

Successful transfer of the bovine embryo and selection of the recipient

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Successful collection of the bovine embryo only accounts for half of the process required for the production of a live calf from that embryo. Following recovery of a viable embryo, the second vital step in the process involves the transfer of the carefully collected and stored embryo into an appropriate recipient animal.

Therefore, in addition to the contributions of the donor animal, the recipient of the donor embryo has an equally important role to play in the process of hastening the distribution rate of enhanced bovine genetics. To obtain the best conception rates it requires careful selection, preparation, examination and implantation of the recipient. All of these stages require specific criteria to be followed and their evaluation can be greatly enhanced with the inclusion of the ultrasound scan in the examination routine.

Selection of the recipient

Recipients are selected in such a way as to optimise the likelihood that they will successfully conceive and carry the embryo

Fig. 2a. Anechoic pockets (AP) formed in adhesions surrounding the uterus.

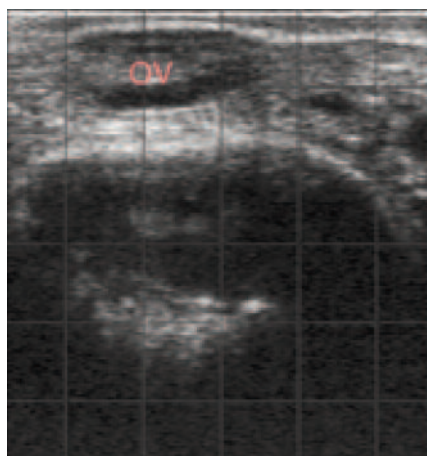
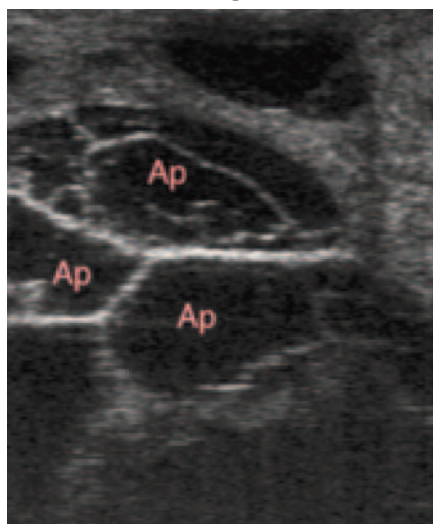
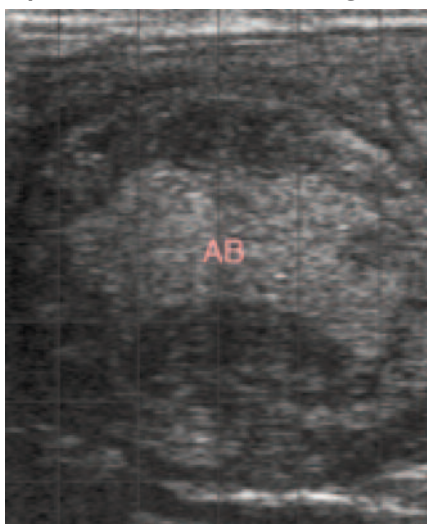


Fig. 1. A small inactive ovary (OV). When both ovaries are found to be inactive the recipient is rejected.

through full gestation. The majority of recipients are heifers as the environment of the virginal uterus is generally free from the potential problems observed in the uterus of multiparous cows which would negatively impact fertility.

However, cows can be used as recipients, especially on beef farms where the availability of heifers may be restricted. Compared to dairy animals, beef cows may be more

Fig. 2b. An abscess (AB) in the myometrium from uterine damage.



useful as recipient animals as there are fewer stressors placed on them.

If recipients are selected carefully then good embryo transfer results can be achieved.

Selection criteria include animals that are free from disease, demonstrating oestrus cycles on a regular basis, and have no ovarian or uterine pathology.

To ensure that only the highest quality animals are chosen to be recipients, the selection examination is carried out using ultrasound to thoroughly evaluate the reproductive tract.

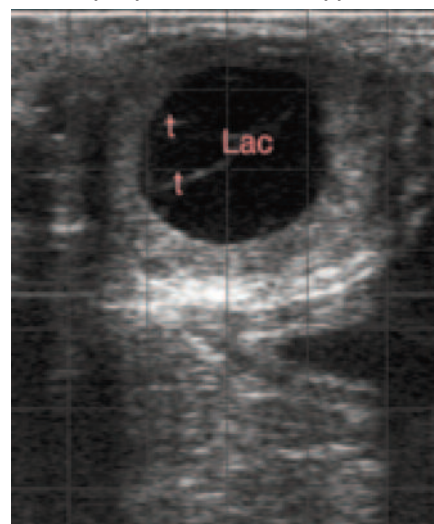
Timing of first examination

The first examination in heifers can be done at any time after the pubertal age is reached and is best performed well in advance of the potential time of transfer. Examination of the cow should take place approximately 45 days after calving.

