IBR Eradication leaflet series

ANIMAL HEALTH IRELAND

Contributing to a profitable and sustainable farming and agri-food sector through improved animal health

IBR in cattle

Information leaflet for Irish farmers, advisors and veterinary practitioners

IBR Leaflet Series Vol. 2 Version 1.1 September 2020

IBR ERADICATION PROGRAMME

Animal Health Ireland, 2-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27

AHI gratefully acknowledges the financial and other contributions of our stakeholders.

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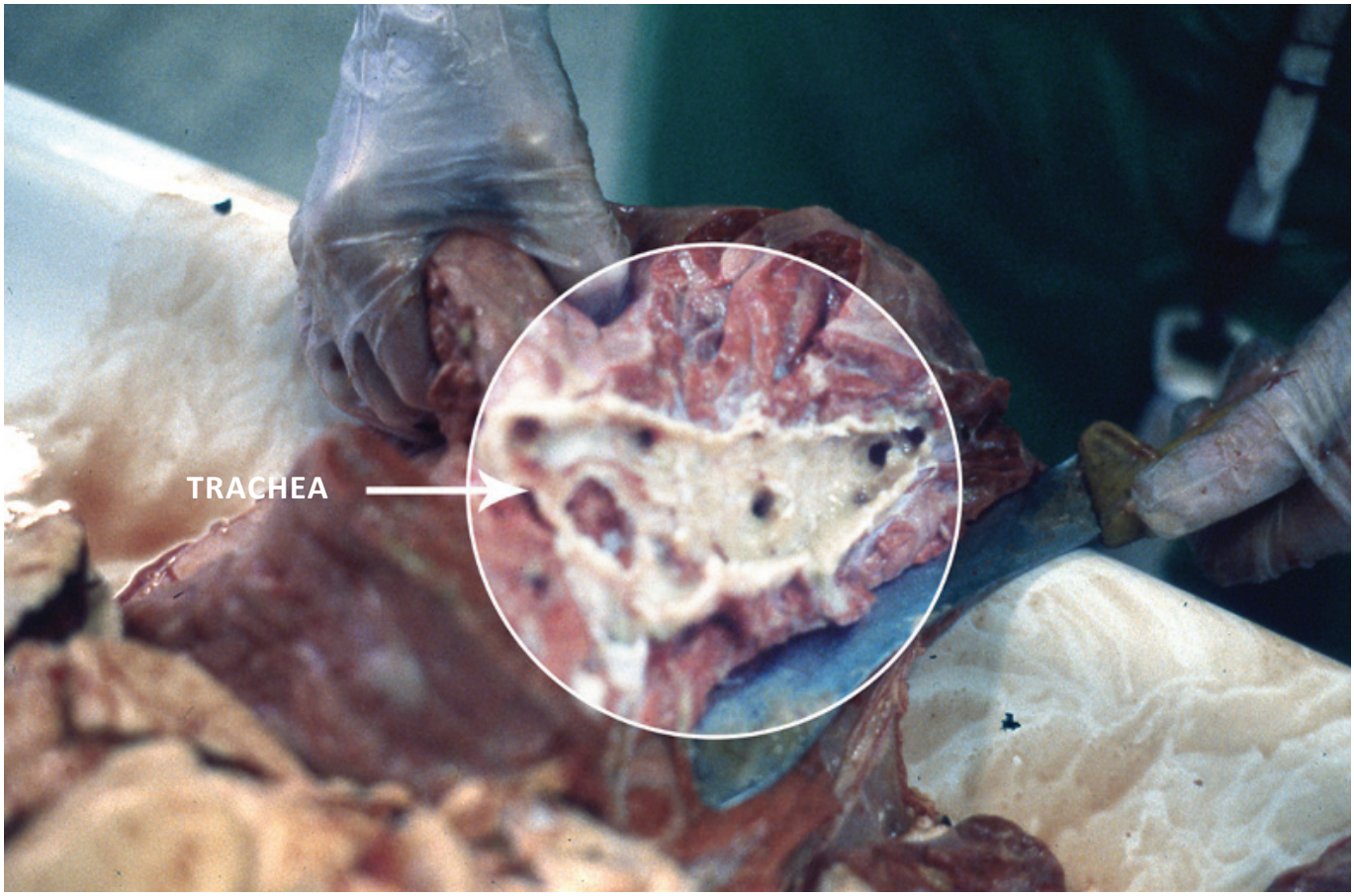
IBR: The Facts

'IBR' stands for '***Infectious Bovine Rhinotracheitis***' and there is evidence that approximately 70% of Irish cattle herds have been exposed to the associated virus. The disease spreads between cattle and can cause the nose and upper airways to become inflamed. Figure 1. illustrates the Infection cycle which is similar to that of other herpes virus infections, such as the cold sore virus in humans.

IBR

- Is caused by a herpesvirus (bovine herpes virus-1 (BoHV-1)) also known as IBRV (IBR virus).
- Virus is spread mainly by close contact between animals.
- Airborne spread of virus may occur over distances of up to 5m.
- May also be spread by using semen from infected bulls, using contaminated equipment and by people who have recently handled infected animals.

In this document we will refer to any infection with Bovine Herpes Virus-1 such as IBR, even though some infections are not associated with obvious respiratory disease.



The discoloured, thickened and uneven lining of the trachea of an animal that has died from IBR. The inside of a healthy trachea should be smooth and a light pink colour.

