

Fertility in Dairy Herds - Advanced

Part 8 : Managing heifer fertility

Richard Laven PhD BVetMed MRCVS

Managing Heifer Fertility

Rearing dairy heifers from birth until their first calving is one of the most costly operations on a dairy farm (on many farms it is second only to the cost of feed for the milking herd), and it is also one of the most crucial to get right as the cost of getting it wrong can be considerable

The target of heifer rearing should be to get heifers to calve down for the first time weighing 90% of their expected adult bodyweight and being < 24 months of age. In order for this to happen heifer rearing needs to be carefully planned and effectively monitored.

Delayed age at first calving increases costs by

1) *Increasing rearing costs per heifer* - if average age at first calving increases from 25 to 28 months, costs go up by 5% (from £1171 to £1227 per heifer - based on figures from AHDB Dairy)

2) *Increasing the number of heifers reared*. In a herd with a 25% replacement rate, a total of 55 heifers will be needed by a 100-cow farm if the average age of first calving is 25 months, whereas if first calving is at 28 months, the same farm will need 62 (an increase of over 12%). These differences can be even higher in herds with high losses between weaning and first calving

Thus delaying the age at first calving from 25 to 28 months results in an 18% increase in the costs of rearing heifers. For a 100-cow farm this is equivalent to an extra cost of ~£5800/year.

There are also other significant benefits in having heifers that calve earlier

1) Better cash flow - heifers start producing milk earlier

2) Better fertility - calving to conception interval is 20 days shorter in younger calving heifers (23-25 months) than older heifers (26-30 months). This difference is still present in the second lactation

3) Better lifetime productivity and profitability - better fertility means that heifers which calve earlier spend a higher proportion of their lifetime in milk; recent research has shown that heifers which calve at 23 months have a lifetime profitability that is 30% greater than heifers which calve at 27 months. It is important to look at lifetime productivity not just the first lactation; heifers which calve at an older age will often produce more milk in their first lactation than heifers which calve at 24 months of age, but the delay in producing that milk and the impact on fertility and longevity mean that lifetime production is compromised by having an older age at first calving

4) Lower culling rates - 70% of heifers which calve at 23-25 months calve for a third time ; the equivalent figure for older (26-30 months) is 59%.

Yet, on UK dairy farms the average age at first calving is 28 months, with <50% of heifers calving before they are 26 months of age. There is thus plenty of scope for improvement on most farms. The focus needs to be on getting heifers pregnant at 14-15 months of age so that they calve down at ~24 months of age and become long-living productive members of the herd. It is important to remember that although getting heifers to calve at 24 months requires them getting pregnant at 15 months, inseminating them for the first time at 15 months will not result in a 24-month average, as on average heifers take 1.4 inseminations to get pregnant. So to get an average age of first calving at 24 months you will need to start serving heifers at 14 months or, if your conception rates are low, 13 months.

Getting heifers pregnant as early as possible

In cows that have calved restoring normal ovarian cyclicity is crucial in optimising fertility, as cows that have had a normal cycle before the end of their voluntary waiting period are more fertile than those which haven't. The same is true for heifers - those which have started cycling and had a heat before they need to be inseminated are more fertile than those which are inseminated at their first heat.

Thus the timing of puberty (the onset of ovarian cyclicity for the first time) is crucial - heifers that have delayed puberty get pregnant later than heifers that have cycled before 15 months of age. In fact heifers which have shown heat at least twice before insemination for the first time at 14 months have the best fertility and the best chance of getting pregnant.

In cattle, puberty is dependent on weight not age - with puberty beginning when a heifer reaches ~40% of its mature body weight. So if your adult cows weigh 600 kg, heifers will start puberty when they reach ~240 kg. In order to get 2-3 normal oestrus cycles before mating, they need to reach this weight at around 9 months of age and then get to 55% of their mature weight (~330 kg if adult cows weigh 600 kg) by the time they are being mated.

So to optimise fertility of your heifers you need to focus on heifer growth, particularly from weaning to puberty as it is the growth rate during this period which has the most impact on the fertility of the heifer at 14-15 months of age. In fact, monitoring and managing growth rate is a crucial part of heifer rearing at all stages. For example, growth rates in the first two months of life has been shown to be



associated with survival into the second lactation, while maintaining heifers on a good plane of nutrition for at least 6 weeks after mating maximises the chance of implantation of the fertilised embryo, and once the mating phase is over, continued growth is still essential as heifers which are too small at calving will have increased risk of dystocia, reduced milk production, reduced fertility and increased risk of diseases such as lameness.

Meeting heifer growth targets (see Table 1) is essential if replacement heifers are going to be long-lived, productive members of the herd. Data show that almost 20% of heifers in the UK fail to make it to a second lactation of which almost half is due to failure to conceive despite multiple inseminations. Growing heifers well and meeting targets will significantly reduce this loss.

