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AESA - AEEMA MEETING, MAY 18th: AVIAN INFLUENZA

Risk assessment of epizootics

F. Moutou

The real « over-flooding » of Asian avian influenza started during summer 2005 when the epizootics went out of the territories where it appeared a few years ago. From this moment new questions about the evaluation of diffusion risks have been asked. As the disease is not really new, sanitary authorities as well as scientists working on Influenza had already in hand a few answers. The possibilities offered to the virus to spread are linked to two major routes: domestic flocks and their trade, wild birds and their natural movements, including migrations. A good knowledge and control of these two items should give a real chance to manage properly the risks. The notification of an outbreak in wild birds will not necessarily lead to an outbreak in a farm. Besides Asian H5N1HP strain circulation these past months, many lower pathogenic Influenza virus strains are present. They all could increase their virulence. The possible cohabitation of different virus strains within bird populations is also to be addressed, as the question of the real reservoir of the nowadays epizootics. If wild birds are the reservoir of Influenza virus as a whole, domestic birds look more likely the Asian H5N1HP strain reservoir. Typing viral strains is fully useful only if the bird species from which the viruses are isolated are also precisely identified. Epizootics risk assessment was mainly oriented towards the understanding of the movements of the different bird categories, knowing that the control of the disease in some of the first infected countries will not lead to a rapid virus elimination. The importance of international domestic and exotic birds' trade compared to the movements of wild birds is still to be documented. Some of the data linked to outbreaks notified in Russia, Turkey and Nigeria are more consistent with trade than with migrations. This epizootic points also to the fact that birds, domestic and exotic, are bred for many different reasons like trade, food, commercial or familial farming, hobby, pets, and that each of these practices means a different risk perception. When more than one practice is present anywhere, risk management becomes more complex. Chicken farming and chicken meat international trade increased a lot these past years, maybe quicker than all the biosecurity international rules.

Public health risks of avian influenza

P. Goubau

This paper gives an overview of avian influenza by the *influenza A* H5N1 virus from the viewpoint of human medicine. On the one hand, sporadic cases of an often deadly' infection have been observed in humans infected from a bird reservoir. On the other hand, we fear the appearance of pandemic influenza, either by direct transmission of a bird virus after minor adaptations, or indirectly with a reassorting virus. Presently, the major problem in human influenza is the seasonal occurrence of flu epidemics with an associated mortality of 800 to 1500 in a country the size of Belgium. Avian flu in humans is at present a sporadic though tragic incident.

Risk management of human influenza from avian origin in France

Isabelle Bonmarin

The management of human influenza due to avian virus is presented under three chapters: management of exposed populations, cases management and collective measures. This text develops specially the points concerning alert and surveillance, principal missions of the *Institut de veille sanitaire*.

Modelling the risk of contact between wild and domestic birds

Audrey Simon, Delphine Doctrinal & D. J. Bicout

As natural reservoirs of Influenza A viruses, the wild birds can transmit these viruses to the domestic bird targets at the time of contacts. In the North-East of Lyon in the department of Ain, the wetland of *Dombes* combines at the same time full air poultry farms and accommodates each year of many migrating ducks, thus meeting the conditions favourable to the contact between wild ducks and poultry. Our objective in this report is to model the risk of contact by developing a method of calculation of an index of contact between wild and domestic birds for each poultry farm in the *Dombes*. Three factors of risk of decreasing importance were identified based on charts representing the risk of contact in winter period: the presence and dispersion of wild birds (ducks), the environment effect present around the breeding farms and the effect characteristics of breeding. From these results, the areas defined according to their level of risk of contact appears similar to those defined by lawful measurements set up at the time of the avian Influenza episode in February 2006 in the *Dombes*.

