CONTROLLING RESPIRATORY DISEASE

> Effective control of Bovine Respiratory Disease is a complex issue and involves many factors. This guide aims to give you an extensive overview of many of the key issues involved and how you might be able to avoid, control or treat respiratory disease in your herd. For more detailed advice for your own farm situation talk to your veterinary surgeon.

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Rispoval RS+PI3 IntraNasal - A freeze-dried fraction containing modified live Bovine PI3 virus, ts strain RLB103, ($10^{5.0}$ to $10^{8.6}$ $CCID_{50}$) and modified live BRSv, strain 375, ($10^{5.0}$ to $10^{7.2}$ $CCID_{50}$) supplied with sterile diluent. For active immunisation of MDA positive or negative calves from 9 days of age against BRSv and PI3v, to reduce the mean titre and duration of excretion of both viruses. Do not use during pregnancy/lactation. Vaccinate only healthy animals. On rare occasions repeated exposure to BRSv may trigger hypersensitivity reactions. Once reconstituted use within 2 hours. POM-V

Rispoval 4 - A freeze-dried pellet containing attenuated BRSv strain 375 minimum $10^{5.0}$ $CCID_{50}$ and PI3v ts strain RLB103 minimum $10^{5.0}$ $CCID_{50}$ together with inactivated, adjuvanted IBR strain Cooper minimum 2 log_2 and BVDv Type 1 viruses cytopathic strain 5960 and non-cytopathic strain 6309 minimum 5 log_2. For active immunisation of cattle to reduce infection, clinical signs and respiratory disease caused by BRSv, IBR (BHV-1) virus and PI3 virus; and leucopenia and viraemia caused by the BVDv, Type 1 cytopathic and non-cytopathic strains. Do not vaccinate pregnant animals. Do not use chemically sterilised syringes or needles. Reconstituted vaccine should be used within 2 hours. POM-V

Store vaccines away from light and transport between +2°C and +8°C. Do not freeze. Do not mix with any other immunological product except the diluent provided. For animal treatment only. Keep out of the reach of children.

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A PRACTICAL GUIDE FOR FARMERS

> Maximise profitability by reducing respiratory disease in dairy heifer and dairy-bred beef calves

zoetis™

> Contents

Bovine Respiratory Disease (BRD), or calf pneumonia as it is more commonly known, is a considerable cost to the dairy and beef industries. It can range from full blown clinical disease with the subsequent losses and reduced performance to underlying, sometimes unseen respiratory problems which may be less evident but can be just as costly.

BRD causes damage to the animal's respiratory tract and lungs, reducing its ability to breathe and at its worst, resulting in death. At all levels the disease can reduce feed intake, feed conversion rates and affect subsequent weight gain, which in dairy-bred beef calves can increase input costs and time to finish, and in dairy heifer replacements can increase age at first calving (AFC) and reduce lactation yields.

BRD is what is known as a multifactorial disease, with multiple factors involved in an outbreak. Whilst treatment can be effective in reducing losses, prevention is the most cost-effective way to manage the disease.

This guide aims to give a detailed insight into the disease, its costs and how to avoid its devastating consequences.

> The Costs of Bovine Respiratory Disease

Bovine Respiratory Disease – a major threat to UK farms

Bovine Respiratory Disease presents a serious threat to the profitability of the UK dairy and dairy-bred beef industries. The cost to the UK cattle industry is estimated at around £80 million per annum[1]. If BRD takes hold on a farm, it has been estimated to cost around £43 per reared calf[2]. In dairy heifer replacements, reduced future productivity and longevity within the dairy herd can result in even further losses in the long term.

It can also affect more calves than you initially think because some animals can be affected without showing obvious signs of disease. As such, the losses are often higher than is realised and therefore the impact of disease on profits underestimated.

