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Towards a monitoring of the risk factors of emergence of animal diseases?

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Objectives: This study was designed to identify and rank risk factors based on their influence on the risk of emergence of infectious animal diseases. **Methodology:** The effect of 33 risk factors on the risk of emergence of 34 (potentially) (re-)emerging infectious animal diseases was evaluated via a Delphi survey conducted by 50 experts. The consensus expert opinions obtained were transformed into scores. The risk factors were then ranked according to their impact on the risk of emergence of the animal diseases studied, either considered as one overall group, or subdivided into different subgroups (zoonotic diseases, vectorial diseases or exotic diseases). **Results:** When emerging animal infectious diseases were considered as one group, seven risk factors were judged as having an important impact (mean score > 2): the problems of detection of emergences, the existence of an animal reservoir for the disease, the difficulties in controlling the disease by vaccination, the geographical expansion of the pathogen, the asymptomatic carriage, the increase in incidence of the disease in other countries and epidemiological role of wildlife. These seven risk factors had also an important influence (mean score ≥ 2) in the three other scenarios considering specific subgroups. For zoonotic diseases, one additional risk factor had an important impact (mean score ≥ 2): the increase in density and/or distribution of wildlife populations. For exotic diseases, two additional risk factors concerning globalisation had an important impact (mean score > 2): increases in trade and in transport. For vector-borne diseases, seventeen risk factors, of which the presence of the vector and the changes in climate and meteorology which scored very high (mean score > 3), had an important impact (mean score > 2), constituting an alert on the importance of the risk of emergence of vector-borne diseases. The legislation/sanitary policy and the intensive production systems appeared to be protective factors. **Conclusions:** This study allowed to identify key risk factors of emergence on which risk managers could act in terms of surveillance and mitigation. Also, it could serve as a tool for the inclusion of measurable risk factors in a still to be developed emerging risk forecasting system designed to identify early conditions favouring the emergence of certain diseases.

Measuring of national animal health: the development of an animal health barometer

Xavier Van Huffel, Pieter Depoorter, Hein Imberechts, Jeroen Dewulf, Dirk Berkvens & Mieke Uyttendaele

This paper reports the development of an animal health barometer, designed to measure on a yearly basis the overall health of the Belgian livestock population and to monitor its evolution over time. Thirteen animal health indicators (AHIs) were selected as the basis for the animal health barometer. These indicators were weighted by experts - including scientists, policy makers and agro-industrial representatives - to determine their respective weight in the barometer. The resulting barometer was computed for each year compared with the previous

year. Based on the values of the 13 indicators selected, it appeared that the overall health of the Belgian animal population improved since 2008. However, the true significance of this estimate must be assessed over the long term. The animal health barometer provides a helicopter view of the status of livestock health in Belgium. It was designed as a tool to communicate in an intelligible, comprehensible manner on aspects of animal health with consumers and professional stakeholders in the animal production and food chain.

Evaluation of the Belgian epidemiological surveillance in animal health

Sabine Cardoen, Pieter Depoorter, Pascal Hendriks, Jef Hooyberghs, Hein Imberechts, Jeroen Dewulf, Guy Czaplicki, Yves Van Der Stede, Katelijke Dierick, Thierry van den Berg, Sigrid Stoop, Mathieu Hubaux, Sophie Quoilin & Claude Saegerman

The epidemiological surveillance activities concerning animal health are generally based on a variable organization and on systems of different nature. The objective of this study was to analyse the surveillance activities related to the specific animal and zoonotic diseases and also to investigate the structural and organizational aspects of the surveillance in Belgium. For this, an extended inventory of the Belgian epidemiological passive and active surveillance activities in animal and zoonotic diseases was carried out. Typologies have also been realized to describe and visualize the organizational aspects of this surveillance. Finally, an inventory of recommendations concerning the organizational aspects of surveillance was compiled, based on a SWOT analysis. The comparison of the current surveillance activities with an ideal situation allowed to identify needs and to propose pathways for improvement of surveillance activities. One of the recommendations concerns the creation of a national platform of epidemiological surveillance made up of persons responsible of the authorities in charge of surveillance of the animal health, wild fauna included, of public health and of food safety. This would ensure a collaboration and a coordination between these domains, which is particularly relevant regarding surveillance of zoonosis and of antibiotic resistance.

