Biosecurity, does it have a place in the management of beef herds in the United Kingdom?

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Abstract

Biosecurity systems are essential in order to prevent the losses that follow the introduction of infectious disease to beef herds. For farmers to be convinced of the need for biosecurity they must have information on the losses that arise from infectious disease entering the herd; an assessment of the risk of the infection entering the herd and the cost of biosecurity systems for their herd. The lack of progress in implementing biosecurity in the national beef herd may be due to the absence of this information. However there has been a lack of demand for the information implying that disease control is not seen as a priority for beef production. Furthermore the extent to which beef farmers rely on purchasing breeding replacements from other herds is in contrast to the situation elsewhere in Europe and with the national dairy herd. This constitutes a real barrier to improving biosecurity. To overcome this aspect purchase policy must be based on sound biosecurity principles adopting post sale quarantine and disease screening. For some diseases this alone is not adequate and a pool of herds of known disease free status are required. Certified health assurance systems are in place to provide this but the uptake has been too low as yet to create an adequate supply of health assured stock. The decoupling of subsidy will create a drive towards increased efficiency of production and losses from disease will be less tolerated. The industry should recognise this and plan now to promote an industry wide approach to biosecurity that will ultimately reduce the loss from disease and increase the efficiency of beef production.

Introduction

Disease causes direct losses to beef producers in terms of reduced output, increased replacement costs, increased veterinary costs and increased labour requirements. For the purpose of control, diseases can be separated into two main categories. Firstly there are diseases such as calf scour and pneumonia where the organisms that cause the damage are part of the normal flora of the animal. These diseases are frequently referred to as multi-factorial diseases as they occur through an interaction between the husbandry of the animals, the environment and the animals themselves. The multi-factorial diseases can be controlled to some extent by altering management and using vaccines. The second category is where the disease is the result of infection with a single infectious organism. In these single organism diseases the organism is not part of the normal microbial flora of the animal. Herd infection with these organisms will result in disease and production losses whether the management of the animals and their environment is good, bad or indifferent. These diseases can be controlled by keeping the herd free of the infection. In essence biosecurity is the key to controlling these single agent diseases. Topical examples of this second category of disease are tuberculosis and foot and mouth disease, but there are several others that infect many herds throughout the country and cause significant losses such as bovine viral diarrhoea (BVD), Johne’s disease and venereal campylobacteriosis.

Biosecurity

Several definitions of biosecurity exist, but essentially the term refers to management systems that reduce the risk of introducing infectious disease to a herd (Crawshaw, Caldow et al. 2002). Top of the biosecurity pyramid is the closed herd where no animal is introduced to the herd. New genetic material is only brought into the herd through semen and embryos from sources operating to the highest standards. The second level is the reduction of risk through the purchase of animals by post purchase test and quarantine and purchasing replacements from herds that have an assured health status. Fundamental to both levels is the provision of farm boundaries that are stock proof. Disease can also be introduced via contaminated food and water sources and from personnel and equipment from other farms. This risk too has to be assessed and managed. At the lowest level, where the majority of herds operate, any practice that benefits biosecurity is purely incidental. Where the diseases in question are widespread and the risk of introducing infection is high the importance of adopting biosecurity is increased rather than diminished. That is the case for the diseases mentioned above with the obvious exception of foot and mouth disease. Control for this disease is applied at national boundaries.

It is difficult to find research papers on biosecurity in the beef herd, but the lessons from dairy herds throughout the world are of relevance. For example in one American study most herds that were increasing herd numbers did not operate a biosecurity system. As a result losses from both BVD and digital dermatitis were significant (Faust, Kinsel et al. 2001). Similarly a Canadian study identified a general biosecurity failing when purchasing replacement heifers and such herds were more likely to be infected with Johne’s disease (Chi, VanLeeuwen et al. 2002). In terms of benefit it has been shown in the Netherlands that closed herds operating effective biosecurity had a 5% increase in net return when compared to herds where breeding replacements were purchased (van Schaik, Dijkhuizen et al. 1998).

