

Management of infectious diseases in split-calving dairy herds

Dr John Mee

Teagasc, Moorepark Dairy Production Research Centre, Fermoy, Co. Cork

Summary

Infectious disease control is far more difficult in split-calving than in spring-calving herds. There are four key steps in the management of infectious diseases. Consult your local vet about a herd health plan combining these four components and designed specifically for your herd.

1. Know your herd health status – through good stockmanship and the use of new laboratory screening tests to establish your herd health status.
2. Prevent disease introduction by biosecurity - split-calving herds need to be treated as one herd when preventing disease introduction.
3. Prevent disease spread by vaccination - split-calving herds are ideally dealt with as two herds when implementing some vaccination programmes.
4. Monitor your control programme – on-going checking both of your herd, new purchases and your implementation of the control programme.

Introduction

Non-statutory infectious disease agents currently affecting Irish dairy herds include BVD, IBR, Johne's, leptospirosis, salmonellosis, neosporosis and mycoplasmosis. In addition to these individual agents, multiple infections causing pneumonia (e.g., pasteurella, PI₃, RSV) and diarrhoea (rota and corona viruses, *E. coli*, cryptosporidia) continue to be the most important infectious diseases resulting in illthrift and mortality in calves and weanlings on Irish dairy farms. Recent Teagasc and DAFF surveys of dairy herds nationally, showed that antibodies to certain infectious diseases are widespread in our dairy herds.

- Leptospirosis, BVD and IBR (over 80% of herds antibody-positive)
- *Salmonellosis* (65%)
- Johne's disease (30%)

However, infectious diseases need to be kept in context. Business planning, cow nutrition, grassland management, genetics, fertility, stockmanship and non-infectious disease control are equally important aspects of profitable farming.

Why is disease apparently so widespread?

The current widespread distribution of IBR, Johne's and Mycoplasmosis can be attributed in part to the increase in importation of livestock into Ireland in the early 1990s (Richardson *et al.*, 2009). The considerable amount of animal movement between farms in Ireland is also a significant contributor to the apparent increase in incidence of these diseases. A Teagasc survey of 450 Irish dairy farmers in 2008 found that over 50% of Irish dairy herds can be classed as open herds (i.e. free movement of cattle onto the farm), while only 25% of herds classified themselves as closed herds (i.e., no movement of cattle onto the farm) (Sayers and Mee, 2009). Hence, risk factors such as:

- Herd depopulation, herd expansions, high cattle densities;
- fragmented holdings, poor boundary fencing, access to waterways;
- lack of pre-movement testing and post-movement quarantine; and,
- use of natural service bulls, borrowed colostrum

have all resulted in widespread exposure to infectious diseases on many dairy farms today.

Disease is more complex in split-calving herds

Split- or year round-calving herds are different from spring-calving herds in both their management and in disease dynamics. They tend to:

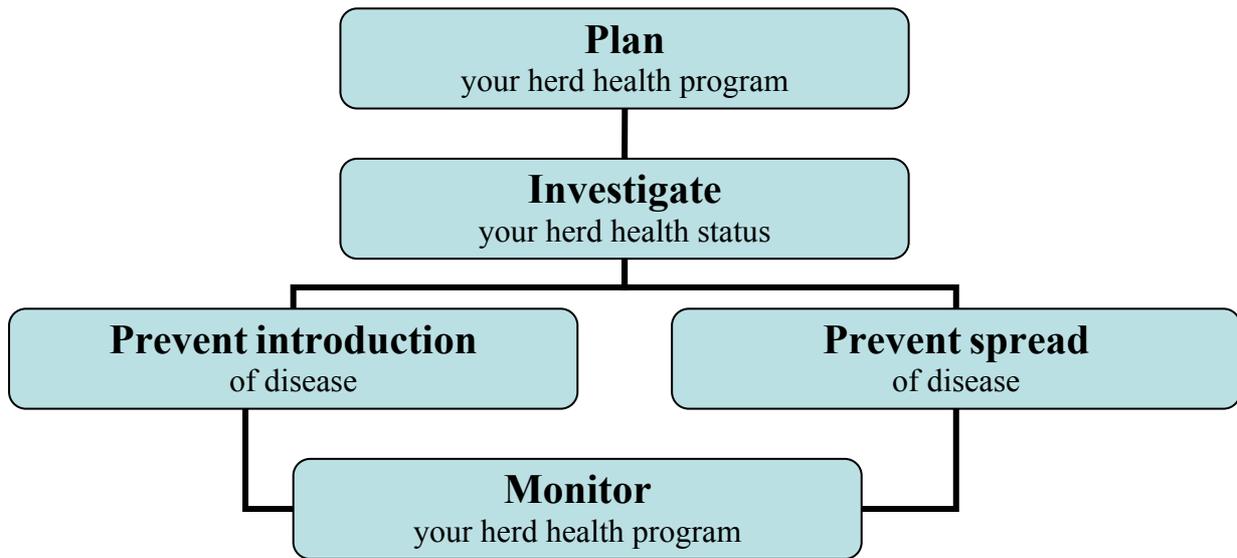
- Have higher yielding cows with increased risk of production stress;
- be located further north with the consequent longer housing period and increased risk of close animal-to-animal contact in the same air-space;
- be larger herds with increased risk of disease maintenance;
- have mixed young stock age groups housed together over the winter;
- have expanded herd size but not necessarily increased housing facilities, e.g., dry cow accommodation, calving facilities, calf housing; and,
- have roll-over cows moving between herds on the same farm with increased risk of missing disease tests or vaccination administration.

