

Section 4

Improving Genetics in the Suckler Herd

by Noirin McHugh & Mark McGee



Introduction

Carefully identifying better animals and breeding them with other superior animals will gradually improve the genetics of a herd. Enhanced genetics will lead to greater profitability. Genetic improvement is permanent and cumulative and if you use animals with high genetic merit the herd performance will benefit into the future. However the reverse is also true. If you introduce an animal with poor genetic merit then those genes can be dragging down performance and profitability for a long period.

- ① How can beef breeding indexes help improve my profitability?
- ② How should I use the indexes?
- ③ What breeding terminology do I need to know?
- ④ How important is reliability?
- ⑤ Do breeding values work?
- ⑥ What can we expect in the future for beef breeding?
- ⑦ What breeds should I use?
- ⑧ Why consider cross-breeding?
- ⑨ What should I consider when choosing a stock bull?

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① How can beef breeding indexes help improve my profitability?

Identifying appropriate superior animals to breed from, be they cows or heifers within the herd, AI sires, bought-in animals, etc., is key. Breeding indexes will help by predicting the impact which a sire or dam will have on the profitability of the next generation of animals.

Beef breeding indexes, which are published by the Irish Cattle Breeding Federation (ICBF) are composed of three Euro-star indexes and are a measure of the effect a sire or dam will have on the profitability of their calf.

An animal with an index of €150 means that, on average, €150 more profit will be generated compared to an animal with an index of €0 produced in a similar environment.

1. Terminal Index This index helps farmers identify sires which will breed high-profit animals for slaughter. This index will be available for males and is given on a € per progeny basis.

2. Replacement Index This is most suitable for the identification of animals (sires and/or suckler female replacements) suitable for breeding high profit replacement females. This index includes maternal cow traits but also terminal traits to account for calves that are destined for slaughter. For example a cow with a Replacement Index of €100 (5 star) is stating that heifer progeny retained for breeding from this cow would leave €100 more per lactation than heifer progeny retained from a cow with a replacement index of zero.

② 3. Dairy Beef Index This index will assist dairy farmers identify beef sires suitable for use on dairy cows.

How should I use the indexes?

Before using any index decide what type of animal you are aiming to produce.

- Farmers solely targeting the weanling or finishing markets should pay particular attention to the Terminal Index when choosing sires. These animals may not be suitable for the production of replacement females.
- In contrast, farmers breeding replacements should consider using the Replacement Index.

Irrespective of the type of calf that is needed, look closely at the star rating of the breeding animal and the reliability associated with the index and traits of interest.

③ What breeding terminology do I need to know?

Estimated breeding values (EBVs): EBVs are estimates of the genetic merit of a heifer, cow or bull. The aim is to predict breeding values from recorded observations on an individual and/or its relatives. EBVs are calculated from the animal's individual performance records as well as those of their known relatives and also information recorded on the animal's herd mates.

Euro-stars: Published alongside each EBV for an animal is a Euro-star rating for the index. Euro-star ratings scored on a scale of one to five stars (one star indicates that the animal falls into the bottom 20% for the trait; five stars indicates that the animal falls into the top 20% for the trait). Euro-star ratings are shown for all goal traits and indicate the relative ranking of an animal both within and across breeds.

④ How important is reliability?

This refers to the "confidence" in the published genetic merit of an animal being a true reflection of the genetic merit of an animal. The genetic evaluation process, using sophisticated statistical techniques, provides the "best estimate" of an animal's genetic merit based on the available data.

Key fact

Reliability values are expressed as a % and indicate the quantity and quality of records used to produce the index or the trait of interest. The higher the % the better the reliability.



The major factors influencing the reliability of an animal's merit are:

- The heritability of the trait – the degree to which the trait is 'passed-on' in the genes. Low heritability traits (e.g., fertility) will have lower reliability values than moderate-high heritability traits (e.g., growth).
- The number of progeny recorded per bull (or cow) – the more progeny that have been recorded the greater the reliability.
- The number of herds with progeny – the more herds with progeny of the bull the greater the confidence that we are taking account of extreme environmental effects or preferential treatment of progeny.
- The number of herd mates for comparison - the greater the number of contemporaries the more accurate the proof.


The examples below highlight the potential movement in Replacement and Terminal Index value of bulls based on their reliability.

Example 1. Bull of low reliability (30%)

	Replacement index	Terminal index
Index value	€250	€120
Potential movement in index value	±€248	±€74
Index value range	€2 - €498	€46 - €194

Example 2. Bull of high reliability (80%)

	Replacement index	Terminal index
Index value	€250	€120
Potential movement in index value	±€132	±€39
Index value range	€118 - €382	€81 - €159

Lot 1 Highfield Frank				
ID: IE151312315461		Breed: Simmental		
Sex: Male		DOB: 30-Mar-2014		
Owner: Joe Bloggs - Highfield House, Bandon, Co Cork				
Breeder: John Smith - New Road, Castlebar, Co Mayo				
				
Sire: Glebefarm Tyson GFY		Derrycallaghan Hamilton		Carnkern Titan
		Glebefarm Natasha		Cleenagh Kay 6th
Dam: Seepa Aster IE271437420059		Milton Lord-Tiffany Et		Blackford Explosion
		Seepa Pearl		Cookstown Jessica 4th
				Carnkern Titan
				Seabank Tiffany
				Star Hugo
				Hillcrest Joan
Star Rating (Within Simmental breed)	Economic Indexes	€uro value per progeny	Index Reliability	Star rating (across all beef breeds)
★★★★★	Terminal Index	€95	29% (Low)	★★★
★★★★★	Replacement Index	€151	29% (Low)	★★★★★
Star Rating (Within Simmental breed)	Key profit traits	Index Value	Trait Reliability	Star rating (across all beef breeds)
Expected progeny performance				
	Calving difficulty (% 3 & 4) Breed ave: 5.39%, All breeds ave: 4.49%	+7.8%	35% (Low)	
★★★★★	Docility (1-5 scale) Breed ave: 0.04, All breeds ave: 0	0.13 scale	40% (Average)	★★★★★
★★★★★	Carcass weight (kg) Breed ave: 19.75kg, All breeds ave: 13.98kg	+31kg	29% (Low)	★★★★★
★★★★★	Carcass conformation (1-15 scale) Breed ave: 1.26, All breeds ave: 1.23	+1.74 scale	28% (Low)	★★★★★
Expected daughter breeding performance				
	Daughter calving diff (% 3 & 4) Breed ave: 6.18%, All breeds ave: 6.48%	+6.2%	23% (Low)	
★★★	Daughter Milk (kg) Breed ave: 8.95kg, All breeds ave: 2.97kg	+8.4kg	31% (Low)	★★★★★
★★★★★	Daughter calving interval (days) Breed ave: 0.74days, All breeds ave: -0.39days	-2.37days	33% (Low)	★★★★★
Additional Information:				
		Linear composites Value Reliability		
		Muscle 117 30%		
		Skeletal 115 30%		
		Function 120 18%		
Herd data quality index				
N/A				
Animal scored. Linear scores and weaning weights in evaluations				



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What is Beef Herdplus?

- Beef Herdplus® is a beef cattle breeding information service offered by the ICBF
- It contains all performance information related to your herd, from calving right through to slaughter
- Information is contained in easy to follow reports which allows you to evaluate animals performance relative to herd contemporaries and also to national averages
- Each report also provides an “Action List” which ranks animals based on their performance
- More information on Herdplus is available through www.icbf.com and on 1850 600 900.

5 Do breeding values work?

- Relationships between breeding values for ‘maternal milk yield’ and measured milk yield on 106 beef cows conducted on the Derrypatrick herd in Teagasc Grange show that ‘maternal milk yield’ is an excellent indicator of actual milk yield.
- Cows with the highest breeding values for maternal weaning weight (which is also a good indicator of milk yield of the cow) on average produced 8.2 kg more milk/day compared to the cows with the lowest breeding values for maternal weaning weight.

