The impact of early calfhood disease

Sharon Magnier focuses on the impact of early calfhood disease on subsequent performance

Optimum management, nutrition, genetics and the absence of significant calfhood diseases are the most important factors in ensuring that heifers reach their target weights at weaning and puberty. Ideal management will result in a first calving age of 24 months[1].

Calves with poor colostrum intake and inadequate immunity in early life were found to cause a 40% increase in treatment costs on farm[2]. While treatment and prevention costs of disease can be substantial, the economic impact of reduced performance can often be greater[3].

The All-island Animal Disease Surveillance Report for 2012 showed that just over one in three calf deaths in the first month of life are due to enteritis or scour. The most common causes of calf diarrhoea are cryptosporidia and rotavirus with each diagnosed in 23% and 18%, respectively, of neonatal calves on post mortem in Ireland. A similar pattern is reported in Northern Ireland with cryptosporidia diagnosed in 16% of neonatal calves on post mortem and rotavirus a close second at 15%[4].

Rotavirus and cryptosporidia are thought to be present in all herds so the risk of infection is always present. Other causes are coronavirus, enterotoxigenic E.coli, *Salmonellae* and *Clostridium perfringens*. Mixed infections with more than one agent are also common and are more severe than single infections.

During 2012, respiratory tract infections were diagnosed in 29% of one-to-three-month-old calf death cases in Ireland, and in 42% in Northern Ireland[4]. These deaths represent a serious loss in income. However, on the majority of farms the biggest income losses are due to treatment costs and poor lifetime performance of calves that suffer from these infections. These animals have lower daily weight gain and, in the case of replacement heifers, older age at first calving and reduced milk yield in the first lactation. These cumulative factors over the lifetime of the animal on farm, are among the hidden costs of a respiratory disease/ diarrhoea outbreak.

GROWTH RATES AND TARGETS

The growth rate targets (Table 1) of female calves from birth to sexual maturity, and whether or not they are achieved, determine the age at first calving. Heifers that grow well pre-weaning will calve earlier and have a higher milk-producing potential than those heifers that have had reduced growth rates due to early calfhood disease. A delay in achieving the typical Holstein heifer weight of 250 to 273kg needed to experience puberty will delay the whole production cycle by delaying the age at first service.

Table 1: Growth rate targets for heifer calves

Prepubertal period growth rate[5].	**600g daily.**
Weight at puberty[5].	**250 – 273kg.**
Weight at breeding if calving down at 24 months[1].	**60 to 65% of mature body weight.**
Weight at calving[1].	**90% of the mature body weight of the mid-lactation four-year-old cows.**
Body Condition Score (BCS) at calving[1]: scale 1 – 5.	**3-3.5 (dairy). 2.75- 3.25 (suckler).**

Milk production is affected by the growth rate of heifers[5]. It is reported that the optimal growth rate in the prepubertal period (100kg to sexual maturity) of Holstein types and Jerseys, is 600g daily, in order to achieve greatest milk production in the first lactation. A daily growth rate of 600g daily results in a greater milk production in the first lactation than animals that grow either faster or slower than 600g daily[5]. For heifers to calve at 24 months, they should reach at least 60% to 65% of their mature body weight at breeding and at calving should have attained 90% of the mature body weight of the mid-lactation four-year-old cows[1]. On a five point scale, the Body Condition Score (BCS) of dairy heifers at calving should be between 3 and 3.5 and for suckler cows 2.75 to 3.25[1]. Cows or heifers that are either too fat or too thin around this critical transition period will run into significant problems.

PRODUCTION LOSSES DUE TO DISEASE

Growth rates: Calf growth rates will be affected by disease. Pneumonia (Figure 1) is associated with a reduction in average daily gain (ADG) of 66g during the first month of a calf`s life[5].

The relative decline in growth rates for female dairy preweaned calves has been reported as 8% for calves with pneumonia alone, 18% for calves with diarrhoea alone, and 29% for calves with both pneumonia and diarrhoea[5]. The more chronic the disease, the greater the impact on subsequent growth rates. It has been reported that the ADG of calves treated for over 22 days for pneumonia or diarrhoea, or both, is 110g less than calves that experience the same diseases, but have recovered by day 11. In this study, calves that experienced illness for 11 to 22 days gained on average about 50g less daily than calves that had recovered by day 115. Calves that were ill for longer than 11 days had still not managed to compensate for this reduced growth rate by five-months-of-age[5].