Of course, split-herds are also more likely to calve throughout the year with no discrete calving seasons making implementation of recommendations on disease control more difficult than in compact spring herds.

So what can you do to control infectious diseases in your herd?

There are four key steps in the management of infectious diseases (1) know your herd health status, (2) prevent disease introduction, (3) prevent disease spread by vaccination and (4) monitor your control programme. You are in the 'driving seat'; start the process by sitting down with your local vet and planning a herd health programme together using these four simple steps to protect your herd (Figure 1).

Figure 1. Management plan for infectious diseases in dairy herds.



Step 1: Know your herd health status

The simplest way to keep an eye on your herd health status is to herd your stock regularly for clinical signs of disease and to use your local vet to pick up problems at an early stage. In addition, there are now new diagnostic tests which allow economical screening of herds using:

- Bulk milk testing (BVD, fluke, IBR, *leptospirosis*, *neosporosis*, *salmonellosis*, worms);
- individual milk testing (BVD, IBR, *leptospirosis*, Johne's *neosporosis*, *salmonellosis*);
- targeted blood sampling of weanlings (BVD, leptospirosis);
- pooling of blood samples to reduce costs (BVD); and,
- ear-notch testing of calves (BVD).

These test methods can be used to give you a starting point from which to decide in conjunction with the clinical herd history what to do next, e.g., the implementation of biosecurity and or vaccination protocols, what tests you need to do on bought-in cattle, which vaccination policy to follow. Samples collected as part of a herd health plan with your vet provide the vital interpretation of the results. In split-calving herds the spring and autumn components should be treated separately for sampling and testing, where feasible, but both herds should be tested.

Step 2: Prevent disease introduction

With herd expansions likely to increase in the phased lead up to quota abolition bought-in stock will become a major source of disease transmission. Currently, nine out of ten dairy farmers carry out no additional routine herd health screening when buying-in cattle. Biosecurity in its simplest form means the implementation of measures to prevent the introduction and spread of infectious diseases:

- A closed herd policy (i.e. no cattle movement, including bulls, onto the farm) will prevent the direct transmission of disease onto a farm. Ireland is currently one of the few EU Bluetongue-free countries; importation threatens this.
- testing of bought-in stock should include more than TB and brucellosis. Diseases such as BVD, IBR and Johne's can all be tested for. The most dangerous animal is the pregnant animal as the fetus may be infected and the dam test-negative ('Trojan animals'); the calf needs to be tested also. Ideally bought-in stock should be tested upon arrival and again three weeks later. Non-pregnant, non-lactating cattle bought over the summer are the lowest risk.
- on-farm biosecurity measures, such as quarantine, stock and disease-proof boundaries (to prevent nose-to-nose contact and breakouts) and footbaths increase protection against the introduction of infectious diseases.

In split-calving herds the farm should be treated as one unit irrespective of which herd the bought-in cattle are added to.

