

Embryo transfer in Cattle

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Why use embryo transfer?

- ▶ Enables rapid genetic improvement- superior females have more offspring- particularly good for herds which want to rapidly expand but cannot afford large numbers of quality new animals
- Accelerated EBV gain
- ▶ Heifers of later maturing breeds which are too young to bull can be flushed (also reducing the generation interval which accelerates a herds genetic improvement)
- ▶ Insurance policy for valuable females in case of death or injury
- ▶ Conservation- embryos can be frozen for a considerable period of time, so bloodlines are not lost
- ▶ Both of the above points are incredibly relevant for herds with disease outbreaks e.g bTB, johnes etc
- ▶ Enables sale and export of embryos
- ▶ Through buying in embryos, entirely new blood lines can be introduced into closed herds
- ▶ Multiple sires can be used in ET programmes; although DNA testing of the calf incurs additional cost, and this is subject to breed society rules.



Why not?

- ▶ ET is an invasive procedure so poses some risk to the cow and to the recipients
- ▶ Suitable recipient females may be hard to source particularly for herds in health schemes
- ▶ ET is expensive, time consuming and not guaranteed to work
- ▶ Breeding from unproven maiden heifers can lead to problems further down the line i.e temperament, calving ease, milking ability, structural soundness, and general longevity
- ▶ Breeding from females repeatedly incapable of holding or rearing calves may result in negative genetic gain, therefore it is not recommended and is likely to be unsuccessful anyway.



Before starting an embryo transfer program:

- ▶ **The donor:** should ideally be young, fit and healthy- a vet check prior to ET will save time and money if there is a problem (i.e she's not ovulating!)
- 'Fit' does not = show condition: cows should be fed a rising plane of nutrition, which is much more difficult in show animals who are probably overweight
- ▶ **The recipients:** (at least 3 should be programmed per donor) must match your herds health status or if you are not in a health scheme should be tested for transmissible diseases.
- These too should be vet checked, consider using less valuable young females already in the herd who will have a suitable immune (and therefore colostrum) status for your farm and you will have full knowledge of their health status and family performance.
- ▶ **Heifers-** naturally more fertile than cows (MUST be well grown- frame over weight)
- ▶ **Cows-** Generally easier calving, higher milk yields and experienced mothers.

Timing

- ▶ ET programs require careful timing and are time consuming; Donors and recipients should be AT LEAST 8-10 weeks calved and had at least one natural cycle post calving. Heifer donors should have also been seen in bulling AT LEAST once.
- ▶ Semen transport for AI bulls need to be organised weeks in advance
- ▶ From your own bulls: must be taken and checked for quality
- ▶ Avoid stressful/busy times i.e health testing, TB testing, vet checks, harvest etc

Note: Having spoken to Stella Scholes from Bovine Genetics, they have found native breeds to be more sensitive to seasonal changes in daylight so winter flushing MAY be less successful as native cows are naturally less fertile at this time (Take this into account if using native recipients too!).

- They have tried to negate this by using special lighting in their unit facilities so the cow responds to longer daylight hours.