Assessing risk

The number of UK beef herds infected (herd prevalence) with the diseases in question is unknown. No national survey work has been carried out instead there has been a tendency to consider the beef herd to be broadly similar to the dairy herd and assume herd prevalence is similar. Studies in the dairy herd have used the antibody present in bulk milk tanks as an indicator of herd infection. For example such a study in England and Wales found that 95% of herds had been infected with BVD and that in 65% of the herds there was evidence to indicate that infection was active. Data also exists in this form for infectious bovine rhinotracheitis (IBR) and for leptospirosis (Paton 1998). Again extrapolating from dairy herd prevalence studies done it has been suggested that the prevalence of Jones disease in the national dairy herd may be as high as 20% (Caldow 2001). As dairy bred replacements have long been used in the suckler herd a similar estimate for the beef herd may be justified. There is the further problem of this disease appearing to be associated with certain breeds ie the within breed prevalence may be higher for these breeds and the risk of buying infected animals may differ according to breed. Despite attempts to extrapolate from the dairy herd it is not known how many beef herds are infected with BVD, Johne’s disease or venereal campylobacter infection. For this reason it is impossible to assess the risk of introducing infection to a herd in terms other than high medium or insignificant on the basis of the assumptions of national prevalence and the existing understanding of the biology of the disease(Caldow, Rusbridge et al. 2003).

Cost of disease

Effort has been made to detail the costs of outbreaks of disease, but once again by and large these are restricted to dairy herds. In order to overcome this deficiency veterinary scientists and economists have turned to modelling the disease by bringing what is known about the disease together with an economic model to generate estimates of the range of losses that have arisen. Examples of the losses calculated for naturally occurring outbreaks and from disease models applicable to the beef herd are given in table 1. Data from the literature is used to generate the expected losses for BVD, Johne's disease and venereal campylobacter infection in table 2. In none of these examples is recognition made of the significantly higher value of pedigree beef stock. Nor is there an estimate given here for recurrent losses due to the presence of disease. For BVD and campylobacter these will be significantly reduced as the disease settles into an endemic pattern over a period of two or more years. In contrast for Johne's disease the losses will tend to increase with time.

Bench top exercises of this nature are of value, but the argument for an industry wide biosecurity initiative would be improved by the provision of more robust disease and financial data.

Health Assurance

There is currently a set of assurance programmes that has national recognition through the Cattle Health Certification Standards (CHeCS) and there are three licensed providers operating to ISO 17025 or equivalent level of quality assurance. The programmes offer a framework for control and eradication for herds where the disease is present. For herds without the disease the control programmes detail the herd testing programme and the required biosecurity to support the claim that the herd is free from disease and likely to remain so. The diseases covered by the scheme are Johne's disease, BVD, IBR and leptospirosis (caused by *L hardjo*). Animals from these herds can then be sold as having a certified level of assurance for any one of these diseases. It costs in the region of £700 per 100 cow herd per annum to achieve accreditation for Johne's disease. The cost is more variable for BVD, but at its least expensive an annual figure of £200 can be achieved. The costs for IBR and leptospirosis are similar to the Johne's disease costs.

There are no more than 500 herds that have been certified as accredited for one or more diseases. This represents an inadequate number of health assured animals to supply the market. There is also concern amongst members of the schemes that they may not receive a premium for their stock in the market. In most industries any premium on accreditation or assurance is usually low and indeed in many cases quality assurance is necessary to gain access to the market in the first place and therefore the wishes of the members may prove to be unrealistic.