- Previous research at Grange has shown that bulls chosen on high breeding values for terminal traits produced progeny with 14kg heavier carcasses compared to bulls with low breeding values for terminal traits.

6 What can we expect in the future for beef breeding?

- Genomic selection is a new breeding technology that uses DNA samples (from blood or hair) to directly establish an animal's genetic profile and generate breeding values. Genomic selection has been incorporated into the national dairy evaluations and will soon become the method of choice for beef genetic evaluations.
- Increases in the reliability of bulls via access to more on-farm performance data through the Beef Data and Genomics Programme, Knowledge Transfer Groups and also through the use of genomic selection.
- Economic values for the beef Euro-star indexes will be updated continually in line with current prices and costs of production.
- New traits relating to health, meat quality and the environment may soon be added to the genetic evaluations.

7 What breeds should I use?

SIRE BREEDS

Breed types can be categorised as dairy (e.g. Holstein-Friesian), early-maturing (e.g. Hereford, Angus) and late-maturing (e.g. Charolais, Belgian Blue, Limousin).

Extensive research carried out at Teagasc Grange comparing sire breeds mated to Holstein-Friesian dairy cows showed that:

- Growth rate is similar for dairy and early-maturing breeds and higher for late-maturing breeds.
- All beef breeds have a higher kill-out proportion than dairy breeds, with late-maturing breeds having a higher kill-out proportion than early-maturing breeds.
- Compared to dairy animals, carcass weight at a constant age is 2-4% higher for early-maturing crosses, 5-8% higher for the smaller (e.g. Limousin, Piedmontese) late-maturing crosses and 9-12% higher for the larger (e.g. Belgian Blue, Charolais) late-maturing crosses.
- Muscle production is broadly similar for dairy and early-maturing crosses but is 10-20% greater for the late-maturing crosses.
- Early-maturing crosses have, on average, a higher carcass fat score and late-maturing crosses have a lower carcass fat score than dairy animals.

- Carcass conformation score is superior for all beef types than for dairy animals and is superior for late-maturing than early-maturing types.
- Dairy breeds have a 5-10% higher intake (for their weight) than beef breeds.
- The relative productivity of the breeds summarised below is approximately midway between that of the parent breeds. The extent to which these differences are observed in practice also depends on the system of production.

Key Fact

Although there is an average breed ranking for different traits, there is huge variation within breed and consequently, large overlap between breeds, especially for individual bulls, in these traits.



Ranking of Holstein-Friesian (HF=100) and beef x HF steers for production traits

Sire breed	HF ¹	HE	LM	PM	RO	BA	SM	BB	CH
Slaughter weight /day (g)	803	101	98	95	101	102	106	104	107
Kill out (g/kg)	527	102	105	105	104	105	104	105	104
Carcass weight / day (g)	425	103	103	100	104	107	109	109	111
Carcass conformation (1-5) ²	2.19	133	136	139	139	132	136	138	143
Carcass fat class (1-5) ³	3.52	125	103	86	97	91	103	95	90
Feed Intake (g/kg LW)	18.2	98	96	94	92	96	98	97	97

Source: M.G. Keane, Teagasc, Grange

¹Actual values for HF, values for the beef crosses are expressed relative to HF=100.

^{2,3} Beef carcass classification scheme; ² 1 (P) = poorest to 5 (E) = best; ³ 1 = leanest to 5 = fattest.

HE = Hereford; LM = Limousin, PM = Piedmontese, RO = Romagnola, BA = Blonde d'Aquitaine; SM = Simmental; BB = Belgian Blue; CH = Charolais.

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Desirable sire traits

These include: relatively short gestation (pregnancy), easy-calving, high growth rate, good feed efficiency, good carcass characteristics, good temperament, etc.

SUCKLER BEEF COW BREEDING

It is not possible to advocate a single breeding policy for all suckler farmers. Breeding policy depends on factors such as whether replacement heifers are produced from within or outside the herd, the production system followed and market requirements.

Desirable cow traits include

- Moderate size
- Moderate feed intake
- Good reproductive performance
- First calving at 2 yrs of age (early puberty)
- 365 day calving interval
- Live calf per annum
- Good calving ability
- Satisfactory milk yield
- Longevity
- Docility
- Good cull value
.....etc.

Desirable progeny traits include

- High passive (and active) immunity (ability to fight-off disease)
- Heavy weaning weight
- High growth rate
- Good feed efficiency
- High carcass weight per day of age
- Good carcass characteristics (conformation & fat score)
- Good meat yield & quality characteristics
- Good temperament
-etc.

Suckler herd replacement strategies

The main replacement breeding strategies available to farmers are:

- Sourcing replacement heifers from the dairy herd or
- From the suckler herd – with heifers either bred from within the herd or purchased from another suckler herd.

Heifer replacements from the dairy herd

- Research at Teagasc Grange has shown benefits to beef suckler cow replacements from the dairy herd having late-maturing “continental” sires rather than early-maturing British beef breed genetics. For example, spring-calving Limousin x Friesian cows were compared with Hereford x Friesian cows within a calf-to-beef production system.

Cow feed intake, live-weight, calving difficulty, reproductive performance and calf pre-weaning growth were similar but the male progeny from the Limousin x Friesian had higher lifetime growth rates, and better killing-out rates, resulting in leaner, heavier, carcasses.

Heifer replacements from the suckler herd

- A series of studies at Teagasc Grange compared replacement heifers from the dairy herd (Limousin x Holstein-Friesian) with replacement heifer breed types from the suckler herd in a spring-calving, calf-to-beef production system.

These studies evaluated the effect of late-maturing “continental” breeding in the cow (i.e. ½ beef ½ Holstein-Friesian vs. ¾ beef ¼ Holstein-Friesian vs. purebred beef).

Progeny from purebred and crossbred late-maturing breed cows had superior carcass conformation and meat yield compared to those with a proportion of dairy breeding in their ancestry.

However these studies demonstrated that crossbred cows with good maternal (milk) traits produced calves with

- (i) High passive immunity (ability to fight-off disease) due to higher colostrum production of the dam
- (ii) Higher weaning weight due to higher milk production of the dam
- (iii) Higher carcass weight per day of age, mainly due to higher pre-weaning growth
- (iv) Good carcass (conformation and fat score) characteristics.

8 Why consider cross-breeding?

- Breeding policy should aim to exploit breed differences and hybrid vigour or heterosis (advantage to crossbreds over the average of the parent breeds).
- Hybrid vigour from cross-breeding can result in a combination of enhanced reproductive performance, lower calf mortality and higher calf growth.
- Research shows that calves born to cross-bred suckler cows are roughly 13% heavier at weaning than calves from purebred sucklers. In addition, using a sire from a third breed (of at least equivalent genetic merit) increases the weight of calf weaned per cow by approximately a further 8%.

This breeding policy is more readily achievable where replacement heifers are purchased rather than bred, and where it is practical to allocate a portion of the herd specifically for the production of replacement heifers, for example, through the use of artificial insemination, or in large herds through the use of separate sires.

Key fact

Ideally suckler cows should be cross-bred and mated to a bull from a third breed.

9 What should I consider when choosing a Stock Bull?

BULL SELECTION GUIDELINES

Key target

Any bull selected must improve profitability whether chosen to breed replacements or animals for slaughter.

How to

select the best bull for my herd?

- Determine the most suitable animal for your production system (i.e. the herd's breeding objective). For example, if you are interested in finishing all progeny then you should pay particular attention to the Terminal Index of the bull. On the other hand, if you are looking to breed your own replacements then you should examine the Replacement Index carefully.
- Establish the genetic merit of your herd. This can be done by logging onto the ICBF website (www.icbf.com). Select bulls that have high genetic merit for the herd's breeding objective but also pay attention to the level of reliability associated with the traits of interest

Where replacement heifers are obtained from the dairy herd they should be from sires used in the dairy herd with relatively high breeding values for growth rate, conformation and leanness etc. As all the progeny produced in this suckler cow herd are destined for slaughter, cows should be bred to sires selected using the Terminal Index.