Carcase quality: A recent study in the UK highlighted the

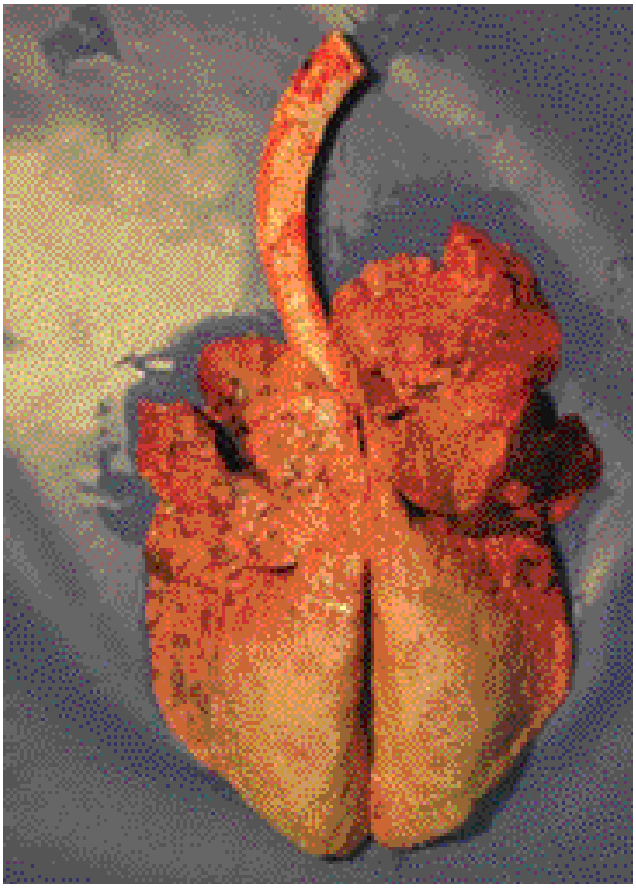

Figure 1: Male Holstein calf lung showing bronchopneumonia due to *Mannheimia haemolytica*.

impact of bovine respiratory disease (BRD) in early life on liveweight gain at slaughter. In this study, the lungs from 645 bull beef from 15 units were examined at slaughter and given a score relating to the presence and severity of consolidation and pleurisy. As well as examining the lungs, data on dead-weight and carcase grade were also collected. Pleurisy and consolidation were found to be correlated within cattle and both pleurisy and consolidation were associated with reduced estimated daily live weight gain (EDLWG). Consolidation was found to have a stronger statistical association with EDLWG and cattle with three, four, five or six consolidated lobes had a significant reduction in EDLWG of 72, 113, 123 and 202g respectively[3]. Animals with a significantly faster EDLWG, and fewer consolidated lung lobes produced higher grade carcases at slaughter whereas animals with lung damage were significantly more likely to produce a lower grade carcase and a lower price per kg dead weight at the factory[3]. BRD lesions at slaughter are commonly associated with Mannhaemia haemolytica and this study highlights the need to prevent BRD with vaccination. This UK study also corresponded well with similar findings in other countries where the presence of lung lesions at slaughter has been associated with a reduction in growth performance of 180g/day[3].

Milk yield: Calfhood pneumonia can lead to production losses due to a reduction in milk yield. A study in a Northern Ireland dairy herd reported no milk yield losses in the first lactation of heifers that had been administered a single treatment for pneumonia as calves. However, heifers that required more than one treatment for pneumonia as calves had approximately a 5% reduction in milk yield in the first lactation and a 10% reduction in the second lactation[2]. This illustrates the importance of selecting treatments that will minimise the relapse rate for pneumonia in clinically-affected calves. Colostrum intake shortly after birth will also affect subsequent milk production. It has been reported that calves that received four litres, rather than just two litres, of colostrum in the first hour of birth, had approximately a 10% higher milk yield in the first lactation, and approximately a 15% higher milk yield in the second lactation[2].

