Colloquium

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Emerging animal diseases: from science to policy

Belgian Federal Agency for the Safety of the Food Chain
& Scientific Committee - October 2008

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Preface

This year, the annual scientific event of the Scientific Committee (SciCom) of the Belgian Federal Agency for the Safety of the Food Chain (FASFC), has a particular dimension as it is organized in collaboration with the General-Directorate Control Policy of FASFC. The topic is "**Emerging animal diseases: from science to policy**".

As a scientific independent advisory body, SciCom has as a major task to perform risk assessment studies. In the framework of this objective, SciCom organises, every year a workshop in order to discuss new developments, to identify new challenges, to report on his activities to stakeholders and to reflect on his own activities.

Within the rules of good governance a strict separation between risk assessment and risk management is general practice. It is however widely accepted that some interaction is advisable between assessors, policy makers, communicators and other interested parties. The second part of the title, "**from science to policy**", demonstrates that both approaches will be included.

As can be expected from the theme, this colloquium has an international dimension. For the first time, the annual scientific event is organized for a broader audience. In addition the viewpoint of international bodies will be clarified by speakers from FAO, OIE, EU and EFSA.

Recent emerging events in the animal sector, such as the avian influenza and blue tongue outbreaks, clearly underline the importance of the theme. The complexity of the problems encountered, necessitates a multidisciplinary approach taking into account human, animal, economical, environmental and climatological factors. Emerging animal diseases are a real challenge for the immediate and further future for risk assessors and risk managers operating at a local as well as at an international level.

It is hoped that this colloquium, through the scientific contributions and the viewpoints of representatives of international and national organisations, may contribute to our knowledge of the risk of the introduction and of the spread of emerging animal diseases.

On behalf of the SciCom I want to thank:

- the direction of the FASFC for their continuous support in the organization of the annual scientific event,
- Prof. Dr. Ir. D. Berkvens, Dr. J. Hooyberghs and Prof. Dr. E. Thiry for chairing this colloquium and the different speakers for providing the audience with new knowledge,
- and the local organizing committee, consisting of agents of the Scientific Secretariat and the General-Directorate Control Policy of the FASFC, for their work in planning, preparing and organizing this colloquium.

Prof. Em. dr. ir. André Huyghebaert
Chairman of the Scientific Committee

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Introduction

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During the past decades, society worldwide was awakened several times by potentially devastating new diseases or by the sudden re-emergence of known diseases. The World Health Organisation keeps on informing us that on average one new human disease per year is 'discovered' and that at least half of them are zoonotic in origin. In addition, animal diseases without zoonotic dimension are also spreading at an ever-increasing pace to regions hitherto uninfected.

Globalisation of trade in animal products plays a very prominent role in this problem, along with more intensive and faster international travel, human encroachment into virgin habitats because of increasing demands for arable land and pastures, the development of urban and peri-urban animal production and climate change. Whatever the single most important reason in any specific situation, it is obvious that the underlying process for the (re)-emergence of the disease is an anthropogenic one.

Strengthening national veterinary services and developing international networks and early-warning systems are priorities when attempting to contain, control or eliminate emerging threats. It is generally accepted now that a rapid, effective response is a prerequisite to a successful intervention and that it is a global responsibility to ensure that there are no weak links in the system. Identification of such links and making efforts to strengthen them must be part of the mission of the various players in the field of international medical and veterinary health and food safety.

Quantification of risk, using a holistic approach, is quickly becoming an indispensable tool to assist disease managers to make the right decision when faced with emerging diseases. A solid understanding of the epidemiology and transmission dynamics of the diseases, the ecology of their vectors and the efficacy and availability of control options is crucial in order to arrive at a meaningful assessment of potential risks. The use of generic models, based on both human and veterinary health paradigms, should be encouraged whenever possible and concepts such as "Health for all" and "One World: One Health" should be taken seriously and put into practice.

Theme 1

Risk assessment of emerging animal diseases

Current position of the OIE on the approach of emerging animal diseases

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As a result of globalisation and climate change we are currently facing an unprecedented worldwide impact of emerging and re-emerging animal diseases and zoonoses.

In the OIE Terrestrial Animal Health Code, an emerging disease is defined as a new infection resulting from the evolution or change of an existing pathogen or parasite resulting in a change of host range, vector, pathogenicity or strain; or the occurrence of a previously unrecognised infection or disease. A re-emerging disease is considered an already known disease that either shifts its geographical setting or expands its host range, or significantly increases its prevalence.

Most of the recent emerging diseases have an animal origin, and almost all of them have zoonotic potential. The interaction between human and animal health is not a new phenomenon. However, the scope, scale, and world-wide impact of zoonoses we are facing today are of particular concern. These diseases must be addressed through coordinated actions between animal and public health authorities. In this respect, the Member Countries of the OIE have clearly indicated their overwhelming support for a greater OIE role in confronting the challenges of such zoonoses. In fact, emerging and re-emerging zoonotic diseases will become a progressively greater factor in the demands on the activities of Veterinary Services, thus impacting on future partnerships, resources and programmes.

The early detection and rapid response to an emerging or re-emerging disease are crucial. It is therefore a key element for all policies to be developed. Actually, the preparedness and response capability of a country towards an emerging disease largely depend on the availability of good veterinary infrastructure, expertise, diagnostic laboratories and in surveillance capabilities as a whole. When the world was hit by the avian influenza crisis, the OIE recommended strengthening veterinary governance worldwide, not just to fight avian influenza, but also to prevent and control any outbreaks of emerging or re-emerging animal diseases, including zoonoses, whether naturally occurring or deliberate. This message was aimed in particular at developing and in-transition countries. Indeed, a single country failing to control animal disease outbreaks could put the entire world at risk. Emerging disease agents associated with wildlife are also an important challenge to the biological safety and to decision-makers who need to give guidance on how best to manage the human/domestic animal/wild animal pathogen interface.

As a follow-up to the Resolution on emerging and re-emerging zoonotic diseases adopted by the OIE International Committee in May 2004, the OIE has created an inter-disciplinary Ad hoc Group to advise on the control of emerging and re-emerging zoonoses and on surveillance systems which cover wildlife, domestic animals, and the relevant corresponding human continuum. The OIE Working Group on Wildlife Diseases has also been requested to develop specific disease surveillance guidelines for diseases of wildlife.

Those issues continue to be closely monitored by OIE, together with partner organisations such as FAO and WHO: the GLEWS (global early warning system for animal diseases including zoonoses) is a joint OIE/FAO/WHO initiative that synergistically builds on combining and coordinating the alert and response mechanisms of the three organizations. Through sharing of information on animal disease outbreaks and epidemiological analysis, the GLEWS initiative aims at improving global early warning as well as transparency among countries.

With the support of all its Members and the World Bank, the OIE includes among its leading priorities the improvement of the governance of animal health systems in both the public and private sector, in particular by helping the developing and in-transition countries among its Member Countries to bring their Veterinary Services into line with the OIE's standards on quality which have been democratically adopted by its 172 Members. OIE Regional Representations play an important role in this respect, by implementing capacity building activities for OIE Delegates and focal points. All these activities and programmes fall within the concept of global public good. In addition, the OIE World Animal Health and Welfare Fund was created by a Resolution of the OIE International Committee in May 2004 to provide a means of responding urgently to these new challenges and in particular to help Member Countries strengthen their capacities in terms of governance of animal health systems. The projects supported by the Fund are currently structured around proposals made in the OIE publication 'Ensuring good governance to address emerging and re-emerging animal disease threats: supporting the Veterinary Services of developing countries to meet OIE international standards on quality'. The PVS tool for the evaluation of the performance of Veterinary Services has been developed in this context and experts have been trained to carry out missions in countries at their request under the auspices of the OIE. This tool is used to identify gaps and weaknesses with regards to OIE standards and thus help to identify priorities for investment and provide solid justification for the recommended reforms. To enhance expertise in the field of laboratory diagnosis, and to further increase the number of OIE Reference laboratories in developing countries, the OIE has also built a twinning project between laboratories.

Indeed, strengthening Veterinary Services, improving transparency, enhancing cooperation among countries, developing research will certainly be key elements to meet the new challenges of emerging and re-emerging diseases.

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Understanding the Factors of Animal Disease Emergence: A World of One Health

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This colloquium is organized to discuss and learn about the (re) emergence of animal diseases and consider the risk factors driving this (re) emergence and the effective management of these forces. The quantification of risk requires the knowledge of the magnitude of potential loss and the probability that the loss will occur. Understanding the factors of disease (re) emergence is important to both these calculations and is central to our ability to counter or manage health risks. This presentation will focus on these factors and introduce the concept of "One Health" as an appropriate construct to better address them.