Where replacement heifers are bred from within the suckler herd a proportion of the herd (40-50%) should be bred to bulls that are specifically chosen as suitable for producing replacements (see Replacement Index) and ideally the remainder to a sire selected using the Terminal Index.

Where one sire is used to breed both replacement heifers and animals destined for slaughter, a bull having both good Replacement and good Terminal traits is required. To maintain hybrid vigour the next generation of replacements should be bred to sires from alternative breeds.

AI versus stock bulls

The advantages of using an AI bull over a stock bull include:

- An AI bull will almost certainly have superior genetic merit
- There is a greater selection of superior bulls to choose from
- Higher reliability – a stock bull will have an overall reliability of approximately 30%, whereas well proven AI bulls can be as high as 90%
- Reduced risk – a stock bull may perform poorly due to injury, poor semen quality, or poor libido

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- AI bulls have undergone rigorous selection criteria (calving difficulty survey and disease testing for example)
- Less physical danger as there is no bull on the farm

How to

Estimate the expected profit from the bull



Quick estimate

- A bull with an index of €150 means that the progeny of that animal will, on average, generate €150 more profit over their lifetime compared to the progeny of a bull with a sub-index of €0 produced in a similar environment.

Detailed estimate

- For this you need to know the breeding values for the bull and the cows or heifers he is mated to. Progeny receive half their genes from their sire and half from their dam so add the figures for each trait together and divide by two.

Example 1. Breeding replacements

	Replacement index
Average cows and/or heifers	€80
AI sire	€150
Estimate for calves	€115

Example 2. Breeding animals for slaughter

	Terminal index
Average cows and/or heifers	€46
AI sire	€100
Estimate for calves	€73

Beef Data and Genomics Scheme

The beef data and genomics scheme (BDGS) is an initiative launched by the Irish Department of Agriculture Food and Marine and administered through the Irish Cattle Breeding Federation (ICBF) with the aim of breeding a national cow herd that has good fertility, produces a high quality weanling each year, is easily managed and lasts for a long period within the herd. Farmer participation is voluntary but is financially supported. The key actions that farmers will have to undertake in relation to the scheme are:

- data recording,
- genotyping,
- replacement strategy,
- carbon navigator, and
- training.

One of the requirements of the scheme is to genotype 60% of the number of suckler cows calved in the herd in 2014 for each of the 6 years of the scheme; all the genotyping information will be included in a genomic selection breeding program to advance genetic gain in the national beef herd. As part of the BDGS a focus has also been placed on the replacement strategy of both the bull and replacement females entering the herd; farmers are required to select 4 or 5 star replacement animals and a number of targets have been set out for the next number of years with the objective that by 2020 50% of cows within a participating herd will be 4 or 5 stars for the replacement index. Information on the genetic profile of animals within your herd or on potential replacements animals for purchasing is available through the ICBF.

The introduction of genomic selection will mean higher reliability breeding indexes for animals at a much younger age. For example, an animal's Euro-Star index at birth is based solely on the information of the sire and dam and the reliability is approximately 20%. With genomic selection, taking a DNA sample could result in the reliability increasing to 30% or more. Using high Euro-Star animals will increase the profitability of beef enterprises and genomic selection will allow this increase in profitability to be significantly accelerated.

Section 4



Achieving high reproductive performance in beef herds

by Michael G. Diskin



Introduction

As calves are the major output, reproductive efficiency is a key factor determining profitability in the beef herd.

- ① What are the main reproduction targets for a beef cow herd?
- ② What determines the reproductive efficiency of the cow or heifer?
- ③ What determines overall herd reproductive efficiency?
- ④ Does breed type influence age at puberty?
- ⑤ How do I deal with late-calving cows?
- ⑥ Is bull infertility a major risk?

Achieving high reproductive performance in beef herds

① What are the main reproduction targets for a beef cow herd?

Checklist

- Compact calving (80% of cows calved in 60 days).
- A 365-day calving interval.
- Low culling rate (less than 5%) for barrenness.
- Replacement heifers are bred from maternally tested AI bulls.
- 5-6 calves/cow/lifetime on average.
- 0.95 calves reared /cow/ year.
- Less than 5% calf mortality by 28 days.
- Maximum use of cross-breeding (hybrid vigour) to improve cow fertility and calf survival.
- Maximum use of grazed grass.

These targets are extremely challenging for beef herds because of the long pregnancy in beef cows, particularly continental-cross cows bred to continental bulls, long post-calving intervals, and variable heat detection efficiency (where AI is used) and variable conception rates.

Key facts

In Ireland fewer than 10% of heifers first calve by 24 months of age, the calving-to-calving interval is frequently greater than 400 days and less than 75% of cows produce a calf in a 12-month period.

Key term

The time from when a cow or heifer calves to when she begins her reproductive cycle and displays heat is known as the 'anoestrous' period.

② What determines the reproductive efficiency of the cow or heifer?

1. Age of Puberty (see later)
2. The interval from calving and return to heat.
3. Heat detection efficiency (where AI is used).
4. Conception rate.

Average intervals from calving to first heat of 50-55 days are common in beef cows, which is almost twice as long as for dairy cows.

Checklist

The main reasons why beef cows have a longer post calving anoestrous interval are:

1. **The strong bond between the dam and her calf.** This is primarily based on sight and smell and to a lesser extent by the suckling effect.
2. **Body condition score (BCS) at calving.** Pre-calving nutrition, as reflected by the BCS of the cow at calving, is the 2nd major factor, and is more important than the level of nutrition after calving. The "cow-calf bonding effect" is compounded by having beef cows in a low body condition score (BCS) at calving.
3. **Heifer effect.** For beef heifers after their first calving, the anoestrous period is usually 10-15 days longer than for mature cows. This is because the heifer needs energy for growth as well as maintenance and milk production.

Begin breeding heifer replacements 2-3 weeks before the main herd so that they will be longer calved at the start of the breeding season following their 1st calving. Heifers should be well grown at planned time of breeding and the breeding period should be restricted to eight weeks. Late-calving heifers usually become late-calving cows.
4. **Season.** There is some evidence that cows that calve in late autumn-winter have a longer post-calving anoestrous interval than cows that calve in late spring/summer. It is not clear whether this is due to day length or feed supply during late autumn/winter. Cows calving during late autumn-winter should be in a higher BCS at point of calving to offset these seasonal effects

Key fact

The role of nutrition

The BCS of a cow at calving is critical in determining when cows commence oestrous cycles after calving. The negative effects of low BCS at calving are only partially reversed by putting cows on a high plane of nutrition after calving. Consequently, producers should regularly body condition score their cows during the dry period. Cows in low body condition score (less than 2.5) should be selected out for additional feeding to reach a target of 3.0 at point of calving (depending on time of calving - see chart below). Cows at BCS greater than 3.5 can afford to lose some body condition without it affecting their subsequent reproductive performance.

Minimum Target BCS for beef cows

Calving season	Calving	Mating	Mid-Pregnancy
Jan-Feb	3.0	2.50	3.0
March to May	2.75	2.50	3.0
Autumn	3.25	2.75	2.25

Conception rate: In beef cows, conception rates of 60-70% are achievable to either AI or natural service unless there are problems with semen quality, AI technique or bull fertility.

Conception rates reach a normal level in cows bred at 60 or more days after calving. However, when cows are bred at 40 days or less after calving, conception rate is usually less than 45% but it is still advisable to breed such cows once breeding has commenced.

Post-calving conception rates are often lower for first-calvers compared to mature cows, which again reflects the young cow's need to grow, maintain herself and produce milk for the calf and calve early as a heifer.

③ What determines overall herd reproductive efficiency?

