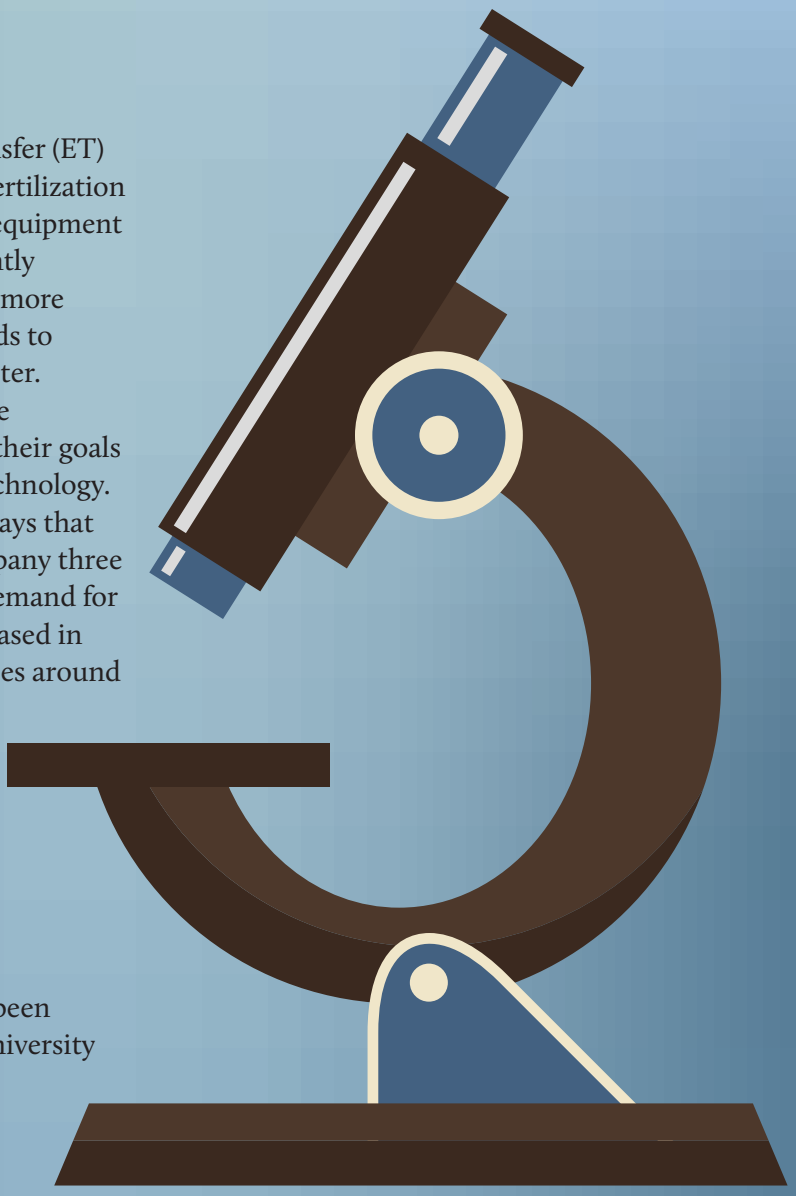
ADVANCING REPRODUCTION

Advanced reproductive technology offers producers a faster way to propagate their herds' genetic potential.

by Sara Gugelmeyer



Cattlemen have been using embryo transfer (ET) with conventional flush and even *in vitro* fertilization (IVF) for decades. But the technology and equipment utilized during these procedures is constantly improving. Especially in the last five years, more and more are using these advanced methods to propagate their herds' genetic potential faster.

Full-service reproductive companies like ReproLogix are helping producers realize their goals through advancements in reproductive technology. Co-founder of ReproLogix Nathan Wells says that when he and his partners started the company three years ago, it was because they saw a real demand for people wanting to recreate top genetics. Based in Fort Scott, Kan., the company offers services around the country through satellite facilities and a mobile lab. They specialize in traditional flushing and IVF for embryo transfer. ReproLogix also has a licensing agreement to utilize sexed semen and to reverse-sort frozen semen.

The latest and greatest

The biggest change in recent years has been the push for more IVF, says Texas A&M University Professor Cliff Lamb, Ph.D.

In vitro fertilization (IVF) is when oocytes are harvested from a donor cow, then fertilized with semen in a petri dish. The resulting embryos can then be placed in recipient (recip) cows or frozen. For conventional flush, the donor cow is bred, then the resulting embryos are flushed from her and placed in recipient cows or frozen for later use.

"I think that the biggest advancements in the last decade have been in terms of IVF," Lamb says. "I am seeing a flat or even decreasing number of embryos produced with traditional ET, but an exponentially increasing number of IVF embryos produced. I think that tells us the technology for IVF is becoming more reliable and gives cattle producers a lot more flexibility in their reproductive management of cattle."

Lamb and Wells agree that's due to more experienced technicians and better equipment used for the procedures.

"There are now more people who have that skill to produce and transfer IVF embryos," Lamb says.