In estimating treatment success for enteritis and pneumonia in any scour outbreak, a thorough disease investigation is warranted in order to identify the underlying causative pathogen as disease management advice will vary depending on the diagnosis made. For example, where Rotavirus, Coronavirus or enteropathogenic E. coli are identified from fresh faecal samples, cow vaccination prior to calving should be recommended. When Cryptosporidium parvum is identified, management will focus on treatment of calves with halofuginone lactate as well as general hygiene and husbandry. Halofuginone lactate works by delaying the development of oocysts by approximately one week and by reducing the number of oocysts excreted. As a result, the calf is older when immunologically challenged with C. parvum. The time of onset of disease is an important consideration in management of the disease. It has been reported that delaying the onset of diarrhoea by one day will reduce the duration of the disease by 0.2 days and improve ADG by about 10g[5].

The treatment of calf pneumonia should focus on early detection of clinical signs and the selection of antibiotics that will result in success after the first treatment. Between one to two thirds of animals that do not respond to the first treatment will be permanently affected or lost from the herd[6]. Gauging the success of different treatments or management changes during a disease outbreak can be difficult. Cattle scales are becoming more commonly used on farms and, as a result, changes in body weight during treatment can be used to give an indication of the treatment success on an individual farm basis. Calves that continue to gain up to 5% of their initial bodyweight during the first treatment for pneumonia are almost three times less likely to relapse than calves that continue to lose weight during treatment. Calves that continue to gain over 5% of their initial bodyweight during treatment are 11 times less likely to relapse[7].

COLOSTRUM

The value of colostrum in disease management and control has long been known. Failure of passive transfer (FPT, serum IgG < 10 g/l in newborn calves, after 24-hours-of-age), where calves do not receive enough antibodies via colostrum soon enough after they are born, will greatly increase morbidity and mortality in both dairy and in beef calves. Colostrum is important, not just for immunoglobulin transfer, but also for the passive transfer of cytokines and growth factors[8]. Calves that survive through FPT will have poorer growth rates than those calves that received adequate colostrum. Calves receiving good quality colostrum in appropriate volumes in an appropriate time frame will grow at least 100 g/d faster than calves that have not received any colostrum at all5. Ensure that three litres of colostrum are fed to dairy calves weighing 35 to 45 kg within two hours of birth1. Smaller dairy breeds such as the Jersey should be fed 2 to 2.5 litres within the first two hours9. The IgG concentration in colostrum falls by 3.7% every hour that passes post calving, hence the importance of early suckling or administration of colostrum[8]. The level of antibody absorption through the calf`s intestinal wall also decreases rapidly after the first six hours of life. Therefore, adequate colostrum intake within this time frame is vital. Despite the fact that the importance of good colostrum management has been emphasised for years, it is still an area of weakness on the overall management of calves on farm. In the All-island Animal Disease Surveillance Report for 2012, analysis of the zinc sulphate turbidity test (ZST) levels of neonatal calves at post mortem found that the levels in 70% of the calves submitted were inadequate and only 30% of the calves had ZST levels that were deemed adequate4.

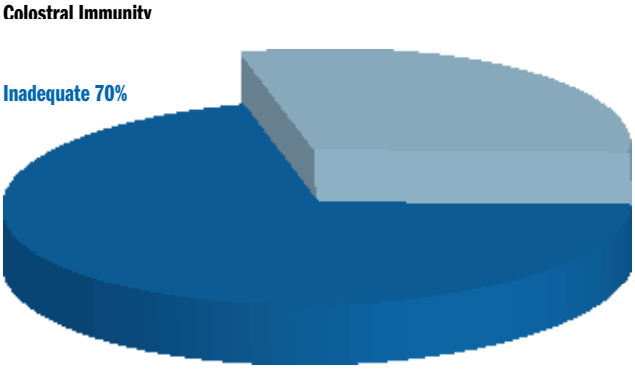

Figure 2: All-island Animal Disease Surveillance Report for 2012. The results of ZST tests performed by AFBI and DAFM laboratories on samples taken from neonatal calves at postmortem examinations during 2012, presented as reflecting adequate (≥20 units) or inadequate (<20 units) (n = 958).

Failure of passive transfer can be evaluated using the ZST or serum total protein (TP). TP can also be used to assess colostrum management, however, it should only be used to evaluate the colostrum intake of healthy calves as opposed to sick, dehydrated calves. When evaluating colostrum management on farm using either Serum TP or the ZST test, 80% of samples should have a value above 55 g/l or 20 units respectively[9].

In summary, the calfhood disease effects on daily liveweight gain, age at first calving and milk yield in the first and second lactation will have a significant impact on overall herd performance. However, good diagnostic evaluation, management advice and appropriate therapy selection can limit the impact of these common calf diseases.

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