Molecular epidemiology of HPAI H5N1 in Nigeria shows multiple introductions of the virus

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Nigeria was the first country in Africa to report highly pathogenic avian influenza (HPAI) caused by HPAI virus H5N1. The virus was first detected in the North from where it initially seemed to have spread to other regions of the country. Here we report the comparison of genomic sequences of H5N1 isolates from two farms in Lagos State with one of the earliest' outbreak in Kaduna state. Despite the vicinity of the two Lagos state farms, they proved to be infected by viruses of two different lineages, both of which are clearly distinct from that found in the North. These data support the independent introduction of three H5N1 lineages along routes that coincide with migratory bird flyways. But independent trade imports cannot be excluded.

Analysis of the introduction risk of avian influenza in the population of captive birds of Switzerland

Ruth Hauser, E. Breidenbach, H. Schwermer & Katharina Stark

Due to the spread of avian influenza beyond the Asian region a risk assessment for the poultry production in Switzerland became necessary. On the basis of international standards hazard identification, the likelihood of entry (release), the likelihood of establishment or spread (exposure) and the consequences of an infection have been assessed. Illegal importations of living birds and wild birds are likely paths for the introduction of the disease. While illegally imported living birds rarely come into contact with poultry, the spread of the disease through

wild birds could have considerable consequences. The intense monitoring of wild birds and risk-based monitoring of poultry herds can reduce the risk of infection.

Proposal and development of an Avian Influenza Surveillance System in Portugal: EPIGRIPAVE Project

Yolanda Vaz, T. Nunes, V. Almeida, M. Melo, Isabel Neto Fonseca, Sara Babo Martins, M. Bragança & A. Louza

The surveillance of Avian Influenza (AI) in Portugal started in 2003 with a gradual increase of the number of samples analysed. Since 2006, a research line, established by the Calouste Gulbenkian Foundation, is financially supporting the implementation of a project for the improvement of the AI surveillance network in the country, EPIGRIPAVE, which is developed by the Veterinary Faculty of Lisbon along with the Veterinary Services, the National Veterinary Laboratory, the Nature Conservation Institute and other public and private institutions. The Project aims to develop the existing AI monitoring activities and focus sampling on different avian subpopulations, to better organise data collection, retrieval and analysis and to improve information management and circulation. Training of county veterinarians and official veterinarians in safe sampling methodologies, data collection and surveillance attitude and cooperation are also key issues of the Project. Mathematical modelling of possible scenarios for AI spread will use data produced by the surveillance network as well as from specific epidemiological studies.

Avian influenza in sub-Sahara Africa: A preliminary assessment

Cécile Squarzoni, P. Bastiaensen, Caroline Plante, N. Denormandie & B. Seck

The occurrence in January 2006, of high mortalities in a poultry farm (layers) in Nigeria has marked, since February 7th, 2006, the beginning of the avian influenza crisis on the African continent. Later, on Egypt and Niger in February, Cameroon in March, Burkina Faso, Sudan, Cote d'Ivoire in April and Djibouti in May, have also been infected. The epizootic spreads slowly within West and Central Africa and represents today a major threat for poultry production in numerous countries of the region, if not the whole continent. These first months of the crisis, which has been monitored by the various experts of the FAO 7/OIE 8/PACE 9/AU-IBAR 10 Regional Animal Health Centre, have made it possible to formulate some preliminary assumptions on the ways in which the virus seems to be spreading in countries already infected and its further spread to the sub-region. Animal trade and live poultry transports would seem to have played a major role in the introduction of the disease on the continent and its spread between countries, in particular through illegal movements. However, the spread of the disease and the rate at which outbreaks in the Sahel countries have multiplied do not appear to follow the same pattern as in Asia, except for cases such as Nigeria or Egypt (countries with a high density of human and poultry populations). The part of migratory bird species in the spread of the disease has not been confirmed yet, despite an important number of samples collected by CIRAD 11 within the framework of the FAO / TCP 12. This hypothesis is nevertheless not entirely excluded, amongst others, in the outbreaks that occurred in domesticated and wild ducks in the north of Cameroon. Many uncertainties and questions remain on the evolution of avian influenza in Africa and on the behaviour of the virus in arid zones, such as the Sahel, with low population densities, subjected to very high temperatures

