Seroprevalence of antibodies to Schmallenberg virus in livestock

Armin R.W. Elbers

Dept. Epidemiology, Crisis organisation and Diagnostics
Central Veterinary Institute (CVI) part of Wageningen UR

CENTRAL VETERINARY INSTITUTE
WAGENINGEN UR

armin.elbers@wur.nl

Introduction

Reporting of suspect cases (malformations of the arthrogryposis hydranencephaly syndrome in calves, lambs and goat-kids) is likely to underestimate the true rate of infection of SBV

- not all infected livestock will produce malformed new-borns;
- not all malformed new-borns test PCR-positive

Seroprevalence of antibodies to SBV in livestock populations gives insight into true exposure to SBV

Seroprevalence studies in SBV affected countries

Belgium

- No seroprevalence study done yet;
- Planning to do:
  - a seroprevalence study in sheep (using samples collected for Maedi-Visna screening program);
  - A seroprevalence study in cattle (using samples from annual winter-screening program);
  - Wait for availability of ELISA test

- source: CODA-CERVA -

Seroprevalence studies in SBV affected countries

Germany

- Seroprevalence studies in federal states in operation, but results incomplete and preliminary;

- Design:
  - random samples from the population (several herds);
  - per federal state 60 cattle, 60 sheep and 60 goats sampled
  - sera tested by indirect immunofluorescence (**IFAT**)

- Preliminary results are in line with clinical case findings: gradient from North to South (high to low) and from West to East (high to low), indicating highest prevalence in North-West of Germany. Final results expected in 2-3 months.

- If ELISA becomes available, more precise estimates possible because more samples can be processed

- source: FLI -

Seroprevalence studies in SBV affected countries

Luxembourg

- No seroprevalence study done yet;
- Wait for availability of ELISA test

- source: Service de la sécurité alimentaire -

Seroprevalence studies in SBV affected countries

United Kingdom

- No seroprevalence study done yet;
- Have made a design for a seroprevalence study, but would adjust depending on a range a questions they want to answer with it:
  - How far has the disease spread ?
  - Did certain areas have limited exposure ?
  - Detecting (seronegative) sentinel animals/herds
  - What archive samples may tell us about past exposure ?

- Wait for availability of ELISA test

- source: AHVLA -

Seroprevalence studies in SBV affected countries

France

- No nation-wide seroprevalence study done yet;
- Detailed serological results from a few individual herds:
- Northern region (sampled in January 2012, close to Belgium):
  - in infected dairy herd, 30 animals tested by VNT, **100%** seropositive (titers from 32 to > 256); 50 sheep on same premises tested, **86%** seropositive.
  - In infected sheep farm, 100 sera tested, **32%** seropositive.
- Central region
  - In infected sheep farm, 53 sheep tested, **7.5%** seropositive (area with late circulation of virus).
- Wait for availability of ELISA test

- source: ANSES -

Seroprevalence studies in SBV affected countries

Italy

- No seroprevalence study done yet;
- There are plans to perform sero-surveys in some areas considered at high-risk (based on vector density and sheep population)
- Plan to use Virus Neutralisation Test
- Hope to start as soon as possible, waiting for administrative decision by Ministry and regions.

- source: IZS -

Seroprevalence studies in SBV affected countries

Spain

- No seroprevalence study done yet;
- Only serological study foreseen right now is testing animals in the one affected holding detected so far (by VNT); results to be expected next week
- Wait for availability of ELISA.

