

# Using Gender-selected Semen

NAAB Symposium features the latest developments in gender-selected semen and protocols for its use.

by Kasey Brown, Lynsey Meharg & Troy Smith

The technology behind gender-selected semen has improved dramatically during the last 10 years. Producers could profit from those advances, said Dustin Dean, director of beef programs at Sexing Technologies.

Dean was charged with opening the 2013 National Association of Animal Breeders (NAAB) Symposium earlier this year by explaining the process behind gender-selected semen and why producers would benefit from use of the product. The symposium was hosted in conjunction with the Beef Improvement Federation (BIF) Research Symposium and Annual Meeting in Oklahoma City, Okla., June 12-15.

"If this technology works with dairy cattle, I promise it will work with beef cattle," Dean stated.

Dean covered the processes behind sexing semen, including how semen is collected, how the semen is sorted and the sorting machines themselves, as well as why producers should use the product. Citing the dairy industry, Dean pointed out the difference in value of a Holstein female compared to a bull calf.

"If producers can see a premium of \$150

per animal for one gender over another, gender-selected semen could be profitable for them," Dean said.

## The process

The sorting process begins by collecting semen from the selected sire. After collection, the semen is then dyed using a fluorescent red stain. Female (X-bearing) sperm cells soak up more dye and shine brighter than the male (Y-bearing) sperm cells.

After the gender is identified, an electromagnetic charge (positive or negative, depending on the gender) is applied to each sperm cell, and the sorting can begin. The sperm cells are sorted into three potential categories: female, male and waste.

Gender-selected semen is marketed in straws at two different dosages: 2.1 million sperm and 5 million sperm. The two different semen concentrations are intended for different purposes, with the 2.1-million-sperm dose used for *in vitro* fertilization, the 5-million-sperm dose being used for embryo transfer (ET), and either dosage being used for traditional artificial insemination (AI) purposes.

Though some producers have doubts about using sexed semen for ET, Dean reassured attendees that the 5-million-count straw was specifically created for and marketed for that purpose.

Dean stated semen from 22%-23% of beef bulls can't be sorted with sorting machines because of motility issues, such as bent heads and broken tails. Some bulls grow out of this issue, while others may never produce semen that can be sorted.

Sexing Technologies guarantees 90% accuracy on gender-selected semen and requires 50% motility at thawing and 30% motility three hours after thawing. All of these requirements are in place to protect producers.

## Producer experience

Kansas seedstock producer Galen Fink of Fink Beef Genetics, Randolph, Kan., shared his experience in using gender-sorted semen to produce both Angus and

Charolais bulls through his family's ET program.

In their experience, said Fink, resulting calf gender has been consistent with the "90% purity" promised for male-sorted semen. He shared results from year-round flushing of 121 donor females bred with gender-sorted semen from fall 2011 through fall 2012. Overall, he reported, 57.4% of embryos were transferable — an average of 6.7 per flush.

Discounting the "busts" resulting from fertility problems with one sire and two cows that wouldn't flush, Fink called results from sexed semen comparable to those following use of conventional semen. Sixty-two percent of embryos recovered after breeding donors with sexed semen were transferable, or 7.2 per flush, compared to 69.8% and 7.7, respectively, for embryos resulting from insemination with conventional semen.

"That's not much difference," stated Fink. "Results with sexed semen weren't much under conventional semen results."

## Production challenges

Challenges exist to producing gender-



PHOTOS BY TROY SMITH

► "If producers can see a premium of \$150 per animal for one gender over another, gender-selected semen could be profitable for them," said Dustin Dean of Sexing Technologies.



► Discounting the "busts" resulting from fertility problems with one sire and two cows that wouldn't flush, Galen Fink called results from sexed semen comparable to those following use of conventional semen in his family's ET program.

selected semen for use in the beef industry. For starters, the dairy industry controls more of the AI industry, Willie Altenburg, Genex Cooperative, said. The dairy industry annually produces about 23 million units of semen commercially and custom-collects about 2.7 million units of semen for domestic AI purposes. Altenburg estimated 10% of that is gender-selected semen. He noted there are about 9 million dairy cows and 4½ million dairy heifers in the United States, so that equates to about a unit and a half of semen per female.