Bovine
Respiratory Disease estimated to cost around
£80 million per annum
to the UK cattle industry[1]

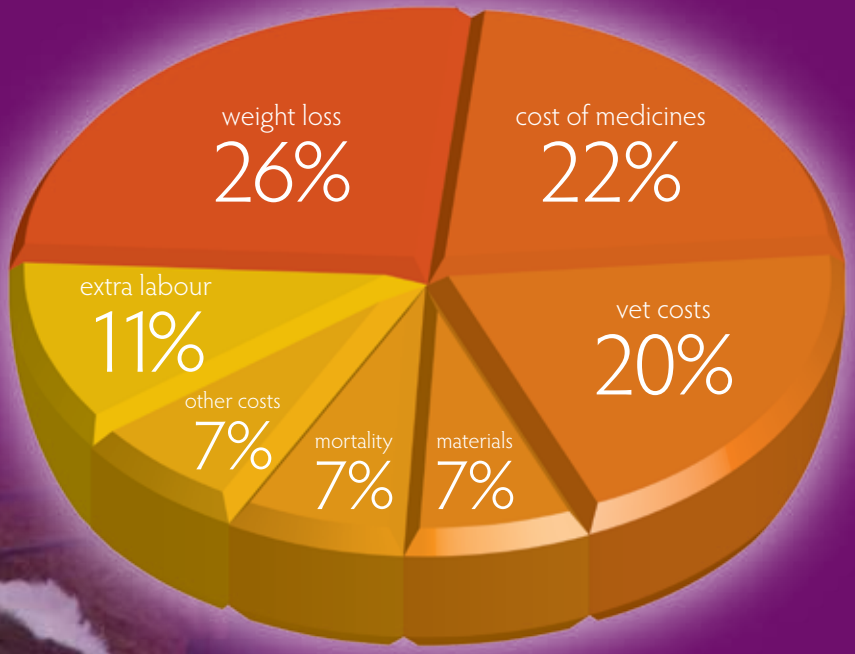
The immediate cost of Bovine Respiratory Disease

The cost of respiratory disease in dairy and dairy-bred calves is due to a number of elements.

Veterinary and medicine costs have been shown to make up about 42% of the total costs[2], which may be lower than thought.

One of the major cost factors is weight loss during the outbreak and subsequent reduction in daily live weight gain, not only in obviously affected animals but also in those that may appear healthy but have underlying symptoms affecting their development. The cost of £43 per calf[2] actually only accounts for weight loss during and immediately after the disease outbreak, and not for any longer term effect. Whether dairy-bred beef calves or dairy heifer replacements, this will have a significant impact on future productivity.

A breakdown of the cost of Bovine Respiratory Disease in reared calves[2]



Bovine Respiratory Disease estimated to cost around £43 per calf[2]

Respiratory disease can affect more calves than you think

The loss of calves to pneumonia can be devastating and put a serious dent in the profitability of a herd. But it's not just the obvious pneumonia cases that can be very costly. Many farmers see low grade respiratory problems as a fact of life. However, although the disease may be mild or even not show at all, underlying damage to the respiratory tract can limit growth rates.

In one study[3] nearly 500 calves were monitored over 15 months from birth to slaughter, when the lungs were assessed for damage from respiratory disease. Although 35% of the calves had been diagnosed and treated for pneumonia, at slaughter 72% were found to have lung damage. This included 68% of the apparently 'healthy' calves which outwardly had never showed signs of disease. Lung lesions were associated with lower growth rates, with calves gaining 21kg less during the fattening period compared to calves with healthy lungs. Hidden disease can therefore have a serious impact on farm profitability.

68%

of apparently 'healthy' calves had lung lesions, which were associated with reduced weight gains

Results of a 15-month study

35%

of total group diagnosed with pneumonia

72%

of total group showed lung damage at slaughter

BRD in dairy heifer calves can impact future milk production and longevity in the herd