EPILOBEE: a European epidemiological program for the surveillance of honeybee colony losses

Emmanuel Garin, Pascal Hendriks, Magali Ribière & Marie-Pierre Chauzat

For the first time, an epidemiological surveillance program on honeybee colony mortality (*Apis mellifera L.*) has been implemented (EPILOBEE) in 17 European countries. Each country has developed a surveillance protocol based on guidelines published to harmonize the procedures. A statistical model has been developed to analyse and interpret in a standardized way all the information gathered by the EPILOBEE network at national levels. The supply and application of the same queries by all participants in the surveillance facilitates the calculation of indicators and allows the use of a standardized calculation method in all countries. However, the ease of access to these indicators by programming the calculation should not be confused with the simplicity of statistical analysis and interpretation. Therefore, each country should identify all potential biases for an accurate and relevant analysis and interpretation. Although it is not possible to obtain epidemiological indicators at European level because of the diversity of protocols, the national indicators developed by this statistical operating model makes possible to better understand honeybee colony mortality at European level.

Re-introduction of Bluetongue in French Corsica Island in 2013

Corinne Sailleau, Cyril Viarouge, Emmanuel Bréard, Thomas Clément, Jean Baptiste Perrin, Morgane Dominguez & Stéphan Zientara

Between 2000 and 2004, the Corsica Island was exposed to the emergence of three different BTV serotypes: serotype 2 in 2000 and 2001, serotype 4 in 2003 and serotype 4 and 16 in 2004. Between 2005 and August 2013, no outbreak was reported in Corsica. In early September 2013, sheep located in the south of the island showed signs suggestive of BTV. Laboratory investigations identified the virus as BTV serotype 1. The virus spread rapidly over the whole Island. The nucleotide sequences of this new strain were closely related to those of the BTV-1 strain circulating in the Mediterranean basin and in Sardinia in 2012. This paper provides an overview of this outbreak.

Two episodes of bovine tuberculosis in 2013 in Switzerland after 30 years of passive surveillance. Re-emergence or importation?

Dominique Suter, Vanessa Kaiser & Lukas Perler

In 2013, two episodes of bovine tuberculosis occurred in Switzerland quite independently from each other. The first was a resurgence of a case dating back to 1998 (*Mycobacterium bovis ssp bovis* SB0120) while the second had its origins in an infection acquired in 2011 during summer pasturing in the Austrian Alps, where deers are known to be infected by *Mycobacterium bovis ssp caprae* (SB0418). Comparative intradermal tuberculin test is regarded as the reference test for live animals. The quantitative IFN- γ test was introduced in addition to increase either the sensitivity (Se) or the specificity (Sp) depending on the control strategies. This paper covers the episodes of 2013 and the controls of early 2014.

Mycobacteriosis in freshwater aquarium fish: a potential risk?

Maria Cristina Bona, Marzia Righetti, Giuseppe Ru, Cristiana Maurella, Claudio Fogliani, Tommaso Scanzio & Marino Prearo

The fishkeeping industry moves millions of euros. There are on the market more than 4,500 species of freshwater fish and 1,450 species of sea fish. According to 2011 Euromonitor data, in Italy there are almost 30 millions of aquarium fish. Importation of aquatic animals in all European countries takes place mostly in Extra-EU Countries; nearly 80% of imported ornamental fish come from South East Asia. The potential risk of introducing diseases through the importation and breeding of exotic fish species is a not negligible factor. For this reason, a preliminary study was conducted on freshwater species imported to characterize the main pathogens cause of morbidity and mortality in fish and in particular *Mycobacteria*.

Factors associated with H1N1 or H1N2 influenza virus infections in fattening pigs reared in 125 herds in western France

Christelle Fablet, Gaëlle Simon, Virginie Dorenlor, Florent Eono, Eric Eveno, Stéphane Gorin, Stéphane Quéguiner, François Madec & Nicolas Rose

Herd-level factors associated with European H1N1 or H1N2 swine influenza virus (SIV) infections were evaluated by mean of a cross-sectional study carried out in 125 herds in France. Serum samples from 15 fattening pigs in each herd were tested by haemagglutination inhibition. Data related to herd characteristics, biosecurity status, herd management and