Animal health is influenced by the actions and health of people and the environment in which we all live. To promote and protect animal health, we will need to change the paradigm that has driven how we traditionally approach animal health and animal diseases. Inherent to this challenge is the fact that we must shift from thinking in terms of "independence" to thinking in terms of "interdependence". This involves recognizing that the (re)emergence of animal diseases needs to be considered within the context of our being a part of a larger biological system that links the domains of animal, environmental and human health together and in ways that we have not experienced in the past.

Many of the factors that are involved in the (re)emergence of animal diseases are identical to the factors that are driving the (re)emergence of human diseases. These include: microbial adaptation and change; changing susceptibility of hosts; climate and weather change; changing ecosystems; economic development and land use; technology and industry; global trade and commerce including the dramatic increase of the global food system; international travel and movement; poverty; war and famine and the lack of political will and/or resources to invest in building effective infrastructures for both human and animal health[1].

In addition there are other factors that are unique to animal diseases. These include: the rapid growing populations of animals; increased density of animals in large production systems; and the remarkable demand for proteins from animal sources especially in developing countries;[2] the expansion and growth of companion animal populations and exotic animal species; and, the advent of large peri-urban centers in the new mega-cities of today and tomorrow where the confluence of animals, people and animal products is unprecedented.

Almost all the factors of disease (re)emergence are anthropogenic; therefore, understanding risk and the mitigation of risk is largely about understanding human behavior, social-economic forces rather than just focusing on the biology of microbes. In order to thrive in an interdependent world, we must view disease (re)emergence ecologically and reconsider our prevention and intervention strategies within this larger context.

Geographers have referred to the result of our global travel and trade as "collapsed space"[3]. Our world is progressively smaller and animals, animal products as well as people are remarkably interconnected. In addition to this phenomenon of merged space, there are also significant changes in the processes of global trade and consolidation of animal production systems that are creating a new ecology for infectious diseases. This new ecology is inherent in our concept of the world's One Health. One Health is defined as the collaborative effort of multiple disciplines – working locally, nationally and globally – to attain optimal health for people, animals and our environments. Also implicit in One Health are the new approaches to risk assessment, management and communications[4]. The intertwined domains of people, animals and our environment has given us an entirely new foundation and perspective for risk analysis.

There is no question that we now live in a world of increasing risk and the implications of an adverse outcome with regard to the (re)emergence of animal diseases is truly unprecedented. Recent outbreaks of Bovine Spongiform Encephalopathy (BSE) and foot and mouth desease (FMD) taught us about the economic devastation to animal agriculture and severe acute respiratory syndrome (SARS) taught us that the economic devastation is not limited to just animal populations but now also to a broad array of serious economic consequences involving transportation, tourism and many other businesses not previously impacted by a disease outbreak[5].

In a recent article appearing in Nature (Jones, et al), the authors analyzed the emergence and spread of 335 infectious diseases since 1940[6]. This extensive work helped to quantify the effects of risk factors such as population density and the movements of animals and people. Clearly disease (re)emergence is on the increase and this study reports that zoonoses are, currently, the most important threat that we face during this remarkable era of infectious diseases which shows no signs of abatement. In addition, the authors suggested that the probability of (re)emergence is correlated with areas richest in wildlife and those largely located in the tropics especially in areas under increasing human pressure.

This article gives us insight to the factors associated with re (emergence) retrospectively but also gives us further insight to where and how diseases might (re)emerge in the future based on new quantifiable risk factors. In essence, the evidence suggests that the confluence of the animal, environment and human domains should be the primary focus of our attention. It is at this confluence where: microbial adaptation will accelerate, host exposure potential and experiences increase; trans-boundary transmission is more probable; pristine populations are expanded and interface with novel pathogens; travel and commerce become multipliers of risk; non-infectious hazards promote infectious disease occurrences; and, health impacts in one domain produce health impacts in other domains.

Our interconnected world continues to create new vulnerabilities to animal populations. Domestic animals and wildlife, alike, are greatly influenced by our profound interdependence. We live in a special era of (re)emergence disease. This era is characterized by more uncertainty, complexity and ambiguity. It is also an era where individual problem solving, by itself, is inadequate; we must now face and manage dilemmas or groups of interrelated problems regarding health and disease[7]. In the world of animal diseases, it is a time where old solutions don't work as well and when new solutions have yet to be created. Identifying, understanding and managing our contemporary risks will require a new holistic and integrated mindset.

Understanding the mechanisms that underlie newly emerging and re-emerging infectious diseases is one of the most difficult scientific problems facing society today. Significant knowledge gaps exist for even the most studied emerging infectious disease. Coupled with failures in the response to the resurgence of infectious diseases, this lack of information is embedded in a simplistic view of pathogens and disconnected from a social and ecological context, and it assumes a linear response of pathogens to environmental change. In fact, the natural reservoirs and transmission rates of most emerging infectious disease primarily are affected by environmental factors, such as seasonality or meteorological events, typically producing non-linear responses that are inherently unpredictable[8]. A more realistic view of emerging infectious diseases requires a holistic perspective and incorporates social, as well as physical, chemical and biological dimensions of our global systems. The notion of "One World-One Health" captures this depth and richness and most importantly, the interactions of human and natural systems. There must be a synthesis of interdisciplinary approaches and insights employing the "One Health" paradigm and offering novel social and ecological approaches for addressing and generating an improved understanding of (re)emerging infectious diseases.

The unprecedented changes and forces that have lead to today's special era of (re)emerging infectious diseases demands an innovative approach for their understanding and resulting in new actions to address them. Health is now an outcome shaped by a wide range of social, economic, natural, built and political environments that form a complex and ever-changing dynamic[9]. It is indeed both a challenge and opportunity for the concept of "One Health" to emerge and become the focus in all of its interconnected and complex demands. Thus understanding the factors of animal diseases and our ability to successfully manage them will be based on adopting the mindset, principles and new strategies of One Health.

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The epidemiological investigation of the 2006 multi-country Bluetongue outbreak: experiences from the European Food Safety Authority

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Background

A number of food safety incidents in the last decade had raised concerns on the modern food production chain. This resulted in a decline in the public trust in food safety regulations and management. The European Commission responded to this development by issuing the General Food Law, which clearly describes the food safety framework in the EU including the role and responsibilities of its partners in the establishment of efficient tools for an early prevention of food borne outbreaks [EC 2002].

The European Food Safety Authority (EFSA) is the keystone of European Union risk assessment regarding food and feed safety, as well as plant health and animal health and welfare. In close collaboration with national authorities and in open consultation with its stakeholders, EFSA provides independent scientific advice and clear communication on existing and emerging risks. How this can work in reality can best be described by experience from an outbreak of an emerging disease that occurred in 2006 and affected several EU Member States.

The Bluetongue outbreak

Bluetongue is an arthropod-borne viral disease of domestic and wild ruminants, affecting particularly certain breeds of sheep with severe clinical disease, and may be fatal. At present, 24 serotypes of bluetongue virus (BTV) have been identified. They are transmitted by biting midges (Culicoides). BTV has a worldwide distribution between approximate latitudes 35°S and 40°N, although in parts of North America, China and Kazakhstan the virus may extend up to almost 50°N latitude. Until 2006 there has been a succession of BTV incursions into certain southern Member States of the European Union, including Italy, Greece, the French island of Corsica, the Spanish islands of Menorca and Mallorca, mainland Spain and Portugal. Several Balkan States and European and Anatolian Turkey have also been affected.

On 14 August 2006, a private veterinary practitioner in the province of Limburg in the south of the Netherlands notified the veterinary authorities of BT-suspect cases on four different holdings in that country. These were the first indications of a rapidly spreading BTV-epidemic in North-West Europe, which affected cattle and sheep holdings in the Netherlands, Belgium, Germany, France, and Luxembourg.

On 28 August 2006, the Community Reference Laboratory, in Pirbright (United Kingdom), reported that the outbreaks were caused by BTV-serotype 8 (BTV-8). BTV-8 was new to this particular region of Europe. This serotype had previously been identified in Pakistan/India, Southern and Western Africa, and the Caribbean regions. The occurrence of this virus in North-West Europe, relatively distant from its known endemic regions, must have been associated with specific risk factors leading to the introduction of the virus. The course of the outbreak has shown that North-West Europe provided the necessary conditions leading to rapid spread of BTV. It was therefore essential to investigate potential factors associated with these incursions to inform risk assessment and management in relation to spread of this or similar infectious diseases.

By September 2006, it had become clear that a novel situation had arisen with the introduction of a rapidly spreading transboundary disease new to the geographic area.

The European Commission with the Chief Veterinary Officers from Member States of the European Union, asked EFSA to lead a series of scientific investigations in the midst of a disease outbreak with the aim to rapidly inform risk managers.

