Vector-borne infections: risk-based and cost effective surveillance

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Key words
Surveillance, Bluetongue, Scenario Tree Model, economic analysis

Aim of the study
The aim of the project was to analyze existing surveillance systems for Bluetongue Virus (BTV-8), and to optimize performance and costs of the surveillance. Surveillance sensitivity was assessed with scenario tree modeling, and economics with cost-effectiveness analysis.

Material and methods
Data on number and type of animals sampled, type of sample, diagnostic test, sample size and associated costs were collected from veterinary services of 5 European countries with a questionnaire. These data were used as input into a stochastic scenario tree model, which calculates the sensitivity of different surveillance designs. The designs compared were (1) a random sample, (2) risk-based surveillance targeting high risk herds, (3) voluntary vaccination with risk-based surveillance targeting non-vaccinated herds, (4) voluntary vaccination with risk-based surveillance targeting non-vaccinated herds at high risk, and (5) mandatory vaccination with risk-based surveillance targeting herds at high risk. In addition, the sensitivity of passive surveillance was modelled. The output of the scenario tree model and the economic data collected by questionnaire was used to calculate the relation between gain in sensitivity and additional costs for each design, as well as the costs for achieving 95% or 99% sensitivity.

Results and significance
While all countries performed surveillance according to the relevant EC regulation 1266/2007, surveillance designs varied widely across countries. Active surveillance was almost exclusively done in the cattle population. Incurrence of BTV-8 in a population is detected with almost certainty within a year using passive clinical surveillance alone. Active, risk-based surveillance is only cost-effective if a small proportion of the population is at risk. The best cost-effectiveness is obtained by sampling the maximal number of herds rather than more animals per herd. Mandatory vaccination saves costs of approximately 0.26 € per vaccinated animal by making risk-based surveillance more effective. Voluntary vaccination only marginally reduces the cost of surveillance. Finally, bulk-tank milk testing is the most cost-effective method to actively demonstrate freedom from disease in populations dominated by dairy production.

Publications, posters and presentations
Schüpbach, G.: “VICE – Risk-based and cost-efficient surveillance systems for vector-borne diseases”. Swiss Vector Entomology Conference, March 2013 in Basel.
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