



# **Epidemic Intelligence of Animal Health Events supporting Early Detection and Outbreak Investigation for Efficient Disease Control**

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## **Key words**

Animal movement data, contact tracing, outbreak investigations, network analysis, prioritisation

## **Aim of the study**

The overall aim of this project was to build up epidemic intelligence tools to support veterinary authorities in outbreak investigations by rapidly identifying possible sources and spread of an infectious disease by the routes of live animal movements and providing information on the potential dimension of an outbreak. With regard to available data sources, cattle served as model population.

## **Material and methods**

Two existing open-source tools were adapted to Swiss cattle movement data extracted from the Animal Movement Database (AMD) and evaluated for their use in contact tracing: FoodChain-Lab (FCL) and EpiContactTrace (ECT). Parameters derived from available data sources such as the AMD and the laboratory database ALIS were identified and investigated for their use in prioritising identified contacts. Focusing on the prioritisation of contact animals, two types of parameters were differentiated: 1) movement-related parameters to indicate contact animals with a potentially higher risk for receiving or spreading a disease due to live animal movements, and 2) health-related parameters to provide an indication on the sanitary status of contact animals. Available outbreak data and documentations on epidemiologic investigations involving bovine tuberculosis (TB) and bovine viral diarrhoea (BVD) cases served as examples to test the tracing tools as well as to investigate and illustrate the potential use of prioritisation parameters.

## **Results and significance**

Although FCL could be customised to Swiss cattle movements, its application is considered more qualified for investigating food-borne disease outbreaks, according to its original purpose. ECT demonstrated most useful for contact tracing during highly contagious diseases such as foot-and-mouth disease, for which shorter tracing windows (days or weeks) and worst-case scenarios are relevant. To address identified limitations of existing tools, a cohort-tracing tool was developed in the frame of this project to enable individual-based contact tracing and introducing a minimum contact period. This tool is considered appropriate for contact tracing of diseases such as TB or BVD for which longer tracing windows (months or even years) are essential. Several possibilities for using movement-related parameters such as the number of contact animals or the duration of contact were implemented for the cohort-tracing tool. Considerations and challenges on using health-related parameters such as on-farm mortalities or diagnostic examination of abortion for prioritising contact animals were described.

In Switzerland, contact tracing is challenged by the large amount of cattle trade between farms, often resulting in complex contact networks requiring resource-consuming investigations that largely need to be done by hand. By providing automated contact tracing and possibilities for prioritisation of identified contacts, tools such as ECT and the cohort-tracing tool can support epidemiologic investigations by veterinary authorities and enable better allocation of limited resources.

**Publications, posters and presentations**

Struchen, R., Schärfer, S., Schüpbach-Regula, G. & Hadorn, D. C. (2017) Kohorten-Tracing für Ausbruchsabklärungen von nicht-hochansteckenden Tierseuchen am Beispiel der Schweizer Rinderpopulation. DACH Epidemiologie-Tagung, 6.-8. September 2017 in Hall, Austria.

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