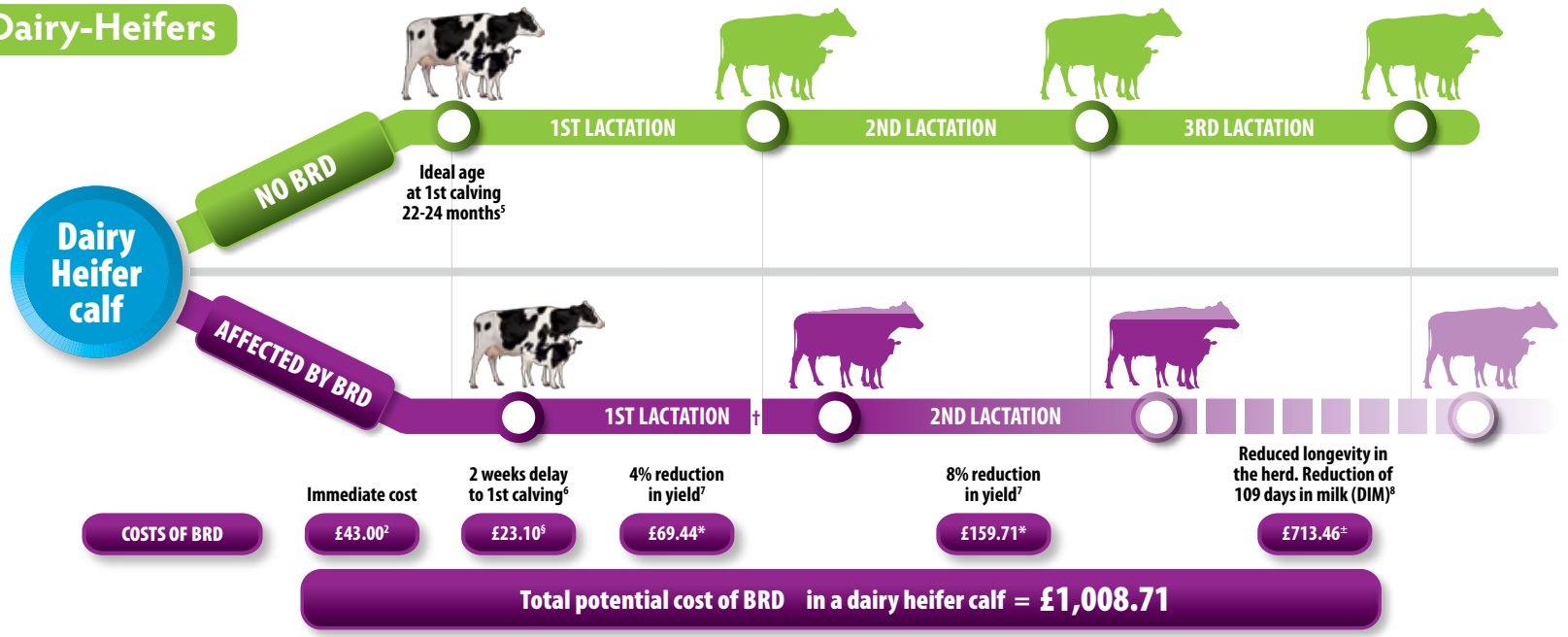
BRD can have a significant impact on the productivity of dairy heifer calves as they move into the milking herd. A UK study[4] showed that on average 14.5% of live born dairy heifers fail to reach their first lactation, with BRD the biggest known cause of mortality in calves aged 1 to 6 months. One third of heifers that join the milking herd complete only a single lactation[5], and the average UK dairy cow has a lifespan of less than 3 lactations.

BRD has been shown to increase the age at first calving[6], and reduce lactation yield[6,7]. Dairy heifers affected by pneumonia are also less likely to complete their first lactation[8].

Herds in which heifers calve young, yields are high and replacement rates are low will achieve better overall herd efficiency in terms of milk/year of life. Careful management of the reared calf in terms of nutrition and disease control is critical to maximising herd efficiency.

BRD Impact Timeline

Dairy-Heifers



†Reduced likelihood of reaching 2nd lactation[8]

§ Cost of £1.65/day[9]

*Assumes a 7,000 litre 1st lactation yield (4% = 280 l), 8,050 litre (15% increase) 2nd lactation yield (8% = 644l) and 24.8ppl margin over purchased feed[10]

± Assumes a daily yield of 26.4l (8,050 litres over a 305 day lactation) and 24.8ppl margin over purchased feed[10]

> The Causes of Bovine Respiratory Disease

The organisms behind Bovine Respiratory Disease

Bovine Respiratory Disease is caused by a variety of infectious agents but the majority of outbreaks start with a virus. The key viruses involved in the disease in young dairy calves are Bovine Respiratory Syncytial Virus (BRSv) and Parainfluenza 3 Virus (PI3v).

BRSv, PI3v

These viruses can act individually or in combination to cause significant lung and airway damage and also reduce the animal's resistance to secondary bacterial infection.

