Using Embryo Transfer and In Vitro Fertilization

ET and IVF are go-to tools for many serious seedstock producers.

by ***Jaclyn Krymowski***

Embryo transfer (ET) and in vitro fertilization (IVF) are go-to tools for many serious seedstock producers. However, if you're not familiar with these processes and what they can do for your herd, you will have questions.

To help beef producers learn more, Penn State University Extension covered the basics of IVF and ET programs in a Feb. 11 webinar called "Understanding Embryo Transfer and In Vitro Fertilization in Cattle."

Ryan Fairbairn, DVM, of TransOva Genetics, has more than 12,000 IVF procedures under his belt. He shared some of his expertise and insight on the topic.

IVF and ET — what are they?

The terms IVF and ET are sometimes thrown around interchangeably or in tandem. However, both are distinct procedures.

Fairbairn defines ET, or in vivo, as simply, "the propagation of desirable genetics from higher-end females by taking embryos from the higher-end females and transferring them into the genetically lower-end females."

In the early days, ET was an extremely difficult and costly procedure. Today, though, advanced technologies make it accessible to producers everywhere.

More recently, IVF has taken the stage where unfertilized oocytes, or immature egg cells, are aspired, or retrieved, from the donor, fertilized in a lab, and then placed into a recipient at a later time.

There are trade-offs to both these practices including speed of genetic advancement and logistics required to perform each procedure. With today's technology, the fertility outcome for both is quite similar.

"By the time a heifer has a calf of her own, she could have 10 to 20 other calves on the ground at the same time," Fairbairn says. "So, we've really markedly decreased in the generation of roles on those efforts."

At TransOva Genetics, Fairbairn notes IVF has quickly become the go-to option for their clients — doing as much as 90% IVF procedures and 10% conventional ET flushing.

For operations with elite genetics, both options are extremely attractive tools — especially as they become more reliable and affordable with time. Likewise, they can also open new revenue streams for herds to sell fresh and frozen embryos from their elite females.

PHOTO BY VERA SCHULTZ

Embryo transfer (ET) and in vitro fertilization (IVF) allow seedstock producers to propagate their most elite females' genetics and can create new revenue streams with embryo sales.

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How does it work?

Hormones are an integral part of ET flushing and IVF procedures. In an ET flush, follicle stimulating hormone (FSH) is utilized to super ovulate the donor so she will produce more eggs to be fertilized. After that, she is artificially inseminated (AI) as usual and then flushed to collect those embryos.

Originally, ET flushing was an invasive and labor-intensive procedure. That is no longer the case, since the modern process is nonsurgical. The whole collection process takes about 20 to 30 minutes per donor, plus freezing time in certain instances. "On average, you can do anywhere from one to 30 flushes in a day," Fairbairn says.

Embryos are frozen for long-term storage before placement in a recipient. While it does stress the embryo, it is very convenient. However, fresh embryos can be immediately placed in a recipient who is at an appropriate point in her cycle. Both are doable depending on your circumstance.

According to Fairbairn, an ET flush usually results in six to seven embryos.

"We also need to give [the donor] time to recover," he continues. "It is a longer process, and we can only really do it every 21 days or once a month."

IVF, alternatively, does not have this concern. In the case of IVF, follicles are collected straight from the ovary, and because no ovulation is required, recovery time for donors is much quicker.

"We're able to collect these donors every other week," Fairbairn says. "About 35% of those oocytes will result in a viable embryo."

IVF can also be done on donor animals up to 100 to 120 days pregnant. It does not require as vigorous of a hormone shot protocol.

It can even be done without any hormone treatment at all, but this may lower success rate, Fairbairn explains.

"There are definitely some benefits to utilizing the FSH shots, but it is not necessary," he says. "However, it is considered a surgical procedure — we do introduce a needle into the body cavity.

The odds of serious injury or an animal bleeding out is extremely rare, especially as the process has been refined. That said, because IVF removes unfertilized oocytes, they are more vulnerable than a fertilized embryo and must be handled with great care, moving from the animal to the lab and through the in-lab fertilization process.

After fertilization and incubation, the new embryo can be put into a recipient for the pregnancy to continue as normal.

First key to success

When using such high-end technology, producers should prepare to succeed and to eliminate errors. Fairbairn recommends eliminating stress from both donors and recipient animals.

The evolutionary nature of an animal's energy requirements makes this important. One of the first systems to be sacrificed in times of increased energy demand — such as stress or poor nutrition — is reproduction.

"You've got to survive before you can be having offspring," Fairbairn explains. "When there are high levels of stress or a poor nutritional plane, you're not going to have much success with this." HW