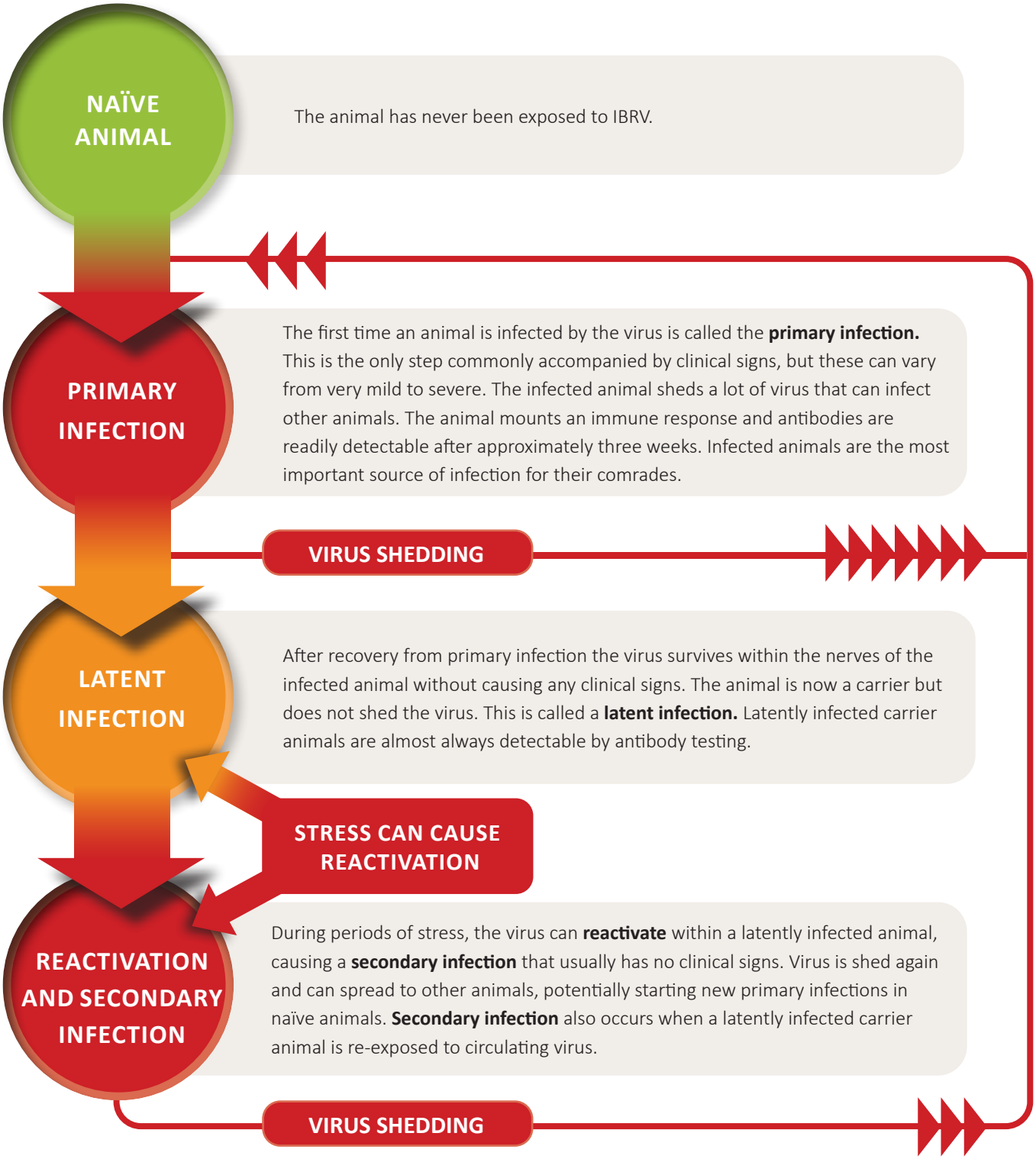


Figure 1. Infection cycle of IBR in an individual animal.

IBR in the herd

The IBR virus persists within an infected herd by way of latently infected carrier animals. Introduction of 'apparently healthy' but actually latently infected animals to a herd (through purchased or borrowed animals, contract reared heifers, stock returning from shows and sales etc) is the most common way of introducing the virus into a herd. The virus starts to spread when reactivation occurs in the latently infected carrier. Any new animals that become infected with the virus may become sick, shed more virus to continue the spread and will always become latently infected carriers. This allows the virus to remain indefinitely within a herd. Figure 2 illustrates how latently infected animals spread infection to naïve animals in a herd. Animals will typically **remain antibody positive for life** but antibody levels will vary when tested at different stages e.g. pregnancy.

Herd infections with IBR can be clinical (where animals are obviously sick), sub-clinical (where no animals are obviously sick) or a mixture of both. Various factors including the immune status of the herd, the management (degree of contact between animal groups, stress levels, etc) of the herd, and the strain of the virus will determine what type of herd infection is present.

