ARSBC 2012: Advancing Technologies

Embryo Transfer: Are Efficiencies Improving?

Preparation of females — donors and recips — is greatest factor affecting ET success.

*by **Troy Smith,** field editor*

Commercial embryo transfer (ET) is a well-established and mature industry. The collection and transfer of embryos is practiced in many countries, and the success of ET in well-managed herds is quite high. According to John Hasler of Bioniche Animal Health Inc., the most important variable affecting success is the level of management applied to the bovine females involved — the embryo donors and the recipients.

Hasler shared his perspective regarding advancements in the practice of ET during the Applied Reproductive Strategies in Beef Cattle (ARSBC) symposium in Sioux Falls, S.D. While few significant changes have occurred in recent years, Hasler believes efficiencies of ET are improving.

"In the last 20 years, there hasn't been much change in the efficacy of superovulation (collection of multiple ova or 'eggs' during one ovulation period). We don't get any more embryos out of a cow," stated Hasler. "We can do it more efficiently, though. We can collect them more often, and do it on our schedule, thanks to the use of GnRH (gonadotropin-releasing hormone) and CIDR® (controlled internal drug release) technology."

Hasler said the average number of embryos recovered from superovulation per donor ranges from five to seven. That's been the case for a couple of decades. However, it's now possible to "flush" cows every 40 days, instead of the old 65- to 70-day interval between superovulations.

According to Hasler, *in vitro* production (IVP) has gained popularity in recent years and is being used extensively in Brazil. Instead of flushing embryos from a donor female's uterus, IVP involves collection of oocytes (unfertilized eggs) by ultrasound-guided ovarian follicle puncture, followed by *in vitro* fertilization and culture.

"It's really not new, but its use is increasing in the U.S., too," offered Hasler, noting that a decade ago, perhaps a few more than 1,000 IVP embryos were produced in the United States. "I expect there will be nearly 40,000 produced in the U.S. by the end of this year."

Hasler noted that sexed semen is available through nearly all bull studs, but results with ET have not been satisfactory. He cited encouraging results reported by labs in Finland.

"It shows it can work," stated Hasler.

Cryopreservation has increased in use, according to Hasler, with an estimated 65% of all embryos recovered in the United States being frozen in ethylene glycol. He said pregnancy rates are lower for frozen embryos as compared to fresh embryos, but the donor-recipient estrous-synchrony requirement is a little more relaxed.

Hasler called "technician effect" a huge factor affecting pregnancy rates, but he emphasized how donor and recipient female quality has the biggest impact on success with ET.

PHOTOS BY TROY SMITH

► **"We don't get any more embryos out of a cow," stated John Hasler of Bioniche Animal Health Inc. "We can do it more efficiently, though."**

Hasler spoke during Tuesday's ARSBC session focused on advancing technologies. Visit *www.appliedreprostrategies.com/2012/SiouxFalls/newsroom.html* to listen to his presentation and to view the accompanying PowerPoint and proceedings paper.

Managing Embryo Transfer to Improve Success

Embryologists surveyed offer their opinions on ET protocols and factors affecting success.

*by **Troy Smith,** field editor*

► **"Systems offering the best opportunities for AI also work for ET," offered Cliff Lamb, who recommended the same protocols for fixed-time ET as for fixed-time AI.**

Areas of management where increased diligence can improve success of embryo transfer (ET) was the topic addressed by University of Florida reproductive physiologist Cliff Lamb during the Applied Reproductive Strategies in Beef Cattle (ARSBC) symposium in Sioux Falls, S.D. Lamb cited results of a survey of embryologists to which respondents ranked factors believed to have significant impact on ET.

"Embryologists were asked if they used fixed-time protocols for ET," noted Lamb. "I thought it interesting that over 72% said 'yes.' "

Lamb said he concurred, believing fixed-time protocols remove much of the error of heat detection and, for the most part,

Can Sexed Semen Work in Your Herd?

Beef specialist considers limitations, opportunities and challenges of using gender-selected semen.