Age	Percentage of mature body weight
6 months	30
9 months	40
Mating (14-15 months)	55
Pre-calving	90

Table 1: Heifer growth rate targets: These are targets not averages - all animals need to meet these targets not just 50% of them.

However, growing heifers well is not about just maximising weight gain. Excessive weight gain, particularly before puberty, has been linked to fat deposition in the udder, reduced udder development and reduced milk yield. The impact varies significantly between studies, but growth rates up to 0.85 kg/day in the pre-pubertal period, a figure which is higher than needs to be achieved in well planned and monitored heifers, seem to have no significant impact on milk yield. Pre-weaning, maximising growth rate seems to have a significant beneficial effect. Recent studies show that although the effect of growth rate pre-weaning has only a short term effect on heifer live weight as heifers which have grown slower before weaning catch up, it has a long term effect on milk production as average daily gain pre-weaning explains 22% of the variation in first-lactation milk production!

If average daily live weight gain in early life is so poor as to need corrective extra feeding to get heifers to the correct weight at puberty, the reasons for the poor growth need to be investigated and identified. This particularly important if there is endemic disease such as pneumonia or coccidiosis, both of which can have long-term effects on growth rates even when clinical signs have long since disappeared..

Even if not associated directly with lower production, excessive weight gain can be associated with increased rearing costs and poorer outcomes if the weight gained is in the form of body fat rather than growth. For example, fatter heifers,

particularly if small, have an increased risk of dystocia and all of the consequences of that. Small but fat heifers are often the consequence of trying to compensate for poor growth rates before puberty by increasing feed intake to too high a level afterwards. To avoid this happening measuring growth (using a measure such as wither height) as well as weight can be useful; measuring condition score and ensuring that heifers have a BCS between 2.5 and 3.0 (on the 5-point scale) when they calve down is also useful.

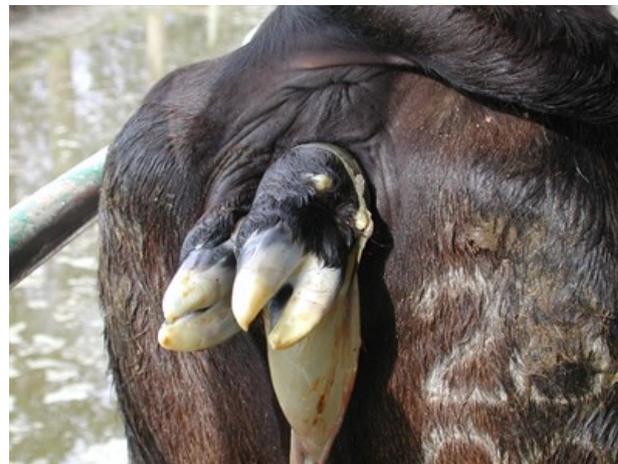


Fig 1: Dystocia is a significant problem in poorly grown heifers particularly if they have too high a BCS

Measuring BCS is also useful in later calving heifers, as these often get fat, particularly in mid to late pregnancy. Fat older heifers have an increased risk of dystocia and poorer fertility so perform even more poorly than older heifers which calve at BCS 3.0 or less.

With stature, the aim should be to achieve most of the growth in the first year - for example for a Friesian heifer with expected adult weight of 600 kg withers height should be >118 cm at 12 months of age and >130 at calving.

Getting stature and body condition right is important when rearing your own heifers; it is equally important (and perhaps even more so) when purchasing heifers. Over-sized / over-conditioned heifers often achieve higher prices at markets even though they will have lower lifetime productivity.

Getting heifers pregnant: what method to choose?

There are three options for getting heifers pregnant.

1) Natural mating

Running a bull or bulls with the heifers appears to be a simple solution avoiding the need for oestrus detection and, on some farms, the hassle of dealing with heifers in a location separate from the main farm with inadequate facilities. However, as discussed in article 7 this has significant disadvantages, particularly in terms of cost. In heifers there are specific disadvantages: using AI you can select for easy calving bulls, this is particularly important in heifers as the risks and costs of dystocia are higher in this age group; if you use natural service the ability to choose easy calving dairy bulls is limited so to avoid dystocia the



bulls used are usually either Jersey bulls or bulls from smaller beef breeds. This significantly reduces the value of the calves produced by the heifers and also reduces the scope for selection and genetic improvement of the herd as you're not producing replacements from the age group with the best genetics.



Fig 2: Bulls are often used for mating heifers where oestrus detection and AI are not easy but using bulls to mate heifers increases costs and reduces genetic gain

2) AI to observed oestrus

Heifers show oestrus significantly better than lactating cows, and they tend to have better fertility (although heat mount detectors may have a higher false positive rate due to the play behaviour that heifers often show). So AI to observed heats is completely feasible in heifers provided heat detection is feasible and the facilities are suitable. On well-managed farms the latter has to be the case as routine weighing and stature measurement are crucial; furthermore the cost of such facilities is not very high as they don't need to be sophisticated and they can be used, in addition to weighing and insemination for vaccination, drenching for worms and pregnancy diagnosis.

