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Fertility and health management of suckler cow herds

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Summary

- Reproductive efficiency is central to economic and environmental sustainability of suckler cow herds and is influenced by number of factors.
  - Puberty and age at first calving.
  - Duration of the post-calving anoestrous interval which is largely affected by cow-calf bonding and pre-calving nutrition.
  - Heat detection efficiency where AI is used or bull fertility in herds using natural service.
  - Infectious agents which can negatively impact on cow fertility by increasing rates of embryo mortality and in particular, abortion. Bacterial agents remain the primary cause of bovine abortion in Ireland.
- Preliminary findings from a serosurveillance study of 169 Irish beef herds indicate a prevalence of 78%, 71%, 44% and 5% for BVD, leptospirosis, IBR and neosporosis in non-vaccinating beef cow herds, respectively.
- A national study of over 300 beef herds documented a herd prevalence of liver fluke of >90%, an infection which can exacerbate the impact of bacterial infections.
- Management practices and biosecurity.

Introduction

Herd fertility and health are two of the main factors determining output and ultimately the profitability of suckler cow herds. In Ireland there is evidence that over 80% of replacement heifers fail to meet the target age at first calving of 24 months; the average calving-to-calving interval is frequently in excess of 400 days and only eight out of every 10 cows produce a calf within a 12-month period. These statistics do not bode well for the future economic and environmental sustainability of the national suckler cow herd. In this chapter the key elements of fertility and health management of spring-calving beef cow herds will be discussed.

Reproductive targets for a beef herd

The reproductive and productive targets for a suckler cow herd can be summarised as follows: 1) 365 day calving-to-calving interval; 2) <5% cows culled annually as barren; 3) >95% of cows calving, wean a calf; 4) heifers calving at 24 months of age; 5) compact calving with 80% of cows calved in 42 days; 6) replacement rate 16-18%; 7) sustained genetic improved of the cow herd for economically important traits relating to reproduction, calving ability and calf weaning weight; and 8) close alignment of calving date with onset of pasture availability in the spring.

There are three key benchmarks that must be achieved in a timely fashion in order to meet the above targets. These are:

1) Occurrence and timing of puberty and breeding of replacement heifers;
2) Resumption of oestrous cycles post calving; and,
3) Breeding and the establishment of pregnancy.

1. Occurrence and timing of puberty and breeding of replacement heifers

Replacement heifers represent the next generation of cows in a herd and ideally each year's cohort of heifers should be genetically superior to their predecessors. Significant costs are incurred during the rearing of replacment heifers and it is imperative that they become pregnant early in their first breeding season, encounter minimal dystocia, are successfully rebred to calve again within 365 days, and ultimately, have long (at least 6 lactations) and productive lives within the herd. Data from Grange studies clearly show that delaying first calving from two to three years of age decreases net margin per hectare by 50%, mainly as a result of increased feed costs. Therefore, the target should be to first calve at two years of age. Indeed, within a two-year old calving system, heifers that conceive early during their initial breeding season have a greater probability of becoming pregnant as first calving cows, have greater lifetime prodution (calf weaning weights), and tend to calve earlier in subsequent years compared to their contemporaries that conceived later as heifers. Hence, age at which puberty occurs, (defined as the developmental stage that supports normal oestrous cycles combined with the ability to become pregnant) will impact on the time of conception in the first breeding season and ultimately lifetime productivity. Additionally, conception rates are typically lower at the pubertal compared with subsequent heats.

There is some variation in the published literature on the threshold proportion of mature bodyweight which heifers must attain before undergoing puberty and absolute weight targets will vary in accordance with breed. In general, it is currently advised that replacement heifers should attain in the region of 65% of mature body weight at the start of the breeding season to ensure that a high proportion are pubertal and eligible for breeding, with a target of 60-70% pregnant after 3 weeks of breeding. However, the concept of 'mature weight' for any particular breed type or crossbred is debatable making it difficult to set clear body weight targets. Thus, in order to generate accurate guidelines on the nutritional management of replacement of replacement heifers for the suckler herd, our group are currently engaged in large Department of Agriculture Food and the Marine (DAFM) funded project examining the effect of post-weaning (>8 months of age) plane of nutrition in heifers sourced from either beef or dairy herds and sired by either Aberdeen Angus or Limousin bulls on age at puberty and subsequent fertility. The results of this study will be available later in 2016.

