Control Strategies for Infectious Bovine Rhinotracheitis (IBR) in Italy

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Abstract

Bovine Herpesvirus 1 (BoHV-1) is a major pathogen of cattle, the infection is accompanied by various clinical manifestations such as infectious bovine rhinotracheitis (IBR), infectious pustular vulvovaginitis, abortion and systemic infection in neonates. Despite of a pronounced immune response the virus is never eliminated from an infected host but establishes life-long latency and may be reactivated. The viral re-excretion is responsible for the maintenance of BoHV-1 within a cattle herd. Vaccines usually prevent the development of clinical signs and markedly reduce the shedding of virus after infection, but do not completely prevent infection. The disease causes significant economic losses and trade restrictions, therefore several eradication campaigns have been carried out or are currently running in different countries. Currently in Europe only a small number of countries have achieved IBR-eradication. In Italy there is no national legislation on IBR, the new trade requirements and the need to limit the introduction of positive animals have led some Italian regions to initiate programs for the eradication, therefore we find regional differences and even provincial.

Keywords: IBR, cattle, control programs, eradication programs, Italy.

Introduction

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Infectious bovine rhinotracheitis (IBR) is a contagious infectious disease caused by bovine herpesvirus 1 (BoHV-1) which is also responsible of different clinical manifestations such as infectious pustular vulvovaginitis (IPV), balanoposthitis, metritis, abortion and keratoconjunctivitis (Pastoret *et al*., 1982). BoHV-1 is distributed worldwide. In most countries vaccination is widely used in order to reduce the economic losses caused by the disease (Van Drunen Littel-Van den Hurk *et al.*, 1997). In Europe the first IBR outbreaks were observed in 1970 (Edwards, 1988; Metzler *et al.*, 1985). Following these episodes many European countries have established different control programs to serve the economic interests (Franken, 1997 and Straub, 1999). Bovine herpesvirus 1 is responsible for considerable economic losses due to disease and trade restrictions. Towards the end of the nineties many efforts had been made to achieve IBR eradication in the European Union (Bätza, 2003; Beer *et al*., 2003; Trapp *et al*., 2003). European Union has included IBR in the list of diseases that may be subject to eradication plans with Union's grants. Infectious bovine rhinotracheitis is one of the diseases listed in Annex E, Part II, Directive 64/432/EEC as amended by 97/12/CEE, and in the Decision 2004/558/EC on animal health problems affecting intra- community trade in bovine animals and swine. If a Member State has a compulsory national or regional control program, may submit this to the European Commission specifying the distribution infection, the cost-benefits, qualifications and standards to be followed, procedures for the monitoring program, the measures to be taken and complementary guarantees for the acceptance of the plan by EU. Where a Member State considers that its territory or part of it is free from any of the diseases listed in Annex E, in accordance with Article 10, is required to submit documentation to the Commission to obtain the status free from disease. The documentation shall indicate the nature of the disease beyond its history, the results of surveillance, the period during which the surveillance was carried out, preventive measures to control the absence of disease and finally the additional guarantees. The recognition of the plans of control and eradication of infectious bovine rhinotracheitis at European level modified cattle's trade flows and changes within an area plan recognized. IBR-free countries have achieved this status by applying programs where animals diagnosed seropositive to BoHV-1 are slaughtered. This method is fea-

