CPD article

Growing great heifers — where it goes wrong and how to get it right

The growth rate of dairy heifers determines not only their rearing cost, but also their performance once they join the adult herd. It is therefore essential to ensure that heifers achieve targets throughout the rearing period, particularly doubling birth weight by weaning and achieving 55–60% mature weight at 13–14 months, ready for service. Growth rate should be monitored by weighing or by measuring withers or hip height. Heifers should not get over fat at any stage. Data collected at Synergy Farm Health has shown that the commonest problems with poor growth are: a poor start (particularly inadequate colostrum intake), low intake of milk, growth check after weaning, reduced weight gain of grazing heifers after mid summer, and uneven size at 13–14 months, target time for first service. The causes and potential solutions to these problems are discussed. Although most problems are seen with under performance and inadequate growth, very high growth rates may also be associated with reduced performance.

10.12968/live.2016.21.2.91

Kat Bazeley BSc BVSc CertWEL MRCVS Synergy Farm Health, Evershot, Dorset DT2 0LD

Key words: heifer | growth rate | targets | age at first calving

In a previous article about the fertility management of dairy heifers (Bazeley and Hayes, 2014), the economic importance of achieving target age at first calving (AFC) of 23–25 months was emphasised. AFC of 23–25 months not only minimises costs for rearing, but also increases longevity in the herd, with more days in milk and increased life-time milk production (Wathes et al, 2008). A recent economic analysis of the costs of rearing dairy heifers (AHDB, 2015) has shown that heifer-rearing represents the second highest farm cost after feed, with an average cost of over £1800, and huge variation between herds. The most significant source of that variation is AFC, with an additional daily cost of £2.87 per day over 24 months. Bodyweight (BW) at 30, 180 and 450 days is linked to age at first service and AFC (Brickell et al, 2009a). It has also been shown that optimal growth rate during the rearing period influences other key performance indicators:

- Early growth rate is correlated with first lactation milk yield (Bach and Ahedo, 2008), with heifers that achieve 1 kg daily live weight gain (DLWG) to 60 days producing, on average, 1000 kg extra milk in first lactation compared with calves that grow at 0.5 kg/day to 60 days
- Growth rate to 60 days is linked with survival rate to second lactation (Bach, 2011)
- Poorly grown heifers are more likely to be culled early from the adult herd (Wathes et al, 2008)
- Mortality rate to 6 months is higher in heifers with a low body weight (43 kg compared with 54 kg) at 30 days (Brickell et al, 2009b).

Heifer growth rate has been monitored at Synergy Farm Health (SFH) since 2008, with most data collected by veterinary technicians using digital weigh scales and handling equipment. Weight data collected by farmers has also been analysed. A fuller analysis of the data is available in Bazeley et al, in press, 2016. Herd results are reported back to farmers, focusing on average growth rate and variation in growth, and identifying individuals that are performing poorly. A comprehensive checklist is used to capture husbandry, feeding and disease information that might impact on growth for each herd. This paper provides a

Table 1. Target weights for growing heifers

	Weaning weight	6 m	9 m	Mating	24 m (pre calving)	Post calving
% mature weight	Double birth weight	30	40	55/60	90	85

summary of factors influencing calf growth, targets and methods for monitoring.

Measuring heifer growth

Various measures of growth can be used, including weight, withers height, hip height, width of the pelvis between the left and right greater trochanter and girth around the chest (heart girth) (Heinrichs et al, 1992). It is time consuming to make accurate measurements of withers and hip height, but easy to identify individuals that have or have not achieved a particular target height, for example by marking a wall or gate or a target height on the crush. Heart girth is commonly used as a proxy for weight, and some have found it to be useful, but results within Synergy Farm Health suggest that farmer measurements may be so inaccurate that they are worse than useless. Digital weigh scales are robust, accurate and easy to use, and the cost is low compared with the potential value of the data they generate. Targets for various breeds are published by AHDB (Dairy Co, 2012). Key times to measure are: birth, weaning, 1 month after weaning, pre mating and around first calving. However, any weight data are valuable. Increasing use of cross-breeding and variation in herd genetics mean that it is useful to weigh mature (3+ lactation) cows to set the average for the herd; target weights for growing heifers can then be set according to % mature weight (*Table 1*).