housing conditions were collected by questionnaire during the farm visit. Climatic conditions in the post-weaning and fattening rooms, where the sampled pigs were housed, were measured over 20 hours. Factors associated with H1N1 or H1N2 sero-positive status of the herd were identified by logistic regression for binary outcome. For both subtypes, the odds for a herd to be SIV sero-positive increased if there were more than two pig herds in the vicinity (OR = 3.2, 95% Confidence Interval (95% CI): 1.4-7.6 and OR = 3.5, 95% CI: 1.5-8.1 for H1N1 and H1N2 respectively). Different factors were specifically associated with either H1N1 or H1N2 SIV infections. The odds for a herd to be H1N1 sero-positive were significantly higher in case of a large number of pigs per pen in the post-weaning room (OR = 3.2, 95% CI: 1.2-8.6), temperature set points below 25°C (OR = 2.6, 95% CI: 1.1-6.4) and below 24°C (OR = 2.6, 95% CI: 1.1-6.1) for the heating device in the farrowing room and the ventilation controller in the post-weaning section, respectively, and moving the pigs to the fattening facility via a room housing older pigs (OR = 3.3, 95% CI: 1.1-9.6). A H1N2 sero-positive status was associated with a brief down period in the farrowing room (OR = 2.6, 95% CI: 1.1-6.3), small floor area per pig in the post-weaning pen (OR = 2.9, 95% CI: 1.2-7.0), large-sized fattening room (OR = 2.5, 95% CI: 1.1-5.9), lack of all-in all-out management in the fattening room (OR = 2.4, 95% CI: 1.0-5.8) and a temperature range of less than 5°C controlling ventilation in the fattening facilities (OR = 3.2, 95% CI: 1.4-7.4). Factors related to external and internal biosecurity and to the control of inside climatic conditions should be considered together when implementing programs designed to improve the control of SIV infections.

Reasonable use of antibiotics in pig farming - accompanying process in 7 farms

Julie Bonnet, Jeanne Dupuis & Gino Scimia

More than ever the rational use of antibiotics is a key objective to safeguard human and animal health. Protecting the current potential for use of antibiotics in therapy is essential and will be a challenge in the 21st century. Over the past few years, the pig sector made efforts to set an example in reducing the use of antibiotics. Our study illustrates the involvement of a group of veterinarians in the pig sector - veterinarians belonging to the *Cristal network* - together with *Zoetis*, a pharmaceutical company, in the development of a program for the prudent use of antibiotics. In order to clearly define the challenges involved in the discontinuation of medication and to understand the adjustments required by such a program, we met seven pig farmers and their respective veterinarians. This study presents a qualitative and descriptive analysis of the feedback we got from the people we met.

Optimizing veterinary field epidemiology

Morgane Dominguez, Pascal Hendrikx, Didier Calavas & Barbara Dufour

The objectives of field epidemiology are the early detection of health threats and a comprehensive analysis of the disease situation to target an appropriate response. To set standards for improvement of veterinary epidemiology in the field, we analysed past experiences in an attempt to identify approaches likely to enhance field epidemiology capacities.

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Conference

What is the added value of the ESA Platform regarding knowledge and data production on the epidemiological status of animal health hazards?

Didier Calavas, Clara Marcé, Kristel Gache, Morgane Dominguez, Alexandre Fediaevsky & Pascal Hendrixx

The goal of epidemiological surveillance - and of the Epidemiological surveillance platform for animal health (ESA Platform) - is essentially to generate knowledge on health events that can be applied either directly, through risk management, or via risk assessment initiatives. This knowledge is based on the production of analyses of the epidemiological situation of health hazards and its developments both space and over time. These analyses also make it possible to evaluate the efficacy of the control measures implemented. These analyses require the collection of data under conditions acceptable to all stakeholders (feasibility). They are based on the interpretation of relevant, high-quality data on the health hazard under surveillance obtained quickly enough. Since it was founded in October 2011, the ESA Platform has done its best, with regard to targeted animal health topics, to bring together the various professional groups involved in the collection and exploitation of epidemiological data and the resulting information. This also has made it possible to develop a methodological corpus which tends toward defining a common frame of reference for surveillance. As it develops, this corpus is applied to the animal health topics under consideration, while aiming to produce relevant and reliable information which meets the requirements of surveillance. This is a review, after 30 months in operation, of the innovations in methodology implemented, of their application and of their re-appropriation by the parties involved in surveillance; We also review the work produced by surveillance plans (data, information, knowledge), based on one example, that of surveillance of the Schmallenberg virus epizootic.