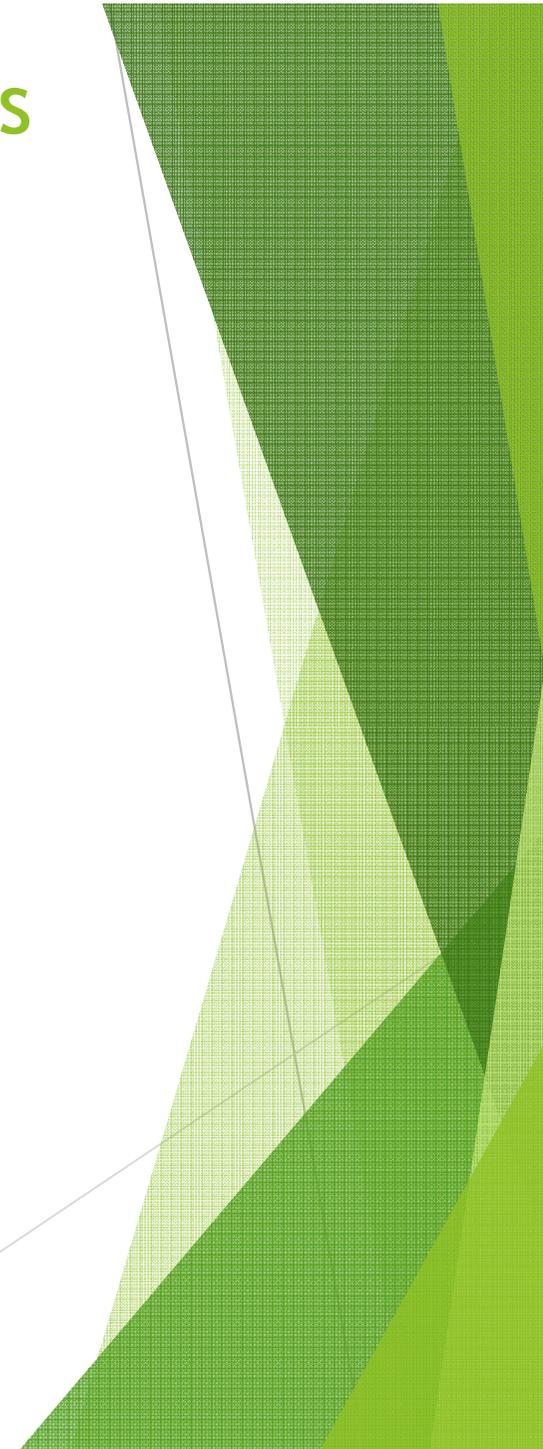
Management

- ▶ **The success of embryo transfer procedures is variable;** to try and reduce the risks which you can control, it is recommended that cows are foot checked, wormed, given some form of mineral supplementation and already in a good body condition score (2.5-3) BEFORE the program begins.
- ▶ Natives are more likely to be over fat which reduced fertility and effectiveness of injected hormones
- ▶ For on farm flushes, excellent handling facilities and assistants, and clean, quiet post-flush facilities are required to maximise success rate.
- ▶ New spring grass, or pasture (or forage) containing red clovers may be higher in oestrogens and can interfere in donor and recipient programming. Cows should only be turned out on grazed pasture and should be offered concentrates and hay.
- ▶ If possible, recipients should be kept separate to other cows to minimise mixing stress, particularly when mixing cows and heifers.
- ▶ If you are considering flushing more than one animal, it may be beneficial to flush them together for ease of management and if one cow fails to flush, the other cow may have produced enough embryos for the spare recipients as well.

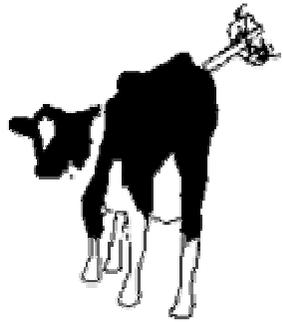
Example ET programme from Bovine Genetics

(typically lasts 5 weeks plus 3 weeks rest)

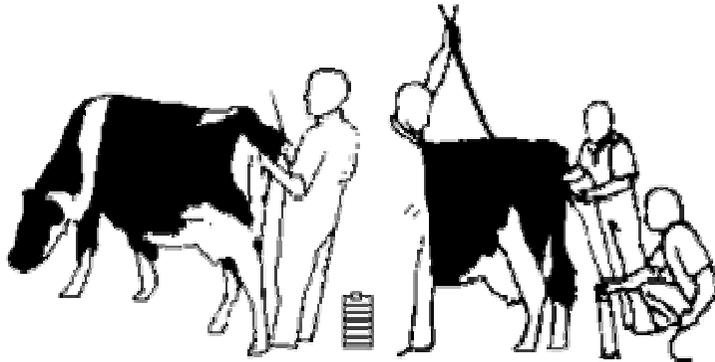
	Donor	Recipient
Day 1	Prid/cidr/injection (PM)	
Day 10	Remove prid/cidr (AM) 3ml estrumate	
Day 12	Expect heat	
Day 14		Prid/cidr/injection
Day 20	5ml Receptal (AM)	
Day 23	2ml FSH (AM and PM)	
Day 24	1.5ml FSH (AM and PM)	
Day 25	1.5ml FSH, 3ml estrumate (AM) 1.5ml FSH (PM)	Remove prid/cidr 2ml estrumate (AM) add tail paint/heat detection aid
Day 26	1.5ml FSH (AM and PM)	
Day 27	AI (AM and PM) 5ml estrumate (PM)	2.5ml Receptal approx. 8-12 after standing heat
Day 28	AI (AM and PM)	
Day 34	Embryo collection	Embryo transfer



