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Impact of early antimicrobial prevention on broiler flocks' performances. A propension score' analyses

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To achieve a significant reduction of preventive antimicrobial use, a realistic evaluation of the impact of antibiotic withdrawal is required. Clinical trials, well adapted to characterize the impact of any therapeutic option, are not easy to perform. A propensity score approach was therefore adopted to determine whether preventive administration of antibiotics at the early beginning of chicken rearing had any impact on technical performance or health characteristics of the chicken population The analysis reported in this article failed to identify any significant effect of preventive antibiotic administration on mortality, growth rate, condemnation rate or number of subsequent antimicrobial treatments courses during the rearing period.

Non-infectious factors associated with pneumonia and pleuritis in pigs. An analytical study in 143 farrow-to-finish farms in western France

Christelle Fablet, Virginie Dorenlor, F. Eono, E. Eveno, J-P. Jolly, Fanny Portier, F. Bidan, F. Madec & N. Rose

A cross-sectional study was carried out in 143 farrow-to-finish herds to identify non-infectious factors associated with pneumonia and pleuritis in slaughter-aged pigs. A sample of 30 randomly selected pigs per herd was scored for pneumonia and pleuritis at slaughterhouse. Data related to herd management, husbandry and housing conditions had been collected previously by way of questionnaires filled during a farm visit. Climatic conditions were measured in the post- weaning and fattening rooms where pigs to be investigated had been kept. Herds were grouped into three categories according to their pneumonia median score (class 1: <=0.5; class 2: 0.5<score<=3.75; class 3: >3.75). For pleuritis, a herd was deemed affected if at least one pig had a pleuritis score >=3 (scoring on a four point scale). An interval of less than four weeks between successive batches (Odds Ratio (OR)=4.5; confidence interval at 95% (CI 95%): 1.5-13.6), a large finishing room (OR=4.3; CI 95%: 1.6-11.6) and a high mean CO 2 concentration in the finishing room (OR=4.2; CI 95%: 1.6-11.3), significantly increased the odds for a herd to be in class 2 for pneumonia. The same risk factors were found for class 3 and, in addition, a direct fresh air inlet from outside or from the corridor in the post-weaning room versus an appropriate ceiling above the pigs (OR=5.1; CI 95%: 1.4-18.8). A short temperature range for the ventilation control rate (OR=2.7; CI 95%: 1.2-5.9) and the lack of disinfection in the farrowing room (OR=2.7; CI 95%: 1.2-5.8), late surgical procedures on the piglets (OR=2.7; CI 95%: 1.1-6.8), a mean temperature in the fattening room below 23°C (OR=3.0; CI 95%: 1.3-6.8) and a herd size above 200 sows (OR=3.1; CI 95%: 1.4-6.9) were associated with an increased risk of extensive pleuritis.

Identification and description of an evaluation method of *Mycobacterium bovis* infection surveillance in wildlife in France

Julie Rivière, J. Hars, Barbara Dufour & P. Hendrikx

France, an officially free country of bovine tuberculosis since 2001, has currently a low prevalence of bovine tuberculosis in cattle with outbreaks localized in specific areas and with outbreaks identified in wild boars, badgers and deer close to the areas of cattle outbreaks. A national monitoring program of *M. bovis* infection in wildlife, named Sylvatub, was launched by the Ministry of Agriculture in 2011. It is based on passive and/or active surveillance according to local risk analysis. However, monitoring of tuberculosis in wildlife is not easy and requires significant financial, human and technical investments. For evaluation of the Sylvatub network an estimation of the sensitivity, the specificity and the costs of each surveillance activity and of Sylvatub as a whole is proposed. The objective is to identify optimal surveillance strategies in terms of cost-effectiveness. The evaluation method presented here is based on stochastic model of *M. bovis* detection probabilities in some wild species in France and is illustrated by way of decision trees.