Once cows have begun oestrous cycles after calving it is then the product of heat detection efficiency and conception rate that determine overall herd reproductive efficiency and compactness of calving.

The effect of heat detection and conception rates on the % of the herd that is pregnant at 90 days after the onset of the breeding season:

		Conception Rate %			
		60	50	40	30
Heat Detection	90	96	91	83	71
Rate %	70	89	82	73	61
	50	76	68	59	48
	40	67	59	50	40

With excellent heat detection (90%) and conception (60%) rates, 96% of cows will conceive in a 90-day period (see table). At 70% heat detection and 50% conception just 82 % of the cows are projected to conceive in the same period.

When a bull is running with a herd of cows, heat detection should be very close to 100%. Compactness of conception and subsequent calving will be determined by the conception rate once cows are cycling.

How to

Ensure good conception rates.

In beef cows and heifers conception rate should typically be 60-70%. For a herd using AI:

- Follow the a.m./p.m. rule regarding time of AI
- For DIY AI operators ensure that the inseminate is placed in the body of the uterus or, for skilled operators, place half the straw in each uterine horn.

For herds using natural service, on average about 4% of bulls can be infertile while a further 30% may be sub-fertile resulting in low conception rates and a prolonged calving season next year.

Achieving high reproductive performance in beef herds

Ensure that the bull is:

- purchased at least two months before planned start of breeding season.
- placed on a moderate plane of nutrition following purchase.
- regularly checked and is serving the cows.

And that:

- the first cows bred are checked for repeat heats.
- the first cows served are scanned for pregnancy at 30-40 days after service.

The ability of a bull to get cows pregnant is the best test of his fertility.

Key fact

In the heifer, puberty is defined as the age of 1st oestrus accompanied by spontaneous ovulation. A low plane of nutrition reduces growth rate and delays puberty by weeks and months.

④ Does breed type influence age at puberty?

Heifers from dairy breeds or breeds of dairy origin (Jersey, Friesian-Holstein, Simmental) reach puberty at the youngest ages, followed by British beef breeds (Aberdeen Angus and Hereford). Larger continental breeds (Charolais, Limousin and Blonde d'Aquitaine) are oldest when they reach puberty.

Key fact

Conception rate is as low as 20% to 30% following breeding at the first or second heats after puberty and only reaches normal levels at subsequent heats. Therefore, heifers should have reached puberty two months before start of planned breeding.

For seasonally calving herds and where the aim is to calve heifers at two years of age, it is important that all replacement heifers reach a minimum weight at 14 months of age.

Breed	Target weight at 14 months of age (Kg)
Aberdeen Angus X	370
Hereford X	370
Shorthorn X	370
Simmental X	400
Limousin X	420
Charolais X	430

This will ensure that heifers are cyclic at the start of the breeding season and are on a growth trajectory that will ensure that they reach 85-90% of their mature weight at time of 1st calving. The benefits include less difficulty calving and a quicker return to heat after their 1st calving. To achieve these target weights, heifers need to be on a very good plane of nutrition from birth.

Key fact

The later that puberty begins in heifers the longer is their post calving anoestrous period as beef cows.

Key risk

It is possible to get heifers pregnant at lighter weights but after their 1st calving a prolonged anoestrous period is likely.

Key target

To get replacement heifers bred early so they calve in the first six weeks of the calving season.

Any slippage in average calving date that occurs in older cows can be counterbalanced by having heifers calve early. Having heifers calve early will ensure that a high proportion of them are again cyclic at the planned start of the mating season. It is not desirable to breed heifers that are old when they show heat for the first time.

5 How do I deal with late-calving cows?

A proportion of cows may fail to show heat by 60-70 days after calving and will be later calving the following year unless actions are taken. Generally, these will be young cows, cows in low BCS (less than 2.0) at calving and/or twin-producing cows. Also it is desirable to bring forward calving date for late-calving cows. There are three options.

1. Remove/separate the calf. The bond between a suckler cow and her calf is the major factor delaying onset of cyclicity after calving. For late-calving cows, cow-calf separation should begin when cows are 30 days calved and should continue for 2-3 weeks with calves allowed to suckle morning and evening. About 85% of cows will exhibit a fertile heat by the time they are 50 days calved.

It is important that calves are at least 50 metres from cows but not necessarily out of sight or earshot. This is a cheap, non-hormonal option but demands time and appropriate facilities (very good fencing, etc). Calf removal/separation can equally be applied to cows that are longer calved and are not cyclic. Again, about 85% of these cows will show heat within 2-3 weeks of the first separation.

Once cows show heat and are bred there is no benefit to continuing the calf separation. If heat is not induced within three weeks of calf separation it is likely that the cows are not cyclic for nutritional reasons and a more aggressive treatment such as the use of a PRID or CIDR is needed. These animals will also require a longer period of high-plane feeding to overcome the nutritional effects on the reproductive system and resume cycling.

2. Hormonal treatment. The insertion of an intravaginal progestagen device such as a Delta- PRID or CIDR for 8 days is capable of inducing heat in about 80-90% of anoestrous cows (see later) .

3. Longer-term solutions

- Ensure that cows calve down in good BCS (3.0+).
- Ensure that replacement heifers are well grown at time of 1st breeding and are bred to calve at the start of the calving season.
- Adopt a higher replacement rate for a number of years and cull late calving cows.

- Limit the breeding period to 12 weeks.
- If you are using AI pay particular attention to heat detection.
- If using natural service monitor bull fertility and never assume that a bull is fertile.



Estimates suggest that 3-4% of stock bulls are infertile and that a further 25% of bulls are 'sub-fertile' Bulls must have: Good legs and feet at start of breeding season, good body condition, a strong libido and produce a good supply of semen with a high concentration of highly motile sperm.

6 Is bull infertility a major risk?

Generally well-fed bulls will reach puberty at 11-14 months of age. British breed bulls such as the Aberdeen Angus and Hereford will usually be 4-6 weeks younger when they reach puberty than the later maturing continental breeds such as Charolais, Limousin and Blonde d'Aquitaine. Simmental is closer to the British breeds in terms of age at puberty reflecting its dairy origin.

Key tip

As a general rule up to 25-30 cows/heifers should be assigned to a yearling bull with up to 45-50 cows/heifers to an adult bull.

Key risk

We don't have data in Ireland for the incidence of bull infertility or sub-fertility in stock bulls.

Achieving high reproductive performance in beef herds

International data suggests that 4-5% of bulls at any one time are infertile, and therefore incapable of getting a cow pregnant. A further 20-25% are sub-fertile. Anecdotal evidence for Ireland would support the international figures for the incidence of bull infertility-subfertility. Sub-fertile bulls are capable of getting some cows pregnant but are incapable of managing a large herd of cows at a normal recommended cow:bull ratio.

How to

Minimise the risk associated with a bull being infertile



There is no single 100% reliable test of a bull's fertility except his ability to get cows or heifers pregnant. Following the introduction to a herd, a farmer should regularly check a bull to ensure that he is properly mating the cows.

The first cows served should be recorded and checked for repeats at 18-24 days and ideally be scanned when 28-40 days bred. On the first suspicion that a bull may be infertile the herd owner should immediately switch to AI, or alternatively introduce another bull to the herd.

Key tip



A semen test is useful in identifying an infertile bull if it reveals a total absence of motile sperm or a sample is produced with a very high proportion of abnormal sperm. However, frequently a bull that is infertile will produce a sample of apparently 'normal' semen with good sperm motility and yet be infertile. Therefore, a semen evaluation test is only of value when there is an absence of motile sperm in the ejaculate.

Checklist



other causes of bull infertility or sub fertility.

- abnormalities of the penis such as corkscrew penis (frequently seen in older bulls),
- arthritis conditions,
- lameness,
- poor libido.

Sometimes a bull can regain his fertility. However, herd owners need to be cautious and should test such a bull on a number of cows or heifers (6-7) in advance of turning him out with a larger herd of cows. This should be followed by scanning them at 28-40 days post-breeding to evaluate the bulls performance.

