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Evaluation of the sensitivity for foot and mouth disease of the national animal disease epidemiosurveillance network (REPIMAT) in Chad

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Early detection of animal diseases is one of the primaries aims of epidemiosurveillance networks in western and central Africa. A sufficiently high sensitivity is an essential characteristic of an epidemiosurveillance network. Foot and-mouth-disease (FMD) is a highly contagious viral disease that affects all artiodactyla. It is included in the list of diseases monitored by the national animal disease epidemiosurveillance network (REPIMAT) in Chad. Surveillance of this disease is passive and primarily concerns bovine. Numerous bovine clinical suspicions are raised annually by the epidemiosurveillance network, but they are only rarely further investigated in the laboratory. A serological survey was conducted in the cattle population in eight of the nine administrative regions of the country (regions with the highest bovine densities) with the aim to evaluate the sensitivity of REPIMAT for FMD. The samples randomly selected were analysed in the OIE/FAO FMD reference laboratory at IZSLER, Brescia (Italy) with the support of EuFMD (The European Commission for the control of foot-and-mouth disease). Antibodies against non-structural proteins (NSP), indicative of recent or past infection, were analysed by a 3ABC-ELISA. A total of 106 villages/herds and 796 cattle were investigated. The herd-level seroprevalence was 63% (95% CI: 51.9-71.2) and the animal-level seroprevalence was 35.6% (95% CI: 32.2- 39.0). A global significant positive relation was found between the estimated seroprevalence and the number of registered clinical suspicions. However, this relation is weak but heterologous and this could lead to an improvement of the declaration of FMD suspicions in some administrative regions where some correctives measures could be introduced.

Enhancing syndromic surveillance for fallen dairy cattle: modelling and detecting mortality peaks at different administrative levels

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The automated collection of non-specific data from livestock combined with current techniques of data mining and time series analyses facilitate the development of veterinary syndromic surveillance. This type of approach may enhance traditional surveillance of animal diseases. An example involves the continuous analysis of fallen cattle data, which are registered at farm level. However, further research is needed to incorporate such monitoring processes within an early warning system. This study presents a process aimed at: 1 - Fitting automatically the parameters of the classical Auto-Regressive Integrated Moving Average models (ARIMA) including patterns of trend and seasonality aggregated at different spatial levels; 2 - Predicting the mortality at n-ahead period; and 3 - Detecting mortality peaks. The application of this work is illustrated in the context of fallen dairy cattle data sets from two regions of Spain. The mortality levels registered by week are modelled at county (i.e.

comarca), province and region levels between 2006 and 2013. Using these models, the mortality is predicted between January 2014 and June 2015. Values of mortality that are out of the predicted confidence limits are identified as mortality peaks. The causes of such mortality peaks in some affected farms are assessed using data from expert's reports held by associated insurance companies This work compares patterns of fallen dairy cattle in populations with disparate management and environmental conditions with the aim of illustrating a novel approach to obtain information from mortality data at different administrative levels.

EPIDEMIOLOGICAL PAPERS

Preliminary study for the effectiveness evaluation of the bovine tuberculosis surveillance in cattle farms in France

Bouveret Adrien, Dufour Barbara & Rivière Julie

Bovine tuberculosis is a contagious disease submitted to regulatory texts, for which collective control measures have been implemented in France since 1955. These measures were effective, as the prevalence of the bovine tuberculosis decreased during years, until France obtained from the European Union the bovine tuberculosis free status in 2001. Since, the reduction of regulatory measures has been the rule in order to reduce surveillance's costs. However, prevalence of bovine tuberculosis is rising again since 2005 in France and is becoming once again an important concern for the sanitary authorities. Therefore, the evaluation of the bovine tuberculosis surveillance system seemed to be relevant, regarding its effectiveness and its costs. Currently, those indicators have never been estimated for this surveillance system in France. The purpose of this study was to elaborate scenario trees that would represent the surveillance protocols of bovine tuberculosis in farms, and to estimate quantitatively the input parameters for stochastic simulations. Scenario tree structures containing all infection and detection category nodes have been built, allowing the creation of a scientific basis for the upcoming studies. In addition, many data were not available concerning factors influencing the detection of the bovine tuberculosis; it was therefore necessary to consult experts on this matter. The experts' answers for each branch of the scenario trees, as well as the input parameters deduced by them, were presented in this article, allowing a first estimation of the influence of field conditions on the characteristics of screening tests in the farm.