Step 3: Prevent disease spread by vaccination

Sales of cattle-specific vaccines have increased by 78% over the last four years (Denise Roche, dmrkynetec, personal communication). Vaccine costs now average between €5 and €20/cow on many dairy farms. This increased vaccine expenditure is borne out by a recent Moorepark survey of Teagasc clients. Of the 450 dairy farmers who responded to the survey, 87% were using at least one vaccine. Leptospirosis, clostridial disease (e.g., Blackleg), BVD, and *salmonellosis* were the most common diseases farmers vaccinated against (Table 1).

Table 1: Vaccine use (%) amongst Irish dairy farmers

BVD	41.1	LEPTOSPIROSIS	60.7
CALF SCOUR	15.2	PNEUMONIA	7.5
CLOSTRIDIAL DISEASES	43.9	RINGWORM	2.3
IBR	6.6	SALMONELLOSIS	27.3

Vaccination programmes are best implemented where there is close veterinary involvement in the WWW.vaccinationdecisions: Whether, Which and When details of the programme.

- Whether to use a vaccine or not?
- Which vaccine to use?
- When to administer the doses?

Vaccines should be viewed as a component of a herd health plan but not the sole means of disease prevention within a herd as is commonly the case. Over-reliance on vaccination without the backup of proper compliance, management and

biosecurity can lead to real or apparent vaccine breakdown. Split-calving herds should ideally be dealt with as two herds when implementing some vaccination programmes and as one herd for others. This depends on the dynamics of individual diseases, the herd circumstances and the particular vaccine product administered. However, usually in reality both herds are treated as one to simplify management and to ensure vaccination is carried out at least once/year and some animals are not forgotten.

Examples of strategic vaccination protocols are provided hereunder. Note these are generic programmes which would need to be tailored to individual herd circumstances through consultation with your local vet to work effectively. By listing these diseases below it is not suggested that you need to vaccinate for all of them. Rather, this list provides you with the information to compare with what you currently do and to stimulate discussion with your local vet on best-practice for your particular herd.

If you find it difficult to remember when to vaccinate it is worthwhile designing with you vet a simple calendar of which month which animals need to be vaccinated on one sheet of paper and stick this up beside your farm files and in the dairy. Pick a date and stick to it. In addition, write these dates, and when you need to order product, into your diary each year. Linking vaccination dates to prominent calendar dates also helps, e.g., *'first lepto vaccine dose for heifers on St Valentine's Day and second dose on St Patrick's Day'*.

Leptospirosis (*Leptavoid-H*)

Vaccination against lepto has been associated with improved fertility and reduced incidence of intrauterine growth retardation and abortions. The four main principles underlying vaccination against lepto are to:

1. Prevent disease spread before the peak period of transmission at pasture;
2. provide protection before, not during, the breeding season;
3. prevent early infection in heifers, and
4. prevent infection in humans.

To apply these principles in a split-calving herd involves administering the single annual booster dose to all cows in early spring. This dose should be given at least a month before mating start date. For problem herds biannual vaccination may be required, upon veterinary consultation. Heifers should be vaccinated twice when they reach six months of age.

Clostridial diseases (*Blackleg Vaccine, Tribovax-T*)

The two main principles underlying vaccination against clostridial diseases are (1) to prevent disease spread before the peak period of transmission at pasture and (2) to adapt vaccination strategy to high risk local areas and years.

To apply these principles in a split-calving herd involves administering two doses of vaccine to susceptible animals in early spring around turnout. In problem herds more frequent vaccination is required, upon veterinary consultation.

BVD (*Bovidec*, *Bovilis BVD*, *PregSure BVD*)

Vaccination against BVD has been associated with improved fertility and reduced incidence of late embryonic mortality and abortions. The two main principles underlying managing immunity by vaccinating against BVD are to:

1. Provide maximum protection before mating, and
2. provide foetal protection.

Application of these principles in a split-calving herd depends on the particular vaccine used. Where *Bovidec* is used a single annual booster is recommended at least a week before the mating start date in either the spring or the autumn (whenever the largest herd is bred) to the entire herd. Where *Bovilis BVD* is used a single annual booster is recommended at least one month prior to the mating start date in the spring herd and a single annual booster at least one month prior to the mating start date in the autumn herd. Where *PregSure BVD* is used a single annual booster is recommended at least a month before the mating start date in either the spring or the autumn (whenever the largest herd is bred) to the entire herd. Differences in recommendations between products reflect differences in onset of immunity and indications for use. Heifers can be vaccinated pre-breeding with two doses approximately a month apart. Note, vaccination alone without sampling, testing, re-testing and removal of persistently infected cattle (including fetuses) will not control BVD; consult your local vet for further details.

