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AEEMA MEETING, JUNE 22nd, 2008: EPIDEMIOLOGY OF VECTORIAL TRANSMISSION DISEASES IN WESTERN EUROPE

An introduction to disease vectors and the diseases they transmit

V. Robert, D. Fontenille & F. Simard

Vector transmitted diseases are numerous both in humans and in animals. Occasional reports remind us periodically of their huge importance. In this paper we present various definitions of the vector concept, and list the prominent vectors among insects and ticks. We also describe various modalities of disease transmission by vectors and other related relevant issues.

Epidemiological aspects of the transmission of micro-organisms by arthropod vectors

F. Rodhain

A vectorial system is composed of three elements: the pathogen, its arthropod vector(s), its vertebrate host(s). The relationships between these three components are complex. Moreover, in nature, environmental factors will act on those systems according to modalities which vary in time and space. As the environment is perpetually changing, primarily as a result of human activities, the epidemiology of vector-borne diseases is also evolving. So, how to assess the infectious risks, how to imagine preventive measures? These questions far exceed the competence of medical and/or veterinary physicians and call for a thorough collaboration of specialists leading to a true ecological approach of epidemiology. To this end, teaching and training of specialists in deserted fields like entomology, systematics and ecology must be improved.

Entomological survey: the case of vector transmitted diseases

G. Duvallet, B. Mathieu, C. Jeannin & A. Caron

Insects play an important role in a variety of animal diseases, primarily vector-borne diseases. Faced with threats of emergence or re-emergence of these diseases, further to global climate the objectives of entomological surveys are 1) to detect as early as possible potential vectors in a given area and to follow up the changes in insect populations, 2) to accurately identify potential vectors and 3) to organize and coordinate control measures for protection of men and/animals. Those objectives require a strong link between research in medical entomology and epidemiology.

Sanitary methods for the control of vectors with particular emphasis on the prevention of arbovirus-transmission by mosquitoes in metropolitan France

F. Schaffner

The control of vector-transmitted diseases is mainly based on preventive sanitary measures aiming to reduce (1) the possibility for the pathogen to spread, (2) the number of vectors, (3) the contact between host and vectors, or (4) the life time of the vectors. Integrated vector control combines treatments with pesticides, management of the environment and community participation. Control methods are multifaceted and are chosen considering their

efficiency and their economical as well as their environmental costs. Schemes for controlling the circulation of West Nile virus or Chikungunya and Dengue viruses transmitted by mosquitoes are examples of sanitary prevention measures that are implemented in metropolitan France.

Phlebotomine sand flies and leishmaniasis

J. Depaquit

Leishmaniasis due to *Leishmania infantum* is endemic in France. It is transmitted by the bite of Phlebotomine sand flies belonging to the subgenus Larroussius: *P. ariasi* and *P. perniciosus*. These species also transmit Toscana virus. Relationships between Phlebotomine sand flies and *Leishmania* are evoked and the risk of introduction of other leishmaniasis is discussed from the point of view of an entomologist.

Unusual mode of tick transmission

Claudine Pérez-Eid

In many respects ticks are unique in their mode of transmission of pathogens. In addition to the route common to all hematophagous' vectors, ticks can transmit by the coxal route or by co-feeding. The latter, only elucidated at the end of the 20th century, may explain differences between the distribution of *Lyme borreliosis* and that of Tick-borne *encephalitis*, both of which have the same vector, *Ixodes ricinus*, and the same reservoirs.

AEEMA MEETING, JUNE 23rd, 2008: FREE COMMUNICATIONS

***Chlamydophila psittaci* infections in France: present data and 2008-2009 epidemiological survey**

Karine Laroucau, Maïthé Clerc, Françoise Obeniche, F. Vorimore, Isabelle Capek, B. Garin-Bastuji, Christiane Bébéar & Bertille de Barbeyrac

