

Importance of Embryo Transfer Technology in Livestock

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SUMMARY

The embryo transfer technique helps in increasing the commercial production that helps in improving the genetic potential of livestock. The embryo transfer technique provides a rapid rate of improvement of the genetic quality of offspring relatively at low cost. A higher pregnancy rates can be achieved with the help of embryo transfer techniques along with natural and artificial insemination.

INTRODUCTION

Embryo transfer technology (ETT) has emerged as an important tool to improve livestock at faster rate, as in this technique, genetic contribution of both the male and female are utilized simultaneously. Although the rate of genetic improvement in dairy cattle may range from 2.58.0% but it could be further increased 3-4 times through the ETT, especially in single offspring bearing animals like cow and buffaloes, if dairy herd replacement is selected from top 10% animals. It was observed that a higher pregnancy rates can be achieved with the help of embryo transfer techniques along with natural and artificial insemination (Hasler,2014).The embryo transfer involves the removal of one or more embryos from the reproductive tract of a donor female and transferred to one or more recipient females. Hence a proper theoretical understanding and technical knowledge is essential to achieve greater success rate in embryo transfer technology (Bo GA *et al* 2013).This technique involves many steps like:-Selection of donors and recipients, superovulation and insemination of donors, collection of embryos, searching, evaluation, transfer or freezing of embryos. The following steps are involved in embryo transfer technology.

Selection of Donor

First step of ETT is the selection of the donor cow in which the dairy cattles are selected on the basis of milk production trait. The potential donor cow should be reproductively sound to produce maximal results and have a normal reproductive tract on rectal palpation and have a normal postpartum history, especially with regard to cycle lengths of 18 to 24 days. Before the beginning of the program the cattle should be at least 60 days postpartum. The donor cows in embryo transfer programs should be selected on the following criteria: Regular estrous cycle, Not be a repeater cow, Previous calving interval of 365-days, No history of parturition difficulties or reproductive irregularities, No conformational or detectable genetic defects, Not in negative energy balance, Not very obese cow or thin cow, and have appropriate body condition score at the time of embryo transfer.

Superovulation of the donor cow

Superovulation is the release of multiple eggs/ova at a single estrus. Cows or heifers properly treated can release as many as 10 or more viable egg/ova cells at one estrus. Approximately 85% of all normal fertile donors will respond to superovulation treatment with an average of five transferable embryos. Some cows are repeatedly treated at 60-day intervals with a slight decrease in embryo numbers over time. The basic principle of superovulation is to stimulate extensive follicular development through the use of a hormone preparation with follicle stimulating hormone (FSH) activity, given intramuscularly or subcutaneously. A prostaglandin injection is given on the third day of the treatment schedule which will cause CL regression and a heat or estrus to occur approximately 48 to 60 hours later.

Insemination of the cow

The donor cows should be inseminated using high quality semen from pedigreed bulls during superovulation. Many embryo transfer technicians choose to inseminate the cow several times during and after estrus. The recommended protocol is to inseminate the superovulated cow at 12, 24, and 36 hours after the onset of standing heat. The correct site for semen placement is in the body of the uterus.

Collection of embryos

Embryos can be collected by following methods:

A. Surgical method :- Most often used in Sheep, Goat and Swine through mid ventral incision under general anesthesia. The method can be performed on day 3-4 after estrus in sheep and goat (8 cell embryo or less) and on 2-3 days after estrus in swine

B. Non-Surgical method:- Commonly performed in cattle, buffalo and mare. It involves 2 ways or 3 ways Foley or Woerllein catheter which allows flushing fluids to pass into the uterus and at the same time allows fluids to be returned from the uterus to a collecting receptacle. A small balloon near the end of catheter can be inflated just inside the uterine horn to prevent the flushing fluid from escaping through the cervix

C. Laparoscopic method:- Laparoscopic is considered to results in fewer adhesions than traditional surgery.

Evaluation of the embryos

The major criteria for evaluation include:- Regularity of shape of the embryo, Compactness of the blastomeres, Variation in cell size, Color and texture of the cytoplasm, Overall diameter of the embryo, Presence of extruded cells, Regularity of the zona pellucid, Presence of vesicles. In addition, embryos are classified according to these subjective criteria as: Grade 1: Excellent or Good, Grade 2: Fair, Grade 3: Poor, Grade 4: Dead or degenerating. Embryos also are evaluated for their stage of development without regard to quality.

Selection and estrus synchronization of recipient female.

Proper recipient herd management is critical to embryo transfer success. Cows that are reproductively sound, that exhibit calving ease, and that have good milking and mothering ability are selected as recipient. They must be on a proper plane of nutrition with sound health. To maximize embryo survival in the recipient female following transfer, conditions in the recipient reproductive tract should closely resemble those in the donor.

Transfer of the embryos

The transfer of the embryo into the recipient cow first requires “loading” of the embryo into a 0.25ml insemination straw. This is done under microscopic viewing, with the aid of a 1ml syringe and requires considerable practice, patience, and dexterity. Degenerated or dead embryos should be discarded. Just prior to embryo transfer, the ovaries of the recipient are palpated rectally to determine which ovary has ovulated. With the aid of an assistant to hold open the vulva of the recipient cow, the transfer gun or insemination rod is carefully passed through the cervix.

Advantages of Embryo Transfer Technology

- Increase the number of offspring sired from superior females.
 - Results in faster genetic progress.
 - Obtain offspring from old or injured animals incapable of breeding or calving naturally.
 - Increase farm income from sale of embryos.
 - Export/import of embryos is easier than with live animals.

CONCLUSION

The embryo transfer technology can be used as a principle technique for most of the assisted reproductive technologies due of its impressive and successful history. Hence embryo transfer technique is useful in increasing the commercial productivity and also helpful in improving the genetic potential of animals.

REFERENCES

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