-0306.*