Salmonellosis (*Bovivac S*)

Vaccination against salmonellosis has been associated with reduced incidence of clinical infection and abortions. Salmonellosis can cause diarrhoea in calves and older stock and abortion. Two peaks of *S. Dublin* abortions occur; in June of cows due to calve in the autumn and from September to December for spring calvers. The main principles underlying vaccination against salmonellosis are (1) to provide protection prior to the period of risk of abortion after drying off (usually *S. Dublin*) and (2) to boost colostrum antibody quantity and quality where salmonellosis in calves is a problem (usually *S. Typhimurium*).

To apply these principles in a split-calving herd involves discussing with your local vet which is the more likely problem on your farm and tailoring the programme accordingly. For abortion, administering the single annual booster at least a month prior to the start of drying off of the spring herd and a single annual booster at least a month prior to the start of drying off of the autumn herd is recommended. *Bovivac S* is not licensed to prevent abortion and the duration of immunity to confer foetal protection has not been established in challenge experiments hence split-herd

vaccination is recommended. Pregnant heifers can be vaccinated prior to the seventh month of pregnancy with two doses, three weeks apart. Note, *Bovivac S* provides protection against the two most common serotypes of salmonella (*S. Dublin* and *S. Typhimurium*) but not cross-protection against all serotypes of salmonella.

Calf scour (*Imocolibov*, *Lactovac*, *Rotavec Corona*, *Trivacton 6*)

The main principles underlying vaccination against calf diarrhoea are:

1. To administer the vaccine to the pregnant dam prior to calving to boost the antibody quantity and quality of her colostrum, and
2. to ensure calves ingest a sufficient volume of colostrum for long enough as they only get the benefit of the vaccination from the colostrum.

The mixing of different age groups of calves combined with the longer calving period can lead to major outbreaks of scour in the later-born calves in split herds. To apply these principles in a split-calving herd involves administering the single annual booster between twelve and two weeks, depending on the vaccine, prior to the expected calving date of the spring and of the autumn-calving herds. Administering this vaccination to cows in batches as they are dried off simplifies the task. Where *Imocolibov* is used a single dose is recommended between six and two weeks precalving with a single annual booster thereafter in the same period. Where *Lactovac* is used two doses, four to five weeks apart, between two and six weeks precalving are recommended in the first year of use and a single annual booster thereafter in the same period. Where *Rotavec Corona* is used a single dose between twelve and three weeks precalving is recommended with a single annual booster thereafter in the same period. Where *Trivacton 6* is used two doses at least two weeks apart completed at least two weeks precalving are recommended in the first year of use with a single annual booster in the same time period. These recommendations apply to heifers also. Note, these vaccines vary in their active substances and they do not provide protection against all causes of calf diarrhoea; consult your local vet for further details

Calf pneumonia (*Bovilis Bovipast RSP*, *Pastobov*, *Rispoval*),

The main principles underlying vaccination against calf pneumonia are:

1. To provide protection prior to the period of risk of infection in young calves, and
2. to provide protection prior to the period of stress in weanlings.

To apply these principles in a split-calving herd involves administering the vaccine at least a week prior to the period of stress/risk in unweaned calves in either calving season and to weanlings prior to the stress of housing in the autumn. The mixing of different age groups of calves in the same air-space in split herds over the winter greatly increases the risks of pathogen build up and respiratory disease in the later-born calves. The schedule of use is dependent upon whether the

vaccine is live/inactivated, intra nasal/not, and the active substances. While some vaccines are safe to use during pregnancy, others are not. Note these vaccines vary in their active substances and they do not provide protection against all causes of calf pneumonia; consult your local vet for further details.

IBR (*Bovilis IBR*, *Rispoval IBR*)

Vaccination against IBR has been associated with reduced incidence of clinical signs, including abortion, and reduced virus shedding. The main principles underlying vaccination against IBR are:

1. To provide protection prior to the period of stress or risk of infection, and
2. to use live, intranasal vaccine in the face of an outbreak of clinical disease.