*by **Troy Smith,** field editor*

Sexed semen from beef sires has been commercially available for a few years, but is its use really practical for artificial insemination (AI) implemented at the ranch level? According to University of Idaho Extension Beef Specialist John Hall, sexed semen may be a reproductive technology that's time has come. Hall talked about limitations, opportunities and challenges associated with gender-selected semen during the Applied Reproductive Strategies in Beef Cattle (ARSBC) symposium in Sioux Falls, S.D.

▶ The number of beef bulls with gender-sorted semen available increased from 0 to 70 between 2008 and 2011, said John Hall, University of Idaho.

Results from work involving dairy cows suggested pregnancy rates from sexed semen would be even more reduced when used in older females.

Hall admitted that data from controlled studies is limited, and neither is there sexed semen available from a large number of beef sires. Still, said Hall, the number of beef bulls with gender-sorted semen available increased from zero to 70 between 2008 and 2011.

"While not an overwhelming selection of bulls and genetics," said Hall, "there are now sufficient numbers of beef bulls with sexed semen to begin to meet the needs of the seedstock sector and address the wanted traits for the commercial producer."

Hall said technical services personnel from the major AI studs report a 10%-15% reduction in pregnancy rates to sexed semen compared to conventional semen. That is comparable with results of studies where sexed semen was used in dairy heifers, as well as results of more limited research involving beef heifers. Results from work involving dairy cows suggested pregnancy rates from sexed semen

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result in more pregnancies per 100 embryos transferred. He recommended the same protocols for fixed-time ET as for fixed-time artificial insemination (AI).

"Systems offering the best opportunities for AI also work for ET," offered Lamb.

According to surveyed embryologists, the top three factors affecting fertility were embryo quality, ET technician skill and body condition score of recipient females (see Fig. 1).

"There's no question that perception is correct," agreed Lamb. "Embryo quality makes a big difference. The technician also is tremendously important."

Lamb said recipient body condition is important, too, calling attention to its dynamic. The ongoing change of nutritional status matters, and it's best if females are on an increasing plane of nutrition.

"We generally say it's best if females have a body condition score (BCS) of 5 or higher," added Lamb. "But I'd rather have a 4 moving toward 5 than a 6 going the other way."

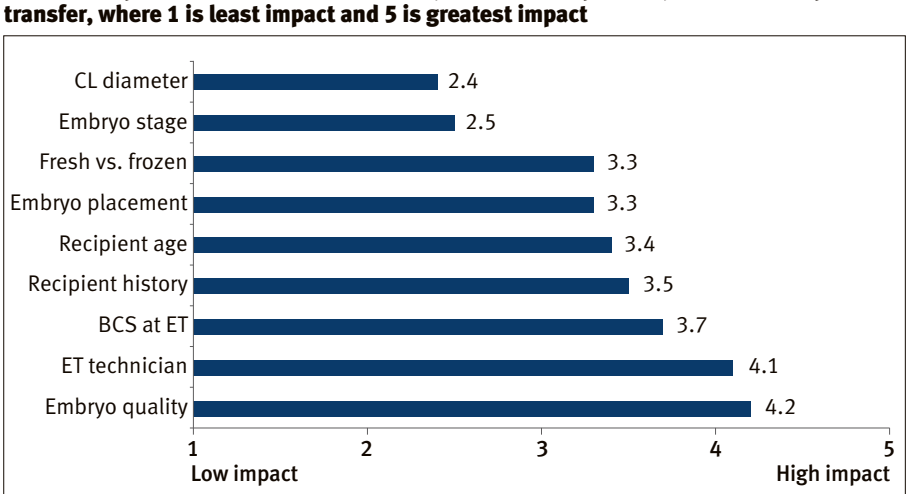
Lamb said other factors that influence ET success include embryo placement, with close proximity to the ovary being favored. With regard to fresh vs. frozen embryos, he said pregnancy rates with frozen embryos tend to be about 10% lower.

Lamb said he fields many questions regarding the importance of mineral supplementation and specifically whether organic sources are best.

"Having a balanced mineral program is more important than whether the product is organic or inorganic," stated Lamb.