Avian chlamydiosis, also named psittacosis, is a zoonosis due to *Chlamydophila psittaci*. In France, human cases of this disease are not notifiable. In 2005, 2006 and 2007, 17, 15 and 28 cases were respectively reported to French National Public Health Surveillance Centre (InVS) by the National Reference Centre (NRC). The NRC performs a passive surveillance for psittacosis based on received requests for diagnosis. During this period, several human psittacosis outbreaks - linked to ducks or to psittacines - were investigated by the InVS and the NRC (human aspects), and by Veterinary Services and Afssa (animal aspects). Medical and veterinary epidemiological surveys and serological and/or PCR diagnosis confirmation were carried out. Few data are available concerning this zoonosis. Therefore, considering the potential seriousness of the human disease and the recurrence of epidemic episodes in various professional contexts, a 2-year prospective descriptive study of human psittacosis, coordinated by the InVS, was started in January 2008. The aim of this study is to determine the incidence of hospitalised human cases as well as the frequency of grouped cases and to describe risk exposures for the patients. Additionally, the analysis of the strains isolated from humans and animals and the description of breeding characteristics and working conditions should improve the knowledge of risk factors for animal-to-human transmission. This may lead to reinforcement of prevention and control measures.

Surveillance of West Nile Virus equine infection in France between 2000 and 2007

Sylvie Lecollinet, T. Lefrançois, B. Durand, Agnès Leblond, Gwenaëlle Dauphin, J. de Goer & S. Zientara

West Nile fever is a mosquito-borne virus disease involving wild birds as amplifying hosts, and humans and horses as highly susceptible and incidental hosts. Outbreaks of West Nile fever have already been reported in metropolitan France, in the Camargue region from 1962 to 1965. After 35 years without any evidence of viral transmission, West Nile fever has been reported again in 2000 in horses in the Camargue region. Following this outbreak, passive surveillance of equine encephalomyelitis has been reinforced in French departments, particularly in those bordering the Mediterranean. This surveillance led to the identification of 4 distinct outbreaks of West Nile fever, responsible for neurological illnesses in horses, in the Camargue region in 2000 and 2004, in the Var department in 2003 and in Eastern Pyrenees in 2006. This equine surveillance system thus allowed sensitive detection of hot-spots of viral amplification in these regions, and could be reinforced by a syndromic surveillance protocol to facilitate earlier detection. The situation in the French West Indies is in many respects different from that in metropolitan France, but the need for West Nile virus surveillance has been underscored by the rapid spread and increased virulence of the virus that was introduced onto the American continent. In this context, an active surveillance system based on regular serological controls of the equine population was useful in demonstrating active viral transmission in Guadeloupe in 2002 and 2003, without any recorded human or equine clinical cases. Results obtained by surveillance in metropolitan France, Guadeloupe and Martinique between 2000 and 2007 are presented.

West Nile virus surveillance in Catalonia

Ana Alba, Nuria Busquets, A. Allepuz, F. X. Abad, Erika Serrano & J. Casal

The West Nile Virus surveillance programme was implemented in Catalonia (North-Eastern Spain) in 2005, having as a main goal the detection of the early circulation of West Nile Virus (WNV) in vertebrate hosts and vectors. This programme was implemented in the three main wetlands of the region during the period of major activity of Culicidae mosquitoes. The programme was based on vertebrate host's surveillance, as wild avian species and equines, and an entomological surveillance system. Both passive and active surveillance were implemented in vertebrate hosts. The passive surveillance system was based on the analysis of dead birds or suspected horses with compatible clinical signs, and the active surveillance system in wild birds at increased risk and equine sentinels was based on a serological response. In 2007, a total of 98 samples from equines and 236 samples from wild birds were collected and tested. An entomological surveillance system was also implemented allowing to get information about the Culicidae population indexes, and to detect arboviral RNA genome for the genus Flavivirus. In 2007, a total of 3,846 mosquitoes were tested. During the year 2007 the circulation of WNV in Catalonia was not detected in any component of the surveillance system.

Estimation of within flock incidence of scrapie in Sardinian sheep

Maria Cristina Bona, Maria Caramelli, C. Ligios, Cristiana Maurella, Gabriella Perfetti, Rosaria Possidente & G. Ru

