PREVELENCE AND CONTROL MEASURES OF INFECTIOUS BOVINE RHINOTRACHEITIS IN LITHUANIA

Jacevičius E.[1], Šalomskas A.[1,3], Milius J.[1], Petkevičius S.[1,3], Mockeliūnas R.[1], Jacevičienė I.[2], Lelešius R[3], G. Pridotkas[2].
[1]Lithuanian Veterinary Academy, Tilžės 18, LT 47181, Kaunas, Lithuania, ejacevicius@vet.lt
[2]National Food and Veterinary Risk Assessment Institute, J. Kairiūkščio 10, LT-08409 Vilnius, Lithuania,
[3]Veterinary Institute of LVA, Instituto g. 2, LT-56115 Kaišiadorys, Lithuania.

ABSTRACT

The aim of the present work was to evaluate the prevalence and efficacy of IBR control measures in selected cattle herds in Lithuania. Serological investigations in 1997 - 2007 years (34600 blood sera samples tested) showed that BHV-1 infection mostly detected in cows (33.86%), less - in heifers (8.77%) and in bulls group (1.69%). In majority of the cases seropositive bulls were detected in quarantine performing control testing before introducing to artificial insemination (AI) centers. The investigation by PCR proved that in three cattle herds BHV-1 was the prevalent agent of endemic respiratory disorder in calves. The BHV 1 was detected in 13 out of 29 tissue samples (44.8%). IBR control programs were performed in 22 farms or 6.9% from all controlled dairy farms. In most cases marker vaccine was used for IBR eradication. Serological testing in farms which perform vaccination showed high efficacy of marker vaccines.
KEY WORDS: Infectious bovine rhinotracheitis, prevalence, vaccination

INTRODUCTION

Infectious bovine rhinotracheitis (IBR) is an infectious disease caused by bovine herpesviruses type 1 (BHV 1). Depending on the subtype of viruses and animal age, infection manifests as pneumonia, conjunctivitis, rhinotracheitis, encephalitis, balanopostitis, and reproduction disorders (Veselinovič et al., 1992; Oirschot et al., 1993; Kaashoek et al., 1996). Adult animals mostly suffer from subclinical forms of this disease, genital pathology or sterility in cows and heifers (Weiblen et al., 1992; Oirschot et al., 1993). For this reason, this disease also is referred as infectious pustulous vulvovaginitis (IPV) or infectious balanopostitis (IBP).

Diagnostics is one of the major control measures of IBR. Therefore, it is important to develop specific time-sparing and sensitive diagnostic methods. Virus neutralization (VN) tests and various ELISAs are usually used for detecting antibodies against BHV 1 in sera. The identification of serologically positive animals provides a useful and reliable indicator of infection status (Kramps et al., 1993). One of molecular tool is the method of polymerase chain reaction (PCR). The PCR method is applied worldwide for testing the cattle blood, milk and semen (Weiblen et al., 1992; Vilcek et al., 1993; Oirschot et al., 1993).

Scientific achievements have gradually changed the control requirements for IBR. When it turned out the method of selection and depopulation of seropositive animals was not relevant, special marker vaccines were developed. The European Commission carried out special efficiency tests after which the vaccines were recognized as suitable for eradication of IBR (Report on Bovine herpesvirus 1 (BHV1) marker vaccines, 2000).

Many IBR investigations were carried out in Lithuania in the last five years. It was determined that 14.5% of cattle were infected with BHV-1 (Milius et al., 2005). Yet problems of IBR diagnostics in pedigree herds have not been investigated in detail since 1998 and PCR method have not been so far applied for BHV-1 identification in Lithuania.

The aim of the present work was to evaluate the prevalence and efficacy of IBR control measures in selected national herds.

MATERIALS AND METHODS

Serological investigations. Pedigree cattle breeding farms were selected for IBR prevalence evaluation. Blood sera (n = 34600) of randomly selected animals were tested to BHV 1 gB glycoprotein antibodies by ELISA (POURQUIER® ELISA IBR-IPV gB Serum, Institute Pourquier, France) at the National Food and Veterinary Risk Assessment Institute. The efficacy of IBR control measures was based on serological tests that can distinguish naturally infected from vaccinated with gE-deleted IBR vaccines cattle (IBR)/BHV-1 gE Antibody ELISA Test Kit, Idexx, USA).