The analyses addressed the following aspects of the outbreak: (1) the introduction of the BTV-8 serotype; (2) the clinical aspects of the disease caused by this strain; (3) the characterisation of within-herd spread to assess, among others, the ratio between sub-clinical and clinical cases; (4) information on factors favouring virus establishment; (5) identification of factors that influenced short-distance spread; (6) identification of factors affecting long-distance spread into new areas, including the potential for vector spread through wind and restrictions on animal movements.

Detailed epidemiological data needed to be exchanged across national boundaries and standardised at short notice. A series of inter-related epidemiological studies had to be designed, involving multi-national teams and the work had to be completed within a very short time to be able to meet the information needs of risk managers.

The complete report on 'Epidemiological analysis of the 2006 BTV serotype 8 epidemic in North-Western Europe' can be found on the link: http://www.efsa.europa.eu/EFSA/DocumentSet/Report_bluetongue_S8_en.pdf

The BTV-8 outbreak illustrates how increased worldwide traffic, coupled with changes in climatic conditions might increase the risk in the appearance and the establishment of diseases.

EFSA pro-active approach

While this investigation brought valuable information, the nature of an outbreak investigation like this is that it can only take place when the outbreak has already occurred and thus is primarily a reactive approach to an existing problem.

On the other hand, it is apparent that potential threats can be reduced if hazards are detected at an early stage and information is rapidly exchanged between partners engaged in maintaining food safety. Several information and monitoring systems on food safety have been put in place at national and international level, which have demonstrated to be useful in the control of the spreading of food borne events. However, these systems are based on signals usually detected after the occurrence of events in a reactive rather than in an early pro-active manner. Systems capable of anticipating and predicting the development of such risks at an earlier stage, allowing a significant reduction in the number of health events in Europe, are the challenge for European food safety in the near future.

The clear need to establish a structured reliable system to identify early warning of emerging risks was indicated as a priority for EFSA by the Scientific Committee (SC) soon after the establishment of the Authority [EFSA 2003]. Subsequently, EFSA SC, supported by an international multidisciplinary consortium of experts, proposed a comprehensive methodological approach for the implementation of a Global System for the identification of Food-related Emerging Risks [EMRISK 2006]. Under this framework, operational guidelines and recommendations for a practical implementation of the system were then proposed by the EFSA SC [EFSA 2006]. A clear distinction was made between the assessments of emerging risks from the assessment of risks under emergency (or crisis) conditions [EC 2004]. The establishment of the EFSA Scientific Cooperation Working Group on Emerging Risks in 2007 by the SC, confirmed the intention of EFSA to develop this major preventive instrument for the Community in strong cooperation with EU Member States [EFSA 2007]. As a consequence the Emerging Risks Unit was set up in 2008.

The work of the Emerging Risks Unit is to "undertake action to identify and characterise emerging risks in the field within EFSA's mission" [EC 2002]. Data from existing data collection systems are to be analysed and used to generate timely information about emerging risks and the quality of those systems is to be evaluated. Setting up efficient structures for the identification of emerging risks will enable more confident predictions of the likelihood of an emerging risk at an early stage. Alert signals can thus contribute to prevention and/or management of risks at a population level.


Sheep with Bluetongue (Photo: Dr. G. Tyrions, FASFC)

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Climatic change and emerging animal diseases

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Key messages:

- Climate change is happening now, mostly as a result of greenhouse gases (GHG) from human activities
- Impacts will be important, with most damages in developing countries, but developed countries will be affected too.
- Human health effects are emerging, and could be much more severe in a warmer climate
- As climate affects pathogen survival, generation times, and seasonality, animal diseases will be influenced by climate change as well.

Climate change

Carbon dioxide (CO_2), an inevitable waste product from the combustion of fossil fuels, has been emitted into the atmosphere in increasing quantities since the industrial revolution. It significantly strengthens the natural greenhouse effect, raises the average temperature and changes the climate. Approximately thirty billion tons of CO_2 are emitted into the atmosphere every year. The concentration of CO_2 has risen by 30% in some 250 years. In order to attempt to determine the possible consequences of the intensification of the greenhouse effect, the United Nations set up the Intergovernmental Panel on Climate Change (IPCC) in 1988, grouping most of the world's specialists in a rigorous process of expert assessment. The IPCC publishes projections of climate change based on different socioeconomic development scenarios, the results of different climatic models and other research, which it analyses and brings together with an assessment of studies related to the impacts of climate change and policies to adapt to and mitigate climate change. Although many uncertainties persist, the work of the IPCC has led to a number of convincing conclusions. In particular, with regard to man's impact on the climate, the IPCC (2007a) concluded: *"Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations".* The IPCC also confirms that it has increased confidence in the capacity of models to project future climatic trends. Having considered the results of all the models and scenarios, the IPCC projects a likely range for the average global rise in temperature of 1.1 to 6.4°C for the period 1990-2100, for scenarios without climate mitigation. The temperature has never risen as quickly over the last 10,000 years at least and the higher values of the temperature range projected for 2100 have probably never been reached for more than 2-3 million years.

A rise in temperature is not the only manifestation of climate change. The IPCC projections show a tendency towards increased average precipitation, with considerable disparities according to the season and region, many dry regions becoming even drier. Precipitation intensity is due to increase as well, which favours floods. Another consequence is a rise in the level of the oceans, following the thermal expansion of water bodies on the one hand, and the melting of glaciers as well as the ice sheets of Greenland and the Antarctic, on the other. Considerable uncertainty surrounding this subject remains with a projected rise in ocean levels (for non-mitigation scenarios) ranging between at least 18 and 59 cm for the period 1990-2100.

The excess CO_2 in the atmosphere will persist for a long time and the warming of ocean water masses will take a very long time. This is why, even if the concentration of CO_2 is stabilized – which requires a considerable reduction of emissions – the temperature will continue to rise slowly with a strong chance of this leading to the melting of a significant fraction of the ice-caps. Together, the warming and melting of continental ice sheets would have the capacity to increase the average sea level by up to 8 m (!) over the next 1,000 years in an "average" scenario. Finally, global warming could cause major "surprises" such as a change in ocean circulation with the potential slowing down of the Gulf Stream, which would reduce global warming at our latitudes.

Projections for Belgium

Although the expected rise in the average global temperature is relatively well known, the same does not apply to the regional distribution of climate change, in particular with regard to the water cycle. What is more, Belgium is small on a climate zone scale and global models have a resolution of a few hundred kilometres. Nevertheless, a number of trends have emerged from the scenarios and models (van Ypersele et al., 2004):

- in all cases considered, temperatures rise significantly by 2050 in both summer and winter. At the end of the 21st century, the rise in temperature in relation to the end of the 20th century would be 1.7 to 4.9°C in winter and 2.4 to 6.6°C in summer;
- the projections for the change in precipitation until the end of the 21st century show a rise of between 6 and 23% for winter and a change in summer between the status quo and a drop of up to 50%.

Other changes follow on from this. Cold winters would gradually disappear. Cloud cover could increase. The likelihood of severe heat waves such as the one during the summer of 2003 would rise significantly. It is very likely that we will experience more frequent episodes of heavy rain. The decrease in summer rainfall and increased evaporation could be accompanied by droughts in the summer, as well as deterioration in surface water quality. As far as storms are concerned, uncertainty is large but it is possible that their intensity and/or frequency increase.

Health effects

Climate change could affect health in many ways. In its latest assessment report, Working Group II (Impacts, vulnerability, and adaptation) of the IPCC (2007b), has an entire chapter dedicated to health. Some of its key conclusions are: *Climate change currently contributes to the global burden of disease and premature deaths (very high confidence). Human beings are exposed to climate change through changing weather patterns (temperature, precipitation, sea-level rise and more frequent extreme events) and indirectly through changes in water, air and food quality and changes in ecosystems, agriculture, industry and settlements and the economy. At this early stage the effects are small but are projected to progressively increase in all countries and regions. Emerging evidence of climate change effects on human health shows that climate change has:*

- *altered the distribution of some infectious disease vectors (medium confidence)*
- *altered the seasonal distribution of some allergenic pollen species (high confidence)*
- *increased heat wave-related deaths (medium confidence)*

Projected trends in climate-change-related exposures of importance to human health will:

- *increase malnutrition and consequent disorders, including those relating to child growth and development (high confidence)*
- *increase the number of people suffering from death, disease and injury from heat waves, floods, storms, fires and droughts (high confidence)*
- *continue to change the range of some infectious disease vectors (high confidence)*
- *have mixed effects on malaria; in some places the geographical range will contract, elsewhere the geographical range will expand and the transmission season may be changed*
- *increase the burden of diarrhoeal diseases (medium confidence)*
- *increase cardio-respiratory morbidity and mortality associated with ground-level ozone (high confidence)*
- *increase the number of people at risk of dengue (low confidence)*
- *bring some benefits to health, including fewer deaths from cold, although it is expected that these will be outweighed by the negative effects of rising temperatures worldwide, especially in developing countries (high confidence).*

Adverse health impacts will be greatest in low-income countries. Those at greater risk include, in all countries, the urban poor, the elderly and children, traditional societies, subsistence farmers, and coastal populations (high confidence).