To apply these principles in a split-calving herd involves administering the basic vaccination course (one or two doses depending on the vaccine) at least a month precalving in the spring-calving herd to prevent virus shedding from recrudescing latent carrier dams to newborn calves and in the autumn boosting this course after six months. Calves vaccinated at less than three months of age with maternally derived antibody need to be revaccinated thereafter. In cattle at immediate risk of IBR, local respiratory tract immunity can be stimulated within days by administering live vaccine via the intranasal route. Note spread of vaccine virus to in-contacts may occur following administration of live intranasal vaccine causing seroconversion. Seroconversion to IBR from field or vaccinal virus precludes admittance of male cattle to AI facilities.

Ringworm (*Insol Trichophyton*)

The main principles underlying vaccination against ringworm are:

1. To prevent disease spread amongst and between groups of cattle, primarily when housed, and
2. to prevent infection in personnel handling affected cattle.

To apply these principles in a split-calving herd involves administering the vaccine course prior to the period of risk in cattle from one month of age (including during pregnancy), irrespective of when they were born. Vaccination may also be an aid to the treatment of cattle infected by ringworm. Protective clothing should be worn by all personnel in contact with affected cattle.

Warts (*autogenous vaccines*)

Warts are caused by papillomaviruses for which there are no vaccines licensed in the ROI. Vaccines prepared from the wart tissue of affected cattle are occasionally used. The main principle underlying vaccination against warts is to stimulate the animal's immunity to cause the warts to stop growing and regress. This involves collecting a sample of an old wart, preparing the vaccine and administering it two to four times at one to two week intervals. The response is highly variable, lowest in flat warts and those on teats.

Roll-over cows

For cows that fail to go in-calf in one breeding season and are retained and bred in the next breeding season it is advisable to vaccinate them in the same way as the group of cows into which they have moved. Note that roll-over cows in excessive body condition are at greater risk of compromised immune function. Beware also of movement of undetected 'Trojan BVD' cows between herds.

Concurrent use of vaccines

It is not recommended to administer another vaccine within two weeks either side of the date of vaccination unless the manufacturer has tested their product for interactions, though this is widely practised. Some vaccines can be used together, but not mixed, on the same day by injecting into opposite sides of the animal, for example, *Bovilis BVD* and *Leptavoid-H*, *Bovilis BVD* and *Bovilis IBR*, *Bovilis IBR* and *Bovipast RSP*, *PregSure BVD* and *Rispoval IBR* and *Rispoval RS* and *Rispoval Pasteurella*. None of the calf diarrhoea, salmonella, or ringworm vaccines has been tested for interactions.

Step 4. Monitor your control programme

Once you have decided to implement a control programme through a herd health plan you need to check that it is working year after year. You can do this by:

- Routine herding of stock to pick up early signs of disease;
- monitoring of records to detect changes in performance;
- testing/treating bought-in stock, and
- use of screening tests to detect a change in herd health status.

Disease conditions worth testing for on an ongoing basis include any abortions, BVD, calf diarrhoea, calf pneumonia, IBR and Johne's disease. In addition to monitoring for disease you need to monitor the control programme itself, e.g., has the timing of your vaccination programme drifted over the years?

Human health risks

Leptospirosis, salmonellosis, colibacillosis, cryptosporidiosis and ringworm are all zoonotic diseases (can affect humans) while BVD, IBR, blackleg and calf pneumonia viruses do not.

Conclusions

So how does this article help you control infectious disease better on your farm? Well, this article is merely a starting point. Firstly, it advises you to make more use of your local vet as a professional adviser in your business. Secondly, it provides you with technical information on control strategies which you can compare with what you currently do. And finally, it raises specific questions on disease control in your herd for you to discuss with your local vet.

References

Richardson, E.K.B., Mee, J.F., Sanchez-Miguel, C., Crilly, J. and More, S.J. (2009) Demographics of cattle positive for *Mycobacterium avium* subspecies *paratuberculosis* by faecal culture, from submissions to the Cork Regional Veterinary Laboratory. *Irish Veterinary Journal*, 62:398-405.

Sayers R. and Mee, J. F. (2009) Awareness and implementation of biosecurity practices amongst Irish dairy farmers: a national survey. *Proceedings of the Agricultural Research Forum*, Tullamore, p. 91.