These viruses are also very widespread. A recent blood sampling survey of 1,731 calves from farms with previous pneumonia problems showed 75% had been exposed to BRSv and 82% to PI3v[11].

Mycoplasma bovis

Calf lungs showing the damage caused by *Mycoplasma bovis**

Mycoplasma bovis is a type of bacteria with increasing importance and which can act as a primary agent. A recent screening study of 1,731 calves with previous pneumonia problems found 41% had been exposed to *Mycoplasma bovis*[11].

In infected herds, calves can pick up infection at an early age via their dam's milk and then go on to shed *Mycoplasma bovis* in large numbers during the first 2 months of life.

Colostral antibodies are not considered protective with primary disease occurring in calves less than 1 month old. Infection spreads rapidly and either alone, or in combination with other viral or bacterial agents, infection can lead to high levels of mortality[12]. There are no commercially available vaccines to protect against *Mycoplasma bovis*.

*Image from NICHOLAS R.A.J., (2011) *Veterinary Record* **168 (17)** 459-462

BVD

The BVD virus acts as an important trigger as it suppresses the immune system allowing the other agents to multiply and cause disease.

BVD is most commonly spread by a PI (persistently infected) animal, which acts as a carrier for the virus. Originally infected in its mother's womb, a PI may be a 'poor doer' or die at a young age, however, many PI calves appear totally normal but continue to shed virus, acting as a constant source of infection and causing huge problems within a batch of calves, especially if bought-in and mixed with previously uninfected cattle.

Control of BVD is achieved through screening and removal of PI calves, protecting breeding stock before mating and protecting young stock to prevent immunosuppression.

IBR

IBR is caused by a virus called Bovine Herpes Virus 1 (BHV-1). It typically affects older calves once protection from the colostrum has waned, with signs including conjunctivitis and discharge from the eyes and nose. However, it can also trigger BRD in younger calves by reducing the animal's immunity[13] to the other viruses and bacteria.

Other bacterial infections

Bacteria such as *Mannheimia (pasteurella) haemolytica, Pasteurella multocida and Histophilus somni* generally act as secondary invaders (taking hold once the viruses have reduced the animal's resistance), causing further extensive damage.

Parasites

Dictyocaulus viviparous, a parasite more commonly known as lungworm can also cause respiratory disease. Disease is classically seen in older calves from July to October, approximately four months after turnout to pasture. Left untreated disease may not be noted until after cattle are housed.

Other factors which contribute to BRD

Young dairy and dairy-bred calves are vulnerable, and with the viruses that cause respiratory disease highly prevalent on many farms, disease can be kick started by a range of triggers and spread rapidly.

Inadequate ventilation/draughty, cold housing

Respiratory disease can be significantly reduced if buildings are well designed and operated correctly. These young calves need a draught free environment with plenty of bedding for nesting and keeping warm. Effective drainage of water and urine, particularly for calves on automated feeding systems, will help ensure the bed remains clean and dry. Cold stress increases susceptibility to disease and can reduce growth rates as calves utilise energy to keep warm. The housing should, however, also be well ventilated to prevent viruses becoming 'trapped' inside the shed, and circulating in the stale air, and also to help minimise the impact of external weather conditions, such as extremes of heat or cold, or still, muggy days.

A colostrometer is used to measure colostrum quality. It is calibrated to colostrum density so is simply placed into the cylinder containing colostrum, and how far it sinks (red, amber, or green areas) indicates whether the colostrum is of poor, medium, or good quality.

Colostrum

Newborn calves do not have a fully functioning immune system and rely on the antibodies in colostrum to protect them from disease. Ingestion of poor quality (low antibodies or contaminated with bacteria) or insufficient colostrum will increase a calf's susceptibility to disease. Calves should receive at least 10% of body weight in the first 24 hours, receiving at least half of this (2-3 litres of colostrum) in the first 6 hours. Ideally, calves should be fed in a calm environment since stress can reduce a calf's ability to absorb the important antibodies.

When suckling is relied on, observe calves carefully for intake - 20 minutes of continuous sucking is required to consume 3 litres of colostrum - and be prepared to top-up quickly.

Where colostrum is harvested, the quality can be easily and cheaply assessed on farm using a colostrometer. Good quality colostrum can then be fed via either a nipple feeder or a tube feeder.

