

IN VITRO FERTILIZATION & EMBRYO TRANSFER: A COMPARISON

Many breeders have elite females from which they can market valuable genetics and offspring. With the use of advanced reproductive technologies, more offspring can be propagated to help multiply the success of breeding and marketing programs. While many breeders are familiar with embryo transfer (ET), an increasing number of breeders are implementing In Vitro Fertilization (IVF) into their reproductive programs.

EMBRYO TRANSFER

Conventional (in vivo) ET involves specific hormonal treatment (with follicle stimulating hormone) of donor cows and heifers to cause multiple follicles to ovulate. The donors are bred using artificial insemination (AI) following super ovulation after estrus (standing heat). Approximately seven days after insemination, embryos are non-surgically collected or “flushed” from the donor’s uterus and transferred fresh into synchronous recipients who will serve as surrogate mothers, or frozen to be implanted at a later date.

Embryo transfer is one option that can increase a cow’s reproductive efficiency, allowing her to have numerous calves per year. While the average cow produces six to seven calves in her lifetime, ET can increase her reproductive efficiency to numerous calves per year – allowing breeders to multiply the success of their superior pedigrees.



Embryo transfer is a very accessible technology and produces the option to have embryos transferred fresh into synchronized recipients, or to have the embryos safely frozen to be transferred at a later date. By creating more offspring that are valuable to a herd, breeders can advance their marketing opportunities, improve the reproductive performance, and enhance the rate of genetic gain.

IN VITRO FERTILIZATION

An IVF collection, called an Aspiration or Ovum Pick Up (OPU), is the process of harvesting unfertilized oocytes, (unfertile eggs) directly from the ovaries of a donor cow or heifer. Recovered oocytes are fertilized one day after aspiration, and transferred seven days after fertilization. During this eight-day time period, they are cultured and grown in an incubator with controlled media, temperature and environment to mirror the cow’s uterus. They are then transferred into recipient cows seven days after the recipient’s standing heat or estrus, which is similar to the transfer process for embryos produced by embryo transfer.

Breeders who choose to use IVF technology have the opportunity to obtain more offspring from valuable females in their herd, similar to the benefit of embryo transfer. Many breeders do not realize however, the additional benefits when using IVF.

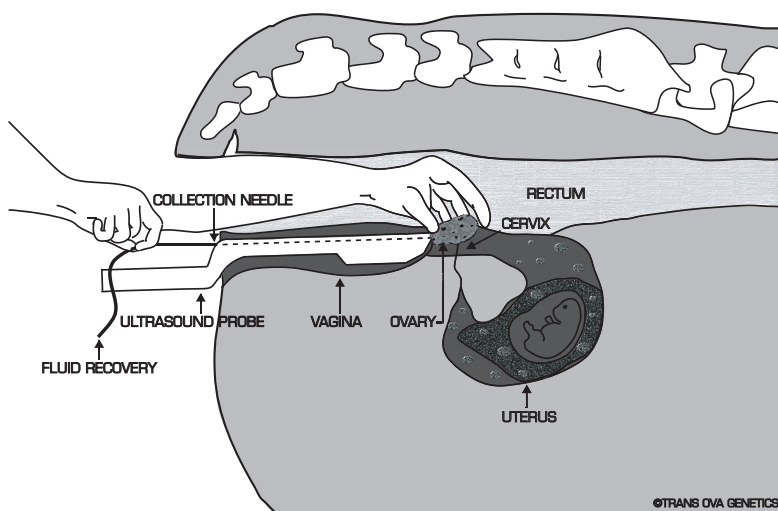
IVF is a technology that allows breeders to collect offspring from open cows, pregnant cows, virgin heifers, as well as problematic females that have had difficulty in conventional breeding attempts. It is also possible to retrieve oocytes (unfertilized eggs) from donors shortly after a death event to produce one final genetic collection.

The applications of this technology allow breeders who would like to get a jump on the next generation to do so without altering other vital aspects of their breeding program. Historically, breeders were forced to decide whether to risk future productivity of young donors by flushing them as virgin heifers or just postponing embryo production until after their first calf. Using IVF technology to create pregnancies from a donor gestating her natural calf allows breeders to generate offspring from elite heifers and keeps them on an annual production cycle to calve on schedule with the rest of the herd.