Since 1995 most of the Italian scrapie outbreaks have involved Sardinian sheep, the main ovine Italian breed. This study was designed to evaluate the incidence of scrapie among Sardinian sheep in all the outbreaks reported based on clinical symptoms between 1995 and 2007. In order to collect information all farmers were interviewed using a standardised questionnaire, containing the following items: number of sheep (classified into three age classes: < 2 years old, from 2 to 4 years old, >4 years old), number of animals with scrapie-like symptoms observed during the last 12 months prior to the confirmation of the disease in the flock. The incidence of scrapie was calculated both in the total Sardinian sheep population and within each scrapie-affected flock. The incidence was calculated both on the overall population and within age classes. The study of results by age classes demonstrates, as expected, that the highest incidence of scrapie is found in 2 to 4 years-old small ruminants. Crude within-flock incidence was 2.59 cases per 100 animal-years (CI 95% 2.46-2.73); the median within-flock incidence was pretty low. There are no significant year-to-year variations in the age-adjusted incidence and no clear temporal trend. These results are a starting point for future investigations on risk factors that may influence within-flock incidence of Scrapie, such as vaccinations, animal handling and management. The validity of these data, collected through oral interviews, may have been influenced by the farmers' ability to recognize the disease and to remember the oldest cases.

Permanent spermatic infection in bulls, after acute infection by BVD virus

Nathalie Pozzi, Virginie Catinot, Y. Charpentier, Delphine Bouilloux & B. Guérin

Acute or chronic BVDV infection on bulls is associated with BVDV excretion in the semen that can be transient in case of acute infection or permanent for a persistently infected animal. Under certain circumstances, BVDV acute infection on bull can lead to a permanent spermatic infection. The objectives of this study were to evaluate the frequency of this kind of infection on AI bulls in France and to study the characteristics of the spermatic permanent infection. Seroprevalence of the BVD infection was investigated on 4611 AI bull serum samples and assessed to be 22.4% (1033 positive animals). Among them, two were found to be persistently spermatic infected by a PCR test (1.9 p./°°). Antibody rates were stable during the six months duration of the study. BVDV was detected in all the ejaculates collected during this period of time. Viral particles were infectious for culture cells. After slaughter of three bulls suffering from a spermatic persistent infection, BVDV genital localizations were found in the testis, epididymis and ampulla. Seminal vesicles were not found contaminated. Despite the 6 months duration of the study, observations carried out are enough to conclude to a highly probable permanent spermatic infection that can occur in male after an acute infection caused by the BVDV. Consequently, AI bulls found virus shedder in semen after a BVDV seroconversion have to be eliminated from the semen collection centres.

Impact of a natural bluetongue serotype 8 infection on semen quality of rams (Belgium, 2007)

Nathalie Kirschvink, Raes Mariane & C. Saegerman

Serotype 8 of bluetongue (BT) virus emerged in 2006 in Northern Europe and affected numerous ruminants in 2007. Infertility in males is one of the consequences of BT, its severity and duration after natural infection have not yet been documented. Here, the impact of BT-8 on clinical signs and semen quality of 79 naturally infected rams in Belgium is described through a longitudinal study of two ram populations (n=12 plus n=24) as well as by a cross sectional study in one ram population (n=43). Macroscopic semen characteristics, semen concentration, motility, percentage of live and dead spermatozoa were assessed in 167 semen samples collected on 1 to 6 occasions in 79 BT-8 infected rams within 5 to 138 days of onset of clinical disease and were compared with those of healthy control animals. Significant changes of all variables were observed after natural BT-8 infection, total recovery occurred in animals undergoing a tight follow-up of semen quality around 85 days after appearance of clinical disease. Good correspondence between the results of the longitudinal and cross-sectional studies suggests that semen quality of BT-8 affected rams reaches reference values within 63 and 138 days after clinical diagnosis of BT. In addition, semen concentration appears as a good epidemiological indicator to monitor semen quality in rams.

Preliminary estimation of economic losses linked to the natural bluetongue serotype 8 infection on sheep flocks (Belgium, November 2007)

C. Saegerman, Marianne Raes, Aude Uyttenhoef, J-B. Hanon, Fabienne Fecher & Nathalie Kirschvink

In Northern Europe, bluetongue caused by the bluetongue virus, serotype 8 (BTV-8), emerged in August 2006 and numerous ruminant herds were found to be affected in 2007. An epidemiological postal survey was sent to 502 sheep holders with the help of the sheep and goats inter-professional federation (called FICOW). A total of 18% of holders responded (mainly meat holders). These holders market their animals on short circuit (direct sales). Despite morbidity and mortality, animal sterility (still not quantified) and lower growth, costs of animal treatment were important (sick animals and/or animals living with sick animals): minimum = 2 €/animal treated; maximum = 135 € / animal treated; mean = 26 €/animal treated and median = 20 €/animal treated. Except for rams, the price of animals (for reproduction and meat) has not varied significantly while the survey was conducted. A second postal survey is programmed after the lambing period to assess reproductive and other economic losses that could not be quantified by the time this survey was run.