Management stressors

Weaning is a stressful event which may compromise the immune response of calves for at least 2 weeks after and incurred illness may compromise growth.

When housing calves together, overcrowding and mixing of different aged animals should be avoided.

Recognising the symptoms

Bovine Respiratory Disease can result in a number of symptoms, but as most of these are non-specific it is usually not possible to know what caused the outbreak from the symptoms alone. The following lists the common signs:

- In the early stages, depression and reduced appetite (off-feed)
- Breathing difficulty – rapid or deep chest movements +/- open mouth breathing
- Coughing
- Raised temperature of >39.6°C[14]
- Nose and eye discharge
- Death

Calves which have respiratory disease often go on to become 'poor doers', a phrase that sums up the general appearance and performance of the animal.

Summary

Triggers

- BVD
- Stress
- Mixing
- Transport
- Handling
- Nutritional deficiency
- Poor/insufficient colostrum
- Lungworm (older cattle)

+

Key Primary Agents

- RSV
- PI3v
- *Mycoplasma bovis*
- IBR (older cattle)

+

Key Secondary Bacteria*

- *M.haemolytica*
- *P.multocida*
- *H.somni*

*can less commonly act as primary agents

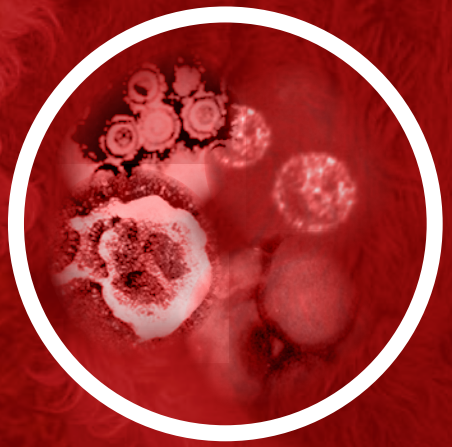
=

Bovine Respiratory Disease

- Calf death
- Chronic 'poor doers'
- Delayed age at first calving, reduced lactation yield and reduced longevity in the herd in dairy heifer replacements
- Delay to finish, increased input costs, reduced carcase value in dairy-bred beef calves
- Economic loss

> Controlling Bovine Respiratory Disease

Animal



Infectious Agents

Environment

The principles of disease control

BRD results from a combination of pathogens and risk factors. Controlling disease therefore requires the correct balance between the presence of infectious agents (challenge) and the calf's resistance to those pathogens (immunity).

Effective control of BRD therefore involves management to reduce the risk factors (particularly through ensuring calves receive adequate colostrum and are housed on warm, dry, draught free beds, within well ventilated buildings), vaccinating against infectious agents when appropriate and having systems in place to ensure that if disease does occur, animals can be identified and treated early to minimise any losses.

1. Improve building function

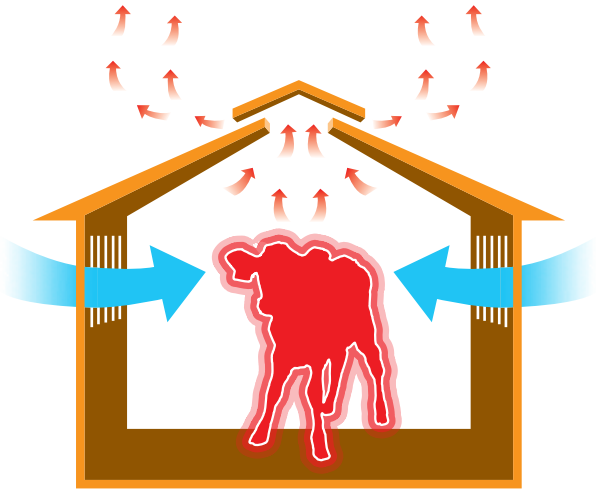
It is essential to provide calves with a clean, dry bed in a well ventilated, draught free environment (air flow <2m/sec). Good building ventilation plays a vital part in maintaining an environment that helps prevent respiratory disease from taking hold, by ensuring a uniform air flow whether it is a still or windy day outside and ensuring that excess moisture, dust, gases and germs all escape from the building. Drainage slopes, set at a 5° slope away from the bed, help keep the bedding dry, further reducing moisture and humidity, both important risk factors for BRD.