Careful examination of the reproductive tract is necessary to ensure the potential recipient has a complete uterine tract and two functioning ovaries present. Small, inactive ovaries (Fig. 1), freemartin individuals and other congenital uterine abnormalities

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Fig. 3. A cystic ovary. The anechoic lacuna (Lac) has trabeculae (t).



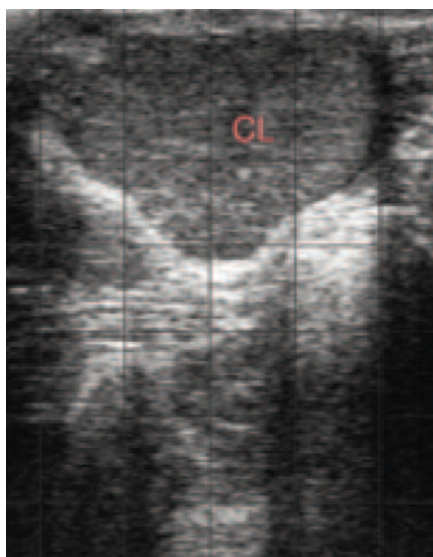


Fig. 4. A good quality corpus luteum (CL).

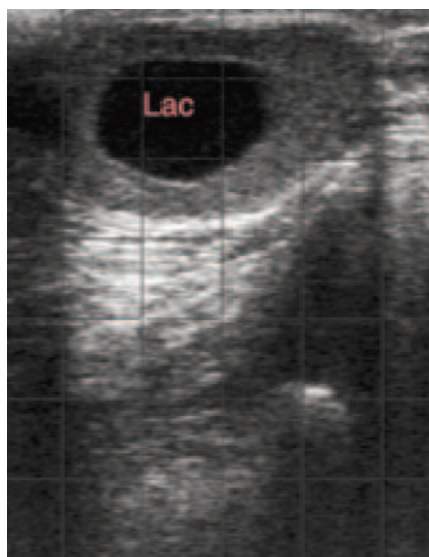


Fig. 5. A corpus luteum with a large Lacuna (Lac). It occupies more than one third of the corpus luteum so is rejected.

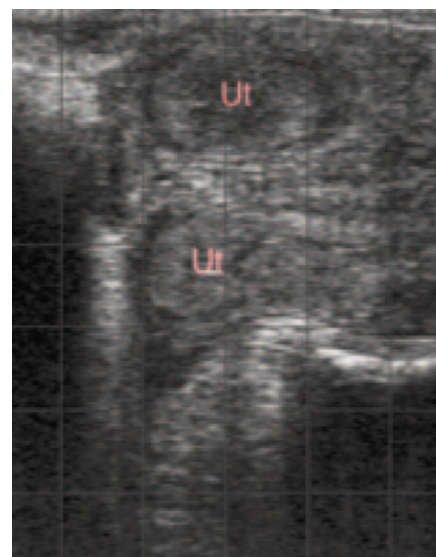


Fig. 6. Uterus with tone (Ut). A reason to reject the recipient.

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need to be identified and these animals rejected as potential recipient candidates.

Preparation of the recipient

Preparation of the animal to receive the donor embryo includes good balanced

nutrition, accurate recording of prior oestrus activity and effective synchronisation with the donor animal. Critically, preparation requires good oestrus detection and record keeping.

The recipient needs to have had at least two normal oestrus cycles with regular interoestrus intervals to demonstrate that the animal has reached puberty in the case

of a heifer and returned to cyclicity following parturition in the case of the cow. It also indicates that the recipient has sufficient hormonal production required for conception.

Abnormal cycling behaviour suggests either a physiological problem or lack of maturity in the recipient. If abnormal cyclicity is observed, the recipient should be rejected from the embryo transfer process.

When multiparous cows are to be used as recipients, the uterine examination should include close scrutiny for potential damage or adhesions affecting the reproductive tract (Figs. 2a and b).

Normal oestrus signs

Having identified a recipient which is demonstrating normal cycling behaviour, that animal can then be put forward for embryo transfer.

Transfer can be carried out after the next natural observed oestrus or after synchronised oestrus. In either circumstance, the recipient should be examined to establish ovarian structures are normal. This examination can be conveniently performed at the onset of the synchronisation program.

The ovaries are examined to ensure an absence of cystic structures (Fig. 3) and to confirm the presence of a corpus luteum (CL) (Fig. 4). If synchronisation protocols are not used and embryo transfer is to occur following a natural oestrus cycle, the date of the observed heat is recorded and transfer is arranged to take place seven days after that heat.