Health impacts in Belgium

Impacts at home should not be underestimated (van Ypersele, 2004). Climate change may affect human health in many ways. A rise in the frequency or intensity of heat waves increases mortality and morbidity rates; conversely, a fall in the number of very cold days in winter decreases the rate of mortality due to cardio-vascular problems. Air quality is also affected: heat promotes the formation of ozone and extends the season during which allergenic pollens are released etc. Extreme events such as floods and storms also cause their share of deaths and injured. The actual impact of climate change on the health of a population depends largely on its vulnerability, which in turn depends to a large extent on the standard of living, access to care and capacity of this population to adapt to new climate conditions. In Belgium, a study by the Scientific Institute of Public Health has shown that the 1994 summer heat wave, associated with high tropospheric ozone concentrations, caused 1,226 additional deaths in six weeks (of which 236 related to persons under 64 years old). The heat wave in 2003 caused in Belgium the death of an additional 1,300 people of 65 years of age or above. When the average daily temperature is higher than twenty or so degrees, it is primarily the heat which explains the rise in the mortality rate, ozone playing a smaller but additional part. For the "high" climate scenarios, we have to expect a considerable increase in the frequency of particularly hot summers. Summers such as the one in 2003 could become the norm before the end of the century. Undoubtedly, it would be possible to anticipate some of the health effects by technical means and hygiene (drinking water etc.)

Some physiological adaptation can also take place, but only if the change is gradual and does not exceed certain limits. Another known phenomenon in Belgium is the increase in the number of cases of Lyme disease since the start of the 1990's. This increase may have several causes, but Swedish researchers have shown that the increase in ticks, carriers of this disease, between 1960 and 1998 was consistent with a rise in daily minimum temperatures. This suggests that climate change could in the future contribute to an increase in the number of cases in Belgium.

No overall assessment has yet been made of the potential impacts of climate change on animal diseases in Belgium, but as climate affects pathogen survival, generation times, and seasonality, animal diseases will certainly also be influenced by climate change.

The talk will describe the evolving climate context in which animal diseases will have to be considered in the coming decades.

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Theme 2

Management of emerging animal diseases

EU policy on emerging animal diseases

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1. Introduction

1.1. Definition of an emerging disease

According to the definition of the OIE Code, an emerging disease "means a new infection resulting from the evolution or change of an existing pathogenic agent, a known infection spreading to a new geographic area or population, or a previously unrecognized pathogenic agent or disease diagnosed for the first time and which has a significant impact on animal or public health." (OIE, 2008) This definition covers a little more than that of the WHO, which states "An emerging disease is one that has appeared in a population for the first time, or that may have existed previously but is rapidly increasing in incidence or geographic range." (WHO, 2008). Both definitions cover the so-called re-emerging diseases.

1.2. Some examples of emerging diseases, their causes and impact

Highly Pathogenic Avian Influenza H5N1 corresponds to the first part of the OIE definition; Bluetongue serotype 8 to the second; and BSE to the third. These are probably the clearest examples of emerging diseases, which have caused major problems in many EU Member States in recent years.

However, there are also other diseases that have emerged or re-emerged in the past decades:

- within the EU: African Horse Sickness (AHS, in Spain 1987-90, Portugal 1989-91); African Swine Fever (ASF, in the Iberian peninsula in the sixties, sporadically in other countries in the seventies and eighties and still present in the island of Sardinia); Contagious Bovine Pleuropneumonia (CBPP, in France 1980, Portugal 1999); West Nile Fever (WNF; in Italy 1998 and in France 2000) (ADNS, 1984-2007).
- in the EU neighbourhood: Peste des Petits Ruminants (PPR, in Turkish Thrace in 2006) or again ASF (in the Caucasus in 2007)
- or further afield: Rift Valley Fever (RVF in East and West Africa in 2000 and episodically); Crimean Congo Hemorrhagic Fever in Africa but also very recently found in Turkish Thrace, Nipah virus in south East Asia and Hendra disease in Australia; all these diseases have also a significant impact on public health. (OIE, 2008b)

The increasing trend for international exchanges of people and goods, the existence of areas with high animal density, climate change, changes in animal handling and breeding have probably all played a major role in the emergence of certain pathogens in the last decades.

At the same time, the veterinary systems in place to prevent, identify, diagnose and fight against animal diseases have in some instances appeared to be insufficient to cope with these emerging problems.

Some of the diseases mentioned above have sometimes provoked long-term crises both in terms of health and economy. Most of them have been eradicated or effectively controlled within the EU territory. Nevertheless, they should be considered as a permanent threat.

An underlining problem is the need for a more proactive rather than reactive approach; crises should be prevented rather than managed. Indeed, the management measures are not only costly, but they can also generate a drop in consumer confidence, and in some cases, even if well implemented, do not lead to eradication. The example of Bluetongue is the most evident: eradication is not envisaged in the short or medium term, only control will be possible, mainly through vaccination, the cost of which will be cumulative over the years.

2. The response of the EU

2.1. Management at EU level

In recent years, avian influenza - and in particular the H5N1 virus - and Bluetongue have been the two emerging diseases that have caused the biggest problems in Europe. They have clearly showed the need to strengthen the whole EU response system to this kind of threats. That said, the management of these two diseases has been by and large effective.

This is probably the result of the progress made in the last decades and of the harmonisation of measures at EU level that started as early as 1982 (EC, 1982) with the establishment of the, Animal Disease Notification System (ADNS, 2008). Since then continuous work has been made on:

- the harmonisation of legislation on major diseases, both for surveillance, notification and control methods;
- the harmonisation of the import conditions and procedures for border inspection posts;
- the harmonisation of animal identification and traceability rules and methods;
- the common network for animal movement notification and certification (TRACES);
- the network of Community and National Reference Laboratories, whose capacities have grown year after year (and should be maintained or grow even more)…

In addition, the Standing Committee on the Food Chain and Animal Health (SCOFCAH) - formerly known as the Standing Veterinary Committee - (EC, 2002) has shown to be a very important and effective forum for exchange of information between Member States and the Commission and for risk management at EU level.

2.2 The role of the Member States and of the European Commission

In accordance with Community legislation, Member States have to ensure a rapid response to outbreaks of major disease such as foot and mouth disease, classical swine fever or avian influenza, by implementing the most appropriate control measures laid down in national contingency plans.

The effectiveness of the Member States' response will always be of fundamental importance. However, within this framework, in case of outbreaks of major animal diseases, the European Commission plays a very important twofold role, as it is able to:

- promptly gather and re-dispatch information on animal disease outbreaks which may occur in the Member States, via the Member States' Chief Veterinary Officers (CVOs) network, ADNS and the SCOFCAH. These direct and centralised information systems are crucial to ensure a swift and effective response to any emerging threat;
- adopt specific Community measures in a few hours, ensuring transparency on the disease situation and on the control measures adopted (EC,1989; EC, 1990a), as well as an appropriate legal framework for the Member States.

In addition, the system in place at EU level includes elements of flexibility that should ensure a quick reaction not only for diseases that are already regulated at Community level, but also for those emerging diseases for which no specific legislation exists. Indeed, the system foresees that the Commission, with the support of the Member States in the SCOFCAH, may adopt specific measures whenever a threat to public or animal health is identified.

A Community Veterinary Emergency Team (EC, 2007a) has also been set up which includes experts in the fields of veterinary sciences, virology, wildlife, laboratory testing, risk management and other relevant areas. Member States have put forward candidates to be included in the Team. From this list of experts, the Commission selects ad hoc team members when a request for assistance is submitted by a Member State or a third country during an animal health emergency. The Commission finances the operation and informs the Member States through the SCOFCAH of its activities.

The Community Veterinary Emergency Team operates not only in EU Member States, but also in third countries. Several assistance missions have taken place in Member States and third countries in recent years. In many circumstances, the EU experts have worked together with international organisations, such as the OIE and the FAO. It is both by intelligence gathering and by providing assistance in areas where these emerging diseases are prevalent, that these diseases can be prevented from entering or spreading across the EU.