Partial stamping out in bovine tuberculosis outbreaks in France since 2014: typology of the outbreaks and study of the efficiency of the protocol

Poirier Valentine & Praud Anne

In France, in bovine tuberculosis outbreaks, cattle are usually totally slaughtered. Nevertheless, since 2014, partial depopulation (only animals with non-negative results to skin tests (ST) and/or gamma interferon assay (IFN_γ) are culled) can be authorized by local veterinary services. The aim of this work was to study the typology of the outbreaks partially depopulated. Data were collected from five French departments from July 2014 to January 2017. On the field, the time limits (between controls or before slaughtering animals with non-negative results) recommended by the government were sometimes not observed. The

sanitary consequences of these deviations seemed insignificant. Among cattle with non-negative results to the tests, 52.6% were slaughtered. Most of the others had negative results to ST and non-conclusive to IFN_γ and finally get negative results to the next controls. Thanks to selective stamping out, 78.9% of cattle were spared but the lock up periods in selectively stamped out herds were longer than in totally stamped out herds. The use of IFN_γ added a real value to the detection of infected animals.

Marine mammal epidemiological surveillance: valorisation of the french national stranding network

Guillerit Faustine & Dufour Barbara

French National Stranding Network (RNE) is a fundamental actor of marine mammals' population's surveillance through stranding's monitoring. This network is currently undergoing some changes in its functioning, as much in standard protocols as in laboratory tests or staff management. In this context, main dangers affecting marine mammals were identified and their most accurate diagnostic tools were determined. Furthermore, 13 European Stranding Networks and the French Terrestrial Wildlife Network were studied in order to identify their key operating points and their critical points. Suggestions for improving the RNE were then established, such as reorganization of stranding's field management and involvement of a laboratories network in the Stranding Network. Main limiting factors such as financials and network member's support were finally identified.

Avian botulism in France: analysis of cases reported by two surveillance networks both in the wild and in poultry farms between 2000 and 2013

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Between 2000 and 2013, in France, the SAGIR ("Monitor and Act") and the RNOEA (French Epidemiological Surveillance Network in Poultry) networks recorded respectively 129 outbreaks of botulism in wild birds and 396 in poultry. In total, 29 species of wild birds and 8 species of poultry were affected by these outbreaks, in particular mallard ducks and broilers. 85% of the autopsied wild birds were Anatidae. Most outbreaks occurred during the summer and mortality rates could reach more than 200 deaths in wild bird's outbreaks. Type "C" toxin was the most frequently identified in wild birds (49%) and poultry (62%) outbreaks. A significant association was found in our study with a bivariate analysis between botulism in Anatidae and the following factors: summer, good body condition, found near water, granivorous, dabbling duck and mallard duck. This study resulted in a descriptive image of avian botulism outbreaks in France between 2000 and 2013.

REVIEW

1887-2017: From « *Micrococcus melitensis* » to frog's Brucella. Back to the origin?

Garin-Bastuji Bruno

While the classification of Brucella had remained unchanged since the seventies, "new" species have been added to the list of "classical" Brucella since the 2000's. While the latter, which include the most important Brucella in terms of animal and public health (*B. abortus,*

B. melitensis and *B. suis)* as well as *B. canis, B. ovis* and *B. neotomae*, have a zoonotic potential (except *B. ovis*) and have a domestic species as a preferred host, the "new" Brucella have been essentially isolated from various wild animal species: *B. ceti* and *B. pinnipedialis* from marine mammals, *B. microti* from wild rodents (as well as red fox and soil), *B. vulpis* from red fox. Other strains have been isolated either only from human patients (*B. inopinata* and *B. inopinata*-like), from baboon *(B. papionis*), or wild rodents or amphibians, with no other reservoir yet known. While the classification is not stabilised and all species well defined yet, it has been established that some of these "new" Brucella, also called "atypical" Brucella, belong to the same group and correspond probably to an evolution step of the genus predating the Brucella adaptation to a preferred terrestrial (ruminants and dog) or marine (cetaceans and pinnipeds) host.

METHODOLOGY IN EPIDEMIOLOGY

Evaluation of epidemiological studies' quality: general method for beginners

Bénet Jean-Jacques, Marsot Maud, Garin Emmanuel & Rivière Julie

In this paper, a method of analysis of the validity of the results of epidemiological studies is suggested. The method relies on several steps: definition of quality of epidemiological studies, evaluation of pertinence of the goals of the study to the needs, determination of the type of study (descriptive or explanatory), evaluation of internal validity (study design: sampling, measures, data analysis and interpretation), evaluation of external validity and global assessment. This paper is completed by several problem's based learning cases studies (through succession of questions/answers organized in order to use the different steps of the evaluation method), which will be downloaded at a later time from the AEEMA website.