Clinical, epidemiological investigations. Clinical, pathologic and epizootiological investigations of IBR were carried out in selected cattle breeding farms taking into consideration the data of serological tests. Tissue samples from dead calves were taken in four farms where epizootiological, pathological and clinical signs were similar to IBR. Samples of affected lungs were taken from 29 calves aged 1–12 months.

Methods of molecular biological analysis. Twenty nine calves tissue samples were examined by the PCR for BHV 1. The DNA extraction was performed by phenol–chloroform–isoamyl alcohol method and the PCR procedure was performed according to the described method (Vilcek, 1993).

The statistical data analysis was done using computer program „Graph Prism 3.0™“. Student‘s reliability coefficient was calculated. The data was regarded as reliable when $p < 0.05$.

RESULTS AND DISCUSSION

Serological investigations in 1997-2007 years showed that BHV-1 virus infection mostly detected in cows, less - in heifers and in bulls group very rarely detected. In many cases seropositive bulls were detected in quarantine performing control testing before introducing to artificial insemination (AI) centers (Fig.1).

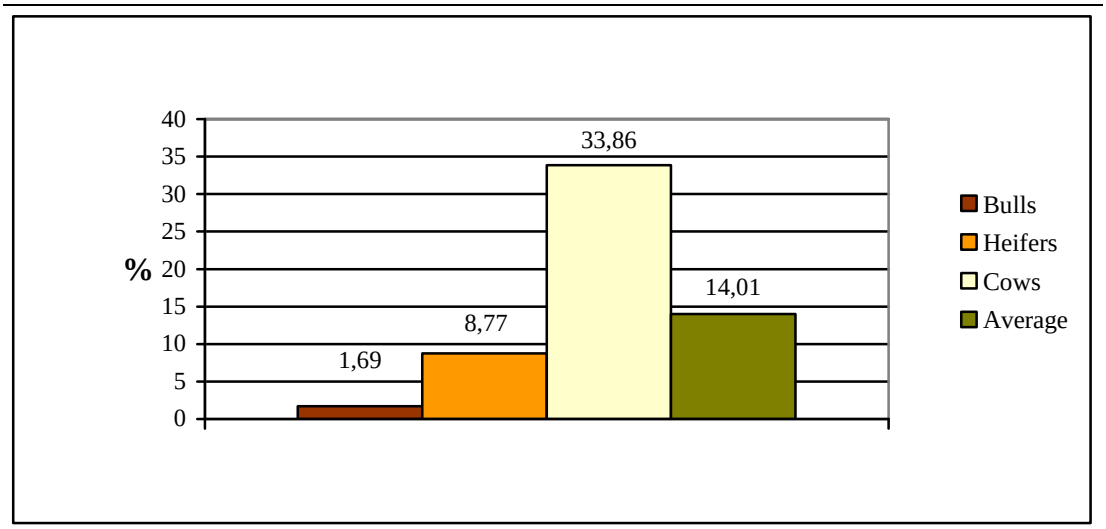

Figure 1. **Seroprevalence of infectious bovine rhinotracheitis in cattle**

The investigation carried out using the PCR (Table 1) proved that in three cattle herds BHV-1 was the prevalent agent of endemic respiratory disorder in calves. The BHV 1 was detected in 13 out of 29 tissue samples (44.8%).

Table 1.

BHV 1 detection in calves tissue samples by PCR

Herd No.	Herd description	IBR seropositive/ lethality in calves, %	Samples	Results of PCR		
				n	Positive	
					n	%
1.	900 cattle, unstrained	80.0/32.8	Lung	7	5	71.4
2.	500 cattle cows bound	10/9.4	Lung	10	4	40
3.	200 calves, unstrained	71.4/5.3	Secretion from nostrils	4	4	100
4.	> 1000 cattle, unstrained	77.8/10	Lung, spleen, lymphatic node	8	0	0
Total:				**29**	**13**	**44.8**

Lithuania in 1993 began to implement measures of IBR controls. Primarily this control have been implemented at farms of six AI centers. All bulls - semen producers were tested for antibodies to BHV 1 and 49.8% of bulls were seropositive. Till 1997 all seropositive bulls were discharged and at the moment all bulls of AI centers are not infected with BHV-1.