Each season, herd owners should monitor a bull's performance through the breeding season to ensure that he is properly serving the cows. The first cows served should be recorded and checked for repeats at 18-24 days and ideally be scanned when 28-40 days bred.

Section 4

AI and Heat Detection in Beef Herds

by Michael G. Diskin



Introduction

Artificial insemination offers suckler herd owners access to a range of proven, genetically superior bulls of different breeds.

- ① Why should I use AI?
- ② Why use AI to produce replacement heifers?
- ③ What are the signs of heat?
- ④ Which factors affect the intensity of heat?
- ⑤ What heat detection aids are available?
- ⑥ What type of records are required?
- ⑦ Is there a role for pregnancy scanning?

AI and Heat Detection in Beef Herds

① Why should I use AI?

- If herd size is small it allows you to avoid the purchase cost and annual maintenance costs of a stock bull.
- AI offers access to a range of proven, genetically superior bulls of different breeds which produce faster-growing calves
- It allows the selective mating of cows/heifers to selected sires strong on particular traits, e.g. proven easy calving bulls on heifers and young cows.
- The production of quality replacement heifers
- AI removes the hazard of having a bull on the farm and the need for special housing.
- The risk of bull infertility is eliminated

② Why use AI to produce replacement heifers?

Most beef farmers do not have a defined policy for producing quality female replacements with the result that many beef cows are now becoming almost pure-bred. The loss of hybrid vigour, associated with this means a decline in cow fertility and calf vigour as well as a decline in milk production and calf performance.

Checklist

Desirable traits in replacement heifers:

- Reach puberty at 12-13 months of age,
- Have good calving ability,
- Fertility - as both heifers and cows and therefore calve within 365 days each year,
- Possess good mothering ability and adequate milk to produce a 300 kg + calf at seven months of age,
- Have good growth potential and be of good conformation
Longevity to remain in the herd for 6-7 lactations.

At least half of the herd should be bred to produce replacements and the remainder bred to terminal sires. For most herds in Ireland this inevitably means the use of AI unless herd size is big enough to justify more than one breed of natural service sire.

Use of AI and selected maternally tested sires will also remove much of the risk associated with the production of replacement heifers. Producing replacements from within a herd greatly reduces the disease risks associated with purchasing replacements.

Checklist

To ensure efficient use of AI you need:

- The ability to detect heat in heifers/cows.
- To be committed to heat detection.
- A strategy: You could use AI at the beginning of the season until sufficient cows are bred to produce the required number of replacements.
- Good facilities that facilitate collecting of individual cows for AI.

③ What are the signs of heat?

Standing to be mounted by herd mates or a bull is the most definite and accurate sign that a cow is in heat. During the period of standing heat, cows stand to be mounted by other cows or move forward slightly with the weight of the mounting cow. Cows that move away quickly when a mount is attempted are not in true heat.



Standing to be mounted by herd mates or bull is the most definite and accurate sign that a cow is in heat

Standing heat may not always be seen so stockmen use other signs of heat in arriving at a decision as to whether or not to inseminate a cow. These **secondary signs of heat** may indicate that a cow is coming in heat, in which case closer attention should be given to her over the following 24-48 hours, or they may indicate a recent heat in which case she should be given close attention 17-20 days later.

1. Discharge of clear mucus: This originates in the cervix and uterus and is a good indication of imminent heat. The passing of long clear elastic strings of mucus indicates an imminent heat while thicker, cloudier mucus indicates a recent heat.
2. Mounting other cows. Cattle that mount other animals may be in, or approaching heat. Generally, cows that are at the mid-cycle stage of their oestrous cycles or that are in-calf perform mounting activity much less frequently.
3. Restlessness: Signs of restlessness such as increased walking, trailing of other cows and bellowing are characteristic of individual cows that are either approaching or are in heat.
4. Swelling and reddening of vulva: Hormonal changes associated with heat cause an increased blood supply to the reproductive organs which in turn causes swelling and reddening of the vulva.
5. Hair loss and dirt marks: As a result of frequent mounting by herd mates, the hair on the tail-head is usually removed and the skin on either side of the tail-head is often scarred and dirty. This indicates that the cow was recently on heat.
6. Blood stains on the tail or vulval area: This is a sign of a recent heat. Such animals should be watched closely for heat 17-20 days later.

Key fact

Duration of an oestrous cycle

Oestrous cycle averages 21 days in cows, within a range of 18-26 days, and 20 days in heifers. Following insemination, 10-15% of cows and heifers that fail to conceive return to heat at intervals greater than the normal 20-21 days. This is caused by late (occurring 16 or more days after insemination) embryo mortality in these cows or heifers.

Key fact

How long cows remain in standing heat.

In beef cows and heifers the reported average duration of standing heat is about 10-12 hours with some evidence that it maybe a few hours shorter in animals on concrete slats as opposed to softer underfoot conditions

Table 1. Effect of underfoot surface type (slats or out-wintering pads OWP) on duration of heat and number of mounts

Underfoot surface	Number of heats	Average duration of standing heat (hours)	Number of Mounts*	
			Mean	Range
Slats	18	5.6	7.62	3-29
OWP	48	7.8	18.2	3-139

* Does not include cows with "silent heats".

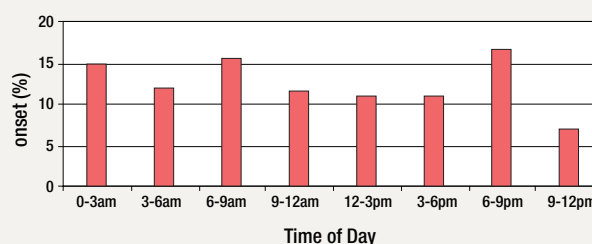


Figure 1. Pattern of heat onset throughout day.

These studies show that cows on OWP receive more mounts than cows on slats and are in heat for a longer period. The pattern of heat onset is evenly spread throughout the day.

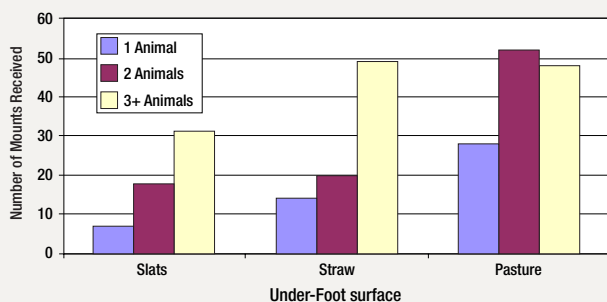
AI and Heat Detection in Beef Herds

Key fact

Careful checking for heat in the early morning and late evening minimises the night interval and results in detection of at least 70% of cows in heat. Three further checks during the day, at about 4-5 hour intervals, are needed to detect 90% of the cows in heat.

4 Which factors affect the intensity of heat?

It is generally believed that the intensity of heat, as determined by the extent of mounting, is less in beef cows that dairy cows or heifers and this is due to the presence of the calf with the cow. Other major factors that affect its intensity are the size of the sexually active group and the under-foot conditions on which the animals are kept.



The effect of under-foot conditions and the number of animals on heat simultaneously on the number of mounts received by animals in heat.