AEEMA-RFSA MEETING, MARCH 18th, 2014: BOVINE TUBERCULOSIS

Bovine tuberculosis surveillance in cattle and free-ranging wildlife in European Union Member States in 2013: a survey-based review

Julie Rivière, Yann Le Strat, Pascal Hendrixx & Barbara Dufour

Bovine tuberculosis (bTB) is a common disease in cattle and wildlife, with major animal health, zoonotic and economic impacts. Most of the bTB data for the European Union concern the epidemiological situation, but comprehensive descriptions of the way in which surveillance is conducted in each country are rare, although they are essential for cross-Europe comparisons. A survey was conducted in the 28 E U Member States and in three other countries (Norway, Macedonia and Switzerland), to review the status of bTB surveillance in cattle and wildlife. Current European legislation requires bTB surveillance solely in cattle. Substantial differences in surveillance systems between the 26 responding countries were recorded, reflecting the official status of the disease in the country and the local prevalence of bTB. These differences related mainly to the combination of surveillance components, the tests being used for diagnosis, the definition of an infected herd and of an infected animal and the wild species being monitored

Network analysis of the neighbourhood of cattle farms in 2010 in an area of Burgundy faced with bovine tuberculosis.

Laure Dommergues, Séverine Rautureau, Etienne Petit & Barbara Dufour

France was granted the official "Tuberculosis-Free" status in 2001. However, the Côte-d'Or department (a French administrative unit) has since experienced an increase in the number of bovine tuberculosis (bTB) cases, with 35% of cases attributed to neighbourhood contamination. The aim of this field study was to investigate the risk factors of neighbourhood contacts in an area affected by bTB in 2010, through the use of social network methods. Contacts were weighted, as not all types of contact carried the same risk of bTB transmission. We attributed 95% of the contacts to direct contact on pasture or contact with wild boars or badger latrines. Most types of contact were correlated but none was sufficient by itself to account for all contacts between one particular farm and its neighbours. Contacts with neighbours therefore represent a challenge for the implementation or improvement of on farm control measures.

Posters

Presence of *Anisakidae* larvae in mullet (*Mullus barbatus*) sampled in the Ligurian Sea

Maria Cristina Bona, Tommaso Scanzio, Mauro Sabbadini, Livio Favaro, Marzia Righetti, Paola Arsieni, Erika Burioli, Elena Pavoletti, Giuseppe Ru, Maria Letizia Fioravanti & Marino Prearo

The exposure to parasitic nematodes (*Anisakidae*) is usually through consumption of contaminated fish, eaten raw, undercooked, or prepared without treatment able to inactivate the larvae infectivity (eg. marinating or cold smoking). Human beings are only accidental hosts that do not allow the normal evolution of the larva. However, Anisakids may affect the human health in two ways: by means of a severe intestinal immune response and by an allergic reaction to chemicals released by worms in fish flesh. The objective of our work was to assess the potential risk associated with the consumption of fish from the Ligurian Sea. The sampling was carried out in the Ligurian Sea from October 2010 to February 2013; 902 red mullets were analysed. Nematodes of the genus *Anisakis* (sub-family *Anisakinae*) and *Hysterothylacium* (sub-family *Raphidascarinae*) were isolated. Thus, in some fish of the Mediterranean Sea, Anisakids may be a risk for the food safety.

Risk evaluation for the development of bovine tuberculosis after contact with infected animals in North-western Italy (Piedmont Region)

Lara Irico, Nicoletta Vitale, Maria Cristina Radaelli & Laura Chiavacci

Bovine tuberculosis is an infectious and contagious disease submitted to animal health control legislation. As a result of an eradication plan in force in Italy since 1977, the prevalence of the disease in Piedmont' farms is nowadays below 0.1%. In this epidemiological context, the control program must consider the analysis of the risk factors to improve the disease surveillance. A cohort study (observational and longitudinal study) was conducted in animals selected using the monitoring data of the Piedmont Region to assess the probability and to estimate the risk of developing the disease in exposed bovines, defined as "having lived in an infected farm". In a total of 427 547 cattle, 3640 (0.85 %) became positive in *in vivo* tests after

an observation period of 751 days (mean $314 \pm$ with standard deviation). The odds to become positive were six times higher in animals coming from infected herds ($n = 713$) than in animals from non-infected herds.

View Point

Populations within the scope of epidemiology: Is the long debate coming to an end?

Bernard Toma, Barbara Dufour, Jean-Jacques Bénét, Alexandra Shaw & Gilles Brucker

The sixth edition of *A Dictionary of Epidemiology* is being issued, under the editorship of Miquel Porta, published by the International Epidemiology Association. This paper reviews the debate on the nature of the populations to be considered by epidemiology by tracking the various exchanges that took place over the last thirty years. This recent edition of the *Dictionary of Epidemiology*, designed to be the reference manual in the field, upholds the position adopted from 1983 onwards by John Last, who edited the early editions, and which we fully support, whereby a basic characteristic of epidemiology is that it deals with the study of health phenomena in all populations, whether human, animal or vegetal.