sible in cases where the prevalence of infection is low (Ackermann *et al.*, 1990). The procedures for diagnosis and eradication would cause severe economic losses in countries with high infection rates. Therefore the best way to reach the goal is to apply eradication programs in combination to vaccination protocols. Vaccination is the most convenient measure to prevent and limit infections. The main purpose of the use of vaccines for BoHV-1 is to reduce the clinical symptoms of the disease and thereby the economic impact of the infection, as well as reduce viral excretion in the environment. Currently vaccines on the market are not able to prevent the establishment of viral latency. It is not known whether passive immunity is capable of prevent viral excretion and the latency after primary infection. However, it was shown that the immunity acquired through colostrum protect calves from disease fatal multisystemic infection caused by BoHV-1 (Lemaire *et al*., 1999). Maternal antibodies do not prevent the initial viral replication thus allowing the establishment of latency. When maternal antibodies disappear, animals likely become seronegative latent carriers of the virus, at least until seroconversion or reactivation occurs. The IBR control programs must then consider the existence of latently infected seronegative animals (Lemaire *et al.*, 1995). The acquisition of territorial qualification is a major achievement for health and economy. It is important to know the requirements for each province in order to acquire the status of free territory. Especially, prophylactic measures prevent the introduction of viruses and its circulation in the herd. The adoption of such measures significantly affects the effectiveness and time implementation of the business plan of control/eradication of the disease. The application of a biosafety plan, modulated on the basis of characteristics of the herd and the epidemiological situation detected, in agreement with the breeder and the veterinarian, is therefore a key element to participate to the eradication program. The biosafety plan of the herd is based on the principle of "protected herd" and provides specific procedures to minimize the risk of viral introduction from the outside. The biosafety plan includes structural and managerial requirements in the farm, which aimed to reduce the risk of transmission of the infection related to the presence of non-seronegative animals and the latency phenomenon. The procedures of internal biosafety include identification, eventually vaccination and the early removal of seropositive animals. The isolation and consequent removal of the seropositive animals would be the most effective measures to remove the infection within a herd. However, although they are not always feasible, especially in the early stages of the eradication plan, such direct measures must be integrated in association with indirect prophylaxis based on the situation of each farm and subjected to periodic checks regarding their effectiveness. As the virus is not very resistant and is sensitive to common disinfectants, the cleaning and the disinfection of the farm are of fundamental importance. It's important to not underestimate the correct herd management in relation to animal welfare, in order to avoid stressful situations involving episodes of reactivation of latent infection, with virus excretion and distribution of infection, including exclusion or, if necessary, carrying out under strict control, pharmacological interventions that may facilitate the reactivation of the virus. Farms that adhere to the control or eradication IBR programs are not allowed to use the traditional vaccines. The herd's vaccination program is evaluated on the basis of information on the health situation and of its history, such as past infections, vaccination plans already in place, the annual prevalence, the accurate prevalence at the time of the tests and possible reporting of symptoms; data available regarding the health situation of the farms and the surrounding territory; identification of risk factors for transmission of infection within the herd and/or introduction of the virus from the outside. It is also important to the programming about elimination times of seropositive animals, herd management, resources available and, in general, the constraints and the possibilities to become IBR-free. In 1984, Denmark has established a program for the eradication which was successful as the country is now IBR-free. Currently Austria, Finland, Sweden, the Province of Bolzano in Italy and the Federated State of Bavaria in Germany (Decision

93/42/EEC), as well as Switzerland are also considered free of IBR (Ackermann *et al*., 2006). The Province of Trento, Friuli Venezia Giulia, province of Belluno in Italy, the Czech Republic and other regions of Germany have implemented compulsory eradication programs. Italy can be considered as a country with medium/high prevalence. The collection of data related to the most consistent serological monitoring refers to the period between 1980 and 1996 and concerned 36500 animals in 1720 farms the Po Valley. This epidemiological investigation showed that 55% of animals and 60% of the herds were seropositive to BoHV-1. It also showed an increase in vaccination, in 1996, affecting approximately 40% of the herds controlled. The main objective of the monitoring plan was to estimate the IBR seroprevalence in dairy herds and to collect information relating to the adoption of specific vaccination plans. These data were certainly influenced by the presence of antibodies vaccine arising from the use of conventional vaccines, but almost half of the farms where the animals had not been vaccinated (83.3% of farms investigated) had detectable levels of positive animals. It was pointed out that these animals did not show any clinical signs of the infection, and that the main risk factor, namely the introduction of virus within a population, was represented by the purchase of infected animals. This survey has highlighted the significant association between the area of the farm and the seropositivity of the farm meaning that the probability that the infection persists would be greater in farms of large dimensions. The genetic centers and bulls centers are officially IBR-free from 1977. The Ministerial Circular 79 of 1997 provides that all animals intended for artificial insemination centers should be seronegative (Turin and Russo, 2003). Italian regions, at the request of the Ministry of Health (Circular No. DGVA VIII/28926/-I.8.d/368 of 09.24.2004), have been recommended to establish control plans against IBR. All the plans for eradication and control have in common the definition of herd, qualifications obtainable and the type of serological tests to be used for the monitoring of the infection. There are identified herds in which they are raised breeding animals of the bovine species and/or buffalo, and are defined as IBR-free the animals that are negative to ELISA test for the detection of antibodies anti-glycoprotein E.

