



Sexed Semen Technology for the Beef Industry

Gender selection in the beef industry presents cattlemen with benefits and challenges.

by Heather Smith Thomas

One of the newer developments with artificial insemination (AI) in the beef industry is the availability of sexed semen. Producers now have the technology to selectively breed certain cows to a desired bull and to be able to determine the sex of most of the offspring. This is beneficial if the producer wants replacement heifers from his best cows or bull calves from certain matings.



Through recent research University of Idaho Extension beef specialist and superintendent of the Nancy M. Cummings Research, Extension and Education Center John Hall has helped the beef industry identify some positives and some negatives with sexed semen.

Gender selection has been commercially available for a decade in the dairy industry and is now gaining interest in the beef industry. The number of beef bulls with sorted semen available in the United States has increased tremendously during the past six years in major AI studs. The sexing service is provided to bull studs by independent companies such as Sexing Technologies. This company has 47 beef bull sires listed in its current catalog and also has custom semen sexing operations in several locations in the United States for breeders who want sexed semen from a specific bull.

The basics

It is more expensive to produce sexed semen than conventional semen for AI, and only about 25% of the sperm from a bull can be utilized. “The companies and researchers involved in the sorting are trying to identify factors related to sorting that impair sperm quality – to have less sperm damaged in the sorting process,” says John Hall, University of Idaho Extension

beef specialist and superintendent of the Nancy M. Cummings Research, Extension and Education Center. “But we are still in a situation where in any ejaculate, 25% ends up sorted X, 25% ends up sorted Y, and the other 50% is damaged or can’t be sorted. So we are still losing half the ejaculate to begin with.”

Conception rates are also lower with sexed semen than with conventional AI, so this lower conception rate adds to the cost of the process in any herd. “In general, we see a decrease in pregnancy rates of 10 to 20% with use of sexed semen compared with conventional AI. So for this to be feasible, you need to be doing well with conventional AI before you try to use sexed semen,” he says. Otherwise producers may not want to risk the extra expense.

Hall has been involved with sexed semen research for the past six years, breeding the first group of cows in 2008. “We’ve been fortunate in our research at this ranch, in that over a fairly large number of inseminations

we’ve been getting 48 to 50% pregnancy rates with fixed-time AI using sexed semen in post-partum cows,” Hall says. “Our pregnancy rates to sexed semen averaged 52% during the first three breeding seasons (48% to 58%), while our pregnancy rates with conventional semen averaged 58% (52% to 68%).”

Hall says he and his staff have been using X-sorted semen to produce replacement heifers, in a sub-set of elite cows and have been fairly successful.

“Our pregnancy rates are not quite as high as we’d like, but if someone is employing this technology to create replacement heifers and only inseminates cows that are observed in heat, they could feel pretty comfortable with this,” he says. Through his research he has been able to change the heifer-to-bull ratio with a single breeding with sexed semen, followed by natural service cleanup bulls from a 50:50 ratio to about a 65:35 ratio. This assures a fairly large group of heifer calves for replacements.

“Since we are trying to maintain a Hereford-Angus cross cow herd, this allows us to maintain those baldy females by breeding selected cows with sexed semen to produce the heifers we want,” he says.

“I think the key to this success is that it’s a select group of cows. They are in good body condition and calved early in the calving season,” he explains. “You want the early-calving cows to be the ones to generate your replacement females because they are the most fertile. We’ve used estrus synchronization with a CIDR, so there is some progesterone in the system, which also helps.”

In the studies Hall has completed, in all bulls that have had their semen sorted, he has observed a large variation in pregnancy rates. “Part of the issue is that even though the bulls that are sorted are some of the better bulls offered by bull studs – the most popular and also the most fertile – their semen does not go through the sorting process the same,” he says. Each bull is a little different in how well his semen can be sorted; some have fewer viable sperm at the end of the process.

“Just like the difference in bulls in how well their semen freezes, there is not a good way to tell, just by looking at the semen, whether it will sort well or not, or what kind of damage there will be after the sorting process,” Hall says. The only way to tell is to try the bull to see what his track record will be.

