2019, ISSUE 75 - Abstracts

COVER

On the first page cover, a humoristic drawing by Pascal Hendrikx, Julien Cauchard and Jean-Philippe Amat, about this issue's theme.

The origin of the phrases "Transboundary animal diseases" and *Maladies animales transfrontalières (/transfrontières)* in English and French

Steinfeld Nadine, Spenler Olivier

The objective of this study is to establish the origin of the phrase Transboundary animal diseases, in particular by answering the following questions: who uses this phrase for the first time? In what context? In what meaning? With what frequency? Who else uses it afterwards? How it spread internationally? We are interested in how the term has been circulated in the Food and Agriculture Organization of the United Nations (FAO)' publications since its first attestation in 1994 and how it has been translated into French by the institution concerned as well as by official UN and EU terminology sources.

AEEMA Meeting, May 23rd, 2019: TRANSBOUNDARY ANIMAL DISEASES

Transboundary animal diseases

Amat Jean-Philippe, Toma Bernard

Certain diseases, animal and/or human, have always been able to cause epidemics and epizootics by traveling long distances. It seems that the term "transboundary" was first used for animal diseases by the United Nations Food and Agriculture Organization (FAO) in 1994. The two most important characteristics necessary to consider an animal disease as transboundary are its epizootic potential and the importance of the impact of its occurrence. It is proposed here to define a transboundary animal disease (TAD) as a "transmissible animal disease with high potential for dissemination between countries and with significant health and/or economic consequences". This definition can include zoonosis with serious health consequences in humans and slight clinical signs in animals. TAD are numerous. Their ranking makes it possible to identify those which are the most dangerous and need particular attention for surveillance and for the preparation of emergency plans in case of introduction into a free country. Any prioritisation requires defining criteria, evaluating them for each disease and defining a way of combining these criteria, which is a delicate exercise. Although there is no single, unquestionable list of criteria, it seems essential to take into account at least epidemiological, health and economic criteria, as well as criteria related to the available means and methods of control. It is difficult to draw up a universal list of the most worrying TAD. Contrarily, a prioritised list of TAD seems valid only for given geographical area and period, especially in view of the evolutions due to the emergence of new diseases, the identification of their zoonotic power and changes in their distribution areas. The prevention and control of TAD at the international level requires a very fast outbreaks' detection ability, effective and transparent notifications from infected country to other countries, the development of international health surveillance systems and the rapid implementation of intervention measures, facilitated by the existence of emergency plans.

Mechanisms of transmission of transboundary animal diseases

Zientara Stephan

A lot of factors can cause the emergence or re-emergence of diseases that can spread across state borders. The mechanisms of transmission of transboundary animal diseases are very different (direct contagion, indirect contagion, transmission by vectors) and can be associated and/or switched for the same disease. From the point of view of fighting against transboundary animal diseases, they can be clustered into two broad categories: the natural modes of transmission and those resulting from human activities. Different cases are presented to illustrate natural direct transmission (example of Foot-and-Mouth disease -FMD-) or indirect transmission (always FMD or West Nile or Bluetongue virus infections whose transmissions are via insects). Human beings, through their actions (transports or environmental changes that he can cause) are likely to intervene directly or indirectly in the transmission of transboundary diseases. Thus, the examples of the FMD outbreak in 2007 in England or the appearance of FMD in the Republic of Mauritius in 2016 are discussed. Similarly, the Schmallenberg virus' emergence in northern Europe is undoubtedly associated with international trade's increase. Animals' transportation and non-compliance with international regulations can lead to crossing-borders' transmission of these diseases. The case of African horse sickness "imported" from Namibia to Spain is presented. Is also mentioned the case of FMD in England in 2001 (introduction through the swills). The consequences of these different modes of transmission may impact actions' choice to fight against these diseases (prevention and control). Thus, strategies to fight against diseases with direct contagion or against vector-borne diseases will necessarily be different, as will be illustrated by the examples of the fight against FMD in England in 2001 or Bluetongue in France.

African swine fever panzootic

Rose Nicolas

The current outbreak of African Swine Fever (ASF) in Europe and Asia began in Georgia in 2007, and most likely resulted from the improper disposal of kitchen waste from a ship coming from East Africa. The virus involved in this African swine fever panzootic is a very virulent strain belonging to genotype II. From Georgia, the virus spread throughout the Caucasus and the Russian Federation, where the disease subsequently became enzootic. From July 2012, African swine fever spread to Ukraine and Belarus in 2013. In January 2014, African swine fever reached the eastern borders of the European Union with the first cases of infected wild boars reported in Lithuania and quickly spread to other Baltic countries and Poland. The last affected countries in Europe were the Czech Republic, Hungary, Moldova, Romania, Bulgaria and most recently Belgium. These countries all had cases in wild boars in 2017 or 2018, in some cases associated with outbreaks in domestic pigs (Romania, Moldova, Hungary, Bulgaria). The virus was introduced into China on August 3rd 2018, probably from the Russian Federation, and today gives rise to a major outbreak, mainly in the domestic reservoir, totally out of control, and which has now spread to Vietnam, Cambodia, Laos, North Korea and Mongolia. Man plays a central role as a factor of propagation through his activities, thus promoting a leapfrogging progression, sometimes over very long distances of this disease and often across borders, as shown by the history of the various countries affected since 2007. Apart from the particular cases of Romania in Europe and China, disease management in the domestic reservoir is generally easier to achieve than in wild boar populations. Only the Czech Republic has now been able to effectively control the disease in infected wild boar populations and has recently regained a free status.