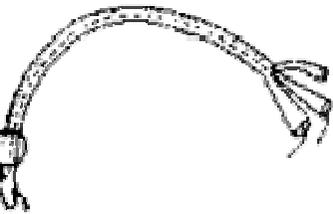
the process



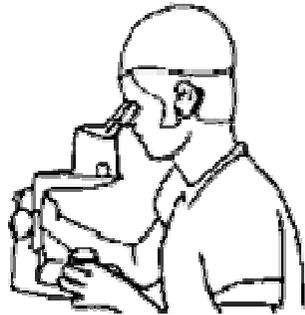
Superovulation of donor with gonadotropins



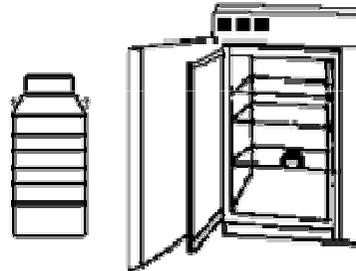
Artificial Insemination (5 days after initiating superovulation) embryos (6 to 8 days after insemination)



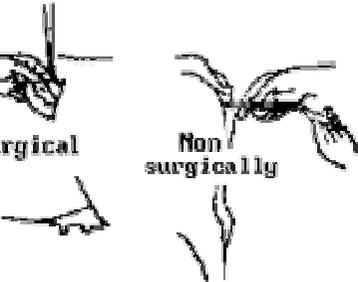
Foley catheter for recovery of embryos



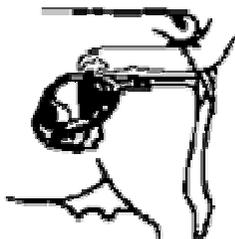
Isolation and classification of embryos



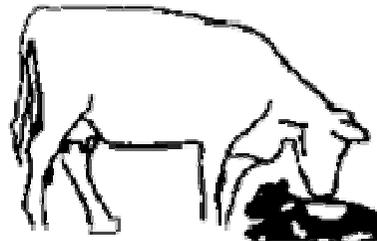
Storage of embryos indefinitely in liquid nitrogen or at 37 C or room temperature for 1 day



Transfer of embryos to recipients surgically or nonsurgically



Pregnancy diagnosis by palpation through the rectal wall 1 to 3 months after embryo transfer



Birth (9 months after embryo transfer)

The mean number of embryos collected is:
4-8 for cows
1-3 heifers

Embryo collection greatly affected by the skill of the operator and how easy the cow is to manipulate internally (handling facilities, general temperament and pelvic size will also affect this)

Not every donor responds to superovulation and not all embryos are viable

Post flushing care of recipients and donors

- ▶ Cows, particularly the donor cow will be fragile after completion of the programme. It is therefore essential that stress in the following weeks be minimised.
- ▶ Spacious, deep bedded pens are considered ideal for recovery.
- ▶ The pre flushing diet should be maintained until pregnancy detection, ideally concentrates should include a vit-min premix if cows are not bolused.
- ▶ The donor cow should return in heat within 10 days of the flush, but ideally should not be bred from until the following heat. She may also be flushed again following this heat (so 8 weeks after the start of the programme).
- ▶ Problems are unusual but can occur, these include:
 - Large offspring syndrome in the calf
 - Damage to endometrium (womb lining) from transfer

In the near future..

This is a rapidly expanding area of veterinary medicine/specialisation, abroad and in research settings the following techniques are already being used:

- ▶ Post-mortem egg collection
- Cows can also be super ovulated (injected before being sent to slaughter)
- Ovaries are manually punctured to release egg cells which are then matured in a lab, fertilised and then implanted in recipients.
- This puncturing technique can also be used in flushes where a cow has failed to ovulate (manual ovulation, so ET programmes would have a higher success rate)
- Oviductal flushing (rather than uterus/horn flushing) reduces risk of losses/missed embryos
- Zonal drilling of the egg/sperm injection enables use of bulls with very low sperm counts



With thanks to Stella Scholes at Bovine genetics embryo transfer and fertility improvement services

If you have any further questions, or wish to have something explained again/in more detail, please email me at r.hetherington2@Newcastle.ac.uk

If I don't have the answer I will try to find out for you!