“Now there is enough sexed semen being used in the beef industry to start to figure these things out. Bulls that are not performing well with sexed semen are withdrawn from these

offerings,” he says. “But this is one of the things people need to keep in mind, that there can be great variations among bulls. We’ve used bulls that gave us above 50% pregnancy rates for fixed-timed AI, which is really good, and we’ve also had bulls that only gave us 25% pregnancy rates in the studies that we’ve done.”

Hall has also begun looking at Y-sorted semen on a large group of cows to make more steers for commercial herds. A purebred breeder might do this with a select group of cows to produce bull calves. “But when we use a large group of cows that are basically unselected, such as a commercial producer’s entire herd, other than the fact that they are all at least 40 days post-partum, we see disappointing pregnancy rates with fixed-timed AI,” he says. “It comes down around 35 to 38% pregnancy rate.”

At this point in time, the conclusion from these studies is that sexed-semen technology might not be ready for blanket use on cows as is conventional semen. “At least with the research that we’ve done, the economics for this are not quite there yet because we are only shifting that ratio to about 65% male using one fixed-timed AI with sexed semen followed by natural service,” Hall explains. “We still have that 10% to 20% decrease in pregnancy rates compared with conventional semen and there’s a higher percent being rebred by the cleanup bulls. We are trying to figure out what’s working and what’s not, and how we can change that.”

Research in the dairy industry has indicated that maybe breeding later is better, but Hall says they haven’t seen that in their work. They have been considering the timing of AI in the fixed-timed systems for a few years; however, their research has not shown significant improvement if insemination is delayed by 8 hours, like those observed in some dairies.

“We haven’t gained a lot of ground, but we have answered some questions — to find out that we don’t see any benefit from breeding later in a fixed-timed AI system,” Hall says. “There is some suggestion that if you are doing it when you check heat, you breed later at about 18 hours rather than at 12 hours, there might be some improvement. We don’t have a lot of data on that, however, just a lot of little studies.”

Through research, Dave Patterson, animal sciences professor at the University of Missouri, found a method that has worked well with sexed semen and fixed-timed AI. Patterson and a graduate student used Estroject heat detectors on all of the females. If, at the time of fixed-time AI, the heifer or cow came in with a patch that had been activated, showing she’d been in heat, she was inseminated. If the patch was still untouched, they waited 20 hours

and then brought those heifers back through the chute and bred them. When the heifers first came through the chute, even though they had an untouched patch, they were given a shot of GnRH.

“What they saw with this method was a good improvement in pregnancy rates on those heifers or cows that had not been in heat yet at the time of fixed-timed AI,” Hall says.

The applications

Sexed semen has beneficial applications in some areas of the beef industry, such as in replacement heifer or bull production. “Work that other researchers have done demonstrates

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that sexed semen can also be used effectively in embryo transfer and in vitro fertilization systems,” Hall says. “With cost of recipient cows, etc. this can be a useful tool. There are many matings in which everyone wants a bull calf but nobody wants heifers.” Sexed semen gives producers an opportunity to have the desired outcome for this type of program in the purebred industry.

“For this, we tend to use a few more straws of semen than we would in typical embryo transfer. When we breed the donor cows we have to use four straws of sexed semen versus two straws of conventional semen. This is simply because there are only 2.1 million sperm cells in a dose of sexed semen, which is only about 10% of normal,” he explained.

“In certain segments of the industry, sexed semen can be very useful, but people need to go into it with eyes wide open and know what to expect. In the seedstock industry some breeders have gambled on young bulls that looked really good and they decided to take a chance on them. Sometimes that works out great and sometimes it doesn’t,” Hall says.

Seedstock breeders have been on the cutting edge of genetics, but it takes a certain amount of trial and error to figure out what works best.

“We are learning more about sexed semen but there is a lot more work to be done if we can get funding to help move things along,” Hall says. “I think we will continue our project here for a few more years. We are still at a point where we continue to learn more about sexed semen.”

Currently, Hall says they are working on a new project that is called a heifer/heifer system. “We breed all our replacement heifers to X-sorted sexed semen to make the next generation of replacement heifers,” he says. “Not only will heifer calves be slightly smaller at birth and

have fewer calving problems, but we’ll have the genetics we want for the next group of heifers. This is a project we just started last year and we are excited about it.