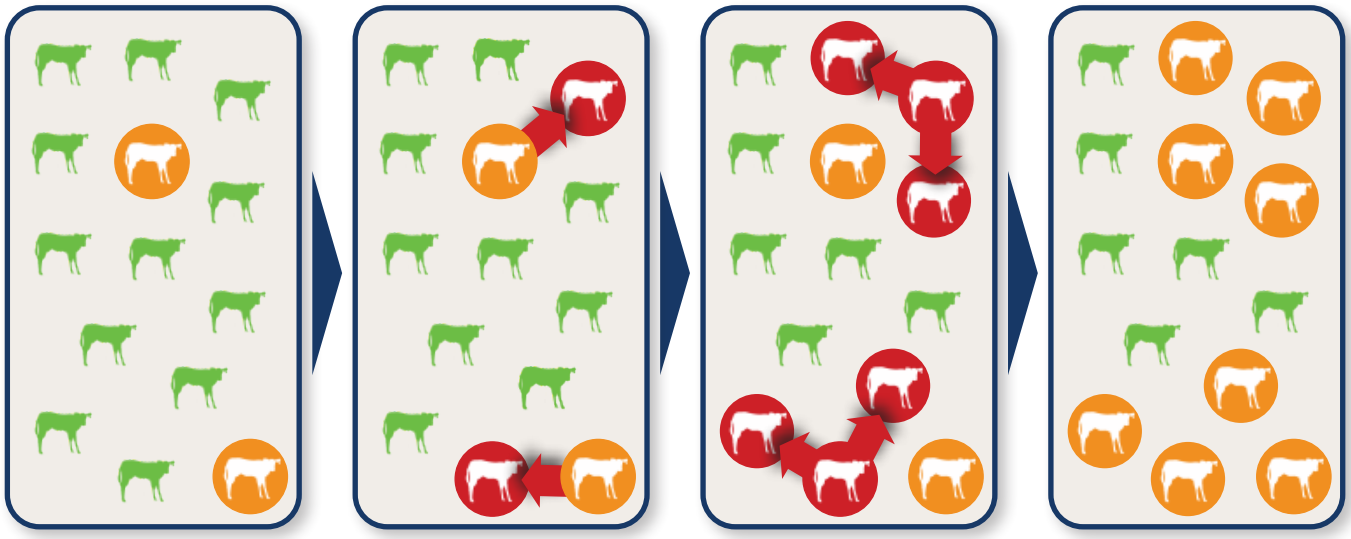
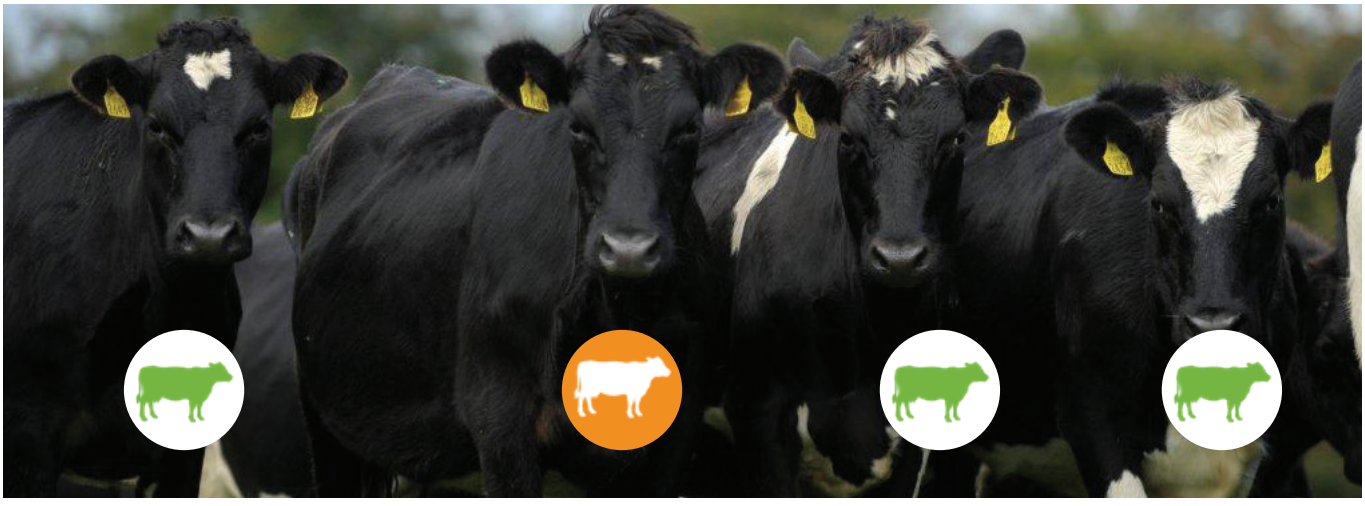


Figure 2. Spread of IBRV following reactivation and shedding of virus from carrier animals.

Naïve

'Apparently' healthy latently infected carriers (antibody test positive)

Newly infected animals



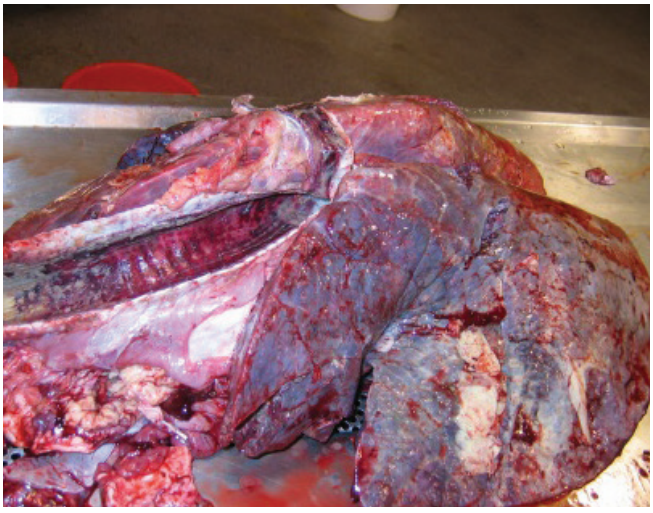
'Apparently healthy' animals can in fact be latently infected carriers making IBR control difficult. One of these animals is a latently infected carrier.