Province of Bolzano

The Province of Bolzano was the first to implement a voluntary eradication program since 1990, later made compulsory in 1994. The decision regarding the implementation of the plan is derived mainly from proximity to Austria and Switzerland, countries that had already begun plans eradication and with whom there were and still are very close trade and grazing relations. The plan stated that the serology was performed on all subjects over 12 months of age and, in infected herds, also in animals older than 6 months. It was scheduled to slaughter behind payment of compensation, or concerns of seropositive animals belonging to infected herds and, as regards the movements, was prohibited the introduction of infected animals in herds. At the beginning, the plan of the Province of Bolzano allowed the use of the vaccine in infected animals, and when gE deleted vaccines were available on the market, they were the only ones to be used in distinguishing the type live attenuated for seropositive animals, while seronegative were vaccinated with the inactivated. These tools have allowed to decrease the prevalence of the infection over the years and enabled the elimination of all vaccination. Since 2000, the Province of Bolzano is the only Italian province officially IBR-free.

Province of Trento

In 1997, the Province of Trento has launched a voluntary eradication program which has been made compulsory from 1st November 1998 in all cattle breeding herds. The plan provided that vaccinated animals with traditional vaccine must be sent only to slaughter and that new animals introduced in a herd should be seronegative. In 2001, 1763 farms and 37646 animals were controlled and 73% of cattle and 50% of herds were negative in serology (Nardelli *et al.*,2002). The Province of Trento is close to eradicate the disease as

the percentage of infected farms (5.1%), and positive animals (4.2%) were reduced in 2010 (Rivista della Federazione Provinciale Allevatori Trento, 2010).

Veneto

A serological plan was initially established in the Veneto region, and became a control plan since 1999. In the province of Belluno and Val Canale, there is a compulsory plan since 2001 because of low prevalence of the infection, as well as cattle from these provinces could be in contact, when grazing, with cattle from the province of Bolzano and Carinthia. Given the importance of the dairy cattle sector, the Veneto region has decided to launch, between October 1999 and December 2000, a serological monitoring plan against IBR, to assess the prevalence of seropositive infection in the dairy cattle herds on the territory region. Together with this monitoring plan, a regional control program on a voluntary basis has been approved in 2001 (Regional Resolution n.1827 of 13 July 2001) and updated in 2012 (Regional Decree no. 36 of 13 April 2012). All breeding animals over 9 months of age must be subjected to serological assessment for IBR in the thirty days prior to the handling. If new animals are introduced in herds that have joined the plan, these animals should always be tested regardless of age. The males of all ages, whether intended for a farm for breeding, must be serologically assessed prior to movement. In breeding herds, the introduction of animals with a positive serological test result against IBR is prohibited. The official serological surveys are carried out on animals more than nine months in farms that have joined the plan and on samples of bulk milk in the manner prescribed. The application for membership to the plan is presented by the breeders to the Veterinary Service of the Health Authority. In the case where serological tests show the presence of positive animals, the farmer is required to enable a plan of reorganization based on immunization with vaccine marker gE-deleted of all animals susceptible to infection, or animals found positive must be removed on the basis of an approved program by the Veterinary Service. Particular requirements and transitional measures for the province of Belluno - All breeding herds in the province of Belluno must participate to the program following the rules set at the regional level for farms participating in the plan (Mandinelli *et al.*, 2001).

Friuli Venezia Giulia

Friuli Venezia Giulia region has launched a similar plan to that of the Veneto region since January 2000. Currently, 60% of the herds is IBR-free or officially IBR-free.

Lombardy

The Lombardy region has initiated a serological program since January 2001. The IBR monitoring was held as part of the plan of voluntary control, surveillance and blood samples related to animal sales. Studies conducted in recent years indicate that the seroprevalence remained nearly constant. On the territory there is a high number positive herds which has increased viral circulation and has led to an increase in disease outbreaks in Lombardy. IBR episodes have occurred both in farms considered negative and in herds with vaccination programs in progress. In addition, the sensitivity of breeders and their associations is very different in function of the different provinces (Giovannini, 2005).

