

EMBRYO TRANSFER

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Scott Bennett, DVM, looking through a microscope



Zap, a Zebra appaloosa

Embryo transfer is a procedure employed to allow a mare (recipient) to be implanted with a seven- to eight-day embryo from another mare (donor). This embryo, while being nurtured in utero by the recipient, has the full genetic compliment of the donor and the stallion to which the donor was bred.

The reasons and benefits of this procedure are multi-focal. Some of the more common reasons include:

1. To produce a foal from a mare that becomes pregnant but chronically aborts the fetus. (Cannot maintain pregnancy).
2. To produce multiple offspring from a mare that is a known top producer.
3. To produce multiple offspring from different stallions to enable an owner to quickly evaluate which stallions cross best with the mare.
4. To produce foals from a mare in competition while the mare continues her career in competition.
5. To evaluate the fertility of a mare and/or stallion (as the ultimate evaluation of fertility involves producing a viable embryo).
6. For preservation of exotic equine species or rare bloodlines.
7. For production of late-foaling mares so they can be bred the next early spring.

Conversely, there are many reasons that make the embryo transfer more difficult. Mares that do not get pregnant at all should not be used without proper evaluation and a proper diagnosis of the reason for infertility. These mares should be properly evaluated using culture, hormone assays, cytology, biopsy and hysteroscopic evaluation before being placed in an embryo transfer program.

Also, there are mares that have a normal uterus and cannot produce an embryo because of a higher reproductive dysfunction. Such mares may have occluded oviducts, fimbrial cysts or adhesions, and ovarian tumors (i.e. Leiomyoma, granulose cell tumors). Older mares may produce poor quality oocytes (eggs) that initially produce an embryo which later dies due to chromosomal damage.

Young mares in training also have an anabolic effect of training and are often kept in dark stalls, which affects their cycles. It is a well established fact that women human athletes often cycle abnormally. The use of anabolic steroids in performance horses also can alter embryo recovery rates.

Embryo recovery and pregnancy rates are affected by the time of year, as the normal breeding cycle of the mare is from April through September. Tricking the donors and recipients to cycle earlier by using lights is not of utmost importance if embryo transfer is going to be attempted in February or early March.

Another wild card is the fertility of the stallion. Using an infertile or sub-fertile stallion with poor semen quality makes for poor embryo recovery rates as well. If breeding with frozen semen, it is imperative to breed as close to ovulation as possible which requires closer monitoring of the donor mare. When using frozen semen, the mare should be evaluated the day after ovulation by ultrasound to make sure the mare's uterus did not react adversely to the cryogenic chemicals often contained in frozen semen.

Choosing a good recipient is just as important as obtaining the embryo. A healthy mare of good reproductive status between the ages of four to 12 is the best scenario. If the reproductive status is questionable, then an ultrasound, culture and biopsy would be suggested. There are many facilities currently offering resident herds of recipients for on-site transfer or for embryos shipped for transfer. In our experience, mixed breed and draft mixed recipients make the best prospective recipients.

the procedure

Close alignment of the cycles is important and it is preferable to have the recipient 24 to 72 hours behind the donor in the estrus cycle. Ovulation of the donor is closely monitored for synchronization with the recipient, as well as breeding.

The donor is flushed for an embryo seven to eight days post-ovulation. This is done by inserting a catheter into the uterus and irrigating the uterus with a nutrient solution. The nutrient solution is recovered as it is backflushed out of the uterus and filtered. The remaining fluid is examined microscopically for the embryo which is usually 1-2 millimeters in diameter. Once the embryo is visualized, it is graded, incubated and washed with a super-nutrient solution in preparation for the transfer.

When the embryo is ready for transfer, it is drawn up in a sterile guarded pipette which is placed through the cervix and deposited into the recipient's uterus. The embryo is slowly injected into the uterus and the pipette withdrawn. Some people perform a surgical transfer through the flank of the recipient, but most practitioners prefer the non-surgical trans-cervical method of transfer.

The recipient can be examined in six to seven days with ultrasound for evidence of pregnancy maintenance. Progesterone assays of the recipient during early pregnancy and hormone supplementation may or may not be used on an individual case basis.

Embryo transplantation easily approaches a 70 to 80 percent expected success rate, but it depends on the time of year, the quality of the embryo, the quality of the semen and the quality of the recipient. Typically, there is approximately a 10 percent loss after the first pregnancy check. Shipped embryos have approximately 10 to 15 percent lower pregnancy rate than on-site embryo transplantation.