

Short communication

# Analysis of national serological surveys for the documentation of freedom from porcine reproductive and respiratory syndrome in Switzerland

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## Abstract

Results of national serological surveys for porcine reproductive and respiratory syndrome (PRRS) conducted in Switzerland in 2001 and 2004 were analyzed. In 2001, 41,124 breeding sows from 2540 herds out of 6406 were sampled, and in 2004 7498 animals were sampled from 1074 herds out of 5320. All serum samples were tested for PRRS using an ELISA developed at the Institute of Virology and Immunoprophylaxis (IVI), Switzerland with a sensitivity (Se) and specificity (Sp) of 94 and 97%, respectively. Positive samples were re-tested with a commercial ELISA (IDEXX) with Se of 100% and Sp of 99%. Samples positive in the second test were confirmed with the fluorescent antibody test (FAT). A stochastic model using data from the main survey conducted in 2001 was done to verify whether the sampling scheme used could detect at least one infected herd with 99% confidence level if the herd designed prevalence was at 0.1 or 0.2%. Additionally, a Bayesian approach was conducted to calculate the post-survey probability of freedom from PRRS using data from the 2001 and 2004 surveys. A Monte Carlo simulation with 5000 iteration was run for each model. Eleven samples in 2001 and six in 2004, all from different farms, could not be conclusively confirmed as negative by the FAT. All other samples were negative. Truly infected animals and herds were not predicted by a stochastic model at the 99% confidence level and 0.1% herd prevalence using data from the 2001 survey. However, it was demonstrated that the prior probability of freedom from PRRS increased from 89.3 to 99.2% after the 2001 survey. Upon completion of the 2004 survey, the probability of freedom from PRRS reached a value of 99.7%. Based on our results, we could conclude that the pig industry in Switzerland is free of PRRS virus with this level of confidence. Restricted import activities over the last decades are a

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possible explanation for the continuing absence of PRRS-infection in the Swiss swine population. Import requirements defined by the pig industry minimize the risk of introduction of PRRS-infected animals in the future.

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## 1. Introduction

Porcine reproductive and respiratory syndrome (PRRS) is an infectious disease that causes reproductive failure in sows and respiratory disease in young pigs. It was first described in the United States in 1987 (Keffaber, 1989). The first outbreak of the disease in Europe was detected in Germany in 1990 and since then it spread rapidly throughout the continent (Ohlinger et al., 2000; Nodelijk et al., 2003). It has been described in many European countries such as The Netherlands, Belgium, Italy, Spain, Great Britain and France (Potier et al., 1997; Ohlinger et al., 2000). The prevalence of infection is generally high in infected countries and after the introduction of PRRS it seems to spread rapidly between farms (Albina, 1997; Nodelijk et al., 2003). In Switzerland, evidence of freedom from PRRS has been reported before (Canon et al., 1998). Although, in 1998 a single PRRS antibody positive herd was detected within the scope of an inspection of illegally imported pigs. The animals were imported from France, a country known to have PRRS infected pigs. Immediately after detection of the antibodies against PRRS the herd was stamped out.

Providing valid data regarding the disease status of an animal population is becoming increasingly important in international trade of animals and animal products. For the demonstration of freedom from a particular disease in a zone or country, it is necessary to collect information including clinical, epidemiological or any other evidence of the disease or its agent over a certain period of time (Baldock, 1998). Surveys employed to substantiate freedom from infection are designed to identify at least one infected herd if the herd prevalence is at an unacceptable threshold level of 0.1% (Audigé and Beckett, 1999). Targeted surveys are a standard requirement to provide statistical evidence for the absence of infection in a target sub-population. The objective of our work was to

analyze data from national serological surveys conducted in Switzerland using advanced statistical techniques to substantiate freedom from PRRS with stochastic and Bayesian approaches to model test results.

## 2. Materials and methods

### 2.1. Surveillance and target population

Results of national serological surveys conducted in Switzerland in 2001 and 2004 were included in the analysis. The target population consisted of sows from breeding herds. The median size of breeding herds in Switzerland is 19. The main survey was conducted in 2001, in which 41,124 sows from 2540 herds out of 6406 were screened. Herds from 25 out of 26 cantons (local administrative units) were included. In the survey conducted in 2004, 7498 animals from 1074 herds out of 5320 were sampled.

### 2.2. Tests performed and test protocols

All serum samples were tested for PRRS using a non-commercial ELISA developed at the Institute of Virology and Immunoprophylaxis (IVI), Switzerland (Seuberlich et al., 2002). The sensitivity (Se) and specificity (Sp) of this test is 94 and 97%, respectively. Positive samples were re-tested with a commercial ELISA (IDEXX) with an estimate Se of 100% and Sp of 99% (Torremorell et al., 2002). A fluorescent antibody test (FAT) was applied on samples still positive after the second test. FAT has a reported Se of 75–100% and Sp of 98.7% (Yoon et al., 1992).

Out of 41,124 serum samples tested in 2001, 41,113 were negative and 11 could not be conclusively confirmed by the FAT. From the 7498 samples tested in 2004, 7496 were negative and six were not confirmed by the FAT.

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