Wells explains that some of ReproLogix's clients had bad experiences with IVF when the technology was first introduced.

"A lot of people jumped on it and thought it was going to be the next best thing," Wells says. "And it does have a lot of advantages, but IVF is not for every cow. Some tried it, had a bad experience and are reluctant to try it again."

Lamb says there was a phenomenon called "big calf syndrome" where the calves produced with IVF were much larger than they should have been, resulting in C-sections for the recip cows.

"The technology has improved and we don't have those big calves anymore," Lamb says. "That has allowed people to think differently of it now."

Wells points out that ultrasound technology and the equipment used to aspirate oocytes out of the cow have improved considerably, even in just the last three years.

"Our processes have gotten better," he says, "and the repetition technicians now get has improved their skills."

One of those technicians is Luke Duckworth, DVM, who also operates Flying M Angus. He worked for a big reproductive services company right out of vet school, then in 2017 purchased a reproductive services business. Now he and two partners operate Southern Veterinary Services.

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Duckworth does mainly cattle work in the spring and sheep, goats and whitetail deer in the fall. He does all this in between growing his own genomic-based Angus seedstock herd.

IVF versus conventional flush

There are pros and cons of each procedure and expert advice is needed to determine which is the best option for each mating. Conventional flushing typically has slightly higher conception rates. If a certain calf sex is desired, sexed semen must be used to inseminate the cow. For superovulated donors, it usually takes three to four straws of semen to breed the cow, which can be pricey if the semen is rare or particularly valuable.

While IVF does have slightly lower conception rates, there are advantages to this option as well.

The first is that oocytes can continue to be retrieved from the cow even after she is bred.

"We can let these donor cows do what God

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intended them to," Wells points out. "They get to carry and raise a calf every year."

Duckworth says he likes his own cows to calve in March.

"Let's say the donor cow calves the middle of March — I wouldn't start setting her up to flush until 45 days post-calving," Duckworth says. "So now it's the end of April. I can really only do one conventional flush, because I'd like to see a natural heat on her so she could be bred and then flushed. Even if I breed her for calf right after that she's probably going to move back in her calving.

"Compare that with IVF, I can wait 30 days after she calves then harvest oocytes every two weeks, breed her and she never moves back in her calving cycle," Duckworth says.

Lamb points out that an advantage of IVF is more pregnancies on an annual basis than with a traditional flush.

"With traditional embryo transfer you can flush a cow between six and 10 times a year if she doesn't carry a calf," Lamb says. "On average you can get about six transferable embryos. With IVF, you can collect oocytes from a donor cow every week even when she is pregnant. Per each collection, you might end up with three or four fertilized embryos. That's a significantly bigger output from a donor cow."

Although Duckworth says he enjoys the advanced technology of IVF, there's a place for both IVF and traditional flush in most beef cattle herds, including his own.

"I am biased toward IVF because I am trying to push the genomics of my herd," Duckworth says. "I can get embryos and pregnancies out of young donors earlier with IVF than conventional flushing."

As a practitioner, too, Duckworth says he appreciates IVF because it is easier for the client.

"They can give the shots, then bring the cows to me. I don't have to trust them to closely watch their heat cycles. They don't even have to worry about artificially inseminating the cows, because some owners are not able to do that themselves. There are definitely some logistics more favorable to IVF."

Faster, faster

One more big advantage Duckworth points out is that IVF is easier than conventional flushing on a young heifer.

"You can conventionally flush a young heifer," Duckworth says, "but it's a more challenging procedure and they're quite a bit more variable in their performance. Whereas, as soon as I can fit my arm inside of a young heifer, I can do IVF with very little to no risk of future reproductive performance."

Duckworth has a lot of experience as a technician in the dairy industry where it's not uncommon to harvest oocytes from a heifer under a year of age.

"On Jerseys only 7 or 8 months old, I was harvesting oocytes. In that case, some of those elite females ended up having granddaughters on the ground before they were

Senior embryologist Shane Morgan evaluating oocytes before they are transferred to ReproLogix IVF lab.

Drew Crisler performs ovum pick-up (OPU) for IVF.

Luke Duckworth

even 2 years old," Duckworth explains. "That's the appeal of IVF; I can grow my herd quicker, even with buying young, open heifers."

Brian and Kim Smith operate Smith Valley Angus at Salem, Mo. Although Kim's family has been in the commercial cattle business for generations, it was only eight years ago that they transitioned to a registered Angus seedstock system. They have been using conventional flush and IVF strategies with ReproLogix. She says young donors are where IVF has been most important for their herd.

"Within about a year of being in the registered business, we got heavily involved in advanced reproductive technologies," Smith says. "We love the DNA information and are so intrigued by all the data and how we can move our genetics forward so much quicker with IVF and conventional flush."

The Smiths have raised and purchased donors

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and, in the last year, doubled their number of ET calves produced. They've tried a lot of options and companies but have seen most success with ReproLogix.

"Whatever we've needed done, they have always accommodated us," she says. "We've flushed on the farm with us doing all the setup and using our recips and we've also taken everything to them and used their recips. If there's ever been an issue they've taken care of it."

