



Syndromic Surveillance of Neuroinfectious Diseases in Animals

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Key words

Surveillance, Neurology, Histopathology, Metagenomics, Cattle

Aim of the study

Neuroinfectious diseases in livestock may pose a considerable risk to human and animal health and many of them are monitored by passive or active disease surveillance. Passive disease surveillance has limitations in sensitivity due to low disease awareness, economic interest and difficulties in the interpretation of clinical signs, while active surveillance requires comprehensive logistics and is expensive. Both systems target only defined specific diseases. There is a need to improve the efficacy of current surveillance systems to detect new or re-emerging infectious diseases as early as possible. Syndromic surveillance relies on the analysis of real time data that may indicate changes in the prevalence of disease syndromes in a given population. Neuropathological examination is an unbiased tool to identify animals affected by neuroinfectious diseases. The aim of the present study was to assess the benefit of neuropathology derived data in the context of a syndromic surveillance concept for neuroinfectious diseases in the Swiss cattle population.

Material and methods

Over a one year period (April 2013- March 2014) we collected a representative number (n= 1816) of medulla oblongata brain samples from adult (> 36 months of age) fallen stock cattle and a normal slaughtered control group. These samples were analysed by histopathology for brain lesions categorized as (i) no and non-significant lesions, (ii) non-suppurative inflammation, (iii) suppurative inflammation, (iv) metabolic toxic and degenerative, (v) listeriosis and (vi) other. For each category the prevalence in the population was estimated, and questionnaires were sent to farms to assess the pathological-clinical correlation. Samples with non-suppurative inflammatory lesions were further tested by PCR, RT-PCR and immunohistochemistry protocols for specific viral pathogens (Herpesviruses, Borna virus, Astroviruses, Flaviviruses) and by next-generation sequencing and bioinformatics for RNA virus sequences.

Results and significance

In total 3.7% (n=67) animals revealed significant lesions in the medulla oblongata. The most frequent type of lesion was “non-suppurative inflammatory” (40.3%) which suggests a viral etiology, followed by “suppurative inflammatory” (28.4%), which indicates a bacterial etiology. Follow-up diagnostics identified infections with *Listeria monocytogenes*, *Ovine herpesvirus 2* and *Bovine astrovirus CH13*; all are known to be associated with encephalitis in cattle. In addition, *Bovine herpesvirus 6*, *Bovine retrovirus CH15* and, unexpectedly, *Posavirus 1* as well as porcine astrovirus sequences were found, for which a causal relationship with the disease needs to be further investigated. Neurological clinical signs were observed by the farmers in ~50% of the animals with inflammatory lesions. Collectively, these data support the notion that a reporting system for neurological disease in cattle in general in combination with a neuropathological examination and follow-up diagnostics could significantly enhance surveillance efficiency.

Publications, posters and presentations

Walland, J. Project presentation. Workshop on early-warning systems in Switzerland, March 4th 2013, Bern

Walland, J.; Lauper, J.; Frey, J.; Imhof, R.; Stephan, R.; Seuberlich, T.; Oevermann, A. Listeria monocytogenes infection in ruminants: Is there a link to the environment, food and human health? A review. Schweiz Arch Tierheilkd. 2015 Jun;157(6):319-28. Review and Dissertation Dr. med. vet, University of Berne.

Seuberlich, T. Surveillance of listeric encephalitis in ruminants in Switzerland. Listeria Mini-Symposium. University of Berne. 14. November 2014.

Truchet, L. Scanning surveillance of neuroinfectious diseases in cattle livestock. Swiss Virology Meeting. Thun 2./3. February 2016.

Truchet, L.; Walland, J.; Wüthrich, D.; Posthaus, H.; Bruggmann, R.; Schüpbach, G.; Oevermann, A.; Seuberlich, T. Active scanning surveillance of neuroinfectious diseases in cattle livestock in Switzerland, Manuscript in preparation.

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