Piedmont

Infectious bovine rhinotracheitis eradication operations were started in Piedmont in 2003 and are regulated by the DGR 24-8144 of 30th December 2002. The eradication program is voluntary, but is required to do serological test in animal sales over 12 months of age. Over the recent years a high percentage herds (65%) joint the plan, and it shows first results of the activities conducted, especially within herds where control measures are taken since several years.

Valle d'Aosta

In Valle d'Aosta region there is a regional control plan since 2003 that has been developed

by the Department of Agriculture and entrusted to Istituto Zooprofilattico Sperimentale (IZS) of Piedmont, Liguria and Valle d'Aosta with the Veterinary Services. From 2005 to 2006 there was a net decrease in positive herds from 46% to 34% (Orusa *et al*., 2007).

Liguria

The Liguria Region has established by resolution n. 1660 of 21st December 2007 the regional program for IBR eradication which has a voluntary submission by farmers. The periodic serological investigations are made free of charge, generally in conjunction with other diagnostics interventions during prophylaxis period.

Tuscany

In Tuscany, the resolution of the Regional Council n. 423/2008 approved the implementation of the regional project for the control of IBR on a voluntary basis. All animals for breeding and production over 9 months of age, from farms participating to the project, should be subjected to diagnosis by tests ELISA. If a part of the territory of a province has more than 50% of farms that obtained the status of IBR-free or officially IBR-free, or more of the 60% of the animals belongs to IBR-free herds, the Region Tuscany, at the request of the local health authorities, may issue an act that not allows the use of conventional vaccines (not gE deleted) throughout the province, making compulsory the control plane to all breeding herds located in the territory.

Marche

The Decree of the Director of P. F. Veterinary and Food Safety 181 of 30th October 2009 has established a regional control plan against IBR. The control plan, although on a voluntary basis, was created to protect the regional livestock about health, with decrease of clinical signs, and economic losses. Marchigiana breed herds have priority for participation to the program. The control plan is carried out by the Regional Health Service (ASUR), IZS, Regional Breeders Associations (ARA) and Provincial Breeders Associations (AAPPAA). The serological tests are performed in all animals that are more 9 months of age on the basis of two blood samples after 5/7 months.

Lazio

Lazio region with DGR 876 of 18th December 2006, has established a regional plan to control IBR, the program is divided into two parts: a one year serological monitoring plan which was compulsory for each herd, which ended in 2007 and a voluntary eradication plan, which is still in force. The eradication program not allows conventional vaccines, except for seropositive animals. The DGR 876 of 18th December 2006 also establishes serological test for the sale of animals over 9 months of age in the 30 days prior to the handling, or regardless of age, on all animals of herds that joined the plan.

Campania

Campania region, with resolution no. 2313 of 29th December 2007, established a monitoring plan for IBR, the participation is voluntary and the plan includes serological tests for each new animal introduced in a farm and for animals that are moved from any cattle herds, blood samples must be collected and tested 30 days before the departure.
There are no official news about other Italian regions.

Discussion

Biosafety and adequate management are the basic pre-requisites for the application of an effective plan. The use of vaccination is useful for the reduction of the clinical forms and virus excretion, while it is inadequate for eradication. Initially, marker vaccines could be useful in a control plan in order to decrease the prevalence of infection and to allow animal's movement to specific areas. The effectiveness of this approach is related to the number of herds that participate to the plan and to the reliability of diagnostic methods. In addition, in some Italian regions, because of notable differences about IBR in close provinces, fre-

quent animals movements, vaccination, high animals and farms density and the high costs, to become IBR-free is hampered. An eradication program, although on voluntary basis, is much more effective the much farms are involved on the territory. Therefore, there is a need to standardize the intervention strategies.

Conclusion

Farmers should be motivated to participate at the control plan for health and economic issues related to the infection. It is important to involve the Associations of Breeders to aware and inform farmers. The official veterinarians have the major responsibility to propose and motivate the adhesion during the annual prophylactic sampling, while the herd veterinarian can play the important role of consultant in the setting and the carrying out the plan of the farm.

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