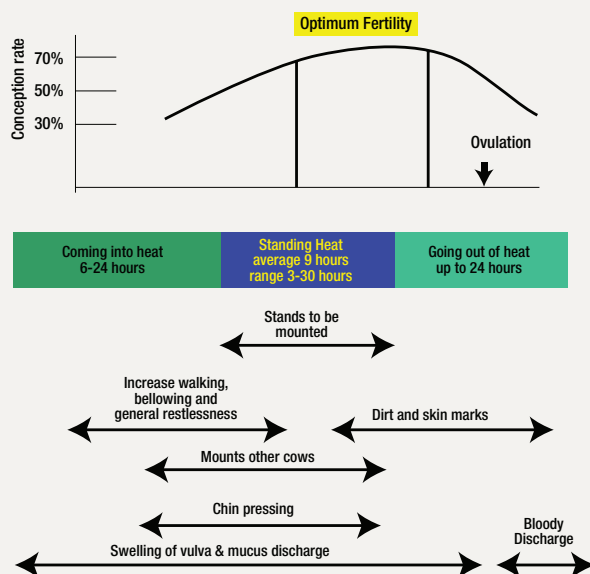
On days when there is only one animal on heat in a group, the numbers of mounts received by a cow is as low as 7 when she is indoors on concrete slats compared with 27 when she is outdoors on pasture. Similarly, the average number of mounts increases with the number of animals in a group that are on heat simultaneously. Again, animals on pasture receive the most mounts when the size of the sexually active group increases.

Are silent heats a problem with beef cows?

There is some evidence that silent heat, defined as an ovulation occurring without any overt signs of standing activity, happens particularly in cows housed on concrete slats.

Key fact

Teagasc have recorded up to 57% of silent heats in cows on concrete slats compared with 22% in cows on out-wintering pads. Research shows that having a teaser bull running with the cows greatly reduces the number of silent heats.



Changes in cow behaviour and signs of heat relative to heat onset, time of ovulation and optimum time for insemination.

Checklist

Factors that affect the expression of heat.

Housing: Cows must have adequate space to allow cow-to-cow interaction to show heat. If the stocking density indoors is too high heat detection is more difficult, and 'false positives' are more likely.

Floor surface: Cows dislike being mounted while standing on concrete, slippery or rough surfaces and prefer softer underfoot surfaces such as grass, dirt or straw bedded yards. Mounting is reduced by almost 50% when cows are on concrete as opposed to softer underfoot conditions and the duration of oestrous activity is reduced by about 25%.

Feet and leg problems: Cows with sore feet or legs, or that have poor structural conformation, exhibit less mounting activity and have fewer “stands”. Such cows may stand to be mounted when not in heat because it is too painful to escape from the mounting cow.

Status of herd mates: The number of cows in heat simultaneously has a major impact on overall heat activity and on the average number of mounts per cow. The number of mounts per cow increases with the number of cows that are in heat simultaneously (up to about 3-4 cows in heat). In smaller and even in larger herds as more cows become pregnant, the likelihood of more than one cow being on heat on any given day is less, thus, making heat detection more difficult.

Key fact

About 10% of the reasons for failure to detect heats are attributable to “cow” problems and 90% to “management” problems. Management problems include too few observations per day, too little time spent observing the cows or observing the cows at the wrong times or in the wrong place, such as at feeding time.

5 What heat detection aids are available?

Vasectomised bulls with chin-ball marking harness

Active vasectomised teaser or detector bulls are very useful in identifying cows coming into, or on, heat. Vasectomy should be carried out 40-60 days before to introduction to the herd. The cost of the vasectomy varies from €90-120 per bull. In larger herds teaser bulls are particularly useful after the first three weeks of the breeding season when fewer cows are in heat each day and when the level of heat-related activity in the herd is reduced as more cows become pregnant.

Bulls should be fitted with a chinball harness 2-3 weeks before turn out with the herd. Teaser bulls require the same management as entire bulls and should be either castrated or disposed of after one season.

Some veterinary practices now carry out the vasectomy on one testis and castrate the other. This reduces the cost of the procedure.

Steers

If recently castrated, are useful in identifying cows coming into or in heat.

Heat detection patches

A number of “scratch card-type” patches including Estrus Alert ® and ESTROTECT™ are affixed to the cow’s tail head. Friction from mounting rubs off the silver coating to reveal a bright colored patch underneath. These devices, when properly applied, are very useful as an aid to heat detection. They cost between €1.50 and €2.00 per patch.



Active vasectomised teaser or detector bulls are very useful in identifying cows either coming into or on heat.

When one of the aids is used cows should be observed at least twice daily- early morning and late evening. Otherwise cows should be checked at least three-times daily. Spend a minimum of 20-30 minutes observing them during each observation period.

Disturb the cows and carefully check and record cows that are sliming or exhibiting any signs of restlessness. Early morning and late evening are critical times to check cows.

AI and Heat Detection in Beef Herds

Are there any easy ways of bringing cows in for AI?

Poor farm layout, inadequate facilities, lack of labour availability, combined with the difficulty of removing an individual cow(s) (and her calf) from the herd for AI, all militate against the use of AI. It is important that the paddock or field layout makes it as easy as possible to remove a cow from the herd.

A temporary fence, possibly electric, to funnel cows towards the gate and roadway (Fig. 1) is an excellent way of easily removing an individual cow from the herd for AI. Currently this is used on many farms.

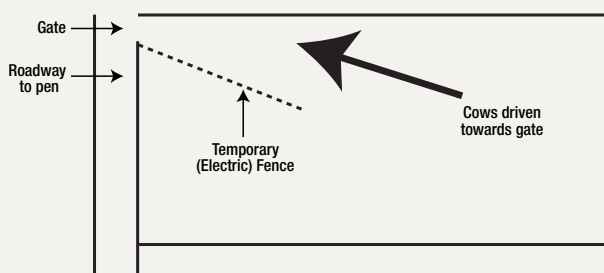


Fig. 1. The use of a temporary (electric) fence to assist getting beef cows out of a field.

6 What type of records are required?

Good breeding records are key to breeding management and are always the first port of call in the investigation of a herd infertility problem.

Checklist

Records should include:

- Calving date,
- Calving difficulty or problems related to calving,
- Heat and breeding dates,
- Sire used,
- Scanning results (where available).

During the breeding season it is important to regularly monitor heat detection efficiency (submission rate) and particularly to identify and possibly treat any cows that are calved more than eight weeks and not yet inseminated.

Submission rate is calculated as the proportion of cows calved at the beginning of the breeding season, that are intended for re-breeding and that are submitted for insemination. A submission rate of at least 80-90% should be achieved in the first 21 days of the breeding period.

A submission rate of less than 80% indicates a problem with heat detection or a high proportion of anoestrous cows. Diagnosis of this problem at such an early stage allows corrective action be taken before much of the breeding period has elapsed. Similarly, conception rates, measured initially by non return rates or cows 30 days bred, and later by scanning results, should be monitored.

Key fact

Heat detection is the key to the successful use of AI. However, it is a repetitive, time consuming task. Where AI is the chosen method of breeding, farmers must be committed to heat detection, at least twice daily (early morning and late evening), for each day of the breeding season. In order to reduce the time involved it is highly recommended that one of the aids described is used.

7 Is there a role for pregnancy scanning?

Pre-service scanning

A single pre-service scanning does not offer worthwhile practical benefits.

Post-service Scanning:

Pregnancy scanning to detect cows in calf can be done reliably from 28 days onward of breeding. A herd scan 1 month after the end of the breeding season will identify:

1. What cows are in-calf and which cows are carrying twins, calf, sex and it is a measure of the success of the breeding campaign.
2. The approximate expected calving dates of pregnant cows. Cows can be grouped according to expected calving date. Labour at calving time can, therefore, be better organised and targeted to ensure adequate supervision of calving.

More targeted feeding over the winter period is possible and empty cows can be sold before winter, saving on valuable feed. Cows that need to be culled can be fed concentrates if necessary to achieve an adequate level of finish.

Section 4

Synchronisation Regimens for Beef Cows and Heifers

by Michael G. Diskin



Introduction

Generally, about 90% of dairy cows will have resumed ovulation and oestrous cycles by 42 days after calving. Beef cows are much slower to re-commence oestrous cycles after calving because of the bond between the cow and her calf. In many herds 30-40% of beef cows will still be anoestrus (non-cyclic) at 60 days after calving.

