Europe's progress in IBR virus eradication

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The bovine herpesvirus type 1 (BoHV- 1) is widely recognised as an economically important pathogen in the cattle industry. Infectious bovine rhinotracheitis (IBR) is the commonest clinical manifestation of the infection with the BoHV-1 and the disease is characterised by fever, anorexia, coughing, nasal discharge and severe rhinotracheitis.

Less frequently, the virus has been associated with infection of the alimentary tract and encephalitis, and in adult animals with abortion, stillbirths and mastitis. When the infection takes place via the venereal route, the virus can cause two syndromes known as infectious pustular vulvovaginitis (IPV) in female animals or infectious pustular balanoposthitis (IBP) in males.

Due to the fact that IBR is the most common form of BoHV-1 infection, the process of eradicating BoHV-1 from a herd is also commonly known as IBR eradication.

IBR can affect young calves as well as adult animals. The severity of the disease varies from mild, or even subclinical, to fatal. The latter can be seen with single BoHV-1 infection but specially when a simultaneous infection with other viruses such as BVD and BRSV, and bacteria like Mannheimia haemolytica and Pasteurella multocida takes place.

One of the most important features of this virus is that after an acute phase of the disease, BoHV-1 establishes, similarly to other herpesviruses, a life long latency. Latently infected animals are clinically healthy but have become permanent carriers of the virus meaning that they pose a potential source of the infection for the rest of the herd.

In periods of stress (shipment, mixing, birth etc) causing the state of immunosuppression, the latent virus can be re-activated and the animal can shed the virus and in some occasions even become clinically ill again.

IBR vaccines

The first commercial vaccine against BoHV-1 was developed more than half a century ago. Those early BoHV-1 vaccines were effective in reducing the severity of the clinical signs or even preventing the clinical form of the disease should the infection with the field virus occur.

Nevertheless, they could not protect against the infection itself meaning that those animals that had been in contact with the field virus would become latent carriers in spite of the vaccination.

A major disadvantage of conventional IBR vaccines is the interference of antibodies induced by vaccination with serological diagnosis and identification of (latently) infected animals.

Because both the animals vaccinated with a conventional IBR vaccine and those infected with the field virus will produce the same type of antibodies, any serological differentiation between the vaccinated and infected individuals is impossible.

To circumvent this problem, marker vaccines and the appropriate diagnostic tools have been developed, which allow for a differentiation between naturally infected and vaccinated animals.

The strain of BoHV-1 used in IBR marker vaccines lacks the glycoprotein E. As a result, the animals vaccinated with these marker vaccines will not produce antibodies against the glycoprotein E, in contrast to the individuals infected with a field virus (which contains glycoprotein E).

Those gE deleted BoHV-1 strains have proven to be suitable as vaccine strains for both live attenuated and inactivated IBR marker vaccines. Live BoHV-1 marker vaccines are generally considered superior to inactivated ones when the efficacy and onset of immune response are concerned.

The choice of the type of vaccine to be used depends on the individual farm situation.

IBR diagnostics

The classical picture of febrile rhinotracheitis is highly indicative of IBR, however, due to the wide variety of clinical forms and grades of severity, the veterinary surgeon in most cases will require laboratory testing to confirm the clinical diagnosis.

The laboratory will use one or all of the following techniques:

- **Virus isolation:** Detection of BoHV-1 can be performed in various specimens: swabs (nasal, vaginal), sperm, tissue samples collected from dead or aborted animals. It is recommended to contact the local diagnostic laboratory for specific requirements regarding sampling and transport procedures.
- **Serology:** Antibodies against BoHV-1 can be detected in blood samples at around 2-6 weeks post-infection.

The choice of the method for the detection of BoHV-1 specific antibodies depends on the BoHV-1 vaccination status of the herd (see Fig. 1).

Fig. 1. Selection of the suitable BoHV-1 antibody testing method for the identification of animals infected with field virus is dependent on the vaccination status of the animal or herd.

Vaccination status	Antibody detection methods	Suitable samples
No vaccination →	Indirect ELISA	Milk, serum, plasma
Vaccination with marker vaccines →	gB-blocking ELISA	Serum, plasma
	Virus neutralisation test	Serum, plasma
	gE-blocking ELISA	Serum, plasma
Vaccination with non-marker vaccines →	Identification of infected animals not possible	

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In situations when animals are likely to be sero-positive for BoHV-1 because of maternal antibodies, vaccination or previous infection, paired serum samples are required to diagnose an acute BoHV-1 infection.

IBR eradication

Any systematic IBR eradication programme to be applied in a herd requires not only a well defined vaccination plan (that needs to be followed until necessary), but also appropriate biosecurity measures in place in order to reduce the risk of re-introduction of the virus in the herd through the purchase of latently infected carriers or new animals in the acute phase of the disease.

Only gE negative individuals should be introduced into a herd and mixed with the rest of the animals after having been placed in quarantine for a certain period of time.

Although, immediate culling of latently infected (gE positive) animals should be carried out, in most cases it is not economic, therefore, those animal will leave the herd through the normal culling process implemented on the farm.

Vaccination plays a big role in the IBR eradication programmes. The purpose of vaccination with IBR marker vaccines is not only to prevent the clinical signs of the disease should the field virus enter the herd but also to reduce its circulation between the animals.

Reduction of the virus circulation within the herd is extremely important as it prevents the sero-negative naive animals from getting infected and becoming gE positive.

By limiting the chances of having new gE positive animals in the herd and gradual culling of those already infected with the field virus at the start of the vaccination programme, the herd will gradually achieve the IBR free status.

IBR eradication from a herd is deemed to fail if vaccination is done non-systematically on an ad hoc basis.

The availability of IBR marker vaccines both live and inactivated, offers the opportunity to develop various vaccination regimes adjusted to the needs of an individual farm.

Based on the results of numerous immunogenicity studies and field experience the use of live vaccine is recommended for the primary course and in situations of high infection pressure, such as in large herds, herds with regular introduction of animals, or herds with high BoHV-1 prevalence.

Moreover, it can be advisable to apply live IBR marker vaccines intranasally from the age of two weeks onwards if a clinical form of BoHV-1 infection can be observed even in young animals. In any other situation, both live and inactivated vaccines are suitable (see Fig. 2).

- **The live vaccine has advantages in the following situations:**
  - Primary course
  - Young animals
  - High risk of infection
    - large herds
    - herds with regular introduction of animals
    - herds with high prevalence of BoHV-1 infection
  - Intranasal route preferred when early onset of immunity is required
- **Live and inactivated are equally well suited in any other situation**

Fig. 2. Recommendations for the choice between live and inactivated IBR marker vaccines.

The European perspective

During the last decade major changes have taken place in Europe concerning IBR eradication. The Scandinavian countries, Austria and Switzerland have already eradicated BoHV-1 through test and removal strategies. This scheme can only be adopted when the initial prevalence of the infection and the cattle density are low.

In most of the other European countries both the prevalence and the cattle density are high, thus in those countries eradication programmes would require the use of marker vaccines.

At this moment countries such as Germany, The Netherlands, Belgium, France, Hungary, Czech Republic and Slovakia have national eradication programmes in place. Ireland banned the use of non-marker IBR vaccines in 2005 although currently no eradication programme is in place there.

In Italy the use of IBR marker vaccines is widespread in the dairy sector, while in the rest of Europe the use of IBR marker vaccines vary between countries.

It is clear that Europe heads towards eradicating IBR and each consecutive year we are one step closer to achieving it. ■