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Short Communication

A control program of Bovine viral diarrhoea virus (BVDV) -infection on large dairy farms in Beijing, China in 2009 and 2010

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A bovine viral diarrhea/mucosal disease (BVD/MD) control and eradication program was introduced on Beijing large dairy farms in 2009 and 2010, according to the Scandinavian countries' experience with moderate modification. At present, 30 of 48 large dairy farms (with≥500 cows) in Beijing have participated in this program. After screening the entire cow individually with antigen capture ELISA in these farms, 130 persistently infected (PI) animals were identified. The total PI rate is 0.34% (134/39290), which is a little lower than that of other countries (0.5 to 1.5%). The PI farm rate is 76.7% (23/30), which is significantly higher than that of other regions (about 15 to 60%). The most important risk factor for bovine viral diarrhoea (BVDV) transmission in these farms is trading of cows, including buying of cows from other local farms and importing cows from other countries.

Key words: Bovine viral diarrhoea virus (BVDV), eradication, persistently infected animals, BVDV-transmission.

INTRODUCTION

No official control program for bovine virus diarrhea virus (BVDV) has been implemented since BVDV was reported in 1980 in China (Li et al., 1983), and only a limited study on the prevalence of BVDV in several provinces has been performed. Financial losses from BVDV-infections can be substantial, but no officially approved vaccination is available in China at present. Further, only a vaccination strategy cannot bring about the eradication of BVDV. Researchers have stated clearly that healthy persistently infected (PI) animals are the main source for virus transmission (Houe, 1999). Therefore, a key element in a BVDV control and eradication program is the identification and elimination of PI animals.

Eradication of BVDV was almost completely achieved in Scandinavian countries about 10 years ago (Bitsch et al., 2000; Hult and Lindberg, 2005; Mars and Maanen, 2005). Several other European regions, American, and Peru have started control program (Rossmanith et al., 2005; Ståhl et al., 2008; Van Campen, 2010). Surveys have shown that BVDV seroprevalence in many provinces of China were very high, especially on large dairy farms of Beijing region (Zhang et al., 2010). As the interest and requirement for BVDV control increased, recommendations were proposed on large dairy farms in Beijing.

In this study, the results of PI animals screening performed in 2009 and 2010 are presented and discussed.

MATERIALS AND METHODS

The BVDV control and eradication program was organized by the regional centers for animal disease as a part of a national project in Beijing. A first BVDV antigen capture ELISA, performed on individual ear notch samples, was used for the identification of BVD-antigen positive animals. All these positive animals were segregated from herd to an isolation pen after first test. Three weeks later, a second BVDV antigen capture ELISA was carried out on these BVD-antigen positive animals. Animals with positive result in second test were identified as PI animals, and animals with negative result in second test were considered as acutely infected animals. The result was retested by RT-PCR with a pair of universally used primers *for* 5' un-translated region (5'UTR). All the PI animals identified were

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Table 1. Results of the PI animals screening performed in Beijing 2009 to 2010.

Geographical location	Farm number	Whether or not trading of cows took place in farms within 3 years[a]	Herd size	Numbers of PI animals	PI rate of each farm (%)
Chaoyang District	1	Yes	927	6	0.65
	2	No	1021	3	0.29
	3	No	617	2	0.32
	4	No	1024	0	0
Changping District	5	No	2058	0	0
	6	No	1302	3	0.23
	7	No	1831	1	0.05
	8	Yes	1168	7	0.60
Daxing District	9	Yes	2656	6	0.23
	10	No	1165	4	0.34
	11	No	701	0	0
	12	Yes	2390	8	0.33
	13	Yes	1263	7	0.55
	14	Yes	1245	8	0.64
Fangshan District	15	No	1208	0	0
	16	No	1177	0	0
	17	No	1094	5	0.46
Haidian District	18	No	1052	8	0.76
	19	No	1171	5	0.43
Miyun District	20	Yes	511	3	0.59
	21	No	500	2	0.40
Shunyi District	22	No	700	2	0.29
Tongzhou District	23	Yes	3011	27	0.90
	24	Yes	1660	9	0.54
	25	No	1224	4	0.33
	26	Yes	793	3	0.38
	27	No	1124	0	0
	28	Yes	1549	8	0.52
	29	No	1211	0	0
	30	Yes	1934	3	0.16