Factors affecting calf growth

The factors that mainly influence calf growth are nutrition and disease, and observations suggest that problems are mostly caused by:

- A poor start
- Inadequate milk feeding
- Post-weaning growth check
- Falling growth rate after mid-summer
- Unequal heifer size at target age for service.

For each of these problems, solutions that have been observed working effectively on farm are suggested.

A poor start

Colostrum protects the calf from disease, but also provides essential nutrients, being high in fats and proteins. Colostrum also contains compounds such as insulin-like growth factor. Although all farmers must be aware of the importance of adequate colostrum intake, surveys of serum collected from calves 1–7 days old show that approximately 1/3 dairy calves have not received adequate colostral protection (Weaver et al, 2000). Factors contributing to the problem include:

- At Synergy Farm Health, farmers report that more than 50%of the colostrum produced is of poor quality in some herds. Studies have shown that lactation number, breed, and a short dry period affect colostrum quality (Lorenz et al, 2011a)
- Colostrum pooling is not practised because of risk of transfer of infectious diseases such as Johne's and mycoplasmas
- Inadequate supervision of the calving cow and over-crowding in calving pens mean that calves may not succeed in sucking from the dam
- A delay before first milking reduces colostrum quality
- Poor storage allows for bacterial degeneration of colostrum proteins
- Staff managing the calving cows are often not responsible for care of the calf once it leaves the calving pen, so may not be motivated to ensure that calves receive enough colostrum.

Potential solutions

- Check the quality of colostrum and freeze any surplus. Thaw slowly in warm water
- Feed calves with freeze-dried colostrum, available as a commercial product
- Keep a store of a product containing concentrated antibodies (particularly *Escherichia coli* K99) from the serum of vaccinated cows (for example, Locatim, Vetoquinol, http://www.vetoquinol.co.uk/OurProducts/Datasheet/datasheet_locatim_v1.pdf) for calves that may be at risk of low colostrum intake. Of course, this is no substitute for good colostrum management and feeding
- Pasteurise colostrum to eliminate the risk of mycoplasma transmission. This may also reduce the number of *Mycobacterium avium* ssp. *paratuberculosis* (MAP) organisms in the colostrum, but a recent study has shown no effect on risk of Johne's disease (Godden et al, 2015). Pasteurisation of colostrum and milk also reduces infectious load of other pathogens
- Improve supervision of the calving cow, e.g. by use of CCTV or an intra-vaginal calving alert device
- Increase area available for calving. It may be possible to calve outside
- Improve hygiene in the calving yard by more frequent cleaning and increased use of bedding
- Increase calf vigour by correcting trace element deficiencies (especially heifers' calves)
- Use a mobile cluster to milk out colostrum immediately after calving
- Cool colostrum immediately after it is milked, and keep it covered
- Improve stockmanship quality with training and increase labour inputs so stockpersons have adequate time for calves.

Inadequate milk feeding

Data collected in the practice have shown that, on average, calves do not grow at all in the first 8 days after birth, and there is little

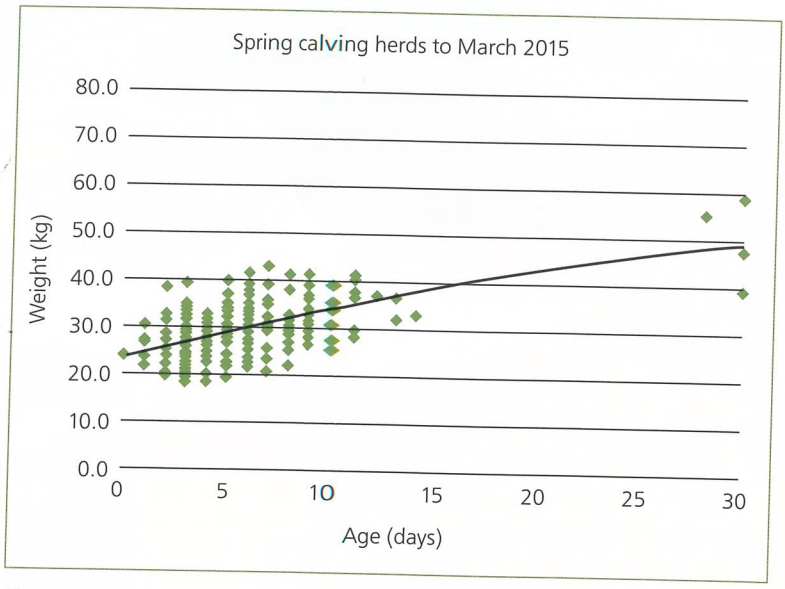

Figure 1. Weight for age of calves in spring-calving herds, showing that calves immediately start to grow when fed plenty of milk.

growth in the first month (Bazeley et al, in press, 2016). Growth rate to 60 days is 0.5 kg/day, which other studies have shown to be associated with reduced milk yield in first lactation (Bach and Ahedo, 2008). This poor growth is mainly due to low milk intake.