“Here at our research station I think we’ve helped identify some positives and some negatives with sexed semen. We’ve also been able to identify areas where we need more research and more information. For instance, we need to learn how to identify bulls, after sorting their semen, to eliminate the ones that don’t perform. Perhaps someone will be able to examine biochemical and molecular markers on those sperm cells, to see if there is anything we can identify.”

This is the sixth year for sexed-semen research at the Cummings research center and the sixth calf crop from the X-sorted semen to make heifers. “This is the fourth calf crop on the Y-sorted semen, where we bred a large number of cows to produce steers,” he says. “Even with the disappointing pregnancy rates on the big group of cows with the Y-sorted semen, we are still able to shift that ratio to about 65% steers. This is good, but to be economically feasible we probably need to be able to shift it to 70 to 75%, when we look at the difference between the value of a steer calf versus a feeder heifer.”

The increased amount of sorted semen available now in the beef industry has helped bring the cost down, and there are more bulls available from which to choose.

“When we first started using sexed semen in 2008 there were very few bulls to pick from and last time I checked — in 2011 — there were more than 70,” he says.

Hall explains that with selecting a single sex from sorted semen, the number of sperm cells is reduced by 75%. “So it basically has to be a bull that the owner can afford to ‘waste’ 75% of his sperm production,” he says. “When you look at where the sexed semen comes from in the dairy industry, it’s not from the extremely popular bulls, but the next tier below the most popular. The top bulls can’t afford to give up any units of semen. When a person is selling every straw of semen they can make (conventional semen), they won’t want to reduce the number of straws.”

One thing that has changed since the research began is that there are now more facilities that will custom sort.

“Trans-Ova is one of the companies that has done embryo transfer and in vitro fertilization for a number of years, and they have set up a process to take semen out of conventional straws, and sort those,” Hall says. “The resulting sort produces very low numbers of sperm, so they use it for in vitro fertilization, where the dosage can be very small and still work. They only need about 1,500 sperm cells for in vitro fertilization.”

Sexing Technologies, the company that does the semen sorting, has now come up with some modifications to its process. “They call it Sexed Ultra and came out with it mid-year,” Hall says. “They feel that this modification has improved their pregnancy rates to sexed semen considerably. This might encourage a few more people to try it.” **HW**

Benefits of sexed semen

When a producer is using sexed semen, the results are predictable about 93% or more of the time. It can be a handy tool to increase heifer numbers or steer numbers. Producers may want replacement heifers from certain genetics or steers from a terminal cross.

The option of sex determination could be useful for reducing calving difficulty in first-calf heifers (heifer calves are typically smaller at birth than bull calves) or for producing a higher number of replacement heifers if herd expansion is the goal. If breeders want their best cows to have heifers, using sexed semen can provide faster genetic progress in improving the cow herd, enabling them to keep more good females and to cull more.

A producer may want heifers from the top 10% to 15% of the cows and steers from the rest of the herd. When the market is good for replacement females, breeders may opt for more heifers, and when the market is better for steers, they may choose to produce mostly male calves. Seedstock producers may select bloodlines for maternal qualities for brood cows and others for producing bulls. This technology gives producers the choice and enables them to develop an early strategy for a potential future market.

“Generating more bull calves from a popular sire to produce bulls for commercial cattlemen, or more daughters from a good maternal line can be advantageous,” says John Hall, University of Idaho Extension beef specialist and superintendent of the Nancy M. Cummings Research, Extension and Education Center. “Costs associated with decreased conception rates to sexed semen may be offset by the demand for offspring of a particular individual.”

In female sales, some breeders are finding their bred cows and heifers worth more when bred with sexed semen. Bred heifers guaranteed to have heifer calves and fewer calving problems may bring a premium. Other buyers may want females that will produce only male calves. Seedstock producers marketing pen lots of bred females or pairs may find an advantage in being able to offer cattle guaranteed to have one sex or the other or may find a premium in offering exceptional female bloodlines in a 3-way package — a cow with a heifer calf at side bred back to have another good heifer calf. **HW**