Clinical Signs

The following clinical signs may be associated with (but are not unique to) IBR infections:

- Dullness and reduced appetite.
- High body temperature.
- Rapid and loud breathing, sometimes with coughing.
- Inflammation inside the nose and in the pink of the eye (conjunctiva) or less commonly on lining of male or female reproductive tracts.
- Fluid discharge from nose and eyes.
- Pharyngitis (inflammation of the throat).
- Sudden reduced milk production.
- Abortion.
- Nervous signs (normally only in young calves).

Animals dying from respiratory diseases should be investigated.



Damage to trachea and lungs may indicate IBR.

IBR can lead to marked respiratory disease and, in severe cases, death or long term ill-health. Cattle with the above signs are not definitely affected with IBR, but it is a possibility and it is important that any suspect animals are examined by the herd's veterinary practitioner.

Sub-clinical infections often go unnoticed in a herd and their impact on production and fertility is not yet fully understood. In some cases there may be few apparent ill effects.

All vaccines contain live inactivated/killed/dead virus. There are two different types of vaccine used against IBR: 'Marker' or 'Conventional' vaccines. 'Marker' vaccines were developed to allow vaccinated and naturally infected (or conventionally vaccinated) animals to be distinguished using an appropriate test for gE antibodies. Only 'Marker' vaccines are licenced for use in the Republic of Ireland. The success of control programmes using marker vaccine can be monitored easily. If a 'Conventional' vaccine is used there is no way to determine whether a vaccinated animal has been naturally infected with IBR. This is a problem when trying to control IBR because you cannot identify animals latently infected with natural virus in vaccinated stock or track the success of a control programme.

Apparently healthy bulls may actually be latently infected and these are a risk to a naïve herd.

Antibody negative latently infected carriers

Antibody negative latently infected carriers occur infrequently. These animals are usually infected with virus at a very young age, when maternal (colostral) antibodies positive to IBR are still present. When the maternal antibodies disappear, the young animal may become antibody test negative despite being latently infected.

Antibody negative latently infected carriers are by definition undetectable with antibody tests and therefore pose a significant threat to semen collection centres, but are a lesser risk to control strategies within individual commercial herds.

What should I do about IBR?

Dealing with IBR often requires a sustained effort. Planning the approach carefully will increase success at controlling this disease. Working with the herd's own veterinary practitioner is essential to get the best control strategy in place.

In the absence of control, IBR usually remains in a herd for a very long time once it is introduced (because all infected animals become 'latent carriers' for life). Latently infected animals are almost always detectable by antibody testing. However, some animals (younger animals with maternally derived antibodies and vaccinated animals) may be antibody positive without having been infected and farmers should review all test results with their own veterinary practitioner. Other sources of virus such as purchased animals, or neighbouring stock must also be considered when formulating a control plan for IBR on any farm.

Figure 3 gives options for planning, investigating, controlling and monitoring IBR on farm. Work through these steps Plan, Investigate, Control, Monitor with your own veterinary practitioner.