2. Resumption of oestrous cycles post calving

Suckler cows are on average much longer calved when they resume oestrous cycles than dairy cows, with average calving to first ovulation intervals of 50-55 days recorded in a number of Tegasc studies. This is almost twice as long as the equivalent interval for dairy cows. Additionally, for the first-calving beef cows (heifers) this interval is usually 10-15 days longer than mature cows.

Cow-calf bonding: The predominant reason for the long anoestrous (absence of normal oestrous or 'heat' cycles) interval in suckler cows compared to dairy cows, is the strong maternal-offspring bond that exists between the dam and her calf. This bond is predominately affected through sight and smell. Teagasc studies have shown the "cow-calf bonding effect" is further compounded by having suckler cows in a low body condition score (BCS) at calving. Indeed the effect of low BCS at calving are only partially reversed by placing cows on a high plane of nutrition after calving. Teagasc studies have shown a clear benefit of short-term restricted suckling for shortening the interval between calving and first breeding. While the labour input is significant, many commercial herds in Ireland are successfully implementing this practice for autumn and early-spring calving herds, in particular. For herd owners planning to use calf seperation the following is recommended:

- Commence calf separation and twice daily suckling at day 30 post-calving and continue for two weeks. Ideally keep the calves and cows 50 meters apart. Between 85-90% of cows will exhibit fertile heat within 18-22 days. About 10-15% of cows fail to ovulate in response to calf separation (nutritional anoestrus). It is unlikely that these cows will respond to synchronisation either until such time that their BCS is improved. Calf separation is particularly applicable to late-calving cows and first-calvers. However, it does entail some additional labour.

Role of nutrition: From the published literature it is clear that: 1) prepartum nutrition is more important than postpartum nutrition in determining the duration of postpartum anoestrus; 2) energy is the primary nutrient regulating reproduction in female beef cattle and inadequate dietary energy during late pregnancy lowers fertility even when dietary energy is adequate during lactation; and, 3) a BCS of 2.5-3.0 (scale 0-5) will ensure that body reserves are adequate for postpartum reproduction. The reported effects of increased nutrient intake after calving on duration of the postpartum anoestrous

interval are inconsistent. However, there is evidence that thin cows at calving and particularly first-calvers and young cows respond to increased postpartum nutrient intake with enhanced reproductive performance although reproductive performance may still be less than adequate. It may well be that a certain level of body fatness may be a prerequisite for occurrence of puberty and resumption of postpartum oestrous cyclicity.

3. Breeding and the establishment of pregnancy

In suckler cows, unlike dairy cows, there is no substantial evidence of a temporal decline in conception rate and typical 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 ar bred at 40 days or less after calving, conception rate is usually <40% but it is still advisable to breed such cows once the breeding season has commenced. Additionally, post-calving conception rates are often lower for first-calvers compared to mature cows, which is a reflection of the increased nutritional demands of the young cow for growth in addtion to maintenance and lactation requirements. Where AI is used, fertility is highest following insemination at 12-18 hours after heat onset but is not greatly reduced following early insemination. However, late insemination, at 24 hours or later, after onset of standing heat, should be avoided.

Role of infectious diseases in cow infertility

A number of infectious diseases are known to affect a cow's ability to produce a live calf, breed successfully, and subsequently carry a healthy calf to full term (Table 1). *Brucella abortus* and bovine viral diarrhoea virus (BVD) are currently the only agents listed that are under statutory control. The Republic of Ireland is now classified as 'brucellosis-free' as no confirmed cases have been reported in the past number of years and the level of BVD have been significantly reduced.

Table1. Infectious causes of infertility (embryo loss and abortion) in cattle. Those agents highlighted in **bold** have recorded cases of bovine abortion in Ireland since 2008 (DAFM, 2009-2010).