3. The EU policy for animal health

3.1. Background

By means of its Communication: "A new Animal Health Strategy for the European Union (2007-2013) where prevention is better than cure" (EC, 2007b) the Commission has launched a new strategy for animal health, aimed inter alia at preventing emerging or re-emerging diseases. This new Animal Health Strategy provides the framework for animal health and welfare measures over the next six years. Given the devastating impact that serious disease outbreaks had, and can still have, on farmers, society and the economy, the new strategy is based on the principle that "prevention is better than cure".

The aim is to put greater focus on precautionary measures, disease surveillance, controls and research, in order to reduce the incidence of animal diseases and minimise the impact of outbreaks when they do occur.

Preventing emerging diseases requires the participation of everyone involved in animal health. Thus all stakeholders will have clear responsibilities in ensuring that the goals of the new strategy are achieved. In order to fulfil its objectives, the strategy relies on an action plan structured around four pillars: defining priorities, setting up a modern legal framework, enhancing prevention and control, and developing science, innovation and research. In all of these pillars, emerging and re-emerging diseases are addressed.

3.2. Underlying principles: Partnership and Communication

The strategy can only bring about real change if everyone involved in animal health works together and with all interested citizens. The EU will take advantage of existing collaborative efforts, encourage new initiatives and make more use of non-legislative alternatives to regulation. An "Animal Health Advisory Committee" has been established. It includes representatives from non-governmental organisations spanning the animal health sector, consumer organisations and governments. The Committee will provide input for strategic guidance on the appropriate or acceptable level of animal or public health protection, and on priorities for action and communication. The Committee will also follow the strategy's progress. It will be consulted on all impact assessments and provide advice and support to the Commission on how best to deliver agreed outcomes.

The Commission is committed to pursuing its objectives of clarity and transparency when communicating with consumers and stakeholders. It aims to achieve this by ensuring participation in international or national events, developing relationships with the media and non governmental organisations, improving websites to include comprehensive relevant information for all interested parties, checklists, manuals and a forum for Questions & Answers. There will be annual reporting on the strategy's progress and wider communication of policies and initiatives.

3.3. The first pillar: defining priorities

The world has changed considerably. Diseases such as BSE, which appeared to pose an important threat for animal and human health 10 years ago, are now considered to be of much lower risk thanks to the measures put in place. Meanwhile, diseases such as avian influenza H5N1, brucellosis or zoonotic Salmonella have an impact on human health far greater than BSE, yet on the level of financing for their prevention, control or eradication is much lower. Moreover, there are new and emerging challenges to face such as diseases that have become more prevalent due to global warming.

In short, there is now a need to revaluate priorities based on careful risk assessment, solid scientific advice and economic impact assessment. The Commission intends to develop a profiling and categorisation of animal disease risks which will provide the basis for the prioritisation of actions. Ultimately, funds should be focused on diseases with high public relevance in terms of their potential impact on human health, society and/or the economy. The Commission will consider integrating this approach in the new EU Animal Health legal framework.

3.4. The second pillar: a modern legal framework

The main objective of the Animal Health Strategy is the development of an EU Animal Health Law. The Commission has already started its work for a legislative proposal, with the intention to adopt it by 2010. It will redefine interfaces with the acquis on animal health, animal welfare, animal nutrition, food safety, public health, environmental protection, pharmaceutical products, common agricultural policy legislation and rules established by relevant international organisations (OIE, Codex) as well as responsibilities – all this having an impact on subsequent financing rules. In the preparation of the Animal Health Law, the Commission will duly consider the recommendations of the European Parliament, the Council and the European Economic and Social Committee. In particular, it will analyse the recommendations concerning the obligations of animal owners (including animals kept for non-commercial purposes), disease prioritisation for pets, vaccination, density of animals and farms, the possible introduction of a system of audits for farms and the accreditation of veterinary schools.

The Commission also envisages adopting by 2011 a legislative proposal for the development of an harmonised EU framework of the criteria for responsibility and cost-sharing, to ensure that all players assume their responsibilities and play a part in detecting and eradicating disease. The Commission will consider basing the compensation system on the categorisation of animal diseases combined with risk-prevention incentives. Mechanisms to prevent distortions of competition between farmers in different Member States and solidarity aspects will also be considered.

3.5. The third pillar: threat prevention, surveillance and emergency preparedness

3.5.1. On farm biosecurity

Identifying problems before they emerge while being ready to manage outbreaks and crises is a major EU objective. In addition, biosecurity measures such as the isolation of animals will help keep diseases out of animal populations, or limit the spread of disease within a herd. The Commission will encourage stakeholders to develop EU biosecurity guidelines in relation to isolating new animals brought to the farm, isolating sick animals, regulating the movement of people, animals, and equipment, using the correct type of feed, and procedures for cleaning and, disinfecting facilities.

It will explore the scope to maximise the use of current "veterinary fund" (EC, 1990b) and other Community related funds (e.g. rural development fund, structural fund, regional fund, fishery fund, external fund, mutual funds and research) when addressing actions which will have a positive impact on animal health. Such actions could include investments in farm infrastructures, training for farmers, farm advisory services, and implementation of legal standards. The Commission will also reflect, in the framework of the 2008/2009 budget review, on the role of the EU budget in promoting animal health.

3.5.2. Epidemiological information system

The role of a unified, accessible, exhaustive and effective surveillance and early warning system is paramount. The ADNS, Animal Disease Notification System (ADNS, 2008), will be further improved by becoming an ADIS, Animal Disease

Information System, compatible with other international information systems such as the OIE "WAHIS-WAHID" system (OIE, 2008b), and capable of providing key information to citizens on the animal health situation in Europe.

3.5.3. Identification and traceability

Threat prevention and crisis management are aided by surveillance mechanisms such as the EU traceability framework. The framework comprises identification systems, labelling, and TRACES (the Community TRAde Control and Expert System for traceability (EC, 2004). The Commission will aim to create by 2011 a wider, integrated electronic system, with a unified database encompassing all elements of the current system under certification, animal identification, and animal health and welfare status. Based on the results of a feasibility study, the Commission may adopt by 2011 a regulatory proposal for the introduction of bovine electronic identification.

3.5.4. Surveillance at EU external borders

Better border biosecurity is particularly important in view of the fact that the EU is the world's largest importer of food, including animal products. To improve the level of protection, import controls should focus on high risk imports. In 2010, the Commission will adopt a legislative proposal to deliver a better risk-based approach to border inspections and to better target illegal trade. The Commission will also continue efforts to help third countries combat threats to animal health and food safety at the source, by providing them with financial and/or technical assistance on the one hand, and to help them meet EU sanitary standards on the other hand.

3.5.5. Early response systems and vaccine banks

When an emergency does occur, the EU's ability to take fast-track decisions is of high importance in limiting and controlling animal-related threats at EU level. The EU will continue to improve measures already in place such as its rapid response network, crisis management units and an EU veterinary rapid response team. It will also launch a reflection on how to ensure the reinforcement of the EU antigen and vaccine banks.

3.6 The fourth pillar: science, innovation and research

3.6.1. Current work

Science is the basis of the new Animal Health policy and the Commission will continue to use the best available science in developing its animal health measures. The European Food Safety Authority (EFSA, 2008) will continue to mobilise and coordinate scientific resources throughout the EU in order to provide the best scientific advice. Based on an external evaluation (2008-2009), the network of Community and national reference laboratories will be further developed, thereby maximising the knowledge and expertise that exists in Europe.

3.6.2. New initiatives

The Commission has also welcomed the initiative from Industry to bring together all partners from various sectors including the agricultural sector, governments, veterinarians and international institutions with the creation of the Technological Platform for Global Animal Health (ETPGAH, 2006). The Commission is very confident that this industry driven platform will contribute to the development of better diagnostics, vaccines and medicines for the benefit of the whole animal health sector. The Strategic Research Agenda (IFAH, 2006) is a very valuable document as it results from a broad consensus among all stakeholders from academia, research institutions, industry, producers, and decision makers from the EU and also from relevant international organisations. It has important consequences for animal health research and is in line with the Lisbon agenda, which aims to make the EU an important science and technology driven society by 2010.

The 7th Research Framework Programme (2007-2013) (EC, 2008) is an important tool in supporting this Strategic Research Agenda for animal health issues. With that in mind, the Commission will work to stimulate scientific innovation and research, and to ensure sufficient funding in this area through public-private partnerships.

3.6.3. Future actions

With the support of the European Medicines Agency (EMEA, 2008), the Commission aims to ensure that a suitable framework at Community level provides more incentives to manufacturers to develop new medicines and diagnostic tools. It will review the policy on the use of authorised vaccines within the context of the Animal Health Law. It will also facilitate the change or addition of strains to an existing vaccine authorisation by proposing in 2008 a revision of the Variation Regulations (Regulations 1084/2003 (EC, 2003a) and 1085/2003 (EC, 2003b) and a revision in 2009 of Annex 1 of Directive 2001/82/EC (EC, 2001) on the Community code relating to veterinary medicinal products.

