



Unchanged Schmallenberg virus seroprevalence in the Belgian sheep population after the vector season of 2014 and 2015 despite evidence of virus circulation



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ABSTRACT

Schmallenberg virus (SBV) emerged in North-Western Europe in 2011 and induces congenital defects in ruminants. Many epidemiological studies were undertaken to study the spread of the virus during the first two years after its emergence, but little data is available on the current antibody protection rate against SBV. A cross-sectional seroprevalence study was therefore carried out in the Belgian sheep population and showed that the total seroprevalence against SBV was 26% (CI_{95%}: 21–32) at the end of the vector season of 2015, being significantly lower than the seroprevalence of 84% detected after the outbreak in 2011. Nevertheless, 63% (CI_{95%}: 51–73) of the Belgian sheep flocks still had a certain level of protection against SBV. Despite the fact that PCR detection of SBV in aborted calves in April 2016 evidenced that SBV had circulated in 2015, no change in seroprevalence between 2014 and 2015 was found in the Belgian sheep population.

Schmallenberg virus (SBV) emerged for the first time at the end of 2011 in North-Western Europe and is closely related to viruses of the Simbu serogroup, part of the family Bunyaviridae, genus *Orthobunyavirus* (Hoffmann et al., 2012). *Culicoides* midges have been proposed to be the putative vectors of SBV (De Regge et al., 2012). SBV induces only mild symptoms in adult ruminants but was shown to be responsible for abortions, stillbirths and congenital malformations in cattle, sheep and goats.

After its first identification in Germany in 2011, SBV spread rapidly and widely over a large part of Europe (EFSA, 2014). Belgium was one of the first and most SBV affected countries, whereby virtually all Belgian sheep and cattle herds had been in contact with SBV at the end of the first vector season of 2011 (Méroc et al., 2013; Méroc et al., 2014). Evidence for renewed SBV circulation was found in 2012 and SBV seropositive animals were still detected at each cattle farm at that time but the overall seroprevalence in cattle had dropped from 86% to 65% (Méroc et al., 2015). Since 2013, only limited efforts have been made to follow the SBV situation in Belgium. The absence of SBV detection by qRT-PCR in suspected samples from aborted lambs and calves submitted to the Belgian national reference laboratory CODA-

CERVA in 2014 and 2015 indicates that SBV circulation was very limited or absent at that time (Poskin et al., 2016). Interestingly, three SBV suspected aborted calves that were submitted to the Belgian reference laboratory tested positive for SBV by qRT-PCR in April 2016, providing the first evidence of SBV circulation in Belgium since three years (Delooz et al., 2016; N. De Regge, personal communication). All three cases were detected in the southern part of Belgium (Wallonia), with two calves coming from the province of Namur and one from Liège.

A cross sectional seroprevalence study in sheep was performed to determine the seroprevalence against SBV after the vector season of 2015. Sera of 409 sheep coming from 70 farms were collected between October 1st, 2015 and April 1st, 2016. A stratified sampling approach was used proportional with the number of sheep farmers per province in Belgium (Fig. 1). After exclusion of herds with < 4 sheep, a random sampling was applied per province among all Belgian sheep farmers except those participating in the voluntary Maedi-Visna and Caprine Arthritis and Encephalitis program for trade certification (Royal Decree 24-03-1993). All samples originated from sheep > 1 year old and maximum 7 samples per farm were tested for the presence of SBV-