Bacterial	**Viral**	**Protozoan**	**Fungal**
Salmonella spp.	**Bovine viral diarrhoea virus (BVD)**	***Neospora caninum***	***Aspergillus fumigatus***
Leptospira spp.	**Bovine herpesvirus-1 (IBR)**	*Tritrichomonas fetus*	**Mucor spp.**
Arcanobacterium pyogenes	*Bluetongue virus*	*Toxoplasma gondii*	*Morteriella wolfii*
Bacillus lichenifomis	Epizootic bovine abortion	*Anaplasma marginale*	
Listeria Monocytogenes	Akabane virus		
Campylobacter fetus	Schmallenberg virus		
Coxiella burnetti			
Chlamydophila spp.			
Haemophilus somnus			
Ureaplasma spp.			
Brucella abortus			

(Adapted from Givens and Marley, 2008)

Fertility-related infectious diseases in Ireland

An infectious agent can impact cow fertility in a number of ways, including:

- Affecting the uterine environment post-calving (endometritis);
- Resulting in embryonic death following breeding. Embryonic death can be described as termination of pregnancy and loss of the embryo prior to day 42 following insemination, with the cow returning to service; or,
- Resulting in abortion. Abortion can be described as termination of pregnancy and loss of the foetus post day 42 following insemination.

The Regional Veterinary Laboratories in Ireland carry out a significant number of foetal examinations on an annual basis and the most common infectious causes of abortion since 2008 continue to be *Salmonella Dublin, Leptospira intrrogans* serovar *hardjo,* and *Neospora caninum. Arcanobacterium pyogenes* and *Bacillus lichenformis* also record significant levels of abortion but these tend to occur on a more sporadic basis and preventative measures are difficult to apply, although *B.lichenformis* thrives in spoiled feed and forage. Embryo losses due to infectious disease are more difficult to quantify as investigations tend to be carried out at farm-level and are not reported nationally. Thus, in order to address this void in information, Teagasc led a large DAFM funded suckler cow herd prevalence study ('BeefCow' programme) which incorporated investigations into BVD, IBR, *L.interrogans* serovar *hardjo* and *N.caninum* in order to provide information on the potential impact of these diseases on herd fertility. Additionally, although not a direct cause of abortion, liver fluke can exacerbate the impact of certain infection disease (i.e. salmonellosis) on farm. Many international studies are also on-going which are investigating the impact of liver fluke infection on overall cow fertility and such investigations are also planned over the course of the 'Flukeless' programme, led by Teagasc Moorepark. It is important, therefore, not to disregard the impact parasitic disease may have on herd fertility. A brief summary of the two aforementioned national on-farm studies is outlined below.

'BeefCow' study

In the summer months of 2014 and 2015, almost 6,000 cows from 169 spring calving suckler cow herds across the island of Ireland (32 counties) were blood sampled to measure the levels of herd exposure to *Leptospira* species, BVD, bovine herpesvirus-1 (BoHV-1 (causative agent of IBR)) and *N.caninum.* A comprehensive survey was also carried out to determine a vaccination policy undertaken by each study farmer. Preliminary findings from the study indicate exposure to *Leptospira* species, BVD, BoHV-1 and *N.caninum* in 71%, 78% 44% and 5% of non-vaccinating suckler cow herds. Some practical steps that can be taken to reduce the risk of exposure to these infectious diseases is outlined in the diseased specific section below.

'Flukeless' study

A total of 250 beef herds were investigated for exposure to liver fluke in winter 2014/2015. Participating herds were selected on the basis of geographic location and herd size in order to best represent the distribution of beef herds nationally. Based on antibody testing of 6-7 cows in each herd, over 90% of herds and approximately 65% of cows sampled were positive for liver fluke. These very high levels of liver fluke exposure require increased control at farm level in order to reduce the impact of this disease on productive and reproductive efficiency.

Steps in taking control of infectious diseases

The following three steps are the critical components in achieving control of infectious diseases on beef farms (Figure 1).