Modelling of the transmission of hepatitis E virus in pigs from experimental data

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Hepatitis E is a zoonosis for which domestic pigs are considered as the main reservoir in industrialized countries. An experimental trial was carried out to study the main characteristics of HEV transmission between orally inoculated pigs and naïve animals. A mathematical model was used to investigate three transmission routes, namely direct and indirect contacts between pigs and an environmental component to represent oral and faecal transmission. Our results showed that direct transmission alone, with a partial reproduction number of 1.06 (95% confidence interval: [0.25; 2.13]), can be considered as a factor of virus persistence within a population. However, this route of transmission alone cannot explain the high prevalence recorded in field studies, which are more likely due to virus persistence in the environment and oral and faecal contamination.

Usefulness of preventive measures to eradicate an outbreak of an emerging disease, based on the model of an outbreak of porcine reproductive and respiratory syndrome (PRRS), appeared and eradicated in Switzerland in late 2012

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The PRRS virus introduced in Switzerland by the importation of fresh semen from infected boars could be eradicated before the onset of clinical symptoms. The alert system dictated by the preventive measures allowed the rapid implementation of control measures. The isolation of suspicious farms and the analysis of 9 500 blood samples prevented the spread of this virus in Switzerland.

Evaluation of diagnostic tests when no gold standard is available

Anne Praud, Barbara Dufour, Laurence Meyer & B. Garin-Bastuji

Assessing the accuracy of available diagnostic tools, whether a single test, a combination of tests or a group of clinical and epidemiological criteria, is essential to elaborate and eventually make decision strategies. Whenever there exists a reference providing information on the

infection status of individual animals, the evaluation of the tests can be made directly. However, in many instances, the true infection status of individual animals is unknown, particularly in the absence of a gold standard or when the gold standard cannot be applied because of financial, practical or ethical constraints.

Serological prevalence survey of Schmallenberg disease on cattle herds in *Saône-et-Loire* in 2012

E. Petit, Claire Pelletier & V. Robergeot

In the *Saône-et-Loire*, department of France, the first clinical cases of Schmallenberg disease declared in 2012 were reported in the eastern and northern parts of the department although bovine herds and sheep flocks are mostly found in the south-western area. In order to test how the viral circulation and the immune response of the livestock spread in the department, a serological prevalence survey was conducted in five distinct areas identified thanks to reports of clinical cases. In order to evaluate individual prevalence, the sampling frame was made of bovine samples taken from the I.B.R. survey carried out during the 2011 2012 winter. 343 herds were randomly selected, and 5 samples of each were tested by the *Laboratoire Départemental d'Analyses de Saône-et-Loire*. The results show that the prevalence may vary from 5% -for an area without clinical cases- to 79% -for the eastern area. Those results highlight a correlation between clinical cases and serological prevalence and illustrate the heterogeneity of viral circulation within a department. The distribution of results in herd samples is analyse and discussed.

Interactions between wild boars, badgers and cattle in Côte d'Or: which opportunity for the transmission of *Mycobacterium bovis* ?

Ariane Payne, Lucie Millet, J. Hars, Barbara Dufour & Emmanuelle Gilot-Fromont

France is officially free of bovine tuberculosis but the infection has been reported to re-occur in cattle and also in wildlife, especially in wild boars and badgers in some regions such as Côte-d'Or. Wild hosts may act as reservoirs and may thus hamper efforts being made to control the infection in livestock. To quantify the level of indirect contact between those wild species and cattle and better understand how transmission may occur, ten badgers and eleven wild boars were tracked in the infected area of Côte-d'Or between August 2011 and December 2012. For each individual, we computed the number of relocations in pastures per night and the area of pasture land covered in the home range per month. Then we analysed how these estimators varied using generalized linear mixed models evaluating the impact of several variables. The distance between pasture and sett for the badgers and the availability of pasture for wild boars appeared to be important drivers for the use of pastures by these animals. Badgers preferred grassland in the spring compared to other seasons; this was particularly true when daily temperatures were low. Wild boars used pastures mostly in the summer and less in winter except when mild and wet weather made earthworms more accessible. These data give an insight into the risk of tuberculosis transmission between badgers, wild boars and cattle. *M. bovis* infection level, its persistence in the environment and the density of animal populations are needed to assess the risk of transmission between these two wild species and cattle in Côte-d'Or.