Bluetongue epidemiology in the European Union: current status and perspectives

C. Saegerman, D. Berkvens, P. Mellor, Fabiana Dal Pozzo, Sarah Porter, L. Martinelle & S. Zientara

Bluetongue epidemiology in the European Union: current status and perspectives Bluetongue (BT) is a World Organization for Animal Health notifiable disease and is of considerable socioeconomic concern and of major importance for the international trade of animals and their products. Before 1998, BT was considered an exotic disease in Europe. Between 1998 and 2005, at least 6 viral strains of bluetongue virus (BTV) belonging to 5 distinct serotypes (1,

2, 4, 9 and 16) have been constantly present in the Mediterranean Basin. Since August 2006, BTV serotype 8 emerged and caused a severe epizootic in Northern Europe. BTV-8 showed a higher tropism for bovines and an increased virulence characterized by the development of severe clinical signs and reproductive disorders. Endogenous vectors have been involved and in particular the *Culicoides obsoletus*, *C. dewulfi* and *C. chiopterus* complexes. During 2007 the re-emergence and the recrudescence of BTV-8 created the conditions for the establishment of an endemic infection in this region. Furthermore, the radial extension of BTV-8 throughout Europe and the progression of BTV-1 to the South-West of France, increases the risk of an encounter between these serotypes and others, particularly those occurring in the Mediterranean Basin. During its southern progression, BTV might encounter *C. imicola*, a vector with a longer activity throughout the year. These conditions increase the risks of reassortment events between the genome segments of the different BTV serotypes. A new reassortment virus may be characterized by differences in the virulence compared to its parental viruses. Two prophylactic measures can be applied to face an endemic situation: vaccination with inactivated vaccines and use of insecticides to reduce the contacts between vectors and susceptible animals. Understanding the BT epidemiology depends in the first place on a full understanding of the virology, pathogenesis and immunology involved. This necessitates continued scientific research and vigilance. In addition to the preponderant vector transmission, other transmission routes have been observed and documented in cattle with serotype 8, such as trans-placental infection during vector-free period and of lesser importance horizontal (oral) transmission. These aspects promote the maintenance of the disease in Europe and need to be also considered in the development of control strategies.

Analysis of a wildlife disease monitoring network for the purpose of early disease detection

Eva Petit, O. Mastain, Charlotte Dunoyer, J. Barrat, M. Artois & D. Calavas

In order to use surveillance data for the purpose of the early detection of emerging diseases, we have analysed a wildlife disease monitoring system: the SAGIR network. We have used a framework for evaluating health surveillance systems, recommended by the Centre for Disease Control and Prevention in Atlanta (CDC). This network fulfils, among others, the criteria of a good flexibility and an acceptable sensitivity at least for the main game species, at least in areas where they are considered as important for recreational activities. We conclude that the data from this network appear usable for the testing of statistical methods designed to detect new or unexpected events early.

Surveillance and diagnosis of West Nile virus infections in animals from mixt ecosystems in Southeast of Romania

G. Savuta, S. Morosan, D. Anita, Adriana Anita, Elena Luanda Ludu, Aurelia Ionescu, M. Marinov Jr, S. Raileanu & Sylvie Lecollinet

We carried out an epidemiological study on the presence of the West Nile virus in horses in the Eastern part of Romania and in the Lucina stud farm, located in the Carpathian Mountains, in the North of the country. We found a 33.5% prevalence in IgG antibodies in horses from the South Eastern area and an anti-IgM response was also present. A combo kit, "WNV-ImmunoComb-Equine West Nile Virus Antibody Test Kit", made by Biogal Galed Laboratories, was tested, the combo kit being more practical for use in the field for preliminary diagnosis of

West Nile infections in horses. We sampled birds from the studied areas. The results of the sero-neutralisation test showed a 9.68% (3/31) seropositivity in adult hooded crow (*Corvus frugilegus*) from Salcioara locality in the Danube Delta and a positive result in one sample from a House Sparrow (*Passer domesticus*) in Maliuc meaning a 0.81% seroprevalence. We also collected mosquitoes and crow brains for viral isolation.