- Calves are fed only 1–1.5 litres milk twice daily for the first 7–10 days of life, equivalent to total 250–375 g milk replacer (MR) per day at 125 g/litre, which is adequate only for maintenance of the 40 kg Holstein heifer calf
- Milk offered then increases to 2 litres (500 g MR per day at 125 g/litres) twice daily later (adequate for only 0.2–0.3 kg/day daily live weight gain (DLWG))
- Calves may be fed only 3 litres once daily (375 g MR at 125 g/litres), usually to save labour costs
- MR is often made up at reduced concentration (12.5% concentration wrongly calculated as 125 g MR added to 1 litre water, rather than made up to 1 litre mixture) or without measuring
- The lower critical temperature for the young calf is 15°C (Webster, 1994), and higher with wind chill or if bedding is damp. Below this temperature the calf must use energy to keep warm. Calf sheds drop below this temperature for at least part of the time for many months of the year
- Disease (mainly diarrhoea) reduces growth in the milk-fed calf. Effects may be prolonged if it is not managed correctly so that there is long-term damage to the gut lining.

Potential solutions

- Increase milk offered to calves. Spring-calving herds in the practice try to ensure high calf growth rates and tend to feed large quantities of milk (the highest that the author has observed were Channel-island calves, weighing about 25 kg, penned in groups of 12 and fed 100 litre milk per day – 8.3 litres per calf — by the time they were 7 days old). This can be done by increasing volume or by increasing concentration of MR to 150 or 170 g/litre. This achieves good growth from birth (*Figure 1*). High milk feeding is not associated with higher incidence of diarrhoea (Grove-White, 2012)
- Pre-weaning rearing costs for calves are approximately 11% of total rearing costs (Boulton et al, 2015) and calves whose early growth is better are more likely to achieve target service weight at the correct time (Bazeley et al, in press, 2016). Thus, extra labour and feed costs during the pre-weaning period are likely to REDUCE overall rearing costs, rather than increase them
- Measure MR every time
- Increase milk intake in winter. Calves require an extra 50 g MR or 0.33 litre milk for each drop of 5°C less than 15°C for calves less than 3 weeks, or below 10°C for calves over 3 weeks. This can be achieved by increasing concentration of MR or by increasing volume. Calves should be fed MR with at least 18% fat (AHDB, 2016)
- Keep calves warm by providing calf coats to 3 weeks, by increasing bedding and reducing draughts
- Protect calves from infectious disease and ensure that standard operating procedures (SOPs) for effective management of the scouring calf are in place.

Post-weaning growth check

In many herds there is a large increase in variation of weight-for-age after weaning (*Figure 2*). This is generally due to:

- Disease (usually bovine respiratory disease (BRD)). BRD reduces calf growth rate (Lorenz et al, 2011b) and growth of dairy heifers (Van der Fels-Klerx et al, 2002). Heifers with a history of four or more BRD cases are less likely to survive first lactation, have higher AFC and reduced first lactation milk yield (Bach, 2011)
- Inadequate protein intake. Protein requirements are low (around 30 g per day) for maintenance, but high for growth, so post-weaning ration requires a crude protein (CP) of 18–19% (Husband, personal communication, 2014). For many calves, protein intake dips rapidly at weaning, with removal of milk and transition to a rearer pellet with a CP of often only14–16%. The weaned calf also has a relatively high requirement for rumen by-pass proteins, since the rumen is not fully mature until 5+ months
- Poor rumen development. Calves that are weaned only according to age may not be ready for the change. Development of rumen papillae is stimulated by intake of concentrate, and calves will not eat concentrate that is stale or contaminated with faeces, where there is inadequate trough space or if access to fresh water is restricted. Ad lib milk feeding restricts concentrate intake, so calves may suffer a severe post-weaning check unless weaning is managed carefully. Any disease during the pre-weaning period is likely to reduce rumen development
- Competition for feed. Weaned calves are often grouped in large numbers where animals may be different ages and sizes. Even where trough space appears adequate, bigger animals will eat a disproportionate amount of feed offered.