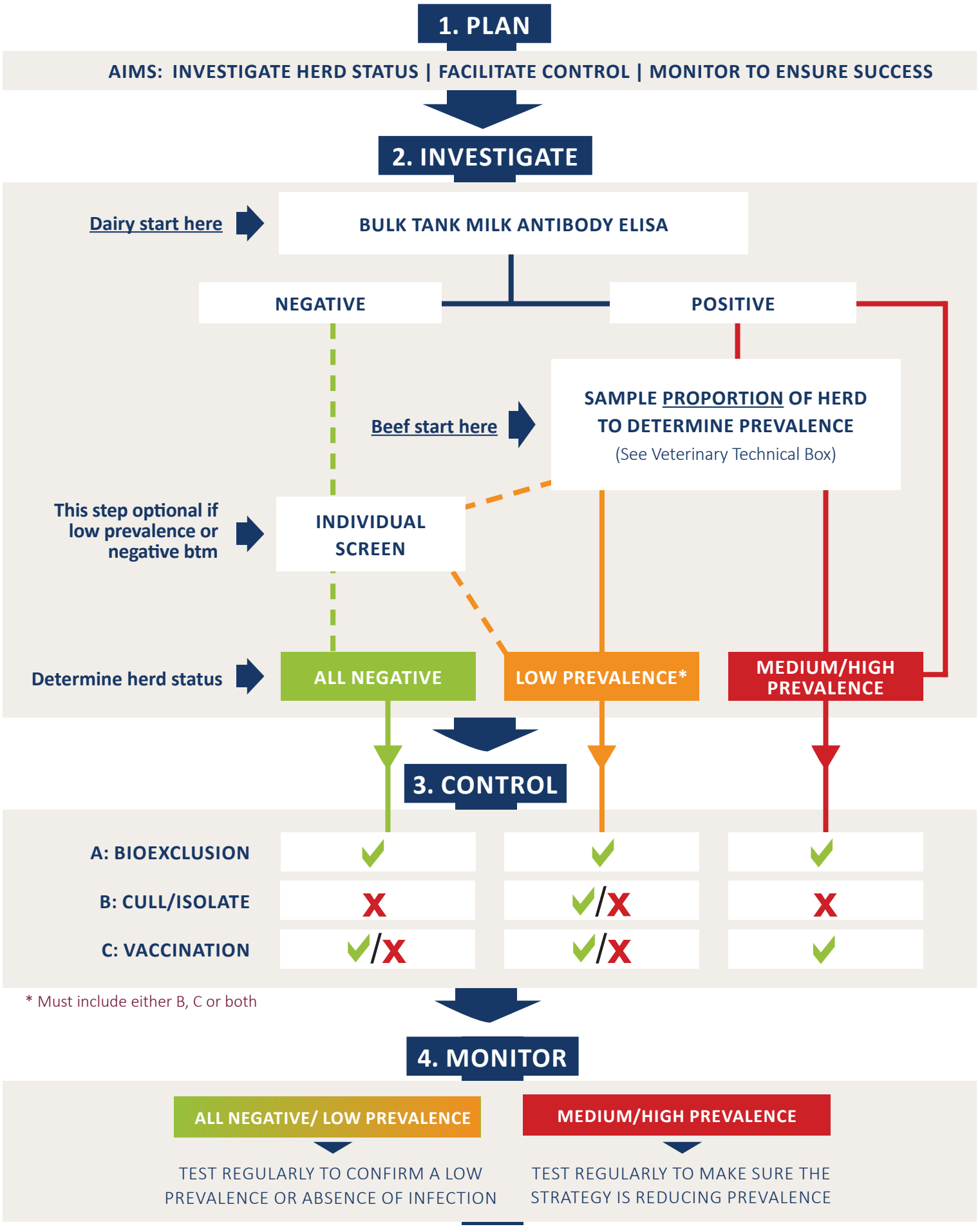


Figure 3. Planning, investigating, controlling and monitoring tool for IBR.

1. PLAN

What are the benefits to controlling IBR in a herd?

The benefits of control may include improved herd health and production, the ability to sell animals into semen collection centres and the ability to export live cattle to countries that are IBR free (or which have recognised control programmes).

Discuss investigation and possible control plans with the herd's own veterinary practitioner.

2. INVESTIGATE

For herds where either little is known about the number of infected animals or where infection has been confirmed in the herd, then laboratory testing can be used to help a farmer working with their veterinary practitioner decide what is the most appropriate control strategy. Figure 3 summarises test strategies and the Veterinary Technical Boxes on pages 13 and 14 give information on test types and what numbers of animals to test during investigations. Dairy herds may commence at step 1 (bulk tank milk antibody ELISA) but beef producers need to start at step 2.

See the Veterinary Technical Information boxes for more information on conducting IBR testing

Investigation will indicate whether a herd is 'all negative', has a low prevalence of infection or a medium/high prevalence of infection. Individual animal testing is the most costly (step 3) but helps determine herd status most accurately. Note that a herd can ONLY be declared All negative if it has undergone individual animal testing with negative results. There are 3 principles (A, B and C in Figure 3 and Table 1) that can be implemented to control IBR in herds.

3. CONTROL

The most suitable control strategy will vary with known herd status (test negative, Low prevalence or Medium/ High prevalence). Table 1 describes how these 3 principles can be used most appropriately depending on the herd's investigation results.

Control principles	All negative herd	Low prevalence herd*	Medium or high prevalence herd
A. Bioexclusion	✓	✓	✓
B. Cull/Isolate	X	✓/X	X
C. Vaccination of the herd	✓/X	✓/X	✓

Table 1. Selecting appropriate methods of control should be based on current herd status.
**Must include either B, C, or both.*

Bioexclusion

If a farmer is introducing cattle regularly or are establishing a new herd, this increases the risk of diseases (such as IBR) entering. Bioexclusion is an essential component of all disease control programmes. Herds where stock are being introduced (purchased, borrowed, contract reared heifers, stock returning from shows and sales etc) regularly are at a higher risk of introducing IBR as the biggest risk comes from animals of unknown health status. **Click here** to access the AHI Biosecurity Leaflet on Purchasing Stock for information on minimising risk. Neighbouring stock, visitors or equipment exposed to cattle on other farms also pose a significant risk.

Vaccination alone will not replace bioexclusion and prevent the introduction of IBR into a herd. See Table 4 Bioexclusion planning for information on bioexclusion practices in relation to IBR control. In some cases, combining control options will enhance their effectiveness.

In **known test negative herds** (no test positive animals after carrying out an individual animal screening), bioexclusion is the only principle that **must** be applied. Vaccination (see below) can be included as an additional option to reduce the risk associated with future breakdowns in biosecurity.

Cull/isolate test positive animals

In herds with very few latent carriers or in herds that wish to achieve IBR freedom or to rapidly stop infection spreading, culling/isolation of latent carriers (animals appearing healthy but which have tested positive) may be appropriate. In doing so, the risk of spread from infected animals can be reduced very rapidly. Long term isolation is not a practical option in many herds.

In herds with a low prevalence culling/isolation can be used in addition to bioexclusion to rapidly remove or prevent spread of the virus. Vaccination (see below) can be included as an alternative or additional option in these herds.

Isolate test positive animals.

