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What is an emerging disease?

B. Toma & E. Thiry

The concept corresponding to disease emergence is not new. It had been elaborated by Charles Nicolle as early as 1930 in his book: “Birth, life and death of infectious diseases”, even if the word itself had not been used. The word became into fashion during the years 90 and it must be asked whether it corresponds to a clearly defined notion, unanimously accepted, or it is used too often, indeed outside matters. From the study of some existing definitions, one can propose that an emerging disease is a disease of which the true incidence increases in a significant way in a given population, of a given area and during a given period, in comparison with the current epidemiological situation of this disease. This definition can be used as well for human diseases than for plant or animal ones. Even if emerging diseases are essentially infectious, they can include sometimes other kind of diseases, toxic, metabolic or other ones. This definition allows to exclude the bias linked to an apparent increase of the incidence, for example following the improvement of the diagnostic methods. Therefore, the true emergence has to be distinguished from the apparent emergence. Mediatic emergence is also a false emergence which depends on the repercussion that give the media of various events linked to human or animal health. To conclude, it is possible to propose some recommendations for the use of the concept of emergence in pathology.

How to detect true emerging diseases?

F. Moutou, S. Zientara & A. Lautraite

An important aspect of emerging « new » diseases is linked to the methods and tools used to detect them. It is then important to distinguish between “true” emerging diseases and “non-true” emerging diseases. This last category is related to bias in detection (specificity problems) and also in the media behaviour, often ready to add the word “new” to many different situations. In the first case, the capacity to detect new diseases is related to the sensitivity, specificity and performances of at least three kinds of tools: alert and epidemiological surveillance networks, specialised laboratories and screening tools. Examples to illustrate these different situations are given. In each category, specific bias are present and much be avoid, as much as possible. Only media emerging diseases” are to be opposed to these true emerging diseases. With new technologies, new diagnostic capacities do exist, but they can lead to interpretation mistakes as their real characteristic are all not yet known.

Wildlife as a possible indicator of the risk of emerging diseases?

M. Artois, Emmanuelle Fromont & J. Hars

The epidemiological mechanism which leads to the transmission of disease from wildlife up to humans and domestic stock can take two forms. The first is a self-sustained wildlife reservoir (such as fox rabies) which then affects the “domestic” population; the second is a true epidemic in which a wildlife pathogen can spread to the domestic population and circulate into this (plague). Wildlife needs to be studied as a risk factor when forecasting these risks (for

both human and animal health). Improvements in the early detection of outbreaks of disease in wildlife would be achieved by developing both molecular and computer-based generic screening tools. Spatial analysis of disease prevalence in wildlife can be performed to prevent these risks. Priority should be given to some wildlife species that should be used as study models for this purpose.

Emergence of vector-borne diseases

F. Rodhain

This text presents the factors linked to emerging or re-emerging vectorial diseases. Factors that can play a role during the different steps of an emerging disease process are not only many but they are also deeply linked and mixed to each other. Emerging diseases are always caused by many different causes. To understand them, the biological and climatological contexts must be analysed, as well as the sociological, economic and political contexts. This is why it is so difficult to establish a ranking order of causes and of mechanisms. This paper also presents what to do to limit emerging and re-emerging vectorial diseases.

Adaptation of the surveillance networks to emergence characteristics

P. Hendrikx

Emergence of some animal diseases such as the Bluetongue and West-Nile in the Mediterranean basin during these four last years have pointed out a lot of deficiencies of epidemiological surveillance networks, when they are facing complex and unstable environments. Several ways of improvement can be proposed for the surveillance networks in order to allow them a better adaptation to emergence characteristics. The two principal ones are reinforcement of risk analysis and implementation of new surveillance procedures and communication management. For the Mediterranean region, these activities could legitimately give place to the implementation of an animal diseases Mediterranean observatory.

Improvement of the detection of an emerging disease: the example of BSE

C. Saegerman, N. Speybroeck, S. Roels, E. Vanopdenbosch, E. Thiry & D. Berkvens

Bovine spongiform encephalopathy (BSE) is an emergent disease as defined by the 69th General Session of the International Committee of World animal health organisation. BSE is an example of the dramatic repercussions of a change of technology in the production of meat-and-bone meal, not only in the United Kingdom, but also in the rest of the world, and not only on the animal industry, but also on public health and the economy in general. Improvement of the detection of BSE relies on clinical surveillance (*i.e.* passive epidemiosurveillance) and/or the application of the so-called rapid *post mortem* tests (i.e. active epidemiosurveillance). An original methodology for improved clinical detection of BSE is presented. The approach is characterised by (i) its exploratory and interactive aspects, (ii) its independence from sample size and disease prevalence, which is usually imperfectly known, and (iii) its spatiotemporal universality (adaptation is possible when the clinical profile of BSE changes in function of time or region and adaptation possible for other diseases). The use of tools to improve the detection of (re-)emergent diseases will lead to more effective epidemiosurveillance networks. The efficacy of these networks requires regular evaluations

together with the elaboration and continuous follow-up of performance indicators. The recent episodes of both human and animal (re-)emergent diseases have also highlighted the important role of global health information systems. These systems necessitate abilities, resources, collaborative and coordinated actions of medical and veterinary regulatory authorities.