[a] refer to the 3 years, 2006, 2007 and 2008.

culled as soon as possible, and the acutely infected animals were segregated for at least 4 weeks. After the culling of the final PI animal in herd, all the new calves in the following 10 months were tested by BVDV antigen ELISA. In the screened herd, all the animals newly introduced were segregated for three weeks, and tested by BVDV antigen ELISA, before mixing them with other animals. The antigen ELISA was performed on individual ear notch samples using a commercial ELISA test kit (Herd-Check BVDV Antigen Test Kit/Serum Plus, IDEXX, Sweden) (Shannon et al., 1991) following the manufacturer's instruction. A commercial RT-PCR kit (Tiangen Biotech, China) was used to confirm the results. This technique combines the detection and genotyping, and the results will be reported in another article.

RESULTS AND DISCUSSION

In the 30 large dairy farms, 134 out of 39290 dairy cows tested were confirmed as BVDV PI animals (Table 1). There were one or more PI animal in 23 farms from 30 farms tested, and the PI farm rate was 76.7% (23/30). The total PI rate was 0.34%, and the PI rate in each positive farm ranged from 0.05 to 0.90%. There were 9 farms with

Table 2. Statistic analysis of the results.

Variable	Farms where trading of cows took place[a] within 3 years	Farms where trading of cows did not take place[a] within 3 years
No. of positive farms [b]/No. of tested farms	12/12	11/18
No. of PI animals/ No. of tested animals	87/17558 (0.50%)	47/21732 (0.22%)
No. of farms with PI rate >0.5%/No. of tested farms	8/12	1/18

[a] Trading of cows, including buying from other local farms and/or importing from other countries. [b] Farms with at least one PI animal identified.

a PI rate not lower than 0.5% (Table 2). PI animals play a key role in the epidemiology of BVDV infection, as they are the main source of the virus spread (Houe, 1999). Thus, the identification and culling of the PI animals are the most important step in this control and eradication program. Of course, the final eradication of BVDV needs systematic efforts. The farms where trading of cows took place within 3 years showed a more serious BVDV infection than farms where trading of cows did not take place. One of the farms in this study showed a most rigorous BVDV infection with a BVDV PI rate of 0.90% (27/3011). This farm was built in 2006 with about 20% cows imported from Australia, and 80% cows traded from other farms in Beijing. Moreover, the 7 farms with none PI animal identified belong to the farms where trading of cows did not take place within 3 years. The average PI rate on farms where trading of cows took place was 0.50%, while the average PI rate on farms where trading of cows did not take place was 0.22%.

Consequently, it seems that trading of cows is a very important risk factor for the BVDV transmission in these farms. So far, as we know, before cows were introduced into these farms, the BVDV infection was checked for the cows from other countries by an antigen ELISA. However, no test about the BVDV infection was performed for the cows from other local farms. A key element to control BVDV transmission in Beijing is to strictly check cows imported or traded from other herds for the BVDV infection.

Since no officially approved vaccination is available in China at present, it is very important to continuously monitor the BVDV prevalence on the farms post screening PI animals, including the bulk milk testing by RT-PCR and monitoring the BVDV antibody level of 6 to 12 months old calves.

Conclusion

In this work, for the first time, a BVDV control and eradication program has been implemented in China. The diagnostic screening of PI animals on large dairy farms has stated clearly that BVDV infection is very rigorous in these regions, and needs to be controlled. Characteristics of BVDV infection on large dairy farms in Beijing are the relatively low PI rate and the high farm PI rate. So, BVDV control programs should be implemented in more farms. A compulsory BVDV test at purchase and the culling of PI animals should be legislated.

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