Lamb spoke during Tuesday's ARSBC session focused on advancing technology. Visit *www.appliedreprostrategies.com/2012/SiouxFalls/newsroom.html* to listen to his prentation and to view the accompanying PowerPoint and proceedings paper.

Fig. 1: Embryologists' rating of relative impact on fertility of recipients to embryo transfer, where 1 is least impact and 5 is greatest impact



Note: This figure is Question 2 on page 349 of the proceedings to the 2012 ARSBC.

Can Sexed Semen Work in Your Herd?

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would be even more reduced when used in older females.

"Use in cows wasn't recommended," said Hall. "We did (at the University of Idaho), with the goal of making replacement heifers. Results were encouraging. Even the lowest pregnancy rates were close to 50 when using sexed semen with fixed-time AI."

Hall said technical services personnel from the major AI studs report a 10%-15% reduction in pregnancy rates to sexed semen compared to conventional semen.

Generally, said Hall, little difference has been seen between pregnancy rates of beef cows and heifers. For both there was similar depression of pregnancy rate. However, lower pregnancy rate and greater variation may be seen in heifers when fixed-time AI systems are used.

Hall said he believes results in beef heifers and cows indicate that application of sexed semen to the beef industry is feasible. Admittedly, there is considerable variation in pregnancy rate. There may be several influential factors, but Hall noted significant variation in pregnancy rate may be attributed to choice of sire. Differences in bull fertility may be magnified after semen has undergone the sperm sorting process. Increasing insemination dose from 2 million to as much as 10 million sperm does not result in much improvement of results.

"This suggests the lower fertility is probably due to uncompensable semen traits," said Hall.

In summary, Hall said expectations from AI with sexed semen will likely result in 10%-20% lower pregnancy rates in cows and heifers, with increased variability. When used with embryo transfer (ET), a 25%-35% and maybe 50% reduction in transferable embryos might be expected. Hall said application of sexed semen with ET still holds promise for seedstock producers seeking bull calves, because few recipient cows will be tied up with female embryos.

Another application for sexed semen is for development of maternal lines of females by targeting replacement heifer production. Hall said an example might be to maintain a Hereford-Angus cow base, which could be bred to terminal sires.

"A producer wouldn't have to breed as many cows to maternal bulls to get replacement heifers," added Hall. "If gene markers are developed to help identify the most 'ideal' heifers, those would be good candidates for insemination with sexed semen."

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Gender-sorted Semen

Technology is most practical in situations where one gender is more valuable.

*by **Troy Smith,** field editor*

For a few years now, bull studs have been offering sexed semen, affording producers using artificial insemination (AI) the opportunity to choose the gender of calves with considerable accuracy. During the Applied Reproductive Strategies in Beef Cattle (ARSBC) symposium in Sioux Falls, S.D., attendees heard how sexed semen is produced and how it might be used practically in a cow-calf operation.

"Use of sexed semen requires excellent management. Still, its use can result in 70% pregnancy rates. It works best after heat detection and is not recommended for fixed-time AI."
— George Seidel

"It's a terrible method," said Colorado State University reproductive physiologist George Seidel in describing how sperm cells are sorted, with up to 95% purity, with an instrument called a flow cytometer/cell sorter.

"It's amazing that it works at all," he added, noting that sperm are stained with a dye, zapped with a laser and spun in a centrifuge.

"It does work, but sperm suffer numerous insults, and fertility is lower."

According to Seidel, a flow cytometer costs about $500,000 and is capable of sorting close to 15,000,000 sperm cells per hour. It's an expensive process. It's too expensive for resulting product to be packaged in normal AI doses, so sexed semen doses contain half as much — just 2 million sperm. Most bull studs merchandise sexed semen sorted for 90% accuracy, but some companies also market semen of lower purity.

"Use of sexed semen requires excellent management. Still, its use can result in 70% pregnancy rates," stated Seidel. "It works best after heat detection and is not recommended for fixed-time AI."

Seidel said the use of sexed semen is most practical in situations where one gender of animal is more valuable than the other. That makes it appealing to seedstock breeders who market bulls. It's also applicable to producers who specialize in marketing registered or commercial replacement heifers.

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