Panzootics of highly pathogenic avian influenza

Scoizec Axelle, Cauchard Julien, Mercier Alizé, Falala Sylvain, Niqueux Eric, Schmitz Audrey, Huneau-Salaün Adeline, Le Bouquin Sophie

Several panzootics of highly pathogenic avian influenza (HPAI) linked to A/goose/Guangdong/1/1996 lineage viruses have affected the global poultry industry since 2003. By 2018, these panzootics had already reached nearly 68 countries with more than 500 million dead or culled poultry. Currently, HPAI panzootics are still a very significant risk, as demonstrated by those of 2014-2015 and 2016-2017. The consequences of these are considerable in terms of animal health and of human health due to the potential zoonotic risk, as well as in economic terms due to associated mortality, slaughter and trade restrictions. Through examples of HPAI panzootics, cases of transboundary transmission and the characteristics of the global trade network for live poultry and exporting countries, we present the respective roles and risks of migratory wild birds and live poultry trade in the transboundary transmission of HPAI. The implications of the characteristics of this transmission for the control and prevention of these HPAI panzootics are then presented.

International epidemic intelligence by the Platform for animal health surveillance

Cauchard Julien, Mercier Alizé, Falala Sylvain, Peyrat Marie-Bénédicte, Calavas Didier, Lancelot Renaud, Lambert Yves, Dupuy Céline

In the current context of globalisation and increasing mobility of people, animals and goods, international epidemic intelligence provides a useful tool to anticipate the spread of infectious and emerging animal diseases, whether zoonotic or not. Epidemic intelligence activities are carried out at international level by official organisations (*e.g*. OIE, European Union) or non-official systems such as ProMED. At national level, some States have set up their own epidemic intelligence system, and for France the Platform for Animal Health Surveillance (ESA Platform) tailors and contextualise the monitoring of animal health threats to fit the needs of metropolitan French territories. All category 1 health hazards identified by French authorities are closely monitored by the French epidemic intelligence system (FEIS), along with a few other diseases of economic interest. The FEIS relies on a network of national and international experts to provide validation and context to the detection and analysis of animal health threats. The FEIS has been particularly active in recent years with the emergence in Europe of lumpy skin disease, highly pathogenic avian influenza viruses and African swine fever. It faces challenges in data heterogeneity, in terms of both format and type of source. The FEIS has developed data collection and analysis tools such as a model that estimates the spread rate of diseases and an automated data collection tool that collects unofficial information from the Internet. These tools improve the early detection and monitoring of alert signals in order to better anticipate and manage animal health threats.

Transboundary animal diseases: Securing entries and international actions

Angot Jean-Luc

The agents responsible for transboundary animal diseases and their possible vectors are moving more and more easily and rapidly around the world. Securing entries is therefore essential, alongside the crucial actions of prevention, surveillance and control in the countries at the source, to conduct within an international framework.

Control measures taken to fight against a transboundary animal disease: The African swine fever example in France and in Belgium

Gerbier Guillaume, Linden Znnick, Licoppe Alain, Desvaux Stéphanie, Rossi Sophie

Through recent experiences of Belgium - infected in September 2018 - and France - still free from the disease in September 2019 - this article addresses the contrasted situations, the efficiency of the various prevention and control measures implemented to control African swine fever after a focal introduction (awareness campaigns, controls, active search and collect of wild boar cadavers, depopulation of wild boars, fences).

Biosecurity in farming: example of African swine fever

Delsart Maxime

Biosecurity is not a new topic in pig farms, but with the increasing risk of African Swine Fever (ASF), biosecurity measures must be put in place with an obligation of means and results in accordance with the decree published on the 16th October, 2018 concerning biosecurity measures applicable to French pig or wild boar farms. The most important aims of the biosecurity measures to be implemented are to prevent direct contact between farm pigs and wild boar, indirect contamination via equipment, vehicles, men, pests or domestic animals and, of course, to ban the consumption of contaminated feed by pigs. A designated and trained biosecurity person, specific to each farm, must put in place a biosecurity plan for the farm, including a zoning and a traffic plan. If animals can access an outdoor area, a double fence must stop wild boars from entering the area and also prevent nose-to-nose contact between farmed pigs and wild boars.

