

## **2022, issue 80 – ABSTRACTS**

### **AEEMA MEETING - MAY 12, 2022: The AEEMA, FORTY YEARS OLD; WHAT OUTLOOKS IN ANIMAL EPIDEMIOLOGY?**

#### ***The AEEMA, forty years old***

Toma Bernard and Dufour Barbara

*AEEMA was founded in 1982 with the aim of facilitating communication between French-speaking people interested in the epidemiology of animal diseases.*

*It achieves its goal through multiple actions:*

- *Annual Days, thematic or presentation of research results and methodological workshops,*
- *The production of books and a journal as well as participation in training,*
- *The creation of think tanks,*
- *The availability of many resources on its website: Terminology, Technical sheets for all, Scientific chronicles, News such as COVID-19 and the animal world, etc.*

*It currently brings together around 300 people, half of them from around ten European and African countries.*

*The text describes these activities.*

#### ***Epidemiological modelling contribution to animal health***

Ezanno Pauline, Arnoux Sandie, Beaunée Gaël, Cecilia Hélène, Cristancho-Fajardo Lina, Picault Sébastien, Vergne Timothée and Vergu Elisabeta

*Anticipating infection dynamics, at all scales (host, herd, production area), makes it possible to limit the impact of animal epidemics by identifying interventions adapted to the epidemiological situation. This issue, which is crucial for ensuring the sustainability of livestock farming, veterinary public health and animal welfare, is even more important in the context of global changes due to the evolution of system components. Epidemiological modelling provides a relevant analytical framework to address this issue, complementing observational and experimental approaches.*

*In this article, the contributions of epidemiological modelling will be illustrated through four examples of animal diseases: bovine viral diarrhoea, which is often studied within a single host and virus framework; African swine fever, which circulates at the interface between wild and domestic fauna; respiratory diseases, whose detection is increasingly based on the use of sensors in a precision farming context; and vector-borne diseases, whose epidemiology is highly driven by ecological processes, as multiple hosts and vector species are involved, with the population dynamics strongly impacted by environmental and climatic characteristics.*

*These examples, encompassing a diversity of situations from the point of view of the pathosystem complexity, the generated epidemiological dynamics and the links with the environment, will allow us to address the methodological challenges still to be met: interconnecting models with observation data, real-time modelling, integrating models into a One Health - Eco Health approach, taking into account interactions between scales, co-constructing models together with animal health managers and public decision-makers, and modelling decision mechanisms.*

#### ***A look at the contribution of economics to the collective management of infectious animal diseases***

Rault Arnaud

*The collective management of infectious animal diseases is primarily the responsibility of various specialists in biological processes, using sciences such as epidemiology, virology or immunology. However, experience and recent epidemics show the central role of human actions in the spread and control of infectious dynamics. The social sciences thus provide a complementary perspective, and among them, economics has shown its importance in understanding the human factors that explain herd health. Through a selection of recent articles in this research field, this article proposes to explain some salient points of economic research that enrich the understanding of infectious dynamics in livestock and serve as support for public health management decisions.*

#### ***Ecological contribution to animal health' epidemiology***

Gilot-Fromont Emmanuelle

*Ecology and epidemiology are two disciplines historically and conceptually unrelated. However, exchanges have been developing in particular through modelling, a common method to represent the*

*dynamics of interactions between hosts and pathogens. Many ecological concepts may complement the epidemiological approach, we will propose several examples.*

*First, considering the evolutionary dynamics of the host-pathogen relationships allows one to understand how virulence may evolve, especially depending on host population demographics. It is also essential to consider compromises between life history features, particularly among immune features, that explain indirect interactions between the dynamics of unrelated pathogens such as helminths and bacteria. Finally, population biology and pathogen dynamics interact together, which explains the perturbation effects that can be induced by some sanitary measures. The interactions between both disciplines under the common framework of One Health is expected to enrich them and foster the emergence of new investigation fields, for example at the scale of communities. An interdisciplinary approach will need to define common objectives and methods to fully develop eco-epidemiology.*

### **Contribution of phylodynamics to epidemiology in animal health**

Guinat Claire, Vergne Timothée, Kocher Arthur, Chakraborty Debapriyo, Paul Mathilde C., Ducatez Mariette and Stadler Tanja

*Infectious diseases are a major burden to global economies, and human as animal health. To date, quantifying the spread of infectious diseases to inform policy making has traditionally relied on epidemiological data collected during epidemics. However, interest has grown on recent phylodynamic techniques to infer pathogen transmission dynamics from genetic data. Here, we provide examples where this new discipline has enhanced disease management in human health and illustrate how it could be further applied in animal health. We describe how phylodynamics can address fundamental epidemiological questions, such as inferring key transmission parameters in animal populations and quantifying spill-over events at the wildlife-livestock interface, and generate important insights for the design of more effective control strategies.*

### **Contribution of sociology/anthropology to animal health epidemiology**

Thys Séverine

*Several of the more cost-effective Neglected Zoonotic Diseases' control strategies involve reducing disease prevalence in the animal reservoir, and such control approaches often profoundly impact on the prevalent culture, livelihood, and socio-behavioural patterns of the affected human communities, including the social relations and social practices that mediate porous boundaries between humans and animals in their ecosystem.*

