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ORIGINAL PAPER

A note on embryo transfer technique in cattle

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INTRODUCTION

Embryo transfer in cattle has gained a lot of traction in the dairy and meat industries. The technique for embryo transfer was established in the 1970s and 1980s, although the notion has a much longer history. Walter Heape was the first to execute and document embryo transfer in a rabbit in 1890. Warwick and Berry reported the first successful embryo transfer in sheep and goats in 1949, and Willett and Kvansnickii in cattle and pigs in 1951.ETT is one of the most important reproductive biotechnologies where male and female genetic material could be utilized for the faster improvement of livestock. Genetic progress necessitates the replacement of genetically superior animals with species of low genetic worth. To a large extent, cross breeding has aided in enhancing production qualities, but the advantage has come exclusively from male germplasm via artificial insemination, leaving the female's potential unaffected. Superovulation, followed by embryo retrieval and transfer to adequately synchronised recipients, has proven to be a successful method of enhancing the contribution of superior females to the population's gene pool. To achieve such goals, all available biotechnologies must be utilised. Various forms of Assisted Reproductive Technologies (ARTs) have been introduced in animal husbandry to help overcome some of these obstacles, one of which is embryo transfer technology (ETT), which is considered to be the primary technique for achieving better pregnancy rates and increased number of offspring thus maximizes the donor female's genetic potential. The following overview delves into the steps involved in embryo transfer in cattle.

Steps involved in ETT approach are as follows:

1) Selection of donors

Animals with good genetic superiority, free from diseases with sound reproductive status and free from adhesions in ovary with history of no more than two breeding per conception are generally selected as donors. For dairy cows, a high cow index value is the best indicator of good genetic potential as it measures the genetic transmitting ability.

2) Induction of superovulation:

Superovulation refers to the release of many oocytes during a single oestrus period. The objective of superovulation treatments is to obtain the maximum number of fertilized and transferable embryos. The preparations to induce superovulation include mare`s serum gonadotropin PMSG, sometimes called equine chorionic gonadotropin (eCG), follicle stimulating hormone (FSH).There are multiple protocols for superovulation but basic principle is to stimulate extensive follicular development through the use of a hormone preparation, which is given intramuscularly or subcutaneously. For optimum response gonadotropin treatment is initiated during mid-luteal phase of oestrus cycle. A prostaglandin injection is given on the third day of the treatment schedule which will cause CL regression and a heat or oestrus to occur approximately 48 to 60 hours later. Cows or heifers properly treated can release as many as 10 or more viable egg/ova cells at one oestrus. Approximately 85% of all normal fertile donors will respond to superovulation treatment with an average of five transferable embryos.

3) Insemination: High quality semen with a high percentage of normal, motile cells is a very critical step as there is a greater need for viable sperm cells to reach the oviducts of the super ovulated females. However, multiple inseminations (12, 24 and 36 hours) are needed during onset of standing oestrus.

4) Recovery of embryos:

Two methods are used to recover the embryos. They are:

i) **Non-surgical method:** This method is performed with epidural anaesthesia which is a very simple method without harm to the donor. Per-rectally palpate the ovary and estimate the number of corpora lutea. A small synthetic Foley catheter is inserted through the cervix of the donor cow and a special medium is flushed into and out of the uterus to collect the embryos.

ii) **Surgical method:** This method can be done in all species in which a Laparotomy is done to expose the reproductive tract by giving anaesthesia. Culture medium is introduced through a puncture at the uterotubal junction or through the oviduct to make uterus turgid. The uterus is then punctured with a blunt needle attached to a

flexible catheter. The pressure will cause the medium to gush through the catheter, with enough turbulence to carry the embryos into a collection tube.

5) Evaluation of embryo

The criteria in embryo evaluation includes shape, colour, number, compactness of cells, size of perivitelline space, number and size of vesicles and status of zona pellucida. Morphological evaluation is done at various microscopical magnifications to see the developmental stages. According to the morphological appearance quality evaluation is done.

Quality evaluation

S.no	Quality	Appearance of embryo
1	Excellent	Spherical, symmetrical and with cells of uniform size, color and texture.
2	Good	Few extruded blastomeres, irregular shape and a few vesicles.
3	Fair	Extruded blastomeres, vesiculation, and a few degenerated cells
4	Poor	Numerous extruded blastomeres, degenerated cells, cells of varying sizes, l numerous vesicles. Not preferred for embryo transfer

7) Embryo storage

Donor embryos can be transferred immediately into recipients, or they can be subjected to Short-term storage for 24 to 72 hours at 4°C in PBS/medium 199 supplemented with 50% FBS.For long term storage, embryos are stored in liquid nitrogen (-196°C)

8) Selection of recipient females

Proper recipient selection is critical to embryo transfer success. The data on Cows that are reproductively sound, free from diseases, calving ease with mothering ability are selected as recipients.

9) Synchronization of the recipients

To maximize embryo survival in the recipient female following transfer, conditions in the recipient reproductive tract should closely resemble those in the donor. Therefore, oestrus of donors and recipients should be synchronised within 24 hours which increases the conception rates. The Synchronization of the recipients and donor is done with same procedure under same time.

10) Embryo transfer

The embryo to be transferred is taken into a 0.25 ml straw and then placed into the AI gun. The insemination gun is carefully passed through the cervix and into the uterus corresponding to the ovary that has a corpus luteum. The embryo should be disposed as deep into the uterine horn as feasible without using force.

Advantages

- Increased reproductive potential
- Relatively faster genetic improvement
- It increases the productivity
- It increases the economic benefit
- It increases the no. of calves in life time
- It reduces the generation interval
- It increases the disease resistance

Disadvantages

- Reduced genetic variability
- Low success rate
- Cost and maintenance of recipient females
- Requires specialised equipment's and trained personal.

CONCLUSION

Embryo transfer technique used in animal breeding plays a critical role in expanding the population's influence of better genotype. However, in order to get the greatest benefit from the techniques that are available, they must be used more widely and competently. Because of its successful history, embryo transfer technology can be utilised as a foundation technique for most assisted reproductive technologies. Embryo transfer is now being employed in the dairy business for genetic enhancement. This is the quickest way to improve genetic efficiency in both large and small ruminant farms. As a result, ETT will change animal breeding for the foreseeable future. To achieve greater success in ETT, more emphasis should be placed on improving infrastructure and offering scientific training with appropriate hygienic procedures.

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