Naturally ventilated buildings rely on the 'stack effect'. Heat generated by calves warms the air, which rises and exits through outlets in the roof. The negative pressure this creates draws air in through inlets in the walls, ensuring fresh air circulates in the building even on the stillest of days. Effective ventilation helps to reduce the level of infectious agents circulating in the shed and reduces gases such as ammonia which can be harmful to the respiratory tract.

In a poorly designed building, for example one which lacks an outlet in the roof, the warm air that animals breathe out cannot escape, so it condenses and falls, or in the case of small calves, if the building is too large, or exposed, the calves may not generate enough heat to drive the expired warm air all the way to the ridge in the roof, in which case it will similarly condense and fall. This creates the ideal environment for the viruses and bacteria that cause respiratory disease to multiply.

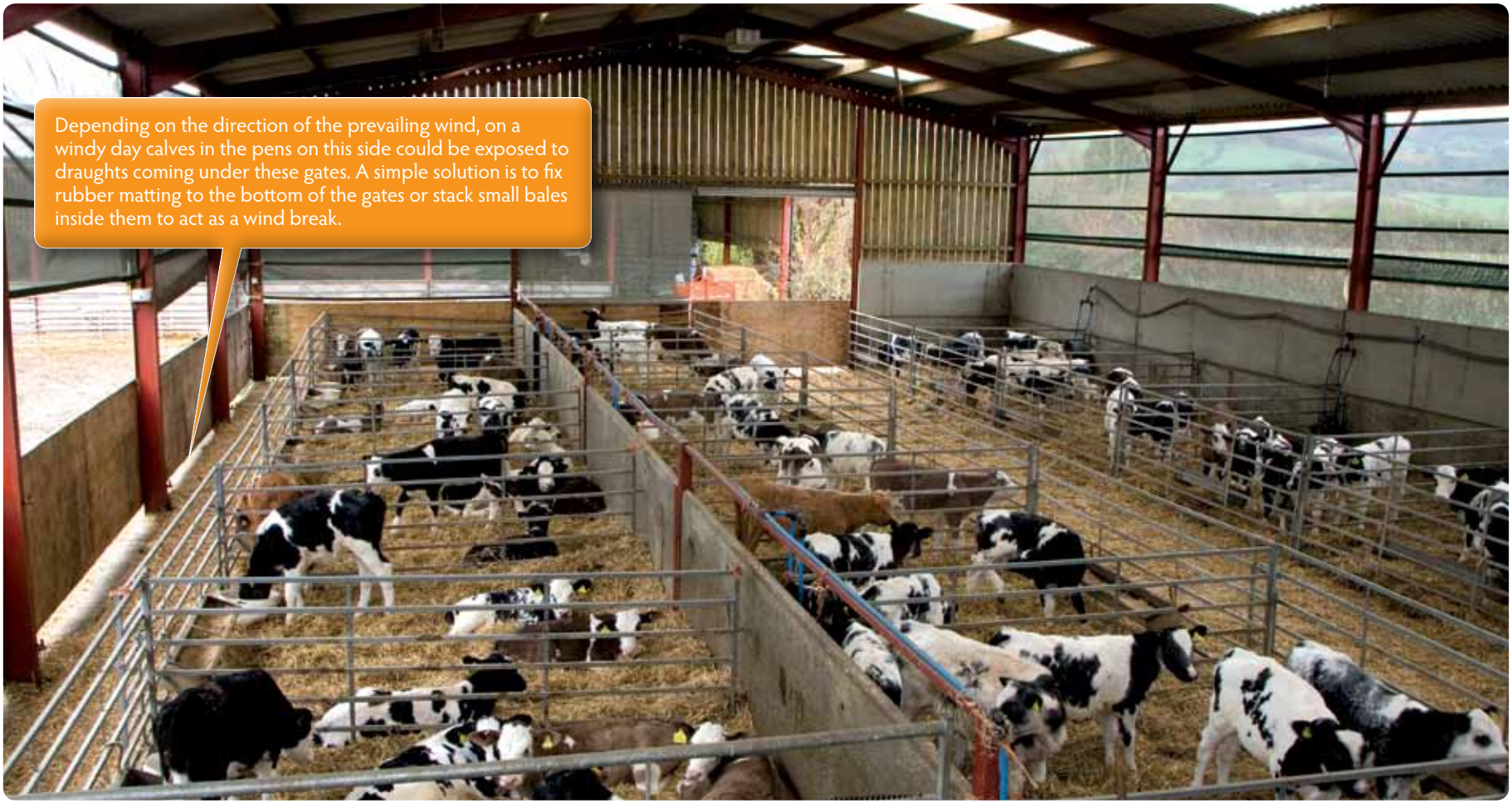
This is just as relevant if calves are housed individually or in groups in a shed.