*Three case studies were conducted in specific endemic settings: cystic echinococcosis (Morocco), Taenia solium taeniasis-cysticercosis (Zambia) and rabies (South Africa). They aimed to illustrate and demonstrate the importance of including the socio-anthropological approach to contextualise the dynamic of disease transmission among livestock owners and their community, including knowledge and perception of zoonoses. Their objectives were also to identify facilitating factors and barriers to interventions, and to support efforts to control animal diseases that operate in challenging circumstances and with marginalised populations, in order to finally better fit needs of different actors.*

### **The role of epidemiology in animal health decision-making**

Lefrançois Thierry and Dufour Barbara

*Epidemiology has gradually emerged, especially during health crises, as an essential discipline to provide relevant scientific evidence to health managers, and thus to inform public decision-making.*

*This article successively reviews:*

- *The usefulness of the different sectors of epidemiology in decision-making in animal health, taking examples treated by animal health safety agencies in each of these sectors: descriptive epidemiology, analytical epidemiology, modelling, risk analysis;*
- *The limits of taking epidemiological information into account in animal health decision-making;*
- *The example, in human health, of the national Scientific Committee of Experts in the management of the COVID-19 crisis;*
- *Difficulties encountered and possible developments.*

*In the presence of each health situation that must lead to decision-making, decision-makers have also to consider a great deal of information of an economic, social, political, or international nature. Epidemiological information is essential, of course, but not sufficient, nor the only. In the health field, human and animal, the decisions taken in France are, in general, convergent with the proposals of epidemiological experts. Suggestions are made for an optimal account of scientific data and specifically epidemiological data taken by politicians, with a view to make a better-informed decision.*

## **AEEMA MEETING - MAY 13, 2022: COMMUNICATIONS**

### ***Evaluation of the contribution of French national parks to a health strategy for metropolitan wildlife using the Oasis method***

Hendrikx Pascal, Hadibi Sabrine and Durand Thierry

*The French National Parks requested Anses to conduct an initial assessment of the surveillance component of their wildlife health strategy in mainland France. The evaluation was carried out using the Oasis method. The analysis of the results highlighted several strong points: the multi-partner nature of the development of the health strategy and the important history of health surveillance of wild populations based on competent actors. The avenues for improvement identified in the form of 22 recommendations concern:*

- 1. the elaboration of a specific document describing the surveillance component of the health strategy, including*
- 2. a reflection on the surveillance objectives and the health hazards to be integrated,*
- 3. a revision of the central institutional organization in terms of steering, scientific and technical support and coordination,*
- 4. the harmonization of surveillance methods and tools throughout the national parks.*

### ***Mapping the risk of introduction and spread of Mycobacterium bovis bovine tuberculosis in Senegal from neighbouring countries in 2018***

Ndour Andrée Prisca Ndjoug, Seck Ismail, Coulibaly Fatoumata, Kone Philippe Soumahoro and Akakpo Ayayi Justin

*Becoming a priority zoonosis in Senegal since 2017, the fight against Mycobacterium bovis bovine tuberculosis (BTb) involves identifying critical intervention points given the high prevalence of the infection in neighbouring countries. This qualitative risk analysis associated to mapping (QRAC) has therefore made it possible to assess the probability of introduction and spread of BTb in Senegal in 2018. Based on the World Animal Health Organisation's qualitative risk assessment and collegial discussions with experts from Mauritania, Mali, Guinea, Guinea Bissau and The Gambia, scores were assigned to the different probability levels (score 1-3 for Negligible, score 4-6 for Low, score 7-9 for High, score 10-12 for Very High).*

*The specific indicators of animal mobility determined based on animal movements, cattle density, the distance (Km) of water surfaces (rivers, lakes, etc.) and border accessibility have made it possible to conclude that there is a high (8%) and very high (9%) probability of introduction of the tuberculosis bacillus into Senegal from the border communes. The probabilities of exposure to M. bovis are assessed as high and very high, respectively, for 49% and 11% of the 423 communes of the Country. The establishment of an effective early warning system will take into account the assigned risk levels to identify priority areas for intervention.*

## **HISTORY OF EPIDEMIOLOGY**

### ***History of the appearance of words corresponding to the concept Epidemiology in the Western scientific literature***

Steinfeld Nadine

*This article sets out to establish the etymology of the French term épidémiologie, while at the same time studying its correlates in Neo-Latin, German, Spanish, Italian and English. The word appeared for the first time in 1598, in Sardinia, by the Latin-speaking Calabrian physician Angelerio, in his book entitled Epidemiologia, which dealt with the human plague.*

*Epidemiologie appeared then in 1795, in German (Gruner), a few years before the publication in 1802, in Madrid, of Epidemiología española ó historia cronológica de las pestes, contagios, epidemias y epizootias que han acaecido en España desde la venida de los cartagineses hasta el año 1801, con noticia de algunas otras enfermedades de esta especie que han sufrido los españoles en otros reynos, y de los autores nacionales que han escrito sobre esta materia, así en la península como fuera de ella, a work with a strong international impact by the eminent Spanish physician Joaquin de Villalba. We note that the title includes the word epizootias, which suggests that for de Villalba epidemiology is not a science exclusively concerned with human health, but that it is also concerned with animal health.*

*The term épidémiologie is found in French from 1803 as a translation of the Spanish title of de Villalba's work, which seems to have been the origin of the introduction of the word into other languages, including Italian epidemiologia (1814) and English epidemiology (1817).*