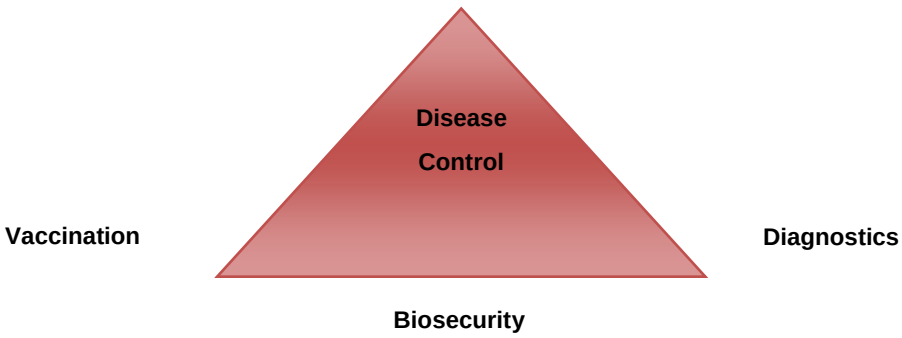

Figure 1. Components of an on-farm health planning and disease control programme.

Step 1: Implementation of biosecurity

Biosecurity is the single most important contributor to the prevention of infectious diseases and subsequent losses on a farm. The higher the level of a particular disease in a country (prevalence of a disease), the stricter the biosecurity measures required to reduce the risk of disease introduction. Based on results from the 'BeefCow' and 'Flukeless' studies, leptospirosis, BoHV-1 and liver fluke present significant risks and biosecurity should be aimed at minimizing their spread.

Implementation of a strict closed herd policy is *the* critical component of disease control. A closed herd policy (i.e. no cattle movement, including bulls, onto the farm) will block the direct importation of disease onto a farm. If at all possible, a suckler herd should aim to remain a closed herd although this is not as easily achieved compared to dairy herds.

As disease transmission can also occur by means other than purchasing an infected animal, beef farmers should aim to implement as many of the following procedures as practically possible:

- Maintain stock-proof and disease-proof (3 meter gap between neighboring farms to prevent nose-to-nose contact) boundaries on all land parcels.
- Use footbaths – need to be well-maintained (cleaned and re-filled regularly).
- Signage should be used to maintain awareness of biosecurity on farm.
- Aim to use separate disposable needles for each animal when administering medications or taking samples.
- Separate rectal sleeves should be used for each animal when scanning, examining or treating cows.
- Importation of animal products (slurry, colostrum) should be avoided.
- Vehicles visiting the farm should be kept at a safe distance from animal areas e.g. housing, holding yards, roadways.

It is important to recognize that an animal health plan once implemented will act as an insurance policy against infections disease. It is not a guarantee that a herd will remain disease free but it will significantly reduce the risk of disease introduction into a herd.

Step 2: Diagnostic testing

The usefulness of diagnostic testing on Irish beef and dairy farms is often underestimated and besides routine annual screening of herds for TB and BVD, many beef farms do not carry our any additional routine herd health screening. Use of sentinel animals (i.e. indicator animals tested at least annually) can prove a useful means to detecting changes in herd disease status, especially in the case of smaller herds. Such a strategy can be used to provide an on-going insight into the disease status of a herd and provide valuable supporting information for the implementation of both biosecurity and vaccination protocols.

Step 3: Vaccination

It would appear that the up-take of vaccines by Irish farmers is much greater than the up-take of either biosecurity or diagnostic testing. Vaccines play a hugely important role in the control of many infectious diseases. Their use, however, without the supporting knowledge provided by diagnostic testing and the implementation of biosecurity plan, could potentially undermine their effectiveness in a disease control programme. Misuse of vaccines is also a significant contributing factor to the failure of a vaccine programme. Vaccine instructions must be read in their entirety and the number of injections administered, dosage and correct vaccination timing adhered to, in order to achieve successful vaccination. Vaccines should be viewed as a component of a control programme but not as the sole means of disease prevention within a herd. Over-reliance on vaccination without the backup of proper management, biosecurity and diagnostics should be avoided. Consult with your vet on how best to implement a herd health program to protect your herd.

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

The prevalence of BVD, IBR, Leptospirosis and neospirosis in non-vaccinated suckler herds is alarming! A herd prevalence of liver fluke of >90% is also alarming although of course Ireland in general has a wetter climate than most of the UK. A lot of these diseases are ‘hidden’ as cows appear to be relatively healthy but the effects on cow fertility for example are very significant with increased incidence of barren cows and few calves reared to weaning. All efforts should be made to control these diseases and in England producers should sign up to the BVDFree England Scheme. Joining an accredited health scheme is also recommended.