From research to practice: implementing a pilot syndromic surveillance system for the Swiss cattle population

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Key words
Syndromic surveillance, cattle population, abortions, stillbirths, data warehouse.

Aim of the study
The overall goal of this project was to move animal health syndromic surveillance (SyS) in Switzerland from research towards practice by implementing a pilot SyS system for the Swiss cattle population. We focused on (i) demonstrating methodological and technical solutions for the FSVO to operate a SyS system, (ii) exploring what information can be generated from the data for other purposes than early detection.

Material and methods
Knowledge gained from various research projects, discussions with researchers from the Veterinary Public Health Institute, and the FSVO's needs and priorities were considered for selection of previously evaluated indicators and algorithms. Possibilities and limitations of the FSVO's data warehouse ALVPH were explored by testing its data analysis and reporting tools and by investigating the possibility to extend its infrastructure by the open source software R. A working group, including experts from the FSVO's animal health, animal welfare, and IT and logistics divisions, was established to discuss what kind of relevant information can be produced from selected indicators and how it can be presented in an easily understandable way.

Results and significance
Two indicators were included in this project: cattle abortions derived from diagnostic laboratory tests registered in the national Laboratory Information System (Alis) and cattle stillbirths reported by farmers to the national Animal Movement Database (TVD). Reports in ALVPH were developed presenting descriptive analyses of these two indicators, including temporal patterns, geographical distribution, data quality controls and farm-level analyses to identify farms having many abortions and/or stillbirths.

Cattle abortion data were used to implement a pilot SyS system. The weekly number of cattle abortions is monitored by the Holt-Winters algorithm provided by the R package {vetsyn}, accounting for seasonality and trend. In a proof of concept (POC), the integration of R scripts to perform algorithms and reuse the results in the front-end tools available in ALVPH was tested. For the POC, R scripts from previous research projects were made available and customised for the integration into stored procedures running on an SQL server (ALVPH infrastructure). All processes (data extraction, cleaning, pre-processing and analysis) were tested in the development environment of ALVPH. A dashboard was developed presenting information on the signals detected in the abortion time series and providing first analyses of the underlying data. The dashboard itself and selected signals were discussed in the working group. The selected signals were also retrospectively investigated. A procedure was proposed defining how the signals detected by the algorithm can be further investigated.

Since the cantonal veterinary services have the most insight in the actual animal health and welfare situation in Switzerland, they are the natural choice for a further validation of the developed system. In order to do so, the legal situation concerning the protection of data privacy was evaluated and a proceeding was proposed. It was decided that cantonal operators can use the proposed dashboard including the farm-level indicators, but the feedback given to the FSVO has to be anonymized. This validation process will be started in 2020.

The project delivered the scientific and technical basis to implement an operational SyS system for the FSVO (and possible cantonal veterinary services). Although the ability of SyS to detect outbreaks earlier than traditional surveillance methods is still largely unproven, it may provide additional benefits, e.g. situational awareness. In our case, data analyses involved in implementing the pilot system contributed to detecting problems related to data quality and a better understanding of the occurrence of cattle abortions and stillbirths in Switzerland. Furthermore, interdivisional collaboration at FSVO was strengthened. Remaining tasks, including automation of data analysis processes and release to the productive platform, will be followed up by the new data scientist position at FSVO in 2020.

Publications, posters and presentations
The project was presented at the meeting of the "Plattform Netzwerk Rindergesundheit" in October 2018.
A publication or presentation at an international congress is planned by the time the pilot system will be operational for 1 year.

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Project duration January 2018 - December 2019