and very low rainfall. The technical assistance (FAO/OIE/IBAR) provided in terms of avian influenza crisis management, as conducted in these first infected countries, has helped to identify the main obstacles to the compliance with good general practice in control and sanitation of the disease in poultry, under field conditions. The structural insufficiencies of human resources and financial and operational means of the sanitary authorities, adversely affects the speed at which field interventions are conducted. Notwithstanding this, prohibition of poultry movements and the drop in chicken consumption have had a significant impact on the commercial flows of poultry products in the infected countries and has so far avoided a widespread in-country propagation of avian influenza, as demonstrated in countries such as Niger, Burkina Faso and Cameroon. The recent officially confirmed outbreak in Cote d'Ivoire (April), will be closely monitored, given the high poultry density in the affected area and in the country. Funding is the main constraint to an appropriate implementation of avian influenza control actions in Africa and has been the cause of important delays in sanitary operations in the first recorded outbreaks. Given these observations, it is of paramount importance that countries endeavour to round-up all necessary means well before an outbreak occurs, in order to control and disinfect any avian influenza outbreak as quickly and effective as possible when it occurs.

Modelling the risk of exposure of domestic poultry to influenza viruses of wild origin

Delphine Doctrinal, M. Artois, P. Sabatier & D. J. Bicout

The threat represented by the geographical extension of the zones contaminated by highly pathogenic virus H5N1 had led the authorities to decide the setting in containment of the domestic poultries since October 2005.These sanitary measurements were taken with the aim of limiting the contacts between wild waterfowl avifauna and domestic poultry. Our objective in this paper is to provide an estimate of the risk of exposure of the domestic poultry to an avian Influenza strain of wild origin. We have developed a model of circulation of avian influenza virus within a wild avian population from which the parameters of the model result from the data of counting and the literature on the experimental infections. The effects of certain parameters of the model on the characteristics of the exposure are studied, and the results obtained are confronted with the sanitary measures taken this year in France. The analysis of these results reveals a more important effect of the date and period of introduction of the viruses into the population than that of intrinsic characteristics of the strain considered such as its pathogenicity and its duration of viral excretion. We conclude that the period of containment as it was decided this year makes it possible to minimize the risk of exposure of the domestic poultry to avian influenza of wild origin. On the other hand, if the viruses arrive in this population during migrations of autumn, the exposure would be higher before the beginning of the period of containment. The active inspection network must thus be maintained in order to ensure an early detection of the circulation of Influenza viruses in wildfowl population.

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Surveillance of equine influenza in France: results of RESPE network and viral phytogenetic

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The RESPE, network for the epidemio-surveillance in equine pathology, has been monitoring equine influenza in France since 1999. This surveillance not only allows the estimation of viral circulation intensity and horse pathology, but is also a good means of collecting circulating strains and checking the good appropriateness of vaccine and circulating strains. The distribution of equine populations monitored by the RESPE has been estimated from a survey of sentinel veterinarians achieved in 2006. This survey has shown that the cover of the network is heterogeneous, both geographically and regarding the kind of equine population, since some areas have no sentinel veterinarians and since only 3% of carthorses and donkeys are covered by the RESPE whereas almost 2/3 race horses and breeding horses are monitored. Moreover, the results of these six years of existence are based on 182 confirmed equine influenza cases and 96 outbreaks (including one or more cases). The existence of national census for some populations has allowed to estimate the coverage rate of the network and the incidence of influenza per horse category. Finally, phylogenetic studies based on strains isolated or amplified in France have shown that strains from both European and American lineages have circulated as in the rest of the world. A unique genotype of the American lineage (sub-lineage Florida) has circulated in 13/14 outbreaks reported in 2005/2006. Even though the RESPE does not offer a maximal coverage of the equine population yet, the incidence estimations have shown that race horses are far more concerned by these infections than the other populations (riding schools and all other populations). The horse races category is at the same time the most monitored population.

Risk assessment of the presence of *Echinococcus multilocularis* and *Toxocara canis* in foxes from Brussels.

