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Maximizing the use of artificial insemination in suckler herds

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Summary

- Current usage of artificial insemination (AI) is low in Irish suckler herds and this has implications for the speed of genetic improvement.
- Beef farmers can use a specific breeding programme especially to produce quality herd replacements.
- AI should particularly be targeted at the beginning of the breeding season when heat detection is easiest.
- A timed AI programme should be considered where labour requirements of heat detection are impractical.

Introduction

In Ireland, approximately 20% of calves in beef herds are bred from artificial insemination (AI). Such low usage of this well-tested and effective technology most likely reflects the difficulty and labour requirements for heat detection, assembly of cow(s) for insemination, as well as land fragmentation in beef herds. Despite this, it is well acknowledged that AI allows access to genetically proven sires for terminal, maternal and ease of calving traits thus, facilitating greater genetic progress and ease of management. Additionally, semen used in AI is consistently monitored for fertility and is generally of very high quality and collected from bulls tested clear of transmissible diseases. With natural service bulls, although the reported incidence of sterility is generally low (<4%), subfertility, at a consistent level of 20-25%, is a much more common issue. Furthermore, use of AI can obviate the necessity to maintain a bull(s) on the farm, and/or can reduce the number of bulls required, which is always a potential farm safety hazard.

Many beef herds have no defined policy for producing quality female replacements, with the result that many herds have become almost pure-bred with a consequent loss of hybrid vigour. This can lead to a decline in cow fertility and calf vitality and survival as well as a decline in cow milk production and calf performance. Cow size is also likely to have increased with a consequential negative effect on cow efficiency especially if ¾ or more of the genetics of the cow are from continental breeds. The importance of quality replacement heifers in beef herds is becoming increasingly recognised. One of the primary objectives of the current Beef Data and Genomics Programme (BDGP) is to improve the genetic merit of the national beef herd with regard to maternal traits. In order to meet the requirements of the programme and given the typical small size of Irish beef cow herds, it is envisaged that AI will be increasingly used to produce higher genetic merit (4 and 5 star on the Replacement Index) female replacements.

Breeding and the establishment of pregnancy

Once oestrous (heat) cycles have commenced it is the combined effect of heat detection efficiency (submission rate) and conception rate that determines pregnancy rates and ultimately the compactness of calving after a short defined breeding period. Where AI is used, the better the heat detection rate and the prevailing herd fertility, the more cows that will be pregnant at the end of the breeding season.

Where an active, fertile bull(s) is used, it is expected that all cows and heifers in heat should be mated and, therefore, under such circumstances, compactness of calving and pregnancy rate will be solely the function of bull fertility. For herds using AI, accurate detection of heat is of paramount importance to achieving good success.

Indeed the time, effort and skill involved in heat detection is usually the downfall of successful AI usage in many beef cow herds. It is suggested that about 10% of the reasons for failure to detect heats are attributable to "cow" problems and 90% to "management" problems. The latter includes too few observations per day for checking for heat activity; too little time spent observing the cows or observing the cows at the wrong times such as at feeding time or movement to a new paddock. A major reason for failure to detect heat is a lack of adequate knowledge of the signs of heat. To optimise heat detection both the primary (standing to be mounted) and secondary signs, must be clearly understood. Notwithstanding this, however, the widely accepted laborious, repetitive nature of heat detection has focused interest on the use of technologies to improve detection rates and/or reduce the labour and commitment involved in observation.

Oestrous synchronisation for beef cows

Measures to control the oestrous cycle, or synchronised breeding regimens have been commercially available for more than 25 years. In recent years a number of alterations have been made to previously used protocols and some new protocols have been developed. The following section will give a brief overview of recently developed regimes for use in beef cows and replacement heifers.

Practical requirements of an oestrous synchronisation regimen

- High proportion of cows must ovulate in a timely manner to allow timed AI (TAI).
- Be capable of inducing heat and normal fertility in cows that have not yet resumed cyclicity after calving (i.e. anoestrus).
- Require a maximum of three assemblies.
- Be cost effective.

At the start of the breeding season, typically up to 50% or more of beef cows, calved 40 days or more will not have ovulated or resumed normal heat cycles. Thus, any oestrous synchronisation programme used must be effective in both cyclic and non-cyclic cows alike. This requires programmes to be based around the use of a device that releases the hormone progesterone, (i.e. a PRID or CIDR) if an acceptable pregnancy rate is to be attained.

Recent Teagasc studies on timed AI in beef cows

Because of the issues around labour involved in heat detection, land fragmentation and the part-time nature of most beef cow herds, there has been increasing interest in the use of oestrous synchronisation protocols which facilitate the use of TAI, where all treated cows are inseminated at a pre-determined time, regardless of whether signs of heat were observed or not.

In order to obtain accurate and robust information on the potential for TAI in Irish beef cow herds as well as to compare currently available protocols, Teagasc, together with UCD and the Agri-Food and Biosciences Institute of Northern Ireland (AFBINI) recently conducted a series of large-scale, DAFM funded, on-farm synchronisation studies involving 85 beef cow herds over the island of Ireland. The trials were run in both autumn- and spring-calving herds with 2,200 cows, calved ≥35days, enrolled across the spring and autumn of 2014 and spring of 2015. Three different synchronisation protocols were compared, which included the protocol outlined in Table 1 as well as two minor variations of this. All cows were subjected to a single TAI at 72 hours after PRID E (CEVA Animal Health) removal. The average size of participating herds was 27 cows. Additionally, as herd owners were free to use the semen of their choice (all herds used a commercial AI service), a large number of AI sires were used across the studies. Pregnancy rates ranged from 50-70% in these trials, with a very acceptable overall average pregnancy rate of 55% achieved to a single timed insemination.

