



Influence of the BVD eradication program on the BVDV- and BDV-seroprevalence in small ruminants in Switzerland

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Key words

Border disease (BD), bovine viral diarrhea (BVD), serum neutralisation test (SNT), seroprevalence, surveillance, sheep, virus transmission, virus reservoir

Aim of the study

The goals of the studies were to (i) determine the seroprevalence of pestivirus antibodies (Ab) in sheep in Central Switzerland prior to and after the main phase of the Swiss BVD eradication program; (ii) to differentiate between BVDV- and BDV-induced antibodies in Ab-positive samples in order to get an insight into the transfer of pestiviruses from cattle to sheep, and (iii) to screen for the presence of viral RNA in these small ruminants in Ab-negative samples.

Material and methods

Sera from sheep originating from Central Switzerland were collected, with sera from 2001 and 2016-2017 representing sera obtained from years prior to and after the start of the Swiss BVDV eradication program in cattle, respectively. All blood samples from sheep were tested by ELISA for the presence of antibodies to pestiviruses. As the ELISA cannot differentiate between antibodies reactive to different ruminant pestiviruses, all the pestivirus Ab-positive sera were subjected to cross-serumneutralisation (XSNT) in order to distinguish between antibodies to Border disease virus (BDV) and to bovine viral diarrhea virus (BVDV). As the SNT is inherently more specific than an ELISA, samples positive in the latter might turn to be negative in the neutralisation test.

Blood samples tested negative or indeterminate for antibodies were subjected to RT-PCR to test for viral RNA in order to detect the possible presence of PI sheep. Sera were pooled (5-10 sera per pool) and RT-PCR of individual sera were only performed from samples out of a positive pool. All these methods were routinely applied at our BVD reference laboratory.

Results and significance

Overall, we analyzed 1247 sheep sera from 133 farms from 2001 (mainly canton SZ) and 1584 sera collected in 2016-2017 from sheep from 83 farms located in Central Switzerland (LU, NW, OW, SZ, UR, ZH). By ELISA, 21.4 % were positive and 2.5 % inconclusive for antibodies to ruminant pestiviruses in 2001, whereas 17.8 % were positive and 3.0 % inconclusive in 2016-2017. Thus, the overall prevalence for pestivirus antibodies was to some extent higher in 2001 compared to 2016/17, *i.e.*, 8-9 years after the start of the Swiss BVDV eradication program.

In ELISA-positive samples, the specificity of the antibodies was differentiated between Ab to BDV and BVDV by XSNT. The quality of the samples stored since 2001 was not always adequate and, thus, a fifth of them could not be analyzed by SNT due to toxic effects in cell culture. From the remaining samples, 60.7 % were specific for BDV, 13.3 % to BVDV, 16.6 % were negative and only 9.5 % were indeterminate. For the samples collected in 2016/17, 90.0 % of the sera contained antibodies to BDV, and only 1.5 % to BVDV, with 7.8 % being negative and 0.7% indeterminate.

As persistently infected animals are immunotolerant to the infecting virus strain, we tested all sera that were negative or inconclusive in ELISA and XSNT by RT-PCR for the presence of viral RNA. Only one single sample

collected in 2017 was positive, and nucleotide sequencing showed that it clustered together with typical BD viruses found in Switzerland to date.

Summary: This study confirms that antibodies to pestiviruses are widely present in the sheep population in Central Switzerland. This clearly indicates that infections with pestiviruses are endemic in the sheep population already for a long time but to a lesser degree than was observed in cattle prior to 2008. BDV is the predominant viral antigen in sheep over all the years, but the prevalence of antibodies to BVDV within the pestivirus-antibody positive sera severely dropped in 2016/2017 compared to 2001. This indicates that there was a significant transmission of BVDV from cattle to sheep prior to the start of the Swiss BVDV eradication program, which is therefore also of benefit for the sheep population. Thus, cross-species transmission of BVDV and BDV does occur between cattle and small ruminants and vice versa but only to a limited extent that does not appear to hamper the eradication of BVDV in cattle. Nevertheless, in case of detection of a calf persistently infected with BDV or BVDV during the surveillance program, small ruminants need to be taken into account during epidemiological investigations to identify the source of infection as quickly as possible.

Publications, posters and presentations

Huser, A.F. (2018) Pestivirus Seroprävalenz in Schafen nach dem Start der BVD- Eradikation. Master thesis, Vetsuisse Faculty, University of Bern.

Schär, J.G. (2018) Ovine pestivirus seroprevalence in Central Switzerland. Master thesis, Vetsuisse Faculty, University of Bern.

Schär, J.G.; Huser A.F; Abril, C.; Zanoni, R.; Schweizer, M. Influence of the BVD eradication program on pestivirus seroprevalence in sheep in Central Switzerland. *Manuscript in preparation*

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