Ideally, ventilation should work on the Stack Effect, shown in the diagram:



The Stack Effect ensures efficient ventilation

- Animals breathe out warm air which rises and escapes from the highest point of the building (the outlet)
- This creates negative pressure within the building which draws fresh air back in through the inlets
- Doors are not suitable inlets; they create draughts, can result in 'wind tunnels' and are closed too easily



How to check building ventilation

The quality of a building's ventilation can be assessed by using smoke cartridges. When set off these release smoke into the building and how or whether it dissipates will give a good idea of the quality of the ventilation. The test should be carried out when the building is full of stock (to get the stack effect) and when the air is still (to ensure that any wind does not skew the results). In a well ventilated building, the smoke will pass out through the outlets in the top of the building. If it hangs in the building there is a problem. It is often a good idea to also test specific areas in a building – even if ventilation is good in the centre, there may be corner areas where ventilation is not so good.

Nearly half of all naturally ventilated buildings investigated in research projects do not supply adequate airflow for the amount of cattle housed. Adequate ventilation is a long-term investment so you should seek professional advice when constructing or changing housing.

2. Managing grouping and group-size

From 8 weeks of age calves should be group housed, although this has to be managed carefully to reduce the risk of respiratory disease. Grouping calves pre-weaning, when milk replacer is halved, can help improve the intake of solid feed and reduce relapses of Bovine Respiratory Disease compared with calves that remain in individual pens until after weaning[15].

Incidence of Bovine Respiratory Disease has also been reported to be directly related to group size[16] – so the recommendation is to keep group size to about 6-10 animals[17]. Forming groups that take into consideration previous respiratory history (i.e. keeping calves with a similar respiratory history together) can also minimise the incidence of overall respiratory cases[18].

Ideally there should be no more than 30 calves sharing the same air space[19] and they should not share air space with older cattle, which act as a source of infection to these younger, more vulnerable calves. Up to a weight of 150kg, the **minimum** area required per calf is 1.5m^2.

Overstocking reduces air quality

Overstocking a building will have a detrimental effect for **TWO** reasons:

1. **More animals means more infectious agents are breathed out, increasing the challenge level in the building.**

2. **Cattle produce large amounts of moisture. Increased stocking rates increases air moisture levels, allowing bacteria and viruses to survive for longer.**

3. Vaccination

Vaccination can play an important role in protecting calves against the infectious agents that cause respiratory disease. Vaccination works in two ways:

- Increasing the calves' immunity so they are better protected
- Reducing the challenge, as vaccination reduces the amount of virus the calves breathe out, hence reducing viral levels in the shed

Vaccination against respiratory disease requires a group approach where ideally all calves should be vaccinated, especially those sharing an airspace.