Finally, the Commission will provide support for research in third/neighbouring countries (international cooperation), especially for exotic diseases of high relevance or for neglected zoonoses which have had a serious impact on those countries.

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Early diagnosis of animal diseases: a key-element for rapid and efficient management

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An efficient control of a new outbreak of an emergent disease or infectious agent depends on many intrinsic factors related to the virulence of the germ and its contagious power, as well as to the receptive population and mode of transmission. The external factors concern the geographic and climatic situation.

A first crucial step in controlling an outbreak of an emergent disease is the early identification of the responsible pathogen. The causal agent must be identified and completely characterised in order to be able to evaluate its dissemination capacity and to develop additional screening tests and other measures for controlling the disease.

CODA-CERVA is the national reference laboratory for Belgium and the Grand Duchy of Luxembourg for all contagious diseases of animals, transmissible or non-transmissible to humans. The challenge we are facing with emerging diseases is to foresee the unforeseeable, or nearly so. To take on this challenge properly, with the limited means at our disposal, we are endeavouring to:

- reduce the unforeseeable part of our mission as much as possible,
- develop advanced expertise in global analyses alongside specific identification tests,
- delegate certain diagnostic activities to foreign reference laboratories.

Reduce the unforeseeable part of our mission as much as possible

Disposing of a thorough knowledge of the worldwide epidemiological situation and its evolution is the key to this action in order to be able to foresee optimally the potential introduction and outbreak of an emerging agent. Therefore, the CODA-CERVA is collaborating in an international network of reference laboratories. This network is an excellent means for monitoring the world animal health situation and for deciding when additional investments are needed to prepare for emerging diseases.

On an international scale, veterinary epidemiologists provide crucial information to the reference laboratories through risk analyses which take also general epidemiological factors such as climate changes, developments in trade, transport and land use into account.

In addition to permanent monitoring of the global animal health situation, enabling to make strategic adaptations to a surveillance plan when necessary, rapid knowledge of the epidemiological evolution of the emerging disease in the field is the second key to the early detection of an outbreak of the emerging agent.

The role of the actors in the field, the farmer and the veterinary practitioner, is of vital importance at this level. The epidemiological monitoring network is normally able to keep track of the evolution of known diseases in the field. However this network has to be reinforced in order to detect new emerging diseases in a sufficiently early stadium. There is a major challenge at this level for the actors in the field already mentioned, but also for the first relays of this identification, the regional screening centres for animal diseases ("Dierengezondheidszorg Vlaanderen vzw" and "l'Association Régionale de Santé et d'Identification Animale asbl", and the veterinary faculties through their clinics and autopsy rooms.

Develop advanced expertise in global analysis

Alongside the development, by reference laboratories, of increasingly more sensitive methods for detecting known agents, there is a growing need to dispose of methods for the global identification of infectious agents by "all catching" techniques.

At CODA-CERVA, we have recognised expertise and a sizeable capacity in electron microscopy analysis. This capacity is used successfully to diagnose diseases of unknown aetiology in the case the causal agent is present in sufficient quantities in the samples. Different examples show the value of this method for detecting new infectious agents. This method can also supplement other global viral identification techniques that indicate the presence of a virus that cannot be identified by specific tests of known agents.

Progress in molecular biology enables us to combine, in one single analysis, the detection of several hundreds of nucleotide sequences from as many different infectious agents. The "Array" technology has the advantage of detecting numerous agents simultaneously, but still suffers from a limited sensitivity at this moment.

The "global" character of the molecular diagnostic approach today is based on the combined detection of many known agents in one single test. The new developments are aimed at revealing multiple nucleotide sequences not targeted at the outset and their analysis by analogy with known sequences.

Delegation of certain diagnostic activities to foreign laboratories

CODA-CERVA is the Belgian contact point for all questions concerning transmissible animal diseases. It is practically impossible, due to the restricted financial means allocated to this mission, to have complete competency in house for all these diseases. This entire field can be covered by networking with European laboratories.   Depending on the risk analysis of the appearance of a disease in Belgium, it is to be decided:

- whether the entire diagnosis is delegated abroad,

- whether the first-line tests are conducted at CODA-CERVA and a foreign reference laboratory is then involved for the confirmation tests, or
- whether the entire diagnosis is carried out at CODA-CERVA.

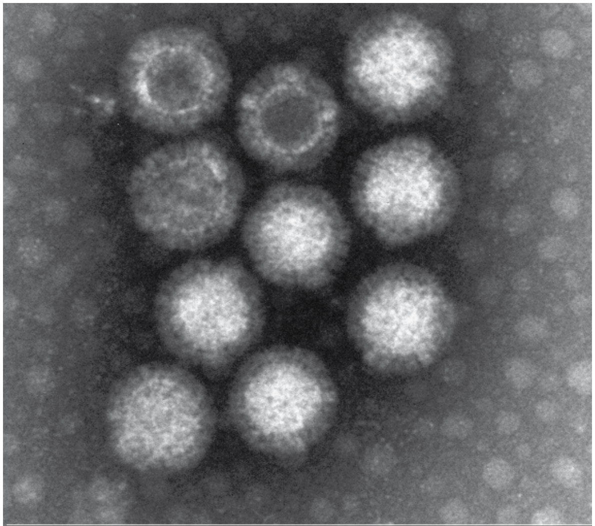
Whenever possible, our collaboration with the outsource laboratory is established on a contractual basis, which makes it possible to guarantee a satisfactory diagnostic response time to the authorities.

This distribution of tasks changes with time. For example: four years ago no bluetongue diagnosis was carried out at CODA-CERVA, as this task was delegated to the AFSSA. We adapted our diagnostic approach in 2004 owing to the development in the parameters of our risk analysis so that we rapidly had a first-line diagnosis test in house, and we have launched research programmes in cooperation with AFSSA. By the beginning of 2006, we were completely independent and had developed a new specific diagnostic test.

Conclusion

The early detection of an emerging disease is one of the major keys to its successful control. This detection starts in the field where animal health trends must be observed, reported and analysed. The information from the field is relayed by first-line centres and transmitted to the reference laboratory. At CODA-CERVA we proceed, in cooperation with reference laboratories of other Member States, to the specific detection of agents potentially involved. We are also developing new "all catching" techniques that makes it possible to analyse the unforeseeable to the best of our capability.

Electromicroscopic diagnosis (CODA-CERVA)



Blue Tongue Virus (CODA-CERVA) 100 nm

Theme 3

Applications: examples of animal diseases at risk of (re-)emergence

Preventing classical swine fever re-emergence: a continuous challenge

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Classical swine fever (CSF) virus, also known as "hog cholera" is a highly contagious viral disease of worldwide importance and classified as such by the Office International des Epizooties (OIE).

Clinical signs of CSF were reported in the early 19th century and the pathogenic agent was recognized as of viral origin in 1903 (CSFV). Historically per acute, acute, chronic or even prenatal forms of CSF were attributed to different levels of virus virulence. However, characterisation of the strain virulence is difficult since the same isolate can induce different signs depending on pigs breed, age, health status and immune status. Wild and domestic pigs are the only natural host for CSFV, but they are also susceptible to bovine viral diarrhea virus (BVDV) and border disease virus (BDV). CSFV, BVDV and BDV are small, enveloped, positive, single stranded RNA viruses in the genus Pestivirus of the family Flaviviridae.

The clinical picture of CSF has changed in recent decades, shifting from per-acute or acute forms to more sub-acute or even subclinical disease appearance making the "field" diagnosis more difficult. At the same time, changes in farm production, resulting in greater geographical concentration of pig numbers and increased pig movements, have exacerbated the consequences for reintroduction of the disease within the domestic pig population.

The economic and socio-economic impact of CSF is very high worldwide, including the territories of the EU. In 1993 and 1994, 10.7 and 21.4 million Euros respectively were spent on outbreaks in Belgium and Germany, with a further 130 million Euros of market support in 1994. In 1997, an epizootic outbreak centred in The Netherlands resulted in the compulsory slaughter and disposal of more than 10 million pigs, with costs estimated at over one billion Euros. An estimation of the overall economic loss results in several times these amounts. Although, this was the last major CSF- outbreak in the region, the situation is dynamic and also very recently (2006) more than 120,000 pigs had to be culled in Germany due to a small outbreak of CSFV in domestic pigs.

Domestic pig populations in North America, Australia and New Zealand are free of CSF. Extensive areas in Central and South America continue using vaccination to control the disease. Although the situation in Africa is not well characterised the disease has been identified in Madagascar and more recently severe outbreaks occurred in South Africa. CSF remains endemic in Asia.