- source: MAGRAMA -

Seroprevalence studies in SBV affected countries

Netherlands

- Seroprevalence of antibodies to SBV in cattle population;
- Test differences in seroprevalence between 3 regions;
- Test differences in age-specific seroprevalence;
- Preliminary insight into within-herd seroprevalence in a few infected sheep and cattle herds

- A larger seroprevalence study is planned for cattle and sheep;
  - Aim: not only seroprevalence estimate at precise regional level but also detecting **sentinel (seronegative) herds/animals**
  - Wait for availability of ELISA test

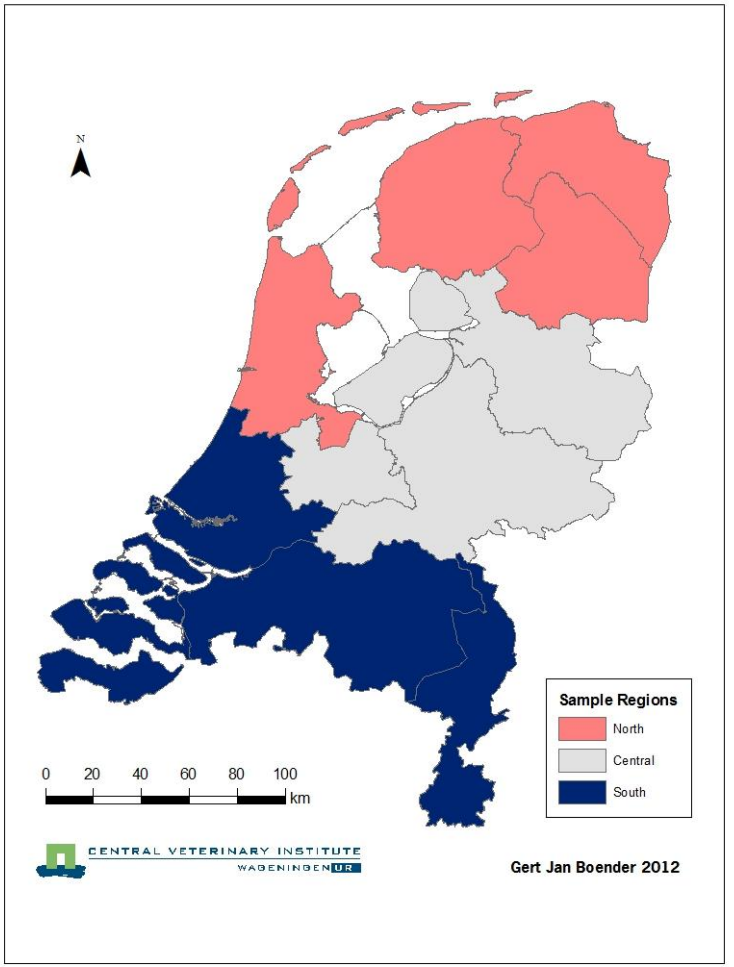
Seroprevalence study in Netherlands

- Sample size of 1,100 randomly selected dairy cattle
- Stratified sampling design by province
- In majority 2 dairy cows from the same cattle herd were sampled
- Dairy cows sampled between November 2011 – February 2012:
  - for Bluetongue monitoring
- Sera from cows were randomly selected within each stratum (province) of the sampling frame proportional to the number of dairy cows present in every province