Other situation is in dairy farms. Till June of 2008 IBR control programs were performed in 22 farms or 6.9 % from all controlled dairy farms. Three farms had IBR free status. In most cases marker vaccine was used for IBR eradication. Serological testing in farms which perform vaccination program longer than three years showed very high efficacy of marker vaccines (Fig.2).

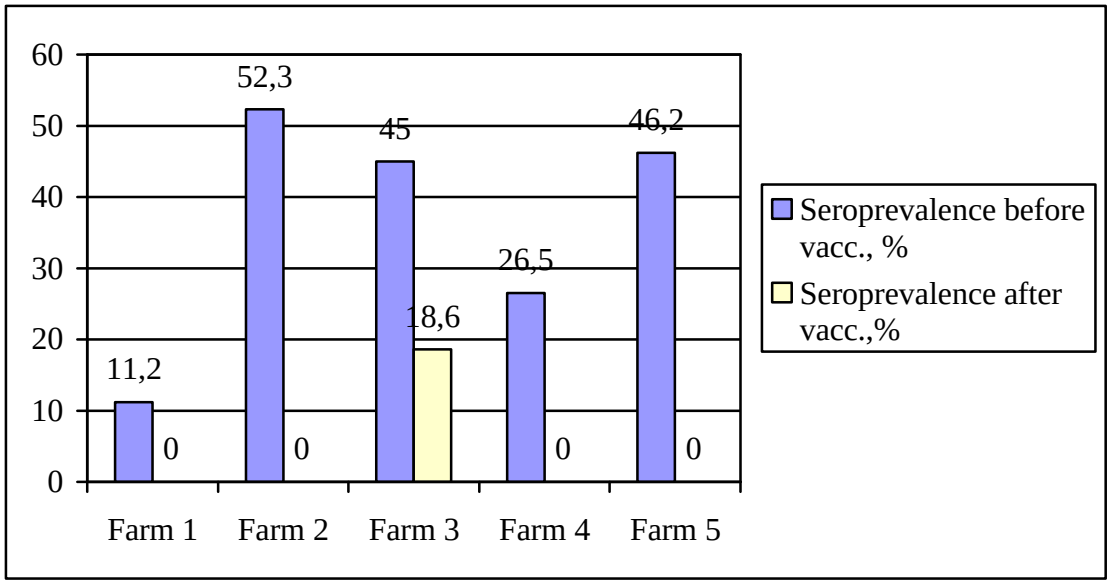

Figure 2. **Evaluation of efficacy of vaccination against IBR in selected cattle herds**

The investigations carried out in 1997 -2007 revealed that without control measures in pedigree herds the number of seropositive animals were not reduced. It is obvious that IBR

control measures only in the herds of pedigree bulls (producers of sperm) are insufficient. The variation of the number of seropositive heifers is the object of concern. This means that without specific preventive measures the dynamics of BHV-1 infection is difficult to predict. Notwithstanding the common opinion that the latent IBR form is typical of Lithuania, our investigation showed that IBR viruses also might often be the cause of bronchopneumonia in calves. This is an object of great concern as cattle with the BHV-1 form of respiratory infection spread the infection at high rates (Mars et al., 1999). The applied diagnostic PCR method enabled rapid identification of IBR. It was determined that even in three farms of four where calves had respiratory diseases, BHV-1 was one of the causes of morbidity and mortality. Our investigations also showed that most of highly productive cows in the selected farms were seropositive.

The method of depopulation (isolation and slaughter of seropositive animals) lying at the basis of Danish and Swedish IBR control programs (The Swedish IBR/IPV eradication program, 1995; The Danish infectious bovine rhinotracheitis program, 1996) is therefore inefficient for eradication of infection in countries with high seroprevalence of IBR. Based on the experience of German, Belgian, French and Dutch researchers and veterinary practitioners, we recommend to use vaccine produced of mutant BHV-1 virus containing no glycoprotein E in some farms for eradication of IBR/IPV (Bosch et al., 1996;; Thiry, 1997; Eloit, 1997; Wizigmann, 1997; De Wit et al., 1998). Among the advantages of this vaccine we can mention the possibility to distinguish between the vaccinated animals and naturally infected by serological methods (Siebert et al., 1995a; Siebert et al., 1995b; Bosch et al., 1996; Strube et al., 1996).