C. Saegerman, Hélène De Blander, R. Hanosset, D. Berkvens, B. Losson & B. Brochier

During the last decades, European red foxes (*Vulpes vulpes*) have been implicated in the transmission of several viral or parasitic pathogenic agents to domestic animals and humans. In urban areas, risks of zoonoses transmission are likely to increase as a result of a higher rate of intra- and inter- species contacts. Foxes occur on 35% of the Brussels-Capital Region area and local densities reach up to 4 family groups per km². According to the directive 2003/99/ECC, a first survey for the presence in foxes of *Echinococcus multilocularis* and *Toxocara canis* was conducted in Brussels from 2001 to 2004. None of 160 foxes were found to be infected with *Echinococcus multilocularis* and 24 of 134 foxes were found to be infected with *Toxocara canis*. Considering numbers of examined foxes, the sensitivity and the specificity of tests used for diagnosis, the 95% credibility intervals for the true prevalence of carriage of *Echinococcus multilocularis* and *Toxocara canis* were estimated in a Bayesian framework to be 0% to 1.87% (median value of 0%) and 12.7% to 26% (median value of 18.7%) respectively. For *Toxocara canis*, a significantly higher risk to be a carrier occurs in cubs and a significantly lower risk in adults.

Actualisation and interval validation of a helping tool for BSE clinical decision in Belgium

Bénédicte Plouvier, D. Berkvens, K. Mennens, E. Vanopdenbosch, S. Roels & C. Saegerman

The use of regression and classification trees is a usual decision support tool for diseases with low prevalence as well for diseases which diagnosis test not exist actually (emerging diseases). These trees make it possible to classify observations (clinical and other) on the basis of a set of predictive variables (categorical or continuous). New data concerning the clinical suspicions of the bovine spongiform encephalopathy were collected in Belgium from November, 2002 until January, 2005. These data make it possible to update and estimate of previous performance characteristics of regression and classification trees. Several modifications of regression and classification tress are proposed and discussed in order to improve epidemiological passive network in Belgium.

Comparative retrospective study of two diets in neutered cats and their impact on general health

Morgane Lamarche & J-J. Bénet

Following sterilization, the cats' behaviour and rate of feeding are modified, leading to a direct risk of increase in the rate of obesity and feline low urinary tract diseases. Some companies which specialized in pet nutrition have produced some formulas adapted to the characteristics of neutered cats, aiming to minimize the negative effects of sterilization. This analytical, exploratory and retrospective study, compare the state of health and level of obesity of neutered cats according to the type of food which the animals have been fed on. Two sets of pets have been compared both fed on food sold in veterinary clinics, first diets from the Neutered Cat® range (Royal Canin) (61 questionnaires filled in at the end of study), second with other veterinary foods (69 questionnaires). No significant difference was noted among the two sets, taking into account the characteristics of the cats or their owners. However, the results covering various health aspects do reveal significant differences ($p < 0.05$), such as a protective effect of studied food, for example for obesity ($p = 0.03$; RR = 0.7 [0.51 - 0.97]), disease after neutering ($p = 0.02$; RR = 0.63 [0.42 - 0.94]) gum recession ($p = 0.08$; RR = 0.78 [0.59 - 1.04] or urinary problems ($p = 0.004$; RR = 0.21 [0.08 - 0.56]. Biases are discussed, mainly due to self-selection by owners who accepted or not to participate to the study, or a cluster effect due to limited number of veterinary clinics. The design of a next study would have to deal with those aspects.

Bovine tuberculosis control programme in France from 1954 to 2004: epidemiological relevance analysis of regulations texts