This means that ease of heat detection is the decisive factor in determining whether to AI to observed oestrus or to synchronise the heifers and use fixed time AI.

3) Fixed time AI after synchronised oestrus/ovulation

There are two synchronisation options in this situation which will allow the use of fixed time AI (see Fig 3). The first is a prostaglandin (PG) - progesterone (P4) programme, the second is a modified Ovsynch programme with progesterone. Adding progesterone is essential for heifers as Ovsynch alone produces poor results.

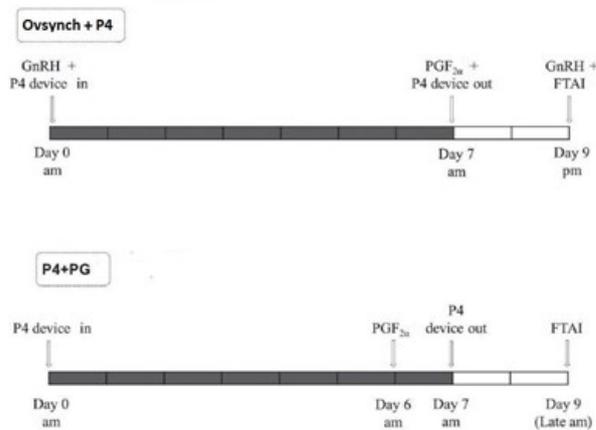


Fig 3: Two suggested synchronisation protocols for dairy heifers. Get veterinary advice on which synchronisation protocol is best for you and on the best time for AI

As can be seen in Fig 3, using Ovsynch and P4 reduces the number of handlings compared to the P4 and PG programme. As the two programmes produce similar results (50 - 70% of synchronised heifers pregnant), the best option for you may depend on whether the cost advantages of PG and P4 are outweighed by the cost of the extra handling. The best person to give you advice for your farm on whether synchronisation is right for you, and, if it is, which programme is best, is your farm veterinarian.

Getting a group of heifers in for synchronisation can have other benefits. The most important of these is that your veterinarian can check the reproductive status of the heifers before treatment. They can identify and eliminate infertile animals which will never get pregnant, such as freemartins; identify abnormalities which will significantly reduce the chances of pregnancy (such as ovarian cysts); and provide information on the proportion of heifers which have not yet cycled or have sub-active ovaries (this is a good check that the rearing programme has been effective and will also provide information on the likely success of synchronisation as these heifers may respond to standard treatment but will have a lower conception rate and may therefore benefit from targeted treatment such as eCG).



Synchronising heifers in groups, which is often feasible on larger farms, has significant advantages for the heifer as they can be calved in a tight group at a convenient time when they can be given the extra attention they need. The tight calving will also mean that the heifers are introduced to the milking regime as a group rather than individuals reducing stress and, particularly if they can be kept as a separate group after calving for at least one month, reducing endemic disease such as lameness (particularly claw horn lesions such as sole bruising).

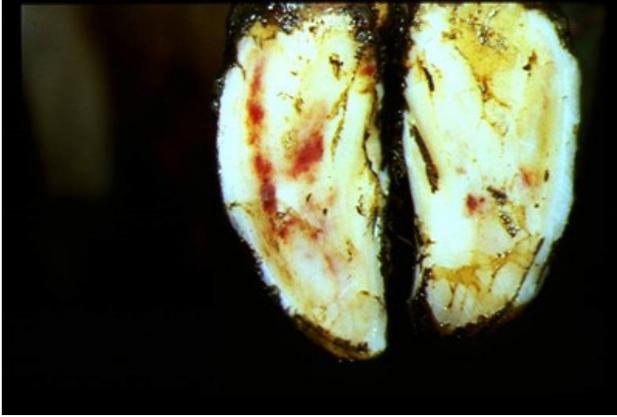


Fig 4: Managing heifers in heifer only groups can significantly reduce the level of hoof horn haemorrhages.

Summary

Heifer fertility is inherently better than that of lactating cows but poor management can still result in poor fertility in heifers. The most important factor in determining heifer fertility at the first insemination is age at puberty which is determined by bodyweight. Well-grown heifers will come into puberty early and cycle 2-3 times before they need to be inseminated, which, to achieve the target of an average age at first calving of 24 months, should be 14 months of age. Calving at 24 months of age has huge benefits in terms of subsequent fertility, longevity, and productivity.

Natural service is often used for heifers to simplify management; however it has significant disadvantages compared to AI. If heat detection is an issue then synchronisation is very effective and has the added advantages of facilitating both a pre-breeding examination which can identify fertility issues and group calving of heifers which can improve their health and welfare.

NADIS seeks to ensure that the information contained within this document is accurate at the time of printing. However, subject to the operation of law NADIS accepts no liability for loss, damage or injury howsoever caused or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

To see the full range of NADIS livestock health bulletins please visit www.nadis.org.uk