Cluster analysis as a tool to enhance dialog between epidemiologists and clinicians. Application to the analysis of complex sero-profiles.

V. Auvigne & L. Léger

Cluster analysis is a statistical method designed to group individuals in clusters based on their similarity with respect to a set of variables. This method is well fitted to analyse complex situations. This paper presents an application of this method to the interpretation of sero-profiles in some sow herds. Each sero-profile was defined based on the results of five serotype-specific Elisa tests against five E. coli antigens. The analysis included a Principal Components Analysis followed by a Hierarchical Clustering. Clusters are described and the biological interpretation of the classification obtained is discussed. Cluster analysis is a useful tool for a more productive dialog between epidemiologists and clinicians to the extent that it is statistically based and, at the same time, focused on individuals. It can be used to build diagnostic support tools.

Development of multi-block regression analysis to process veterinary epidemiological data.

Stéphanie Bougeard, Coralie Lupo, Claire Chauvin, Christelle Fablet, S. Dray & N. Rose

The purpose of this paper is to describe the development strategy of statistical methods to be applied in the field. As an example, the development of multi-block regression methods applied to veterinary epidemiological data is described. The sequential steps in this strategy are detailed: listing of constraints to be considered, methodological development, associated indexes and design of graphical displays, testing phase with applications to numerous datasets and finally package development on the free R software to make these methods available to all potential users. An illustration of a multi-block regression method and of way how to apply it to epidemiological data in broiler chickens using the R package is presented in order to identify risk factors of losses (mortality and condemnation).

Identification and characterization of blue tongue and epizootic haemorrhagic disease viruses in French Guyana on 2011-2012

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In French Guiana, the sero and viro-prevalence of bluetongue (BT) virus is high but circulating serotypes are unknown. No data are available concerning the prevalence of epizootic haemorrhagic disease (EHD). This study was conducted to identify the circulating serotypes of Orbiviruses (BTV and EHDV). Blood samples were collected in main livestock areas, from 122 young cattle between June and August 2011. Virological and serological analyses were performed. Moreover, sheep and goat with BTV-like clinical signs and also newly imported animals were analysed by the same assays. Results confirmed an important viral circulation, with viro and sero-prevalence of 85% and 84% and 60% and 40% for BTV and EHDV respectively. Ten Orbivirus serotypes were identified (BTV-1, 2, 6, 10, 12, 13, 17 and 24, EHDV-1 and 6). The circulation of many serotypes in Inter-tropical America and in the Caribbean area underlines the need of monitoring and control measures of animal movement.

Isolation and molecular characterization of foot and mouth disease virus in Benin on 2010

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This study describes the isolation and characterization of FMDV circulating in Benin between June and August 2010. Epithelial tissue samples (n=77) collected in three departments in the Northern part of Benin were analysed. FMDV was isolated from 42 samples. Within these isolates, 33 were typed as serotype O and 9 as serotype A. Phylogenetic analysis allowed the identification of two different groups of type O isolates, and one group of type A isolates. VP1 sequence comparison with sequences available in the GenBank database revealed a close relationship between the Benin isolates and strains of topotype O of West Africa (WA) and the African topotype A of genotype VI. A better identification of recent strains circulating in this region of West Africa should contribute to improve the selection of strains for vaccine production and to update available data on the molecular epidemiology of FMDV in West Africa in general.

REVIEW

The reservoir in Aujeszky's disease

B. Toma

In the latter half of the 20th century, Aujesky's disease became a major issue among swine diseases in a number of countries where swine production is significant. National programs to control the disease were generally successful in most countries. But the virus was found to circulate unchecked among feral swine and wild boar. In most of those countries, the virus was detected in those animals and often appeared to infect ever larger the numbers of them. This paper reports the difficulties experienced through the 20th century in the identification of the true reservoir for this transmissible disease and the changes in epidemiology of the disease recorded, primarily as a result of human interference with swine breeding and wild fauna management. The impact of the changes in the site of the virus reservoir, from domestic to wild, on epidemiological surveillance and prophylaxis of the disease is being discussed.