J-J. Bénet, Maria-Laura Boschiroli, Barbara Dufour & B. Garin-Bastuji

France implemented a real collective control campaign against bovine tuberculosis (BTB) in 1954 after an unsuccessful prophylactic phase applied since 1933, which was individual and free-based. This new programme leads the country to be recognised as BTB free by the European Commission in 2001. At the beginning of this campaign, 25 to 30 % of cattle farms were infected while, at present, a few dozen outbreaks are declared per year. French BTB control campaign proved to be a complete success. This programme was the first collective control campaign implemented in France against a livestock disease, which served as a model for other diseases in this and other countries. Although it began at a period when

epidemiology did not exist as a formalised scientific discipline, and, nevertheless, having produced matter for new epidemiological knowledge, it can be now submitted to post-hoc evaluation for epidemiological relevance of its regulation texts. Firstly, it should be noticed that the annual rate of infected herds is represented as a decreasing exponential curve. This data can be line-adjusted by a logarithmic transformation. The line's slope can be interpreted, in an arithmetic scale, as follows: each year (from 1954 until 2004), the number of infected herds is proportional (80-85%) to the number of infected herds observed the year before. The slope did not change, despite the various modifications intended to enhance the programme performances. This slope stability strongly suggests a lack of risk factors´ management. However, the slope changed since 1996 corresponding to a rate of approximately 70%; from this time on, indeed, the proportion of infected herds submitted to total slaughter changed from 10% since 1991 to approximately 50% in 1999. We analysed the epidemiological relevance of French BTB-programme's regulation texts. Until 1990, the plan was focused on detection and cull of infected animals. It was only at that time that control of infection-free status of cattle upon introduction in an infection-free herd became compulsory. Actually, this is a major and well-known risk-factor control measure. Indeed, herds which did not respect this recommendation lost their disease-free qualification and their trade allowance. In 1999, total slaughter of infected herds was officially introduced in the texts in order to eliminate the risk of herd re-infection. In 2003, the last introduction on regulation texts, dealt with different measures, such as risk management on exposure to infected neighbour farms and detailed investigations to detect potential contaminated herds. Since then, systematic screening has been withdrawn and replaced by a surveillance system of herds´ infection free status, of infection risk management and its control by a systematic annual visit of herds, according to the nowadays classical food safety principles, well known as "hygiene pack". On this presentation, however, we also emphasise the still remaining difficulties on the subject.

Foot and Mouth disease risk in Spain: expert opinions

A. Picado, J. Casal & A. Martin

Specialist consultation is a method for obtaining information, and its use is growing in the animal-health sector. In this paper, we describe the methods used to obtain data needed to evaluate the risk of introduction and dispersion of the Foot and Mouth (FMD) virus in Spain. Several data-collection methods were used (individually and collectively), as were different formulae for posing the questions: target and control questions, 3-point method and conjoint analysis. The results and varying methods were analysed and compared. The data were used to evaluate risk of introduction for the FMD virus and to simulate the consequences of an FMD epidemic on the bovine sector in Spain.

***Yersinia enterocolitica* and its role in bovine brucellosis monitoring: A statistical analysis**

Carla Grattarola, Maria Silvia Gennero, Simona Zoppi, Stefania Bergagna, Laura Chiavacci & A. Dondo

184 animals were tested to detect *Yersinia spp*. from faeces: 76 of them were positive to RBT and/or CFT and 108 were negative. Association between serological tests and detection of *Yersinia spp.* was studied considering health status of native herds (PROC. LOGISTIC and PROC. GENMOD SAS 8.2). Odds ratio value confirms that Yersinia presence increases the

chances to detect false seropositive compared with Yersinia free herds, according to bibliography.

EPIDEMIOLOGY PAPER

Resapath: Critical analysis and proposals for improvement

Marie-Anne Botrel, Myriam Chazel, Danièle Meunier, E. Jouy, Marylène Kobisch, J-Y. Madec & D. Calavas

A national veterinary surveillance network named Resapath monitors resistance to antimicrobial agents in the main pathogenic bacteria isolated from diseased cattle, swine and poultry in France. The aims of Resapath network are the detection of antimicrobial resistance emergence and the monitoring of its evolution over time and space. With the aim of constantly improving the network, a detailed description of its organisation and production has been elaborated, based mainly on the process described by B. Dufour and P. Hendrikx [Dufour and Hendrickx, 2005]. If not consisting in a true network assessment, this work allowed for identification of the limits of data interpretation and for new proposals aiming at improvement of the network functioning.