Eradication of CSF in domestic pigs has been achieved in several areas within the EU. However, despite intensive efforts on national as well as on international level, the complete eradication of CSF in Europe has proved to be elusive, since sporadic outbreaks still occur in free areas. The latter is most likely due to the persistence of the virus in wild boar populations, which acts as a reservoir for the virus. In addition, the last decade, the wild boar population has increased all over Europe and wild boar density is recognized as one of the most relevant risk factors enabling endemic infections. Since about 80% of the first outbreaks of CSF in domestic pigs occurred in regions where CSF is endemic in wild boar, controlling CSF in wild boar is an indispensable prerequisite for keeping domestic pigs free of CSF.

The disease is still endemic among domestic pigs and wild boar in some new EU member states (Romania and Bulgaria). In these countries, back yard pigs are recognized as a possible reservoir of CSF and have to be considered as an additional threat for CSF reintroduction in a CSF-free population. Direct and indirect contacts between domestic and "wild" species and illegal swill feeding practices have been demonstrated as the main source for the spreading of the infection to the domestic pigs. Furthermore, population dynamics in back yard pigs is not fully understood, as this type of pig holdings is new to the European Community and hasn't been fully investigated. This type of production system, has a large structural variety, spanning from a largely controlled environment to completely uncontrolled whereby frequent contacts with other herds and specifically with wild boars are not uncommon. As a consequence, there is a strong need for improvement of knowledge and intervention strategies for back yard pigs.

Currently a non-vaccination policy exists in the EU. However, due to the problems in wild boar and in domestic pigs in some member states derogations of this non-vaccination policy are given and some field trials are ongoing. In case of oral vaccinations in wild boar, the live C-strain vaccine is used, since only live vaccines can be used for oral vaccination. The disadvantage of this vaccine is that no differentiation can be made between vaccinated and infected animals. In Romania and Bulgaria some pig herds are intra muscular vaccinated with the registered marker vaccine based on a baculovirus produced E2 subunit vaccine. As this use of the E2 marker vaccine is new, some very valuable information on the field use of this vaccine could be made available from these countries. Furthermore, the efficacy of the accompanying marker vaccine tools in pigs under field conditions could be further analysed. The combination of the highly effective live vaccine and the marker principle would add very important information on the situation in wild boar and feral pigs.

In contrast to an unknown emerging disease a lot of information is available concerning CSF. Virus characteristics are well defined. The transmission and eradication strategies for CSF are well documented. Under natural circumstances the primary transmission is by direct contact between pigs or by oral ingestion of contaminated feed. People should be considered as single most important factor in transmission of CSFV between herds. In finishing units and in areas with small pig farms, transport and introduction of infected pigs accounts for the majority of outbreaks and for the spread of the disease. Airborne spread has been demonstrated experimentally but is considered of minor importance but can have major consequences in densely populated areas. In an epidemiological study of a CSF epidemic it was found that the probability of neighbourhood infection is related to the size of the neighbourhood herd, the distance between neighbouring herds and the primary herd and the number of observations of the neighbouring herd downwind from the primary herd. Other studies didn't confirm the effect. Trucks contaminated with excretions and insufficiently cleaned and disinfected are considered one of the most important routes of virus transmission. This is based on expert opinion and epidemiologic evaluation. Recent experiments put into perspective these facts. Although swill feeding is forbidden in the EU, experts estimate that illegal swill remains an important threat. The role of pets and rodents in transmission has been proved unlikely. During the outbreak in the Netherlands in 1997 the possibility of CSFV transmission by semen was shown after experimental studies. Indirect transmission by people can occur when biosecurity is deficient. For example visitors entering farms without changing clothes, use of contaminated fomites. Recently more focus is put on biosecurity in order to prevent introduction of a disease. A recent survey demonstrated that despite the industrialized character of pig production in Belgium, 9,4% of the pig herds were small hobby herds that reported different biosecurity and management characteristics.

The changing farming and trading structures, the wildlife management and geo political decisions influencing trade structures influence the possible spread of CSFV. It also has been shown in the past that the re-emergence of CSF is always a risk and several areas previously free of CSF have had introductions in recent years. Taking into consideration these experiences it is important to update the actual knowledge in consideration with the changing environment and improve the detection using new technologies and tools.

A quantitative approach to understand CSFV spread between animals and herds is important. However relatively few studies have been conducted. One objective is to identify the biological and population factors influencing the rate of transmission. Another objective is to construct mathematical models that predict the course of the epidemic. Ideally these models should give insight in the decisions to make to control the disease. In Belgium and the Netherlands such models have been developed for domestic pigs.

Recent CSF epidemics have shown that early recognition of CSF and prompt elimination of CSF infected animals is the key to control. It was however observed that the duration of detection of a first CSF outbreak could last between 3 and 10 weeks. It should also be recognised that farmers and veterinarians detected 75% of the recent CSF epidemics on the basis of clinical observations. This indicates the need to establish standardised protocols for evaluating herds suspected of CSF. However the list of clinical parameters to monitor cannot be complex if it is to be used in the field. Average daily feed intake, daily gain and body temperature are useful parameters. Because there are no pathognomonic clinical signs in CSF, laboratory confirmation is always required for confirmation. Several diagnostic tools including virus isolation, virus neutralisation ELISA and more recently real time PCR are available. In this perspective laboratory awareness including real time exercise has been proven very useful. It is important to include the characteristics of these new methods in the available monitoring and decision models.

As mentioned CSFV circulation in wild boar is a major risk for reintroduction. During a recent EU project CSFVACCINE&WILDBOAR it was demonstrated that controlling CSF in wild boar is an indispensable prerequisite for keeping domestic pigs free of CSF. During this project epidemiological parameters were estimated by analyzing time series data of different epidemic areas from Italy, Luxembourg and Germany. Such parameters are essential in the modeling part of the epidemiology of CSF. Interestingly, the coefficient of infection transmission b, is quite similar for all the analyzed outbreaks. Furthermore, it could be noted that the epidemic evolution depends from environmental and population conditions. In many European countries the epidemic risk for wild boar populations after virus introduction is realistic.

By using surveillance data of CSF in hunted wild boar between January 1999 and March 2007 the influence of oral immunization on serological prevalence was evaluated. Although the hunting bag is influenced by many factors, as hunting intensity, species density and habitat, it represents the only sample available. It is representative enough to draw the generalized conclusion that oral vaccination of wild boar led to a marked decrease of virus positive cases and a significant increase of seroprevalence resulting in a reduction of target animals for CSFV.

By using a metapopulation model output results were in concordance with field outbreak data of different outbreaks. Simulation of different control strategies, using this model, indicated that hunting is not a very effective CSF management tool as only unrealistic high rates of depopulation (> 70% / year) resulted in an effective reduction of the virus persistence. In contrast, vaccination appears to be a much more effective way, if the Critical Proportion of Vaccination (CPV) of at least 40% is reached in a short time (approximately 15 days), the developed immunity is protective and lifelong and no age differences are present. Combining of both will only result in a reduction of the virus persistence and spatial diffusion for values respectively >60% / year and ≤ 30% / year as other combinations can increase the probability of virus persistence in the wild boar population. Furthermore, endemic stability might be explained by the interaction of some factors as size of the wild boar population, presence of long virus shedders (chronic or immunotollerant animals) and stochastic variations of both infection and management parameters (recovery, latency, beta and passive immunity, hunting and vaccination). Also the size of the baits can influence the vaccination coverage. For this reason the actually used C-strain vaccine baits were adapted for use in wild boar with special attention to young animals.

A very efficient tool to evaluate the epidemiological situation of CSF is the EU-database. Up till now, 309,543 data records have been added into the central CSF database and around 128 defined areas have so far been recorded in the central region data base. In addition a genetic data base including sequences of many strains supports the swift characterization of a new isolate in order to determine the source of the disease. The similarity of the sequence from an isolated virus with those already obtained can indicate whether or not outbreaks of CSF are caused by new or already recognized strains. This can support or refute hypotheses on transmission routes.

Conclusions

In contrast to an unknown emerging agent CSF is well documented. However emergence, sometimes with devasting consequences, has been experienced in several parts of the world. As for all diseases improvement of primary detection including new tools focusing on CSF (like hand computer) and a good communication between science and decision makers is crucial. If we want to be ready, permanent actualization of our knowledge, taking into consideration the changing environment and structure and the development of new tools for diagnosis and prevention (live marker vaccines, anti virals) are a prerequisite. A quick action is important but it will be more successful if based on reflection which can be based on research during "peace time". The development of flexible models allowing an active decision support is recommended.