When compared to embryo transfer, IVF may further maximize the potential of an elite female in a shorter time period, as the interval between IVF aspirations is shorter than the interval between traditional embryo transfer sessions. It is possible to obtain IVF cycles every week or every other week, whereas most embryo transfer programs will collect donors every 60 days.



TRANSVAGINAL OOCYTE RECOVERY



While conventional embryo transfer generally requires the use of two to three units of semen per donor, IVF can be used to maximize the value of rare, sexed, or expensive semen. One unit of semen can be applied to oocytes from multiple donors, or semen from several different bulls may be used to fertilize a group of oocytes collected from an elite female.

There is a perception in the industry that IVF is a more costly option. However, it actually becomes more cost effective than traditional embryo transfer on donors that produce limited numbers of embryos. This fact – coupled with the opportunity to increase the number of calves, the sex ratio of the calves and the ability to increase the opportunities for collection, makes IVF a leading choice for the progressive producer looking to increase the number of offspring that create the most value in their program.

WHAT'S THE BEST OPTION FOR ME?

Embryo transfer is likely the best choice for prolific embryo producing donors that can meet the owner's embryo production needs. In this scenario, embryo cost is economical and in vivo embryos hold a slight pregnancy rate advantage for both fresh and frozen embryos when compared to IVF.

In many instances, IVF provides more value. It is more cost effective to use IVF on low embryo production donors or females you would like to keep in the production cycle. Additionally, IVF can reduce donor boarding costs and semen costs by utilizing a single straw of semen to fertilize multiple embryos, with the opportunity to use more than one sire on a single donor aspiration. IVF is also a more economical choice if offspring of one gender are strongly desired from bulls that do not have frozen sexed semen available. Even if the initial cost of the procedure is higher, the actual cost per embryo will often be lower.



CONCLUSION

Depending on the specific needs of a breeder's program, various approaches can be taken. It is important for producers to understand how each and every reproductive technology can be used to benefit your operation. While IVF may not be the answer for every donor program, many have realized it is a tool that offers unique opportunities to extend elite genetics provided by both proven donors and rare or expensive sires.

To effectively and economically integrate IVF technology into a breeding program, breeders are encouraged to carefully review their goals, understand the opportunities and limitations of both options, and work with the experienced, professional teams to determine the best advanced reproductive technology programs to meet their goals.

QUESTIONS?

Contact a Trans Ova Genetics client service representative.

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	In Vitro Fertilization	Embryo Transfer
advantages	<ul style="list-style-type: none"> • Averages 4 - 6 embryos per collection. • Can be performed on pregnant donors up until day 100 – 120 of pregnancy. • Can be performed on juvenile heifers. • Can be performed every week or every other week. • Can be used on healthy or clinically infertile cows that aren't responding to ET. • Most cost effective on donors that either failed to produce or produce low numbers of embryos per collection in ET. • There is less cost for boarding per procedure for IVF (because of the short interval time period.) • Can fertilize multiple donors with a single straw of semen. • Can use sexed semen from either previously sorted or from unsorted frozen semen. • Almost all bulls can be used to create sexed semen to use in IVF. • Embryos can be shipped fresh directly on farm or transferred into Trans Ova recipients 	<ul style="list-style-type: none"> • Averages 5 - 6 embryos per collection. • Studies show that embryo transfer procedures lead to a slightly higher pregnancy rate – 6 to 7 percent advantage on embryos transferred fresh, and a 10 percent advantage on embryos that are frozen then transferred. • Prolific embryo producing donors have an advantage in cost per pregnancy due to better conception rates. • Embryo Transfer is a technique provided by numerous practitioners across the US. • Countries have current export protocols and are able to accept ET embryos.
disadvantages	<ul style="list-style-type: none"> • Requires highly skilled professionals to perform aspiration. • Slightly lower pregnancy rates when compared to Embryo Transfer — 6 to 7 percent disadvantage on embryos transferred fresh, and a 10 percent disadvantage on embryos that are frozen then transferred. • Some countries either do not have protocols or are still developing protocols for IVF embryo export. • Slightly lower average in embryos produced per collection. 	<ul style="list-style-type: none"> • Procedure can only be done every 45-60 days. • Limited number of bulls with sexed semen available. • Requires more straws of semen. • Higher cost in relation to boarding – donor is in clinic for 60 days versus the shorter time required for IVF. • Producers have to choose between flushing virgin heifers or postponing embryo production until after the first calf. • Pregnant cows are not eligible for the embryo transfer procedure.