3. CONTROL (Continued)

Vaccination of the herd

All vaccines contain either live or inactivated/killed/dead virus. There are two different types of vaccine used against IBR: 'Marker' or 'Conventional' vaccines. 'Marker' vaccines were developed to allow vaccinated and naturally infected (or conventionally vaccinated) animals to be distinguished using an appropriate test for gE antibodies. The success of control programmes using marker vaccine can be easily monitored. If a 'Conventional' vaccine is used there is no way to determine whether a vaccinated animal has been naturally infected with IBR. This is a problem when trying to control IBR because you cannot identify animals latently infected with natural virus in vaccinated stock or track the success of a control programme.

Complete and regular herd vaccination (following the manufacturers' guidelines and with the herd's own veterinary practitioner's advice) is the most commonly used method to control IBR. Vaccination makes it less likely that a latent carrier will reactivate and shed the virus, and less likely that a naïve animal will become infected and spread the virus after exposure. It has the advantage of not requiring the identification and culling or isolation of latent carriers early in the control programme. Vaccination of IBR test negative herds can also be done to reduce the impact of virus introduction. **In herds with medium or high prevalence,** vaccination combined with bioexclusion is the most practical and appropriate control option. This is likely to be the best option for the majority of herds in Ireland currently. It is likely that bioexclusion and vaccination will need to be used for a period of years before a herd becomes low prevalence or becomes test negative.

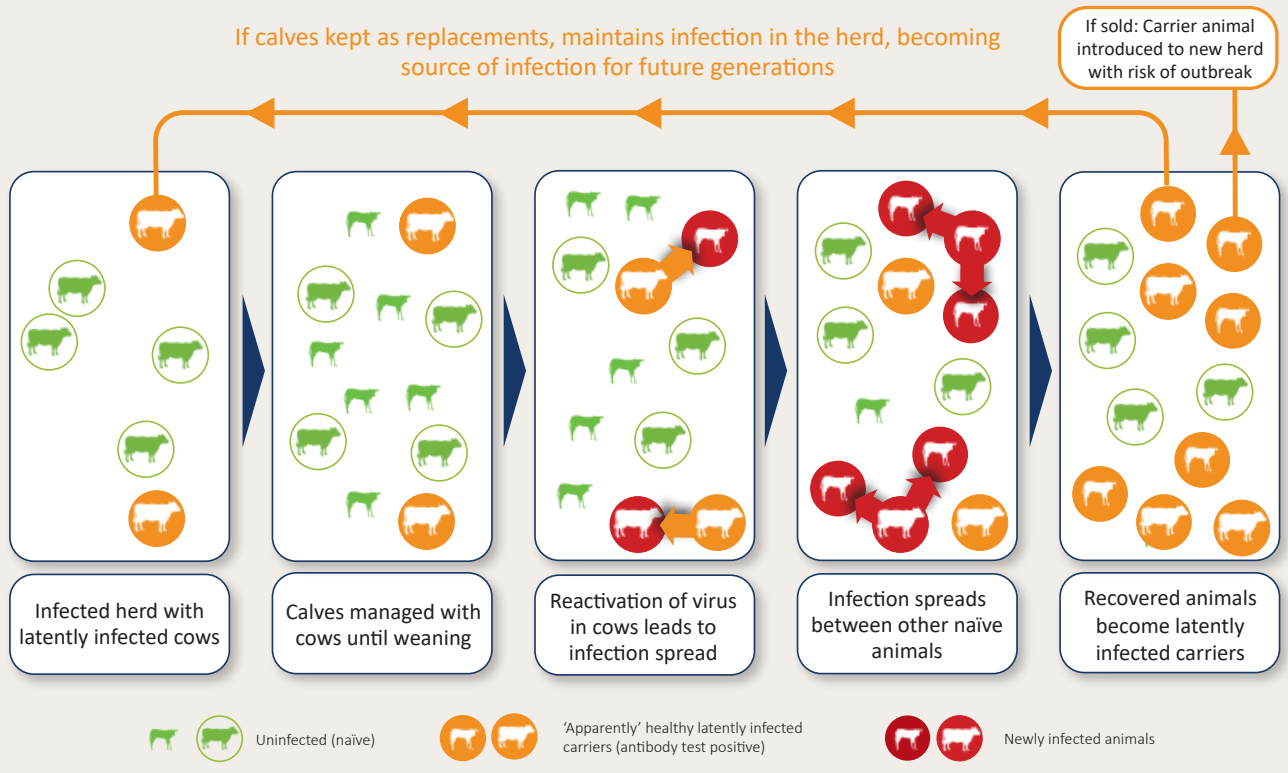


Figure 4. Spread of BoHV-1 (IBR) in a non-vaccinating suckler herd following reactivation from carrier animals.

4. MONITOR

All control programmes should be monitored to make sure they are working. If monitoring tests indicate lack of progress, the strategy should be reassessed in consultation with the herd's own veterinary practitioner.

The most appropriate method of monitoring will depend on the herd status. Be aware of the clinical signs of IBR (see earlier) and have suspect cases examined by the herd's own veterinary practitioner.

ALL NEGATIVE/ LOW PREVALENCE

Test regularly to confirm the herd status (once or twice per year). This is best done by testing all animals or alternatively a representative sample (Figure 3, Step 2) from each group of animals can be tested (see the Veterinary Technical box for further information).