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Two viral emerging diseases in fish: marine nodavirosis and Koï herpesvirosis

R. Thiéry, Françoise Pozet & P. de Kinkelin

Marine nodavirosis and koi herpes virosis are two viral entities that emerged in fish in two different epidemiological contexts. Nodavirus-induced diseases have been described mainly in the larval and juvenile stages of about thirty marine species of recent aquaculture significance. The disease provokes an encephalopathy and a retinopathy in affected fish leading to high or total mortalities. The species affected by this disease were bred intensively in the Caribbean, in Asia, in Europe, in the Indian and the Pacific oceans, and more recently in North America. Fish nodaviruses (betanodaviruses) belong to several genogroups that reflect the geographical origin of the strains, thus arguing for the pre-existence of these infectious agents in the environment. Thus, they would have emerged together with the intensification of aquaculture. The epidemiological features of herpes virosis in koi carp are different. In 1998, very severe mortalities were reported in common and koi carps in Israel. Diseased fish showed gill necrosis and herpes-like viral inclusions in the lymphoid tissues. After a few months' interval, similar clinical pictures were observed in the United States. A new and single herpes virus, called « koi herpesvirus » was then isolated and characterized in the two countries. Cases of the same disease were described in 2000 in Germany, Holland, Belgium, United Kingdom and South Africa. The genomic studies carried out on various viral strains are in favour of the propagation of a single virus. As the virus may be present in France due to commercial movements of fish, a program of detection is set up, mainly because this infection could be a risk for fish reared in ponds. The emergence of koi herpes virus seems closely related to the exchanges of fish taking place between various countries.

Measure of the effect of hyperimmunization for the control of infectious bovine rhinotracheitis in Belgian dairy herds: a survival analysis.

M. Dispas, P. Kerkhofs & E.Thiry

To prefigure an IBR control programme based on the hyperimmunization with marker vaccines the individual serological follow up of cattle held in 32 dairy herds, spread in three experimental groups, was performed during 28 months. The first group was vaccinated according to a protocol combining attenuated and inactivated vaccines. The second group was exclusively vaccinated with inactivated vaccine. The third group was a positive control group. The groups were compared by the mean of a survival analysis, the considered event was the seroconversion against the glycoprotein gE (gE) of the bovine herpesvirus 1. Both protocols of hyperimmunization allowed for a significant decrease of seroconversion incidence against gE compared to the control group. No significant difference was shown between hyperimmunization protocols. Although they failed in conferring a total virological protection,

both hyperimmunization protocols might be used as control tool of infectious bovine rhinotracheitis in dairy herds.

Evaluation of competitive ELISA tests applied for the bluetongue control and eradication programmes in France

Fabienne Biteau-Coroller, P. Hendrikx, Colette Grillet, E. Albina & F. Roger

Since 1998, bluetongue could be regarded as an emerging disease in the Mediterranean basin, especially in the northern latitudes. Following the outbreaks occurring in the island of Corsica (France) in 2000 and 2001, cross-sectional studies and surveillances have been set up in Corsica and in the southern part of mainland France - disease-free area but considered at high risk. In that framework, two competitive ELISA (cELISA) tests for antibodies detection were considered for assessing their performances. The data collected during the 2000 and 2001 control campaigns were examined. ROC analyses were carried out using PCR results as gold standard for determining the infection status of animals. The areas under the ROC curves were respectively for the two cELISA tests 0.84 (95% CI: 0.73 – 0.95) and 0.78 (95% CI: 0.68 - 0.89). In order to optimise the sensitivity and specificity of the tests, cut-offs values were computed and, as a result, prevalence in infected areas were corrected. The use and validity of PCR results as gold standard are discussed. Complementary data are needed to better estimate sensitivity and specificity values, particularly for their use as diagnostic tool in endemically infected areas and as vigilance tool in free areas.

EPIDEMIOLOGICAL SITUATION

West-Nile virus infection in North America

B. Baudet & S. Sidibé

This article presents the evolution of the West Nile virus (WNV) epidemic that occurred in the United-States from 1999 to 2002. This disease which was absent from the North-American continent appeared in the year 1999 in the North-Eastern United States and spread in a few years to the whole of the country. It represents the largest epidemic ever recorded in the North hemisphere. It also appears as a major disease owing to the high mortality in equines as well as its strong ecological impact in wild birds. The high number of vectors mosquitoes suggests that the disease is now permanently established in North America.

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