Comparatively, the domestic beef industry produces about 1½ million commercial units and custom-collects about 2.8 million units. This means that

about 3 million units of semen are collected for use on 30 million beef cows and 4½-5 million heifers.

Another 16½ million units of dairy semen are exported, with a large percentage going to the European Union, which requires bulls to be negative for infectious bovine rhinotracheitis (IBR). It's routine to vaccinate beef cattle for IBR, Altenburg says. That's problematic because vaccinated beef bulls cannot stand in the same stud as dairy bulls being collected for export to the EU, nor can their semen be sorted with the same machines as semen sorted to go to the EU.

High-demand bulls create another challenge, said Altenburg, noting there are

25-40 beef bulls for which all the semen produced is sold. Gender-sorting the semen would lessen the volume of semen available, which doesn't make sense when the studs can sell it all for conventional purposes. It would be far too costly to slow down to sort the semen, he explained. "The semen price would be astronomical."

The dairy industry most often sorts for females, discarding the remainder of the collection. The beef industry selects for both. Fortunately, he mentioned, beef semen is sorted by primary and secondary sorts, which means that the gender sort that wasn't the initial goal still can be used and priced accordingly.

CONTINUED ON PAGE 246

### Current uses of gender-selected semen

Gender-selected semen may seem like a technology for the future, but there are many uses for it now with improving results, John Hall, University of Idaho, told participants of the Beef Improvement Federation (BIF) 45th Annual Research Symposium and Convention in Oklahoma City June 12-15.

Gender-selected semen is much more widely used in the dairy industry, but beef producers are starting to use the technology. Where there was no sexed semen available on beef bulls in 2008, gender-sorted semen is now available on nearly 130 beef bulls through bull studs and the company Sexing Technologies.

Success rates have tended to be 35%-40% with gender-selected semen in fixed-time artificial insemination (FTAI) programs. That used to be the success rate for conventional semen in an FTAI program. With advancements in technology, pregnancy rates to conventional FTAI currently average 55%-65% — 10%-20% better than with gender-sorted semen. The lower pregnancy rates have been a deterrent to using gender-sorted semen, but research indicates improvement is coming.

Hall shared research that indicated using gender-selected semen after detected estrus is best, and FTAI is feasible. There is still a 10%-20% decrease in pregnancy rates compared to conventional semen, with greater variability in success. However, there is similar fertility in postpartum cows and heifers; and gender-selected calves perform the same as calves from conventional AI.

Use of gender-selected semen in embryo transfer (ET) has been discouraged by the semen-sexing industry. Hall reported that there is a 20%-35% reduction in transferable embryos. However, even though fewer embryos are obtained with gender-sorted semen compared to conventional semen, the embryos are 90% of the desired gender. Therefore, fewer recipients are needed and fewer animals of the undesired gender are produced.

*In vitro* fertilization (IVF) with gender-selected semen has resulted in pregnancy rates of 30%-50%. Pregnancy rates have been shown at 36%-40% even when shipped during culture.

Another option is called reverse sorting. This sorts previously frozen semen by gender, which can allow production of gender-selected semen from bulls no longer producing semen. He said it is generally used for IVF.

The most exciting use for gender-selected semen, Hall said, is to produce maternal lines to be mated to terminal lines, a practice which is limited in beef cattle compared to other meat animals. Producing maternal lines by means of replacement

heifers would be quicker and use fewer resources with use of gender-selected semen.

Gender ratios could also shift with use of gender-selected semen given the desires of the operation. Seedstock applications



PHOTO BY KASEY BROWN

► Where there was no sexed semen available on beef bulls in 2008, gender-sorted semen is available on nearly 130 beef bulls through bull studs and the company Sexing Technologies, John Hall told those attending the Producer Application Committee breakout.

include using Y-sorted semen for bull production, and X-sorted semen for replacement-heifer production or enhancing female lines. Commercial operations can use it to create a marketing advantage by producing more steers for a uniform trailer load and to meet specific customer needs.

"Sexed semen is a technology whose time has come in the beef industry; however, producers need to understand the risks and limitations," he concluded.

Hall made his comments to the Producer Application Committee at the 2013 BIF Research Symposium and Convention in Oklahoma City June 12-15. To view the PowerPoint he used to accompany his presentation and/or to listen to his presentation firsthand, visit the Newsroom at [www.bifconference.com](http://www.bifconference.com).