Screening the dairy herd with Bulk Milk Testing

Regular Bulk Milk antibody Testing (BMT) may also be used in test negative/low prevalence herds to monitor the milking herd's disease status (Figure 3, Step 1). Antibody levels in the bulk milk will become detectable or increase if the virus starts spreading within the milking herd. A positive bulk milk tank test result will be obtained in herds with moderate to high prevalence of latently infected animals, with on-going circulation of the virus in herds that have recently been vaccinated (depending on the vaccine and test used, see Veterinary Technical Information box).

Note: Following a break-in of neighbouring stock, or any other contact with other stock, supplementary testing may be necessary. Discuss with the herd's own veterinary practitioner.

Note: a negative BMT result can be obtained in herds with up to 10%-15% of the milking cows latently infected. Therefore, a negative BMT result cannot simply be interpreted as indicating an IBR-free herd.

MEDIUM/HIGH PREVALENCE

Test regularly to make sure vaccination is reducing spread

This is best done by testing only younger animals that have been born into the herd since a comprehensive vaccination programme (implemented according to the manufacturers' instructions) has been in place.

Ideally, a successful vaccination programme will stop the spread of infection in the herd, so that animals born after the start of the programme should remain uninfected.

For example, in the first year after vaccinating, test young-stock (at least 6 months old), born since the start of vaccination; in the 2nd year after vaccinating, test young stock and 12 - 24 month animals. The number and age of such animals being monitored will therefore increase each year. If they are all IBR gE negative, there is no evidence of virus spread since vaccination commenced.

In addition, repeating the investigation test (BMT, etc) to determine within-herd prevalence (see above) should indicate that the within herd prevalence is reducing with time.

Purchasing for store, finishing or export markets

IBR is a recognised part of the 'respiratory disease complex' in herds where animals are purchased from multiple sources and mixed after purchase. Animals from multiple sources are often of unknown health status and have varying levels of immunity. Transport and mixing of cattle of unknown health status can result in clinical IBR disease (and other diseases) occuring within the group. Mixed infections with other disease causing viruses and bacteria can result in more severe clinical IBR problems. Reduction of stress prior to and during transportation and on arrival at farm can help minimise the problem. Use of IBR vaccines (ideally in advance of movement or on arrival on farm) can help control the contribution of IBR to the respiratory disease complex. Follow the manufacturers' recommendations for vaccine use. See AHI CalfCare leaflet on the *Management of the Suckler Calf at Weaning to Prevent Pneumonia* for further information **click here**.

In addition, these IBR infected animals (and their associated products such as semen or embryos) cannot be traded to many regions and countries in the EU under current EU legislation (2003/43/EC). One of the drivers of national IBR eradication policies within Europe, in addition to addressing the direct costs associated with the disease, is to overcome trade restrictions.

IBR in herds that breed bulls for A.I. and semen collection centres

Control of IBR in herds aiming to send bulls to semen collection centres requires careful additional planning and should be discussed in detail with the herd's own veterinary practitioner. Please consult AHI information leaflets providing guidance to herds with potential beef or dairy AI sires for further information **click here**.

As exposure to IBR virus is common in Ireland, the virus greatly restricts the genetic pool of animals that are able to enter semen collection centres and may limit the potential for genetic progress in the national herd.

Animals that have antibodies following infection or vaccination (with conventional or marker vaccines) against IBR cannot enter semen collection centres in Ireland

- Avoid exposing potential AI sires to IBR virus (both vaccine and field strain).
- Vaccination of potential AI sires with any type of IBR vaccine **will exclude them from entry to semen collection centres.**
- Giving live IBR vaccines (particularly intra-nasally) to animals that are in-contact (or likely to be in-contact) with potential AI sires may lead to their accidental exposure to the vaccine virus and should be avoided where possible and managed carefully when carried out.
- Use dedicated equipment (syringes, handling equipment, etc) for any animals that are being considered as potential AI sires in order to avoid accidental transmission of vaccine or field virus.
- For further advice on biosecurity practices please **click here**.

Vaccination strategies must be discussed and reviewed with the herd's own veterinary practitioner.

Veterinary Technical Box

Choosing the right test for IBR

gE and gB

Glycoproteins are a type of protein. All vaccines will cause production of antibodies to the glycoprotein B (gB) of IBR virus. Marker vaccines do not contain glycoprotein E (gE) and therefore do not cause production of antibodies to gE, thus this test is used for animals that have been vaccinated with marker vaccines.

Remember to use a gE-specific ELISA test in herds that are vaccinating with marker vaccine.

Marker vaccines, non-marker (conventional) vaccines and field virus all cause production of antibodies to the glycoprotein B (gB) of IBR virus.

Marker vaccines do not contain glycoprotein E (gE) and therefore do not cause production of antibodies to gE. Field IBR virus and non-marker (conventional) vaccines do contain gE and therefore lead to production of antibodies to gE.

Animal Status	Detectable antibodies to gB/ whole virus	Detectable antibodies to gE	Most likely test results
Previous exposure to IBR virus (regardless of vaccination) OR vaccination with non-marker vaccine (regardless of exposure)	Yes	Yes	gB or whole virus positive, gE positive
Unexposed but vaccinated with marker vaccine	Yes	No	gB or whole virus positive, gE negative
Unexposed and unvaccinated animal	No	No	gB or whole virus negative, gE negative

Table 2. Influence of animal status and test methods on test results.

Secure double fences are one possible bioexclusion measure against IBR.