Potential solutions

- Control and prevent disease
- Feed the weaned calf a ration that includes adequate, high quality protein

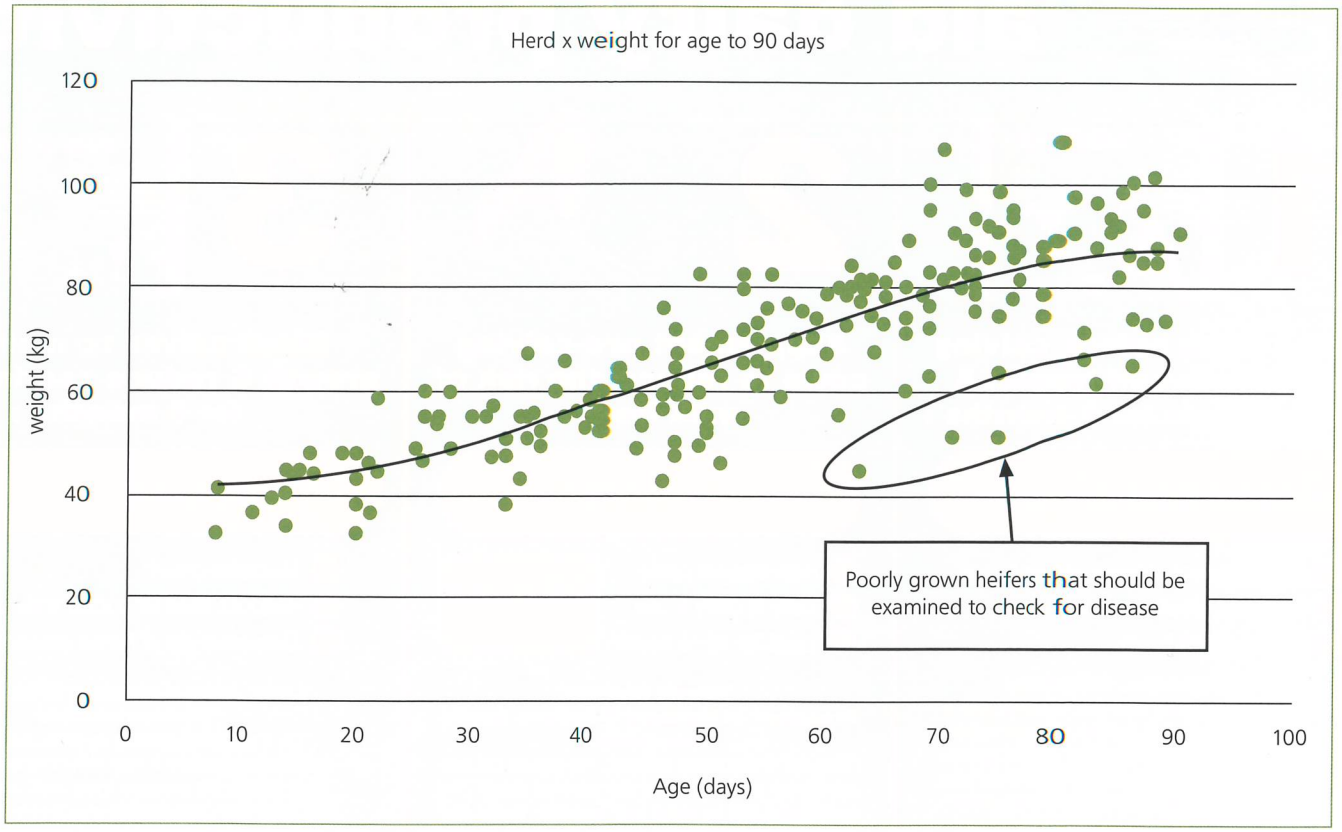

Figure 2. Weight-for-age graph to show increase in weight variation after weaning, with some heifers growing very poorly.