The Smiths use mainly conventional flushing because the embryos are stronger and there are better conception rates, she says.

Smith Valley Angus has been using more and more embryo transfer to produce calves like this heifer.

"There have been a few times we've used IVF," Smith says. "Especially with heifers, there is more advantage to that."

For the Smiths, the decision to use ET has really been a great one.

"The percentage of our herd that is quality has jumped tremendously because we are using our best genetics," Smith says. "We have 60 percent ET calves compared to 15 percent just three years ago and it's made a huge improvement, especially when we look at the data. We are also seeing a difference in the demand and prices for our calves as well."

Individualized plan

Wells explains that the first step when getting a phone call from a prospective client is to set up a meeting for the ReproLogix staff to really get to know the producer and his or her individual goals.

"The goal at ReproLogix is to understand the needs and goals of the customer, so we can help them make the most informed decisions," Wells says. "Because everyone is different."

Duckworth gives the example in his herd this year, he reverse-sorted all IVF procedures so that he only got female embryos.

"The way that works, if you can take one straw of semen, thaw it, run it through a reverse-sorting machine that stains the DNA from the nuclear material of each sperm," he says. "It measures it and separates the male sperm from the female sperm. I then collected all the sperm of the desired sex and use that to fertilize the oocytes. Then with about 95 percent accuracy I should only get female embryos."

Duckworth chose that option because he's trying to grow his herd and wants to retain those females. If someone was in the bull business they could sort for male sperm. He explains that it's possible to do conventional flushing with sexed semen, but it doesn't work as well and a lot more semen is necessary.

That's why it's important to individualize each plan. Depending on the availability of the semen the producer wants to use, IVF may be the best option.

If the semen is really rare, say the bull is dead and there's limited frozen semen left, it's possible to breed multiple cows in different states with the same straw of semen.

Duckworth gives an example. "I could be collecting oocytes in Texas, someone else in Wisconsin and even another on the West Coast on the same day. We ship the oocytes to a central location and fertilize all three of the oocytes with

one straw of semen the next day. It takes a little bit of work to iron out all the logistics, but it's possible."

Cost analysis

Some may be quick to dismiss the idea of IVF or even conventional flushing because of the cost. Wells says, "It's like anything else, you need to be aware of the cost. But if you have a cow and you believe in your program, you know what cows make you real money. Why not zero in on those cows that you are able to sell the most expensive bulls or females out of? Let ReproLogix make some more embryos out of them, put them in recips, calve them out and sell them."

Duckworth points out that it all comes back to the individualized plan as well, because every producer has a different situation.

"Some automatically think conventional flush is cheaper, but that may not be necessarily true," Duckworth says. "I can house my own cows and AI them, but not everyone can do that. If someone has to send their cow off to get flushed conventionally, they are going to pay for at least 30 days of board. They are also going to pay multiple AI charges and for three to four straws of semen, then the fee for the procedure itself.

"For an IVF program, the producer can give the shots at their place, then bring the cow in that day to harvest the oocytes. They can leave the semen there, load up the cow and go back home. They have skipped on a lot of board and service charges that go into a conventional flush."

Wells reiterates that these options are all things that need to be discussed and understood up front. "Everyone wants to know, 'What's it going to cost me?' And I say it will depend on the cow and what you want to do. I love to sit down and have that dialogue with customers."

He says a healthy cow that has both functioning ovaries is much different from one who has had some damage. Wells gives an example of a customer who had a great cow that had suffered damage from a breech calf.

"She had one ovary but considerable damage to the rest of her reproductive tract," Wells explains. "That cow was never going to calve again, but we were able to make that customer five more heifer calves. He was able to regain his investment plus some. Those are the types of things we can do with IVF."

For others it's just about making more of a perfect product to sell.

The industry has changed. Now, with gene testing and all the data available, once a cow has her first couple of calves it's easy to identify which cow makes phenomenal bulls calves, for example.

"We can take this super-awesome cow, use sexed semen to AI her to carry a bull calf and also use IVF reverse-sorted semen," Wells says. "So now we just created 31 bull calves for sale that are all the exact same genetically. Some of these bigger ranches that want to buy bulls with the same parentage can come in and buy them all."

That's just one example, Wells points out. Which is why it comes back to the individualized plan again.

"If the customer wants to sell bulls, we can make a really nice bunch of bulls for them. If they market primarily females, we can make those," Wells says. "If they don't have recips, we can put them in our recips and the customer can buy the recips carrying their embryos. These are advantages full-service reproductive technology companies like ReproLogix can offer. We take all the hassle out of the business and all you have to do is calve them out and sell the product."

Wells adds, "Many people sit around and talk about the one awesome cow they have that every year she's making money off one calf," Wells says. "What if we could make 30 of them every year? With the reproductive technologies and services available to today's cattlemen, that's a real possibility. Like we say at ReproLogix, 'Why add when you can multiply?'" AJ

Editor's note: Sara Gugelmeyer is a freelance writer from Lakin, Kan.