- ① Why should you consider synchronising beef heifers or cows?
- ② Which synchronisation regimens are available for beef cows?
- ③ Which synchronisation regimens should be used for replacement heifers

Synchronisation Regimens for Beef Cows and Heifers

① Why should you consider synchronising beef heifers or cows?

Advantages

Can be used to facilitate AI and the use of genetically superior bulls or to introduce bulls with high breeding values for maternal traits to produce replacement heifers

With fixed-time AI most cows can be bred on an appointed day

For larger herds the need for a number of natural service bulls is reduced

Can be used to induce heat in anoestrous cows. While the conception rate achieved at the induced heat in such cows is generally low (30-50%), fertility at subsequent repeat heats is normal (55-70%)

Disadvantages

Cost: around €25-30 per cow treated + Veterinary call out fees and AI costs.

Repeated collecting and handling of cows

Variable conception rates

Does not eliminate the need for heat detection. Cows returning to service must be detected in heat and re-inseminated. Alternatively, a bull can be used to breed cows returning to service.

② Which synchronisation regimens are available for beef cows?

The method will always be based on the use of progesterone inserts (PRID® Delta or CIDR) combined with GnRH and prostaglandin (Table1)

Table 1. Some commercially available Prostaglandin, GnRH and eCG products used for oestrous cycle control in cattle

Commercial Drug	Product Type	Active Ingredient	Dosage (ml/animal)		Classification
			Cows	Heifers	
Estrumate	Prostaglandin	Cloprostenol	2	2	POM (Prescription-Only Medicine)
Lutalyse	Prostaglandin	Dinoprost Tromethamine	5	5	POM
Enzaprost	Prostaglandin	Dinoprost	2	2	POM
Prosolvlin	Prostaglandin		2	1	POM
Dalamzin	Prostaglandin	d-cloprostenol	2	2	POM
Receptal	GnRH	Buserelin	5	5	POM
Ovarelin	GnRH	Gonadorelin (as diacetate)	2	2	POM
Dalmarelin	GnRH	Icirelin acetate	2	2	POM
Folligon	Gonadotropin	eCG	400 iu	Not recommended	POM

A possible regimen for beef cows is outlined below.

Recommended synchronisation regimen for beef cows
35 days or longer calved at time of treatment

Day	Action
Day 0, a.m. (Monday)	PRID® or CIDR insertion + GnRH at insertion
Day 7, a.m., (Monday)	PRID® or CIDR removal + prostaglandin + 400 iu eCG 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 p.m. and through the night. Record cows in heat and active
Day 9 (Wednesday)	Most heats expected. Inseminate all cows observed in heat in the evening of Day 8 and on the morning of Day 9. Heat check cows and record all cows active or in heat (if required)
Day 10 (Thursday)	Continue heat detection and inseminate cows observed in heat. Alternatively, inseminate all cows not observed in heat at 72 hours post CIDR or PRID® removal and administer GnRH to these cows at time of insemination.

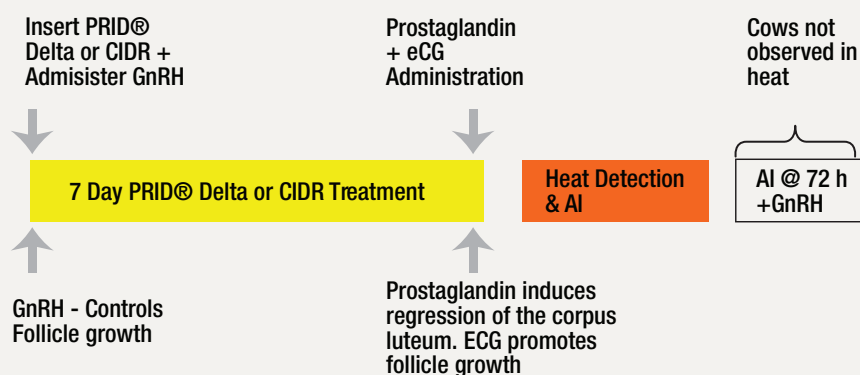
Notes

- All drugs are Prescription Only Medicines (POMs) and are under veterinary control.
- Dosage of drugs will vary according to drug and drug formulation.
- Inadvertent administration of prostaglandin to a cow/heifer during the first 3-4 months of pregnancy will cause abortion.
- The 8-day treatment can be substituted with either a 7- or 9-day duration treatment without compromising fertility. Synchronisation regimen for beefs cows.

Use of eCG (PMSG): There is a significant body of scientific evidence indicating that equine chorionic gonadotropin (eCG; better known as PMSG), administered at the time of device removal, improves synchronised conception rates in beef cows, particularly cows that are anoestrus at the start of treatment. The improvement in conception rates arise from increasing the proportion of cows ovulating (particularly cows in a low body condition score and or cows that were anoestrus at time of treatment initiation) and also possibly from increased concentrations of progesterone following AI. The incorporation of a low dose (300-400 iu) of eCG is now normally incorporated as part of synchronisation regimens in both dairy and beef cows in South American countries where synchronisation treatments are now widely used.

For beef cows under Irish conditions and typically 30-70 days calved, 400 of eCG at device removal is recommended. The projected cost of the 400 eCG is about €3-4/dose.

Figure 1. Synchronisation regimen for beefs cows.



Synchronisation Regimens for Beef Cows and Heifers

How to

Use fixed-time AI:

As an alternative to heat detection and inseminating only cows observed in heat, GnRH could be administered at 48 hours after PRID® Delta or CIDR removal with all cows inseminated once at 64-66 hours after PRID® Delta /CIDR removal.

The overall proportion of treated cows becoming pregnant would be expected to be slightly greater following a fixed-time AI as opposed to inseminating at observed heats only. While this option eliminates the need for heat detection, the extra dose of GnRH would cost €5-6 per cow as well as an extra handling of cows.

The use of single fixed-time AI will require that PRID® Delta /CIDR insertion and removal be carried out in the afternoon/evening to facilitate the administration of GnRH at 48 hours and the timed AI at 64-66 hours all being carried out within the working day.

Checklist

To optimise success with synchronisation regimens

The expected conception rates vary from 30- 75%, for best results:

- Cows should have a moderate Body Condition Score (2.5–3.0) at time of treatment. It is equally important that cows are a minimum of 35 days calved at time of PRID® Delta or CIDR insertion and are on a good plane of nutrition (plentiful supply of grass) 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 following the synchronised 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°C) and inseminated into the cow within 1-2 minutes of thawing. The correct site for semen deposition is in the common body of the uterus. Each straw should be thawed separately.

③ Which synchronisation regimens should be used for replacement heifers?

The regimen out-lined above for cows can be used for heifers. However, as the vast majority of replacement heifers should be cyclic there is a reduced requirement for incorporating an exogenous source of progesterone in the regimen for heifers. Consequently, prostaglandin-based regimens are the methods of choice for use on replacement heifers. A number of such regimens are outlined in Figures 2a and 2b. The regimen outlined in Figure 2a 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 for replacement heifers is outlined in Figure 2b. Good heat detection is initially carried out for 6 days and 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.

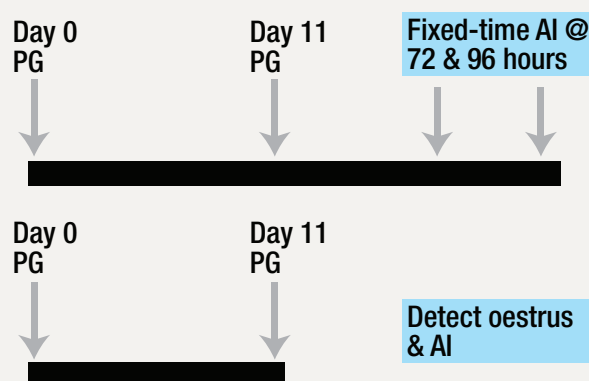


Fig 2a. Commonly used prostaglandin-based synchronisation protocol for heifers

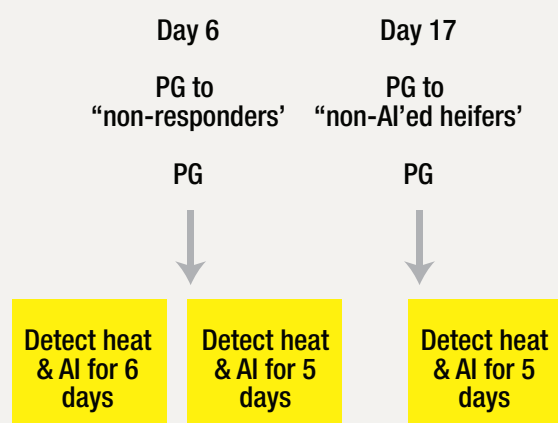


Fig 2b. Alternative prostaglandin-based regimen for replacement heifers. This is the most cost-effective regimen for heifers.