If synchronisation is to be used, then the synchronisation program is initiated following ultrasound examination of the reproductive tract. Transfer of an embryo following synchronisation is most commonly employed as this technique enables a number of embryos to be transferred during a

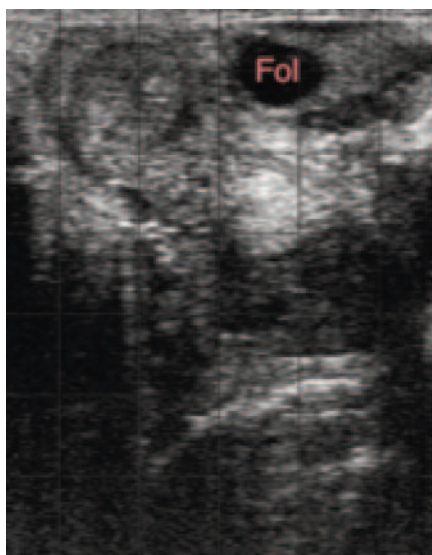


Fig. 7. An ovary with one 10mm follicle (Fol).

single farm visit. Synchronising individuals participating in the embryo transfer program can also encourage an improvement in oestrus display within the group.

Examination prior to transfer

Transfer of the embryo takes place on the seventh day following observed oestrus. The embryos are seven days old when harvested and therefore the uterine environment and hormonal state of the recipient animal must be at an appropriate stage to receive an embryo of this age.

Ultrasound examination of the ovaries and uterus immediately prior to transfer can confirm if the recipient is at the correct stage. Problems which can be identified at this time include ovarian cysts, a small corpus luteum (less than 1.5cm diameter), a

corpus luteum with large lacuna (Fig. 5) and uterine tone (Fig. 6).

Observation of any of these structures suggests a poor receptive state of the uterus to the embryo, necessitating rejection of the recipient. Approximately 25% of recipients are rejected at this point and are not used for transfer.

Considering the rejection rate at this stage in conjunction with a 10% rate of recipients failing to display oestrus following synchronisation, a larger number of potential recipient individuals need to be chosen for inclusion in the program to account for these losses due to rejection.

Once no significant problems have been identified involving the two primary ovarian structures (the follicle and corpus luteum) the recipient can be assessed for quality and stage of the oestrus cycle. On day seven of the oestrus cycle, the first follicular wave is ending.

In the majority of cases, only one dominant follicle of approximately 10-15mm diameter is observed (Fig. 7). A good quality corpus luteum, defined as being equal to or greater than 1.5cm in diameter, needs to be present. In most cases the corpus luteum is considerably larger than this minimum value with measurements commonly ranging from 2.5 to 3.5cm in diameter, with or without the presence of a small lacuna (Fig. 8).

Observing these two features confirms that the animal is at the day seven stage and ready for transfer to take place.

Transfer of the embryo

If all of the criteria previously agreed upon have been met, the recipient is classified as being of an acceptable standard for transfer of an embryo to take place. Legal requirements stipulate that the embryo transfer must be performed following administration

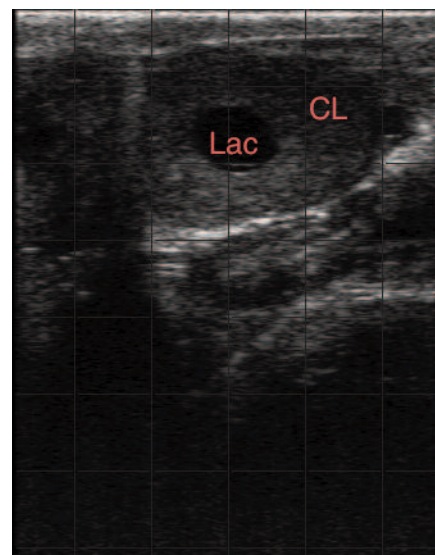


Fig. 8. Good corpus luteum (CL) with small lacuna (Lac). Lacuna is smaller than one third of diameter. It can be used for transfer.

of an epidural anaesthetic in order to safeguard the welfare of the animal.

Epidural anaesthesia also helps to relax the pelvic structures, ensuring a gentler passage of the transfer gun into the appropriate uterine area thereby reducing risk of damage or trauma to the uterus.

This will facilitate enhanced viability of the pregnancy.

Successful transfer of an embryo resulting in a viable pregnancy and the birth of the genetically superior calf requires careful planning, thorough examination of the reproductive tract and skilled embryo transfer technique which is greatly aided by the use of ultrasonography. ■

References are available from the author on request