Seroprevalence study in Netherlands

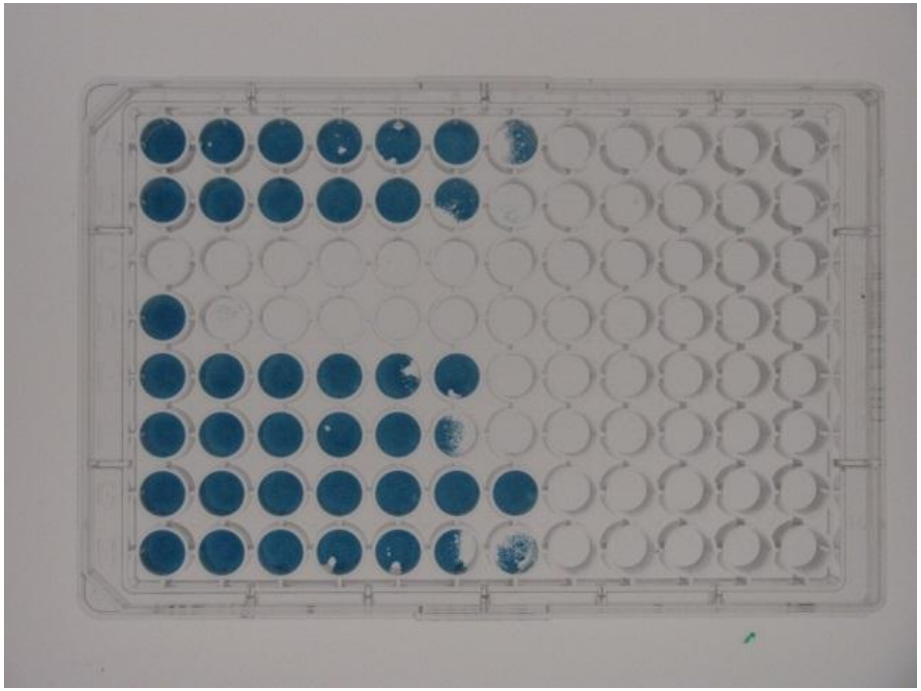
Sample size appropriate to

- estimate seroprevalence in cattle population
- test differences in seroprevalence between 3 regions



Virus Neutralisation Test

- Serum samples were diluted in the test plate, starting from 1:4, followed by two-fold dilutions until 1:512
- After 5 days, the plates were emptied and stained with amido black
- Titers ≥ 8 were defined as positive, based on a prior validation, in which a specificity and sensitivity of > 99% were estimated with this cut-off.
- Hands-on time is limited (so not very laborious)



Within-herd seroprevalence of infected herds

In order to get preliminary insight into within-herd seroprevalence:

Two sheep flocks (located in Southern and Eastern part of Netherlands) and two cattle herds (located in Northern and South-western part of Netherlands) were sampled that tested PCR-positive when malformed lambs and calves were born

Dependent on herd size:

- sera of 60 and 35 ewes were tested from 2 sheep flocks
- Sera of 34 and 34 dairy cattle (> 2 years of age) were tested from 2 cattle herd

Results

- Seroprevalence of antibodies to SBV in dairy cattle population in the Netherlands: ± 70%

- SBV-seroprevalence in dairy cattle in Eastern part significantly higher than in Southern and Northern part of country

- No statistically significant ($p > 0.05$) differences in age-specific mean prevalence of antibodies to SBV of cattle in the three different regions

- No indications for an association between cattle density and occurrence of seropositive or seronegative herds

Results

- Geographic distribution of seropositive and seronegative herds is random, there are no specific clusters of seropositive or seronegative herds.

- <u>Within-herd seroprevalence</u>

  Sheep flocks: 70 – 95% Dairy herds: 70 – 100%

Conclusions

High seroprevalence in Dutch dairy population

↓

Huge underestimate of true infection rate when only relying on observation of clinical suspect cases

A seroprevalence study concerning Akabane virus in Australia showed a 80% seroprevalence in cattle at the end of the New South Wales Akabane virus outbreak season in 1974

↓

outbreak season with other Orthobunyavirus can result in comparable level of infection

Conclusions

High within-herd seroprevalence in infected herds

Australian studies on Akabane virus infections showed comparable high within-herd seroprevalences

Monthly sampling of sentinel cattle in Australia indicated that often within 2-3 weeks to a maximum of two months after the start of sampling, 100% of sentinel animals within herds seroconverted to Akabane virus

Conclusions

From our study no indications for strong differences in age-specific prevalence of antibodies to SBV

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Indication that SBV is newly arrived in the area

(and not 2 – 3 years earlier)

It would be of interest to test sera banked during other studies before 2011, to determine if there is any evidence of SBV infection before 2011

Discussion

Are animals, naturally infected by Schmallenberg virus, protected (lifelong) against re-infection ???

↓

We don’t know yet, needs to be investigated

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[1] Central Veterinary Institute, Lelystad; [2] Netherlands Food and Consumer Product Safety Authority, Utrecht; [3] Animal Health Service, Deventer

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