Table 1. Recommended synchronisation regimen for beef cows ≥35 days calved.	
Day	**Action**
Day 0, am (Monday)	PRID or CIDR insertion + GnRH at insertion.
Day 7, am (Monday)	PRID or CIDR removal + prostaglandin + 400 iu eCG (also known as PMSG) i.m. at time of removal (Ideally tail paint cows or affix heat detection patches to cows).
Day 8 (Tuesday)	Cows will start to show standing heats late pm and through the night. Record cows in heat and active.
Day 9 and 10 (Wednesday – Thursday)	Most heats expected on Day 9. For best results, inseminate all cows 12 hours after initial observed standing heat. Cows not observed in heat can be inseminated at 72 hours following PRID/CIDR removal (i.e. Thursday am, here) but must receive GnRH at AI. If heat detection is not possible, all treated cows can be inseminated once at 72 hours after PRID/CIDR removal (or as close as possible to this time), though GnRH must be administered to **all cows** coincident with AI.

Notes: 1. All drugs are Prescription Only Medicines (POMs) and are under veterinary control. 2. Dosage of drugs: will vary according to drug and drug formulation.

More importantly, synchronisation had the effect of condensing the calving pattern and the subsequent breeding period the following season. For example, 78% of all synchronised cows were pregnant within 23 days of the start of the breeding season (55% to TAI plus 48% of repeats to the first cycle after TAI). While many herds decided to AI cows that repeated, others turned out stock bulls approximately 10 days after the TAI. This latter practice is very popular in large herds throughout north and south America, as together with removing the necessity to detect heat in repeats, it also reduces the cow-to-bull ratio, with many herds focussing on the use of maternal genetics for the TAI and on terminal traits in their stock bulls.

Success with synchronisation treatments
As alluded to above, cows that fail to become pregnant to the synchronised breeding and that repeat and are re-inseminated usually have normal fertility at the repeat heat. For best results with oestrous synchronisation in beef cows, it is recommended that:

- Cows are in a moderate BCS score (2.5-3.0) at time of treatment. It is equally important that cows are a minimum of 35 days calved at the start of the programme and have a continuous supply of high quality pasture available for a minimum of 3-4 weeks prior to, during and after treatment.
- Synchronisation should only be used in herds where the levels of management and in particular heat detection skills are high in order to detect heats and particularly repeat heats. Alternatively, a bull should be turned out with cows 7-10 days following the initial AI.
- It is vitally important that high fertility semen is used and the competence of the inseminator is high. Semen must be thawed carefully (15 seconds in water at 35^{o}C) and the cow inseminated within 1-2 minutes of thawing. The correct site for semen deposition for semen deposition is in the common body of the uterus. Each straw should be thawed separately.

Synchronisation regimens for replacement heifers

Where the vast majority of replacement heifers are cyclic during the breeding season there is a reduced requirement for incorporating an exogenous source of progesterone in the synchronisation regimen. Consequently, prostaglandin-based regimens are the methods of choice for use on post-pubertal, cyclic replacement heifers. A common regimen used for heifers involves two administrations of prostaglandin (PG) at an 11-day interval. All heifers can be inseminated twice on a fixed-time basis at 72 and 96 hours after the second administration without any heat detection or, alternatively, heifers can be checked for heat after the 2nd prostaglandin administration and inseminated on the basis of a detected heat. A more cost-effective regimen involves good heat detection carried out for the initial 6 days, during which all heifers detected in heat are inseminated. On the 6th day all heifers not yet detected in heat are injected with prostaglandin. About 90% of the injected heifers will respond to the prostaglandin and show heat 2-4 days after injection and should be inseminated as normal. Using

this protocol, drug use, semen costs and veterinary costs are minimised. Conception rates to prostaglandin-induced heats are normal (65-75%). It is imperative that heifers are bred to easy-calving sires, as dystocia or calving difficulty can be four-fold higher in heifers than in more mature cows.

Sexed semen

It is expected that sexed semen will become more widely available in the next number of years. Currently, conception rates are 10-15 percentage points below those achieved with conventional frozen thawed semen. Current recommendations are that sexed semen should only be used in replacement heifers which are normally highly fertile (expected conception rates of 65-75% to a single service using frozen thawed conventional semen). Even at a conception rate of 50%, the use of sexed semen to produce high genetic merit female replacements may be worthwhile provided the premium on the sexed semen is not excessive.

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Footnote comment from Simon Marsh, Principal Lecturer – Beef Cattle Specialist, Harper Adams University.

In the introduction it states that 20% of the Irish suckler herd uses AI. I would suggest that it is significantly lower in the UK and not even at 10%.

Dissatisfaction with synchronisation programmes is often due to lack of ‘sweeper bull power’ if AI is not be used on repeat breeders. If conception rates of only 50-60% are achieved to synchronisation then 40-50% of the herd will return to oestrous 18-23 days latter which could be too much for one sweeper bull.

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