— by Kasey Brown, associate editor

**Using Gender-selected Semen** CONTINUED FROM PAGE 245

Altenburg says sexing technology is expensive, and the price is charged for producing the sorted semen, not by how much is ultimately sold. Demand must be solid to justify the cost of sorting semen.

Breed differences do play a role.



► Beef semen is sorted by primary and secondary sorts, which means that the gender sort that wasn't the initial goal can be used and priced accordingly, said Willie Altenburg.

Altenburg gave examples that the Angus and Simmental breeds are sorted for both genders, while Herefords are generally sorted for females and Charolais are sorted for males. These single-gender-selection breeds don't have the advantage of the secondary sort.

He mentioned a few geographical trends in demand. There is higher demand for female-sorted semen east of the Mississippi River for show heifers and other females. There is more demand for bulls west of the Mississippi, where bull prices tend to be higher.

Altenburg noted that seedstock producers are more likely to take the risk of using gender-selected semen. Commercial producers, he said, would be more apt to use the technology if cost could be reduced and result consistency could be improved.

**Using in a timed-AI program**

AI with gender-sorted semen offers cattle breeders the opportunity to choose the gender of resulting calves with a high rate of accuracy. However, sex-sorted semen is typically not recommended for use with fixed-time AI due to the lower pregnancy rates achieved, as compared to timed AI with conventional, non-sorted semen.

Modification of an estrous synchronization protocol to optimize timed AI with sexed semen was discussed during the 2013 NAAB Symposium.

University of Missouri (MU) master's student Jordan Thomas presented results of a study aimed at developing a strategy for better managing anestrus females. Thomas said the main impediment to using gender-sorted semen for timed AI is poor pregnancy rates among cows that have not expressed behavioral estrus prior to insemination.

Thomas said producers could use sexed semen to breed synchronized females observed in estrus, followed by timed AI of females not seen in estrus. Sexed semen could be used only in the females for which heat was observed. Less-expensive conventional semen could then be used for appointment breeding, as these usually will have lower fertility, especially with sexed semen.

Another strategy would be to use sexed semen for timed AI of only those cows known to have expressed estrus prior to breeding time.

"However, utilization of sex-sorted



► Sharing results of a Missouri-based study, Jordan Thomas said modification of the 7-day CO-Synch + CIDR protocol offered improved pregnancy rates using sexed semen to breed non-estrous cows.

semen only among estrous females would not achieve the degree of progeny gender ratio skewing that would be possible if

**Jordan Thomas said the main impediment to using gender-sorted semen for timed AI is poor pregnancy rates among cows that have not expressed behavioral estrus prior to insemination.**

sex-sorted semen could be utilized among all females regardless of estrous expression," stated Thomas.

Sharing results of a Missouri-based study, Thomas said modification of the 7-day CO-Synch + CIDR® protocol offered improved pregnancy rates using sexed semen to breed non-estrous cows. Typical implementation of that timed-AI protocol calls for insemination, concurrent with

injection of GnRH, 66 hours after removal of the CIDR vaginal insert. However, the improved pregnancy rates for non-estrous cows were achieved when insemination with sexed semen was delayed until 20 hours after GnRH administration.

Thomas said timed-AI pregnancy rates for cows that expressed estrus were still higher with conventional semen than with sexed semen. However, among cows that failed to show estrus, delayed insemination with sexed semen yielded higher timed-AI pregnancy rates than when timed AI with sexed semen was performed at the standard time.

"Furthermore," said Thomas, "among cows that failed to express estrus, fixed-time AI pregnancy rates using sex-sorted semen at the delayed time were comparable to those achieved using conventional semen at the standard time."

Developments in the use of sexed semen were discussed during the NAAB Symposium hosted in conjunction with the Beef Improvement Federation (BIF) Research Symposium and Annual Meeting in Oklahoma City June 12-15. For access to the PowerPoints these speakers presented and/or to listen to their presentations firsthand, visit the newsroom at [www.bifconference.com](http://www.bifconference.com), the *Angus Journal's* event coverage site for the annual BIF symposium. Coverage of the event is made possible through collaboration with BIF and sponsorship of *LiveAuctions.tv*.