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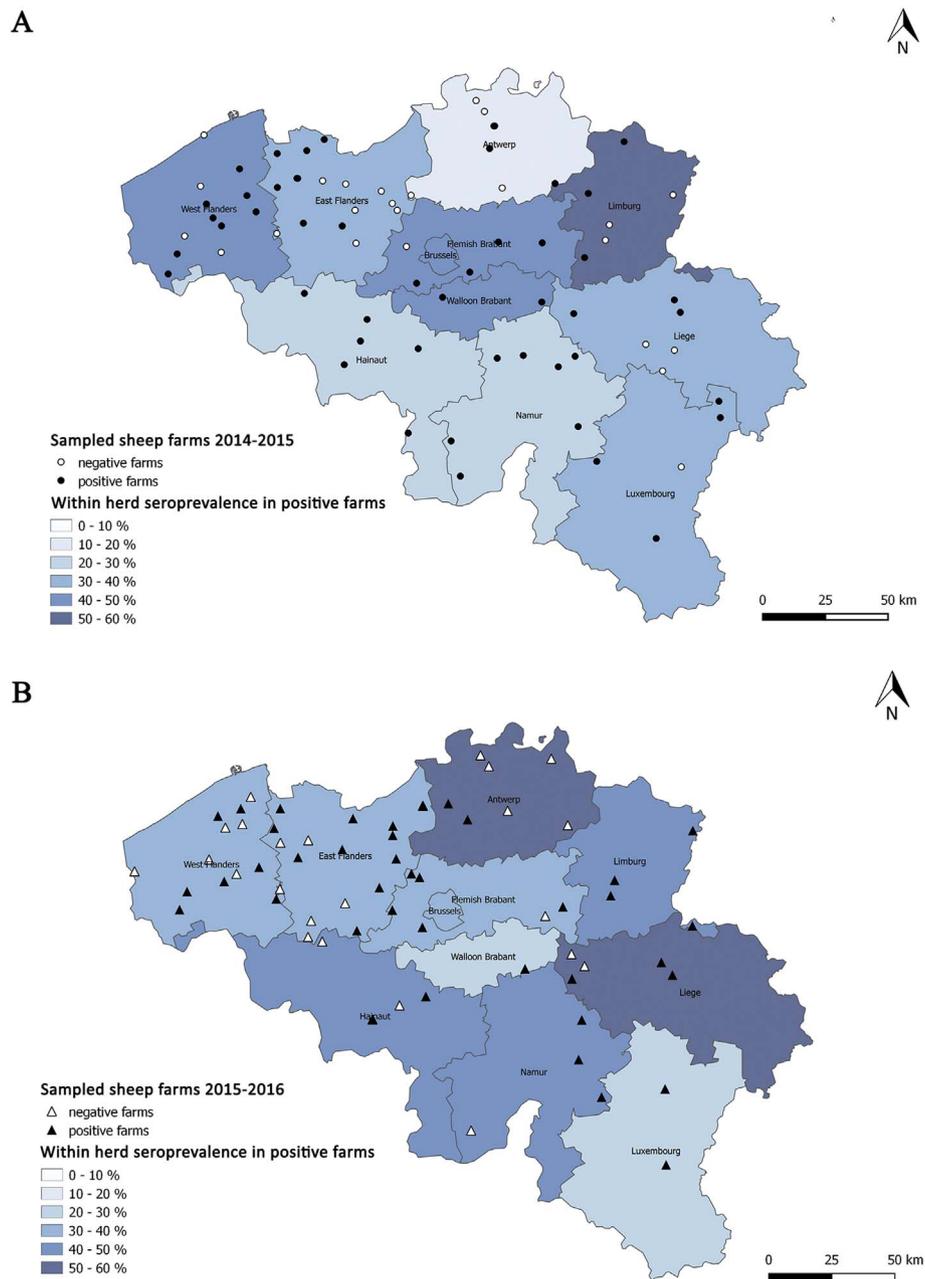


Fig. 1. Geographical distribution of selected sheep farms in 2014 (A) and 2015 (B).

specific antibodies using a commercially available ELISA kit (ID Screen®, Schmallenberg virus, *competition multi-species*, ID-vet, France) following manufacturer's instructions. Based on information provided by the manufacturer, this ELISA has a specificity of 100% (CI_{95%}: 99.6–100) and a test agreement of 97.6% with the ID Screen® indirect ELISA that has a reported sensitivity compared to virus neutralization tests of 97% (Bréard et al., 2013). 20 out of 409 samples scored doubtful in the ELISA and were considered as negative in our analysis.

By analyzing the ELISA data with a generalized estimating equations (GEE) model that takes into account the correlation between animals that belong to the same herd (Méroc et al., 2014), we found an overall SBV seroprevalence of 26% (CI_{95%}: 21–32) after the vector season of 2015 (Table 1). This indicates a clear reduction of SBV seroprevalence in sheep since the SBV emergence in 2011 when an overall seroprevalence of 84% was found in Belgium (Méroc et al., 2013). This seems to be in line with the general assumption that SBV circulation has ceased since the initial outbreak, leading to a decline in the proportion of sheep that have been into contact with the virus. We

estimate that this decrease in seroprevalence can merely be explained by replacement of sheep as a part of normal herd management. Yearly replacements rates of 25% are normal in commercial farms (Lievaart-Peterson et al., 2015) and this is in line with a drop in seroprevalence from 84 to 26% in a 4-year time period. The fact that some of the seropositive sheep found in this study lived during the 2011 outbreak makes it also tempting to speculate that antibodies against SBV can persist for a long time. This would be in line with previous observations in sheep under experimental conditions (Poskin et al., 2015) and with findings on long term SBV antibody persistence in cattle (Elbers et al., 2014; Roberts et al., 2014; Wernike et al., 2015). It can however not be completely excluded that the detected antibodies in those sheep come from a (re)infection since the initial 2011 outbreak or from vaccination. The latter is however unlikely since we inquired veterinarians of the regional animal health centers in Flanders (Dierengezondheidszorg Vlaanderen) and Wallonia (Association Régionale de Santé et d'Identification Animaux), and none of them was aware of any SBV vaccination in Belgium.

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