- Do not wean the calf until its rumen is functional. There should be several weaning criteria: it should eat at least 2 kg concentrate per day for 3+ days before weaning; it should spend time chewing the cud at rest; it should have doubled its birth weight
- Make sure that fresh water is always available (this is also a legal requirement)
- Delay weaning for very small calves or those that have suffered disease
- Wean gradually over 7–10 days. This is particularly important for calves fed ad lib milk, or poor weaning management may eliminate all the advantages of high milk intakes
- Maintain manageable group sizes. Where housing/facilities prevent this, creep feeders can enable smaller calves to be fed ad lib concentrate while the remainder are fed a restricted ration
- Feed concentrate at least twice a day
- Monitor weights around weaning and tackle problems as they emerge.

Falling growth rate after mid summer

Heifers that are turned out to pasture usually grow very well in the early part of the season. There is little/no competition for feed and protein levels are adequate. Young cattle have an excellent capacity for compensatory growth, so heifers may achieve growth rates of well over 1 kg daily during the spring and early summer. Growth rates fall from mid summer due to falling pasture quality and/or parasite infestation. Where heifers remain at grass until late autumn, growth rates may fall to zero where they are not offered supplementary feed.

Potential solutions

- Supplementary concentrate feed twice a day
- Worm egg counts to monitor parasite burden
- Monitor weights to check that growth rate is on target. Heifers at pasture must be handled from time to time (moving, tuberculosis (TB) testing, fly control etc.) and can be weighed at the same time. One spring-calving herd separates the lowest 10% heifers at each weighing and feeds them extra concentrate; by the next time they are weighed, these have usually caught up.

Unequal heifer size at target age for service

Heifer weight is one of the principal determinants of puberty, and is linked with age at first service (Brickell et al, 2009a) and services per conception (Wathes et al, 2008). The heifer must achieve service weight by 13–14 months if she is to calve at 24 months, and variable heifer size is often associated with poor heifer fertility and variable AFC. It is the result of all the accumulated problems outlined above.

Potential solutions

- Weigh heifers around 2 months before target service date. Separate animals that are too small and provide extra high quality feed at low stocking density to promote compensatory growth

KEY POINTS

- The growth rate of the dairy heifer is an important determinant of both her rearing cost and her future performance when she joins the adult herd.
- Targets can be set for each herd according to mature weight of cows in 3+ lactation.
- Key times to weigh the heifer are: at birth, at weaning, prior to start of the target service period, and before service at 13–14 months but any and all weight data are useful.
- Average growth rates and variation in heifer growth should be monitored.
- The commonest problems with inadequate growth rate are: poor colostrum intake, inadequate milk intake, poor weaning management, reduced growth of grazing heifers after mid summer and variable size of heifers pre-mating.

- Check records to identify animals with a history of disease or other problems that may make them unsuitable to join the milking herd
- Make a clinical examination of animals whose growth is unexpectedly poor and treat as required
- Control parasites and correct trace element deficiencies.

Can heifers grow too fast?

So far, this paper has discussed how to increase heifer growth because inadequate heifer growth is so common. However, it is possible for dairy heifers to grow too fast; heifer growth should be limited to 0.8 kg/day from weaning to puberty for maximal first lactation milk production, or 0.84 kg/day for maximal milk protein production (Zanton and Heinrichs, 2005). Very high pre-pubertal growth rates have been associated with reduced first lactation milk yield (Van Amburgh et al, 1998), although the effect may be less in high genetic merit heifers (Carson et al, 2002). Over fatness may jeopardise future milk production, and may be associated with increased incidence of dystocia and post-calving problems (Le Cozler et al, 2008). A group of heavily pregnant heifers in a large herd in the practice suffered a severe pre-calving ketosis after they were turned out to pasture in April. Sudden bad weather precipitated a clinical syndrome similar to pregnancy toxaemia in ewes, with several deaths and very high beta-hydroxy-butyrate (BHB) and non-esterified fatty acids (NEFA) concentrations in other members of the group. They suffered a high incidence of post-calving problems such as left displacement of the abomasum (LDA), despite intensive therapy. These heifers were particularly well grown, achieving growth rates of around 1 kg/day throughout the rearing period. Some were over fat. This syndrome is well documented among beef heifers, but is not common in dairy animals, and it is not yet clear whether this was an isolated disaster or the tip of a much bigger iceberg. Further investigations are underway.

Conclusion

Achieving optimal heifer growth is essential for minimising replacement costs and optimising future performance by ensuring that heifers achieve their genetic potential once they join the adult herd. LS

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