With this later regimen (outlined in Figure 2b) 90% of heifers are inseminated within 10 days and conception rates of 65 to 70% should be expected. The remaining heifers not yet recorded in heat and inseminated can be treated with a 2nd prostaglandin injection 10-11 days (see Fig 2b) after their initial injection. It is important that replacement heifers are well-grown (minimum 350-450 kg depending on breed type) and are regularly cyclic. Ovsynch-type regimens are not recommended for use in heifers. It is strongly recommended that replacement heifers are bred at the beginning of breeding season to ensure early calving the following season. It is important to remember that late-calving heifers generally produce late-calving cows. Heifers should be bred to easy calving sires.

Key risk



Ovsynch-type regimens are not recommended for use in heifers. It is strongly recommended that replacement heifers are bred at the beginning of the breeding season to ensure early calving the following season. It is important to remember that late-calving heifers generally produce late-calving cows. Heifers should be bred to easy-calving sires.



Section 4

Replacement Heifers

by Aidan Murray



Introduction

Choice of replacement strategy centres on breed selection, whether to breed your own replacements from within the herd or purchase them in, and at what age heifers should first calve down.

- ① How important is it to set targets for a suckler herd?
- ② How do I decide my replacement strategy?
- ③ What are the benefits of rearing replacements from within the suckler herd?
- ④ How should bulling heifers be managed?
- ⑤ How important is heifer weight at weaning, bulling and calving?

Replacement Heifers

① How important is it to set targets for a suckler herd?

There is a worrying trend in the national herd in recent years: fertility performance defined as calves/cow/year appears to be declining and calving interval increasing.

Efficient suckler herds will:

- Rear as many calves as possible in relation to the number of cows put to the bull
- Have good quality calves at weaning time that have achieved good weight for age
- Use grass efficiently to help control production costs.

Key facts

Replacement rate in the national herd is 14%. Some 60% of replacements are homebred; 40% are bought in. Seventy five per cent of replacements are $\frac{3}{4}$ bred beef crosses with the remaining 25% being 1st crosses from the dairy herd.

② How do I decide my replacement strategy?

The long term success of a suckler system will depend on regular replacement of breeding stock.

Checklist

Things to consider when choosing a replacement strategy:

- **Herd size.** Average herd size in Ireland is small, so breeding replacements from within the herd can complicate the system, create more stock groupings and may not be feasible where a terminal stock bull is used.
- **Existing cow base.** Milk production and fertility are key traits in replacements. Look critically at your existing cow base. Have you a good proportion of milky cows which, with correct sire selection, will breed good replacements. Have your cows gone too 'pure' in terms of breeding and are you losing out on hybrid vigour?

- **Farm facilities.** Have you sufficient feed and housing on farm to rear heifers through to calving?

- **Ability to source replacements** Have you a reliable source of replacements you can buy from?

- **Use of AI.** If you are using AI you have the opportunity to select good maternal sires to put on your best cows to breed your replacement stock even in smaller herds.

- **Implications for cashflow.** If you intend to breed all your own replacements, 40-50% of your cows will need to be bred to a maternal sire. Can the business withstand the decline in cashflow as a result of not selling these heifers as weanlings or stores? Equally, can you afford to go out, year-on-year, and buy in replacements?

- **Interest in maternal breeding.** A keen interest in improving the maternal traits within your herd together with attention to detail will yield results. The least valuable weanlings or stores should not, by default, become your replacements.

③ What are the benefits of rearing replacements from within the suckler herd?

Rearing replacements from within the suckler herd will allow you to;

- Focus on maintaining or even improving the potential milking ability of replacement heifers. This is particularly important as the % of continental blood in the herd increases. Use the ICBF maternal index to select both AI sires and stock bulls with strong maternal traits.
- Select heifers from your best cows in terms of their calving ability, temperament, fertility and condition.
- Avoid letting your herd become too purebred. A criss-cross breeding programme with at least two breeds will maintain hybrid vigour. This will give better calf weaning weights as a result of better fertility and higher growth rate. Where you have a crossbred cow and a sire of a third breed, hybrid vigour can account for a 21% increase in weaning weight.
- Keep a closed herd which leaves your stock less exposed to disease risks such as BVD, Leptospirosis and IBR.
- Assess the temperament of potential replacements prior to breeding.

④ How should bulling heifers be managed?

Key fact

The average age of suckler heifers calving down in Ireland is just over 32 months according to ICBF data. Heifers calving at three years of age have a lower lifetime economic efficiency compared to those calving at two years of age.

Key fact

Cows don't reach their mature weight until they are five years old. Heifers that calved down at two years will be smaller as first and second calvers compared to those calving older but by their third calving it will be difficult to see the difference.

Checklist

Heifers that are to calf down at two years of age should:

- Come from the best cows in the herd and be sired by bulls with strong maternal traits,
- Be born early in the calving season to allow them to be heavier at bulling,
- Achieve a daily liveweight gain of 1.1-1.3 kg/day up to weaning,
- Be fed to achieve 60-80 kg liveweight over the first winter so they will need good quality silage plus 1-2kg of concentrates,
- Be turned out early in spring to grass,
- Have reached 60% of their mature weight by bulling,
- Be bred to a known easy calving sire,
- Have reached up to 80% of their mature weight by the time they calve down,
- Receive preferential treatment as first and second calvers.

⑤ How important is heifer weight at weaning, bulling and calving?

Mature Cow Weight	Weaning Wt.	Bulling Wt.	Calving Wt.
Target % of Mature Wt.		60%	80%
600 kg	260-280 kg	360 kg	480 kg
700 kg	300-320 kg	420 kg	560 kg

Achieving at least 60% of their mature weight at bulling will ensure that there is a strong likelihood that heifers will be cycling at 15 months. Puberty in heifers is more related to weight than age so a good plane of nutrition is important. Traditional breeds and crossbred heifers reach puberty earlier than purebreds.

Particular attention needs to be paid to the weanling heifer at housing. She needs to be dosed for fluke and worms. Concentrate feeding should be front loaded at the start of the winter where they are offered up to 2 kg/hd/day depending on silage quality.

Key risks

Heifers that are bulled too light may well go in-calf but they are likely to struggle thereafter as 1st and 2nd calvers because they will have difficulty reaching the correct body condition score for mating.

Heifers are generally a very fertile group and should be bred for eight weeks. This will allow each animal two services. Heifers that are not in calf after this are less fertile and may become problem breeders in the future.

Reaching 60% of their mature weight at bulling means that heifers need to achieve a steady gain of around 0.85 kg/day from birth. By the time they calf down at 80% of their mature weight their required daily gain has dropped to 0.7 kg/day.

Heifers should be calved down in fit condition but not fat. Once calved, they require preferential treatment, particularly if they are to remain indoors for a period.

Key risk

Heifers are shy feeders if mixed with mature cows and can lose condition quickly. Heifers can be fed as a group and given 1.5-2 kg of concentrates/day after calving until turnout, to maintain body condition. This is vital if they are to remain in the herd and calve down as second calvers.