EPIDEMIOLOGY PAPER

Emergence of serotype 4 blue tongue virus in mainland France

Pandolfi Fanny, Calavas Didier, Grandcollot-Chabot Marie, Mollaret Estelle, Bréard Emmanuel, Sailleau Corinne, Zientara Stephan, Dion Françoise, Garin Emmanuel, Tourette Isabelle, Viarouge Cyril, Vitour Damien, Zanella Gina, Bronner Anne

During November 2017, the accredited laboratory of the *département de la Loire* found that a calf that was to be exported to Spain was group-specific BTV RT-PCR positive (PCR which detects all serotype of bluetongue virus) but serotype 8-specific RT-PCR negative. A blood sample was sent to the ANSES National Reference Laboratory which on 6 November confirmed the results and identified serotype 4. The calf came from a farm located in the *département de Haute-Savoie*. On 9 November, from among the 20 bovine blood samples taken at the same farm, another animal, the mother of the infected calf, was also found positive for BTV4. This was the first BTV-4 case detected in mainland France. At this time, the BTV-4 virus was currently present in Corsica, Sardinia and Northern Italy. The calf was euthanized. Investigations were conducted in order to identify the origin of the contamination and estimate the prevalence of BTV-4 infection in the area surrounding the index farm. According to EU regulations, infected, protection and surveillance zones were designated (20, 100 and 150 km around the outbreak, respectively). Blood samples were collected in the protection and surveillance zones in order to detect the presence of the virus, with random sampling of 45 farms per "*département*" and a homogenous spatial distribution. In each selected farm, RT-PCR analyses were performed on 20 cattle aged 12 months or older. Investigations were also performed on farms epidemiologically linked to the outbreaks. An epidemiological data analysis was conducted by a dedicated ESA Platform working group. On 22 December 2017, considering the spread of the infected area and the shortage of available vaccine doses, the Ministry of Agriculture decided that it would be impossible to eradicate the virus through the vaccination of all domestic ruminants. On 3 May 2018, 103 outbreaks of BTV-4 have been detected in mainland France, including 80 in *Haute-Savoie*.

AEEMA MEETING, MAY 24th, 2019: COMMUNICATIONS

Multivariate syndromic surveillance systems for bovine illness in Switzerland: simulating epidemics and evaluation of different detection's algorithms

Faverjon Céline, Carmo Luis Pedro, Berezowski John

Multivariate syndromic surveillance systems offer interesting opportunities to strengthen early detection of epidemics. However, the number of operational multivariate SSy systems in animal health is low because it remains difficult to assess the performance of these systems. The objective of this study was to evaluate a multivariate SSy system for bovine diseases in Switzerland using a standardized method to simulate realistic multivariate epidemics of different diseases and comparing the detection performance of two algorithms: the Multivariate Exponentially Weighted Moving Average (MEWMA), and the Multivariate Cumulative Sum (MCUSUM). These two algorithms make it possible to combine quantitatively the information provided by several time series into a single easily interpretable indicator. Twelve time series of syndromes were extracted from two Swiss national databases for the 2013-2017 period. Then outbreaks of four bovine diseases (i.e., viral bovine diarrhea (BVD), infectious bovine rhinotracheitis (IBR), bluetongue virus (BTV) and Schmallenberg virus (SV)) were simulated, using information obtained through experts' consultation. Both algorithms detected all simulated epidemics about 4.5 months after the beginning of the epidemic, with a specificity of 95%. However, the results varied depending on the algorithm and the disease considered. Our results show that the two multivariate directional control charts are promising methods for combining information from several time series to quickly detect changes in a population, while maintaining the number of false positive alarms at a reasonable level.

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First tests of delivery of candidate baits for oral vaccination of badgers against bovine tuberculosis in France. Impact of non-target species

Payne Ariane, Ruette Sandrine, Schmitd Rémi, Duhayer Jeanne, Colombe Matthieu, Lesellier Sandrine, Richomme Céline, Rossi Sophie

The aim of this study was to assess the impact of non-target species on a candidate baits deployment, in the perspective of orally vaccinate badgers against bovine tuberculosis (BTb). Indeed, vaccinating badgers could be an interesting tool to manage BTb at the badger-cattle interface in France. The study was carried out in the infected area of Côte-d'Or, on 15 setts located in the vicinity of pastures. The baits (developed in the UK, here used without any vaccine) were deployed in spring and summer, either down or in front of the holes. Camera-traps were used to monitor the presence of non-target species on setts as well as their behaviour towards the baits. The removal rate of the baits was also monitored and analysed. Apart from the Badger, the Roe Deer, the Wild Cat and the Red Fox were the most frequent species observed on the setts. The bait removal rate was more frequent in summer when baits were placed down entrance holes and bait uptake was observed from birds, red foxes, cattle, small rodents, nutrias and martens. This study: 1. showed a wider range of non-target species than what was reported in the UK; 2. identified the Red Fox as the species that might have the highest impact on badgers' bait uptake; 3. showed that cattle might consume the bait, which has to be taken into account when deploying baits containing BCG, as this could interfere with diagnostic tests.