Individual disease screening of breeding replacements

Animals can be screened prior to, at the point of sale or after sale whilst in quarantine. Such a practice clearly has a role and is a less expensive option than achieving herd accreditation. However for a number of reasons it is very much second best in terms of providing assurance of the health status of the animal. All screening tests are limited in their sensitivity to detect the infected state to some extent. Therefore there remains a slight risk of a false negative result being generated when the animal is actually positive (infected). For BVD and IBR this may result in no more than one in a hundred true positives being missed. However the consequences of this failure for the health and productivity of the herd mistakenly purchasing an infected animal will be considerable. In contrast herd health assurance programmes rely on testing many animals each year and require herds to be biosecure for the disease in question. This means that the deficiencies in individual testing are overcome.

This principle is at its most extreme for Johne's disease where the screening test will identify only a very small proportion of the animals that are infected when they are tested before two years of age. With the exception of confirming clinical disease the screening test is best considered a herd test and animals should only be considered to be a low risk of being infected when the herd of origin has been tested and found to be clear.

The other weakness in the approach of screening individual animals is that infection may occur after the sample for testing has been collected. Animals that test clear of IBR prior to sale may pick up the infection at the sale. Testing with vaccination at the time the blood sample has been collected offers a useful way of managing this aspect of the problem.

The final concern with this approach is the difficulty and inconvenience of returning an animal to the vendor when it has tested positive during post purchase quarantine. While it is undeniable that an animal persistently infected with BVD virus could only have been infected whilst in the womb of its dam and therefore was purchased with the infection the situation may be less clear for other diseases.

The costs of this approach for the vendor or purchaser are similar and relate to veterinary time, sampling and testing. For the vendor of a single animal this may be in the region of £30 to £40 with the cost per animal falling as the number of animals screened increases.

Boundary biosecurity

Boundaries must be stock proof and prevent nose-to-nose contact. Double spaced fencing has long been the standard for this and a gap of 3 metres has been used as the distance between the two fences. The ability of such a fence to prevent the transmission of disease has to be questioned as large cattle can extend their neck a considerable distance. No guidance has ever been given on the height that such a fence should be. The situation is further weakened as under experimental conditions the viruses of the respiratory tract, including bovine herpes virus 1, the causal virus of IBR and BVD virus, can result in infection over distances in excess of 5 metres (Mars, Bruschke et al. 1999). In the field it has been shown that the risk of spread is diminished to insignificant levels at distances over 4.4 metres (Mars, de Jong et al. 2000). To improve the effectiveness of boundary fencing in this respect mains electric scare wires can be used each side of a boundary fence. This is an effective stock barrier and discourages animals from attempting nose-to-nose contact. Where such boundaries enclose a strip of hedge or trees then the biosecurity will be enhanced.

While the double fencing is required to reduce the risk of transmission of IBR and BVD virus infection it is not necessary for Johne's disease, leptospirosis or for venereal campylobacteriosis. Electric fencing is recommended for the last of these diseases.

The cost of fencing including materials and contractor's charge is put at £3.00 per metre for the extra stock fence to create a double fence and £1.28 per metre for electric mains fencing and £500 for energiser and earthing point (SAC 2003). The average upland farm with 100 cows and 500 ewes might be expected to have 250 hectares and a periphery fencing requirement of 7000 metres. Three quarters of its periphery may require double fencing at a cost of £15750 and the entire boundary with mains electric scare wire at a cost of £9460. These are generous estimates and it could also be argued that effective stock proof boundaries should not represent a cost for biosecurity alone, but should be a necessary prerequisite for a stock farm. These costs can be written off over several years and the electric fencing will have the additional benefit of reducing damage to fences and walls caused be stock.

A further important element of boundary security is the use of rented grazings. In many situations this is the consequence of small farm size and the restrictions that this places on farmer's who wish to expand. However there has also been the pressure to increase grazing area caused by the extensification premium. Even with decoupling it may be a requirement to keep the same area of grazing so perpetuating this artificial pressure. It is difficult to see how biosecurity can be effectively maintained when groups of cattle from one herd are distributed around the country, as the investment in boundary biosecurity on pasture for rent is likely to be minimal.