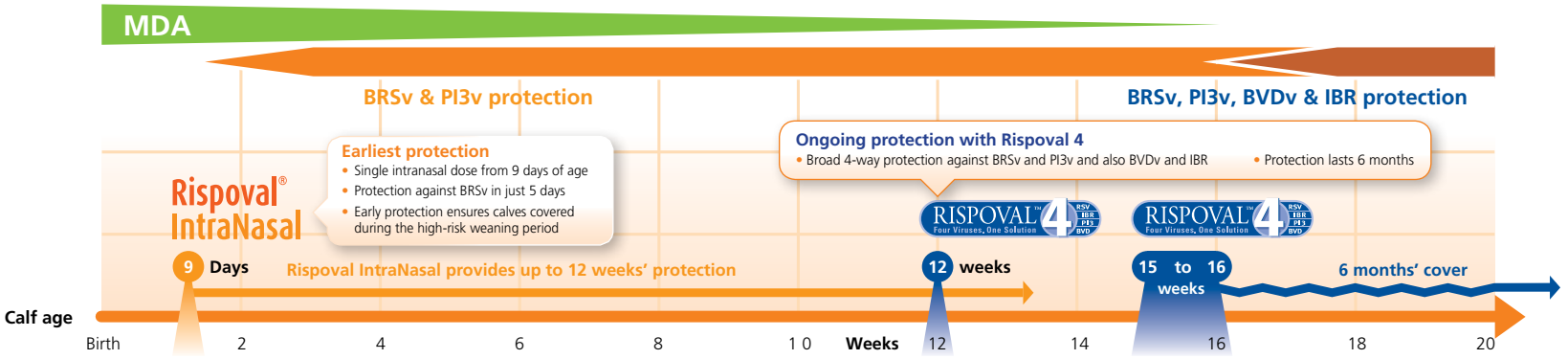
Vaccination of young reared calves

Young dairy and dairy-bred calves are particularly susceptible to BRD, so rapid protection is important, particularly against BRSv and PI3v, the most important viruses in young calves[20].

RISPOVAL® INTRANASAL is a single shot intranasal vaccine that can protect these very young calves against BRSv and PI3v – it can be used from 9 days of age and lasts for 12 weeks, ensuring calves are covered through the critical period before and after weaning.

Where required there is also the option to maintain protection for a further 6 months with RISPOVAL® 4 – a combination vaccine that not only continues protection against BRSv and PI3v, but also protects against IBR and BVD viruses.

Vaccination schedule for young reared calves



4. Protect older cattle against parasites

Lungworm is a parasite that can cause respiratory disease but is only important in older cattle who are at grass. Lungworm are particularly prevalent in the autumn and can cause lung damage, which increases the risk of pneumonia soon after housing when animals are exposed to the viruses and bacteria as well. A vaccine is available to protect against lungworm, or alternatively control can be achieved through use of an appropriate endectocide or anthelmintic treatment programme.

If the pre-housing anthelmintic treatment can be given some weeks before housing, this will help ensure calves are free of lungworm and therefore healthier, and less at risk of BRD in the early housing period.

Some endectocides (for example Cydectin® Pour-On for Cattle) allow treatment up to 5 weeks pre-housing.

5. Treating an outbreak

If pneumonia occurs, rapid treatment with an effective antibiotic is frequently necessary to help ensure a rapid recovery. In some cases it might be appropriate to treat the whole group based on criteria such as disease history, speed and severity of the outbreak. Responsible use of antibiotics is paramount so the decision to group treat should be made in conjunction with your vet. Remember that these antibiotics treat only the secondary bacteria involved in the outbreak, not the viruses, so the best way to reduce reliance on antibiotics is through disease prevention.

If disease does occur, antibiotic use can be optimised by ensuring the best possible treatment outcome. Two key factors in this are: (1) Early identification of BRD cases, and (2) Early, effective treatment. Improved first treatment success will reduce the negative long-term impact of disease and help reduce the need for further treatments.

Some of the key considerations when choosing an antibiotic treatment are:

- Correct spectrum of activity – the antibiotic needs to have reliable activity against the key bacteria, specifically *M. haemolytica, H. somni, P. multocida* and *Mycoplasma bovis.* *Mycoplasma bovis* in particular can be difficult to treat and many antibiotics have no activity against it.
- Fast acting – the antibiotic needs to be rapidly absorbed and start to work quickly.
- Optimum duration of activity – once an animal is infected it takes approximately 7-10 days for the lung tissue to repair itself[21], so any antibiotic treatment needs to be effective over that period of time.

In some cases, anti-inflammatories may be used alongside antibiotic treatment to reduce inflammation in the lungs and reduce the animal's temperature.

Bovine Respiratory Disease is a very common problem in young dairy-bred beef and dairy heifer replacement calves: its severe economic effects make effective countermeasures a high priority to maintain herd profitability, especially as not just sick animals contribute to the cost of the disease.

The most effective approach will combine good husbandry and disease prevention, together with careful monitoring of your animals for signs of disease. While the investment in housing, vaccination and good management practices may initially seem an unwelcome extra expense for a tight farming budget, the economic gains from healthy, high-quality cattle nearly always considerably outweigh the costs.

Speak to your vet about control of Bovine Respiratory Disease on your farm