Vaccinating an animal already infected with IBR will not remove an established latent infection

It is not possible to test a herd for prevalence of IBR infection if a non-marker (conventional) vaccine has been used. Only marker vaccines are licensed in Ireland while both marker and non-marker vaccines are available and approved for use in Northern Ireland.

Herd vaccine status	Appropriate antibody test to use
Never vaccinated	gB specific or whole virus ELISA
Vaccinated with marker vaccine	gE specific ELISA only
Vaccinated with non-marker vaccine	No appropriate test available for vaccinated stock; test unvaccinated stock by gB specific or whole virus tests

Table 3. Choice of antibody test type based on vaccination status.

Veterinary Technical Box

How many animals to test for IBR

When sampling a proportion of the herd (Figure 3, Step 2) calculating exactly how many animals to test is very important.

The more animals tested, the more accurate and reliable the result will be in identifying the herd or group status.

Animal Health Ireland has produced a 'Rough guide' table to help in sample size selection. This is available in the IBR FAQ leaflet **click here**. For suckler herds, a 'snap shot' test (see FAQ leaflet) is recommended. The lower sensitivity of the gE ELISA in milk means that a higher number of animals must be tested to obtain the same degree of confidence in the results.

To identify which animals are latently infected, or to be very sure that a herd has no latently infected animals, then the entire herd should be tested. If testing to achieve or maintain a herd certification then the numbers to be tested will be dictated by the provider of the certification scheme.

Veterinary Technical Box

Choosing the right vaccine

There is a limited amount of published evidence to suggest that:

- Live vaccines offer both better protection against clinical signs and greater reduction of viral shedding in newly infected animals than inactivated vaccines
- During an IBR outbreak, live vaccines offer faster protection against clinical signs when used intranasally
- Inactivated (killed, dead) vaccines are more effective at reducing viral shedding by latently infected animals than live vaccines

Always follow manufacturers' guidelines and advice on vaccine usage.

Higher Risk Activities	Control Option	How effective will it be?
Purchasing and introduction of stock	Keep a closed herd (including no borrowing or purchasing of bulls)	Excellent
	Isolate any incoming stock for four weeks before testing for antibodies; only introduce test-negative animals[1]	Very Good
	Introduce stock only from IBR accredited free herds (and isolate for four weeks)	Good
	Buy stock from herds with no clinical signs of IBR and (and isolate for four weeks after arrival)	Poor
Mixing home stock with cattle from another farm at pasture, housing or by contract rearing	Do not allow home stock to mix with animals from any other farm	Excellent
Grazing stock in boundary fields with poor perimeter fencing	Do not graze boundary fields when there are neighbours' cattle in the adjacent field	Very Good
	Ensure all perimeter fencing is unbroken and maintains 5m between stock on a neighbours' farm	Very Good
Taking stock to a mart	Do not take stock to marts and allow them back home	Excellent
	Take stock to marts but do not allow them back home without isolating and testing	Very Good
Taking stock to an agricultural show	Do not take stock to agricultural shows	Excellent
	Only take stock to shows that require a negative IBR test result for all entrants; if no such shows exist encourage development of these through breed societies; isolate and test (as above) on return from the show	Good
Farm staff contacting external stock (e.g. at shows, farm walks etc)	Ensure all farm staff change outer clothing and wash hands before and after contact with any external stock	Excellent
	Ensure all farm staff disinfect all outer clothing and wash hands before and after contact with any external stock	Good

Moderate Risk Activities	Control Option	How effective will it be?
Allowing visitors that move between farms access to stock[2]	Provide visitors with clean, disinfected[3] (or disposable) outer clothing (that stays on the farm) and hand washing facilities before they contact stock	Excellent
	Ensure visitors[2] completely clean and disinfect[3] all outer clothing and footware before they contact stock	Very Good
Sharing farm equipment with a neighbour (e.g. nose tongs, crush etc)	Do not share farm equipment with a neighbour	Excellent
	Clean and disinfect[3] all shared farm equipment before and after every use	Very Good
Visitor's vehicles coming close to stock[2]	Do not allow visiting vehicles close contact with stock	Excellent
	Ensure vehicles drive through a disinfectant[3] bath before close contact with stock	Moderate- Poor
Conducting AI	Only purchase semen from collection centres approved to EU standard 2003/43/EC [4]	Excellent

Lower Risk Activities	Control Option	How effective will it be?
Conducting Embryo Transfer[5]	Only use *in-vivo* embryos (produced directly from live animals) that are processed according to guidelines from the International Embryo Transfer Society	Excellent
Shared grazing with sheep, goats or deer	Do not share grazing with sheep, goats or deer	Very Good

Table 4. Bioexclusion planning- in some cases combining control options may reduce risk of introducing IBR.

[1] If introducing stock follow the Bioexclusion document guidelines, and see www.animalhealthireland.ie for more information on testing animals.

[2] This includes delivery/pick-up drivers and their helpers.

[3] A list of approved disinfectants is available from the websites of DAFM (www.agriculture.gov.ie) and DAERA (https://www.daera-ni.gov.uk/publications/approved-disinfectants).

[4] All semen collection centres in the Republic of Ireland and all legally imported semen must meet these standards.

[5] This does not include the risk of purchasing recipients, which is a 'higher risk' activity (considered above).

THIS DOCUMENT HAS BEEN PREPARED BY THE ANIMAL HEALTH IRELAND IBR TECHNICAL WORKING GROUP.

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