REFERENCES

1. Bosch J. C., De Jong M. C. M., Maisan J. et al. Quantification of experimetal transmission of bovine herpes-virus 1 in cattle vaccinated with marker vaccines. XIX World Buiatrics congress, Edinburgh, 8–12 July, 1996. P. 12–13.
2. De Wit J. J., Hage J. J., Brinkof J., Westenbrink F. A comparative study of serological tests for use in the bovine herpesvirus 1 eradication programme in The Netherlands. Veterinary Microbiology. 1998. Vol. 61, P. 153–163.
3. Eloit M. Identification and monitoring of IBR-free herds in the French IBR certification programme. IBR control programmes, Maastricht, June 1997. http://www.animalhealthservice.nl/pages/staff/litlijst/ibr/eloit.htm
4. Kaashoek M. J., Van Engelenburg F. A. C., Moerman A., Gielkens A. L. J. Risjewik F. A. M., Van Oirschot J. T. Virulence and immunogenicity in calves of thymidine kinase and glycoprotein E - negative bovine herpesvirus 1 mutants. Veterinary Microbiology. 1996. Vol. 48. P. 143–153.
5. Kramps J.A., Quak S., Weerdmeester, Van Oirschot J.T. Comparative study on sixteen enzyme-linked imunosorbent assays for the detection of antibodies to bovine herpesvirus 1 in cattle. Veterinary Microbiology. 1993. Vol. 35. P. 11-21.
6. Mars M. H., Bruschke C. J. M., van Oirschot. J. T. Airborne transmission of BHV1, BRSV, and BVDV among cattle is possible under experimental conditions. Veterinary Microbiology. 1999, Vol. 66. P. 197-207.
7. Milius J., Lukauskas K., Tamošiūnas V. Išlaidos galvijų virusinių ligų tyrimams Lietuvoje 2000–2004 metais. Veterinarija ir zootechnika. 2005, T. 31 (53). p. 37–42.
8. Oirschot J. T. Van, Straver P. J., Van Lieshout J. A. H., Quak J., Westenbrink F., Van Exsel A. C. A. A sublinical infection of bulls with bovine herpesvirus type 1 at an artificial insemination centre. Veterinary Record. 1993. Vol. 132. P. 32-35.

9. Report on Bovine herpesvirus 1 (BHV1) marker vaccines and the accompanying diagnostic tests. European Commission. Scientific Commitee on Animal Health and Animal Welfare. Adopted 25 october 2000.
10. Siebert S., Auer S., Heinen E. et al. Marker vaccines – new opportunity for IBR control. Part III: routes to control IBR. Tierarztl. Umschau. 1995a. Vol. 50. P. 707–713.
11. Siebert S., Auer S., Heinen E. et al. Marker vaccines – new oportunities for IBR control. Part II: safety and efficacy of the gE-deleted Bayovac IBR marker vaccines. Tierarztl. Umschau. 1995b. Vol. 50. P. 582–584.
12. Strube W., Auer S., Block W. et al. Ag E deleted infectious bovine rhinotracheitis marker vaccine for use in improved bovine herpesvirus 1 control programs. Veterinary Microbiology. 1996. Vol. 53. P. 181–189.
13. The Danish infectious bovine rhinotracheitis programme. Ministry of agriculture andfisheries. Danish veterinary service (1996).
14. The Swedish IBR/IPV eradication programme. Swedish board of agriculture (1995.01.12).
15. Thiry E. The Belgian field trial. IBR control programmes, Maastricht, June 1997. – http://www.animalhealthservice.nl/pages/staff/litlijst/litribr.htm
16. Veselinovič S., Vesilinovič S., Medič D. et al. Disturbances in bovine reproduction caused by action of IBR/IPV viruses. 12-th International Congress on Animal Reproduction. The Hague, 1992. Vol. 3. P. 1605–1607.
17. Vilcek S. Detection of the bovine herpesvirus-1 (BHV-1) genome by PCR. Journal of Virological Methods. 1993. Vol. 41(2). P. 245–247.
18. Weiblen R., Kreutz L. C., Canabaro T. E., Schuch L. F., Rebelato M. C. Isolation of bovine herpesvirus 1 from preputial swabs and semen of bulls with balanopostitis. Journal of Veterinary Diagnostic Investigation. 1992. Vol. 4. P. 341–343.
19. Wizigmann G. Qualifying and monitoring of IBR-free herds in Bavaria (Germany). Maastricht, June 1997.
http://www.animalhealthservice.nl/pages/staff/litlijst/ibr/wizig.htm