Influence of border disease virus of small ruminants on the serological surveillance of bovine virus diarrhea of cattle in Switzerland

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Key words
BVDV, BDV, serum-neutralization test (SNT), seroprevalence, small ruminants

Aim of the study
The aim of this study was to determine the incidence of BD virus infections in cattle by an optimized cross-serum neutralization test (cross-SNT) protocol and to identify risk factors for BDV infections in cattle and their potential impact on the serological surveillance and eradication of bovine virus diarrhea (BVD) in Switzerland.

Material and methods
For the optimization of the cross-SNT protocol by selecting suitable challenge-viruses, a total of 10 ruminant pestivirus isolates (4x BDV, 5x BVDV-1 and 1x BVDV-2) from 10 different subgenotypes were tested with homologous sera in all possible combinations in cross-SNT assays. Overall 1'555 seropositive blood samples from the BVD surveillance program (collected in the years 2012, 2013 and 2014) were tested with the adapted cross-SNT to differentiate between the two ruminant pestivirus species BVDV and BDV as source of infection. Furthermore, a case-control study by questionnaire was carried out to investigate the risk factors for BDV infections in cattle.

Results and significance
The cross-SNT procedure regarding the performance and resolving power for differentiation of the source of infection was improved by the use of three strains representing the subgenotype BVDV-1a, BVDV-1h and BDV Swiss a. The results obtained by the cross-SNT show that the majority of pestivirus infections in Swiss cattle can be attributed to BVD virus (71.5%), while 6.7% were induced by BD virus. 104 sera samples which originated from 65 farms of 15 cantons reacted with significantly higher titers against BDV than BVDV. The highest BDV-seroprevalence was found in central Switzerland.
In case- and control farms common housing of cattle and sheep was identified as the most significant risk factor for BDV infection in cattle (OR = 167; CI95%: 15 – 1'819) by logistic regression. It is shown that small ruminants, especially sheep, have a potential to interfere with the BVD control in cattle. They also pose a significant risk to the (re-) infection of BVDV free cattle herds, in particular if persistent BDV-infected sheep are stabled together with cattle.
The BDV-seroprevalence has increased from 2012 to 2014 from 4.2% to 8.1% which would not be detected by ELISA due to the serological cross-reactivity among pestiviruses. The differentiation by cross-SNT is time-consuming and more expensive but permits the identification of the source of infection, which may be beneficial to the BVD eradication program.

Publications, posters and presentations
Kaiser, V. (2016) Einfluss des Border Disease Virus bei Kleinwiederkäuern auf die serologische Überwachung und Bekämpfung der Bovinen Virusdiarrhoe bei Rindern in der Schweiz. Dissertation, Vetsuisse-Fakultät, Universität Bern. Vom Fakultätsausschuss genehmigt am 11. April 2016.

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