Vaccination

Vaccination can be an important adjunct to boundary biosecurity. If the breeding herd is vaccinated against BVD then the possibility of this infection crossing into the herd from neighbouring herds is significantly reduced. When this approach is used it must involve the entire breeding herd and requires an annual booster. For BVD the initial cost per 100 cows herd is around £450 with recurring annual costs of £280. The same approach may be used for IBR and for leptospirosis. There is no commercial campylobacter vaccine available in the UK and vaccination cannot be used to reduce the risk of bulls crossing fences and either infecting cows or being infected by cows with venereal campylobacteriosis.

Vaccination for BVD does not replace testing and quarantine or purchasing accredited stock as the purchase of a virus carrier animal is likely to have significant effects. If the animal is a bull it will be infertile or subfertile. If it is female the calf it produces will also be a virus carrier and result in losses in the calf crop from other diseases such as pneumonia.

Other risk factors

Co-grazing with sheep and goats constitute a risk for BVD, Johne's disease and leptospirosis, but in practice these animals are likely to be more at risk from the cattle than vice versa. The situation is similar for wild ruminants. Other wildlife notably rabbits can be infected with Johne's disease and the role they have in the epidemiology of the disease is yet to be defined (Greig, Stevenson et al. 1999). The current recommendation is to ensure rabbit control on the farm is as effective as can be achieved.

Biosecurity programme

Biosecurity programmes are farm specific because of the risk assessment aspect and the differing disease status requirements depending on the enterprises on the farm. The cost of drawing up such a programme is likely to be two to three hours of veterinary consultancy for the first year. Subsequently a review and fine-tuning is all that is required and that should be covered by one hour veterinary consultancy.

Is there a place for biosecurity in the beef herd?

While the figures on cost of disease do support the need to prevent the occurrence of such losses it is difficult to put the problem into perspective due to the lack of clear information on the risk of introducing infection. At the present time all that can be said is that Johne's disease, BVD and IBR are common and the risk of purchasing an infected animal is high. The need for this type of approach to disease control would appear to increase with the cost of the animals. Hence there should be no difficulty in justifying biosecurity for the pedigree sector producing breeding bulls and to a lesser extent for herds that produce female breeding replacements. Such an approach would safeguard the investment in the herd and offer quality assurance to clients. The issue of quality assurance can only become more important as the legislation on the sale of goods is tightened up. For the commercial suckler cow herd a biosecurity programme should be built into the health plan for the herd, but the focus should be on the purchase policy. Sourcing from herds that have achieved assurance of freedom from BVD and Johne's disease is a justifiable target. Similarly the risks of bringing venereal campylobacteriosis onto the farm through the hire or purchase of adult bulls or purchase of adult females must be addressed. Boundaries should be stock proof to prevent the spread of venereal campylobacteriosis, but for many units the cost of double fencing may be prohibitive and the recurrent cost of BVD vaccination will be preferred.

This position is based on the premise that decoupling subsidy will result in a greater need to ensure that the suckler herd achieves higher levels of production efficiency. Disease control will be an important element of any strategy seeking to achieve that and for effective disease control a farm biosecurity plan is essential.

Table 1: Examples of loss per year per 100 cow herd for disease outbreaks

Disease	Type of loss	Estimated value per 100 cows per year	Type of information	Source
BVD	Mucosal disease calves	£13300	Disease outbreak	(Wright 1998)
Salmonellosis	Abortions and cow deaths	£16015	Disease outbreak	(Taylor, Caldow et al. 2001)
Venereal campylobacteriosis	20% barren cows additional to expected numbers.	£5350	Estimate based on field experience.	Data from salmonella outbreak(Taylor, Caldow et al. 2001)
BVD	Infertility, mucosal disease and calf disease	£3500	Model	(Stott, Lloyd et al. 2003)
Johne's disease	Increased wastage of cows	Average loss £1617	Model	(Humphry, Stott et al. 2001)

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