

Bovine Embryo Transfer  
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The beginning of each livestock value chain is the breeding choices that farmers make. These choices or selections influence your herd for the years ahead. Thus, stressing the importance of making informative selection decisions.

Information can be gathered by using Breeding Values, Indexes, Genomics, Pedigree, Performance and Phenotypic data. With this you also need a clear breeding objective to identify what you want to achieve. Implementation of the data will assist you to identify your herd rank, and specifically the top 1% males and 5% females that will enable genetic progress in your herd.

These top genetics animals should form the core of your herd and the type of animal that your breeding goals strive toward. With new reproductive technologies, this type of animal can be multiplied much faster than previously to speed up the genetic progress of your whole herd. Most breeders already know which cows have previously produced top sires. By combining all the above-mentioned breeding tools, it is possible to continuously improve the genetic makeup of your herd.

How does the process of Embryo Production & Transfer take place, and how can the farmer make a success thereof:

Firstly, there is two processes available to produce embryos namely In Vitro Fertilization and Embryo Flushing.

**In Vitro Fertilization (IVF)** can take place after a process called Ovum Pick Up (OPU). This is the process whereby oocytes (egg cells) are aspirated (recovered) from the follicles on the ovaries of the donor. This service is available at our embryo center, as well as on farm. After retrieval of the oocytes, the oocytes are washed, graded, and matured for approximately 24 hours and fertilized with semen from a selected sire (conventional or sexed semen) in the laboratory – this process is called In Vitro Fertilization (IVF). Early embryonic development takes place in the incubator, with embryo transfer or cryopreservation on the seventh day.

No hormonal treatments are required for OPU & IVF, making it easier on the animal in comparison to embryo flushing. Oocytes can be collected more often than embryos can be flushed. Oocytes can also be collected from a much younger age and from cows until 3-4 months of pregnancy. IVF also generates more pregnancies from a single dose of semen. Sexed semen, or more valuable conventional semen can be used more effectively.

**Embryo Flushing** is the process where the donor undergoes a hormone synchronization program, with injection of follicle stimulating hormone (FSH) to ensure superovulation of oocytes (egg cells). The donor is then artificially inseminated to fertilize the multiple oocytes. Seven days after insemination, the embryos are recovered through a non-surgical procedure. Embryo Flushing, just as IVF, allows a genetically superior cow to produce more calves yearly. Flushings can be repeated every 6-8 weeks, with a maximum of 3 flushes recommended. It is always wise to preserve (freeze) one round of embryos before scheduling a transfer program, thus ensuring enough embryos (fresh and frozen) are available for transfer with the second flushing.

**Embryo Transfer (ET)** occurs after embryo production, where females of lower genetic potential are selected and synchronized as surrogates (also called recipients). This allows these lower genetic females produce more genetic superior calves from the top females in your herd with your selection of bulls. This increases the rate of genetic gain for the next generation top replacement heifers or young bulls for a specific herd.

Several factors can influence the success of ET in cattle. These factors can vary from the management of the donor and recipient animals to the handling of the embryos themselves. Here are some key factors that can affect the success of embryo transfer in cattle:

**1. Donor and Recipient Selection:**

- The reproductive health and fertility of both the donor and recipient animals are crucial. Healthy, fertile donors with good reproductive histories are more likely to produce viable embryos.
- Recipient cows should be in good body condition and free from reproductive disorders to support embryo implantation and development.

**2. Synchronization of Donor and Recipient Cycles:**

- Timing is critical for successful embryo transfer. Synchronization of oestrus cycles between donors and recipients ensures that embryos are transferred into a receptive uterus.
- Hormonal protocols may be used to manipulate the oestrus cycles of both donors and recipients to synchronize them for optimal embryo transfer.

**3. Embryo Quality:**

- The quality of embryos produced through in vitro fertilization (IVF) or embryo flushing greatly influences their ability to survive and develop after transfer.
- Embryos should be of appropriate stage and quality for transfer, with good cell numbers and morphology indicating viability.

**4. Handling and Transfer Techniques:**

- Proper handling and manipulation of embryos are essential to maintain their viability. Care should be taken to minimize stress and damage during collection, evaluation, and transfer procedures.
- Experienced technicians should perform embryo transfer procedures using sterile techniques to reduce the risk of contamination and infection.

**5. Uterine Environment:**

- The condition of the recipient uterus plays a significant role in the success of embryo implantation and development.
- Uterine health, proper synchronization of oestrus, and absence of uterine infections or abnormalities are critical for successful embryo transfer.

**6. Post-transfer Management:**

- After embryo transfer, careful monitoring of recipients is necessary to ensure successful pregnancy establishment and maintenance.
- Management practices, including nutrition, housing, and health care, should be optimized to support the well-being and reproductive success of recipient cows carrying transferred embryos.

**7. Genetic Factors:**

- Genetic compatibility between embryos and recipients can influence implantation success. Selection of suitable recipients based on genetic background and breed characteristics may improve embryo transfer outcomes.
- Certain breeds or genetic lines may have different reproductive characteristics and requirements. Matching the breed or genetic background of the embryos with suitable recipient cows can improve the success of embryo transfer.

- Some breeds or genetic lines may have higher fertility rates or be more adaptable to specific environmental conditions, which can influence the likelihood of successful pregnancy following embryo transfer.

**8. Environmental Factors:**

- Environmental stressors, such as heat stress or nutritional deficiencies, can impact the reproductive performance of both donors and recipients, affecting the success of embryo transfer programs.

In conclusion, effective breeding decisions and the utilization of advanced reproductive technologies are fundamental to enhancing the genetic progress and productivity of cattle herds. By leveraging tools such as breeding values, genomics, pedigree analysis, and performance data, farmers can make informed selection choices aligned with their breeding objectives.

By addressing the above-mentioned factors and implementing sound management practices, producers can optimize the success rates of embryo transfer programs, leading to enhanced genetic progress, increased productivity, and improved profitability within cattle operations. Ultimately, the strategic use of reproductive technologies coupled with informed breeding decisions paves the way for sustainable genetic improvement and the continued advancement of the cattle industry.