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Surveillance of West Nile virus infection in Europe: assessment and improvement axes

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1. West Nile virus infection in humans and horses

1.1 Epidemiology of West Nile virus infections

West Nile virus (WNV), a member of the family Flaviviridae (genus flavivirus) first isolated in 1937 in Uganda, is the most widespread arbovirus nowadays. Until 1996, WNV was not considered to be a significant human pathogen as most infections appeared to result in asymptomatic or only mild febrile disease. In the late 1990's, the epidemiological context of WNV infection has significantly changed, with the introduction of the virus to the American continent in 1999 and the occurrence of large outbreaks in Europe (Romania (1996), Russia (1999)) and the Mediterranean basin (1994-2003), which involved hundreds of human cases (Zeller & Schuffenecker 2004). The virus spread rapidly to virtually any state in the USA (43 states recorded WNV activity in 2006) and caused more than 27000 human cases and 1050 deaths between 1999 and 2007 (CDC). WNV virus also intensively spread north to Canada and south to South America, reaching Argentina in 2006.

WNV is maintained in nature through a transmission cycle involving birds and mosquitoes, especially of the Culex species. In comparison with other arboviruses, WNV has a broad range of hosts and vectors. Culicidae are regarded to be preferred vectors, but WNV has been identified in a wide range of arthropods, including ticks and biting midges. Although birds are the major amplifying reservoirs, humans and other mammals, in particular horses, can become incidentally infected by mosquito bites and are considered to be "dead-end" hosts for the virus (Dauphin et al 2004), because they do not produce significant viremia, and do not contribute to the transmission cycle. Recent studies, mostly in the USA, have shown that besides vectored transmission, WNV can also be naturally transmitted among humans through blood transfusion, organ transplantation, breast feeding and transplacentally. WNV may be introduced by infected migrating birds from Africa in regions of Europe with a temperate climate (Hubalek & Halouzka 1999). The transmission cycle of WN virus is rather complex and not fully understood: it implies a chain of events susceptible to allow the amplification of the virus and, in some unknown circumstances, further transmission to mammals. Many factors have been suggested to be involved in the occurrence of WNV infection in mammals, including density of bird and mosquito populations, land cultivation, climatic conditions,…

1.2 Phylogeny and diversity of circulating strains

WNV exhibits considerable genetic variation. WNV strains can genetically be divided into two lineages, showing till 30% nucleotidic divergence. Lineage I includes strains that circulate in Africa, in the Mediterranean basin, Southern Europe, India, Australia and America and were responsible for the majority of recent epidemics/epizootics. Lineage II gathers enzootic strains from sub-Saharan Africa and Madagascar that are mostly not pathogenic (Murgue et al 2002). However, lineage II strains circulation should also be monitored, since encephalitis and mortality in birds have been associated to infection by a lineage II strain in Hungary in 2004 and 2005 (Erdelyi et al 2007). Recent isolates from central Europe and Russia (Rabensburg virus), which are pathogenic for humans, can be classified as new lineages of WNV or as new flaviviruses, closely related to WNV.

1.3 Clinics

Since the first large outbreak in Romania in 1996, WN fever has become a major public health and veterinary concern in Europe and in the USA. Human beings and horses are sensitive to infection, although most cases are asymptomatic. The latest outbreaks of WNV were characterised by an increased proportion of neurological disease in both humans and horses (Petersen & Roehrig, 2001). In humans, approximately 20% of WNV-infected individuals develop a mild febrile illness during three to six days (fever, headache, malaise and sometimes rash). Less than 1% of infected patients progress to a nervous form of the disease: meningitis, encephalitis or myelitis, which can be fatal, particularly in the elderly. Symptoms of severe neurological disease may last several weeks, and in some cases, give permanent sequelae.

WNV infections in equids (horses, donkeys or mules) are comparable to human infections, as clinical symptoms are only seen in a small percentage of WNV infections. However 10% of infected horses develop a neurological disease, and reported mortality rate among neurologically affected horses can range from 20 to 57%. The severity of clinical signs is influenced by many factors such as age, method of rearing, housing conditions, virulence of the strain, genetic susceptibility and prior immunity to flaviviruses (Autorino et al 2002). The most common neurological signs of the disease are ataxia and hind limb paresis, possibly associated with muscle tremors, fasciculations, atonia, proprioceptive defect and/or any other characteristic symptoms of meningo-encephalomyelitis. Horses are very sensitive to WNV infection and can be used as sentinels of WNV amplification.

1. 4 Diagnosis

Laboratory diagnosis is necessary for the surveillance of WNV infections in horses due to the subclinical or asymptomatic nature of the majority of WNV infections and due to non-specific clinical manifestations. The major difficulties in WNV diagnosis arise from the requirement for level 3 safety facilities due to the zoonotic nature of WNV, the necessity for a multi-species testing and for specific diagnosis that overcomes cross-reactivity with other related flaviviruses (Saint-Louis encephalitis virus, Japanese Encephalitis virus, Murray Valley fever virus, Usutu virus,…). Confirmation of WNV infections can be inferred from direct identification of West Nile (WN) virus or genome from body fluids (blood or cerebrospinal fluid) or tissues (virological methods), or indirectly from detection of anti-WNV IgG or IgM antibodies. Virological methods, such as virus isolation or reverse transcriptase (RT)-PCR, are of limited interest for the identification of clinical cases, due to the short duration and low level of viremia in horses and humans, and the late appearance of neurological signs in humans/horses, when the viremia is usually no more detectable.

Diagnosis of WNV infection is typically based on serological tests, such as an enzyme-linked immunosorbent assay (ELISA) or immunofluorescence assay (IFA), or the gold standard Plaque Reduction Neutralization Test at the 90% Plaque Reduction Level (PRNT90) (Dauphin & Zientara 2007). ELISA tests have the advantages of being rapid, reproducible and less expensive. The IgM capture-ELISA is optimal for the detection of early antibodies (IgM, which are induced a few days after the onset of clinical signs and then rapidly decrease over several weeks or months), and allows for an early diagnosis and the distinction between old and recent infections or vaccinations. One limit of ELISA tests is their difficulty to differentiate infections with WNV from other flaviviruses. For this reason, a confirmation by PRNT90 is necessary for sera found positive by ELISA.

As a consequence, results of serological surveys determining the level of circulation of WNV need to be interpreted with care.

I. 5 Treatment and prevention

The absence of effective treatment against WNV infection encourages vaccine development to prevent the infection. Three vaccines, one formalin-inactivated WNV (West Nile-Innovator®, FortDodge, Princeton, NJ, USA), one DNA vaccine (West Nile-Innovator® DNA, FortDodge, Princeton, NJ, USA) and one recombinant live canarypoxvirus vaccine (Recombitek®, Merial Merial Ltd., Athens, Georgia, USA) are actually commercially available only in the USA. No human vaccine for WNV is available. However, several laboratories are currently undertaking vaccine research.

Other preventive means against WNV infections rely essentially on WNV surveillance and public education (reduction of mosquito breeding sites, personal protective measures to reduce mosquito exposure using mosquito repellent and protective clothing).

2. Surveillance of West Nile virus circulation in Europe

2.1 Objectives

Surveillance of WNV aims at providing relevant and updated information on levels of WNV circulation to decision makers and professionals in human and animal health, so as to take appropriate information and prevention measures in order to reduce the incidence and prevalence of WN clinical cases.

2.2 Methodology

Surveillance of WNV circulation can be performed at different levels of the WNV transmission cycle: birds, horses, mosquitoes, humans. It relies on passive surveillance systems (based on clinical diagnosis of WNV infection in horses or in humans, or on analysis of enhanced bird mortality rates) or by active surveillance (development of a specific epidemiological network for prospective WN virus and/or WN virus-antibody detection in birds, horses,...). Each surveillance system has to fit to epidemiological, climatic and geographical conditions in the exposed area. Most of the european countries have organised a passive surveillance, including a survey on human and horse neurological cases occurring during late spring-autumn, which is the preferential period of WNV infection in relation to favourable climatic conditions and high vector density in our temperate regions. In Europe, bird mortality cannot be considered currently as a good indicator of WNV activity since bird mortality related to WNV infection is rare, whereas it has been largely reported in Israel from 1998 and in North America from 1999 (Deubel et al., 2001).

Seroconversion surveys on naïve bird (captive sentinel birds, domestic poultry, and identified wild birds) and horse populations have also been used to demonstrate WNV circulation (Murgue et al., 2001). This active surveillance seems particularly indicated in those areas where outbreaks have occurred and/or in areas considered especially at risk because of their climatic and/or land use characteristics (river deltas, frequently flooded areas,..). Mosquito collections in areas where newly infected animals have been detected are important for isolating and characterizing circulating WNV strain. However, mosquito collections are not a practical method for routine surveillance of transmission, because this costly method lacks some sensitivity.

2.3 Results of West Nile virus surveillance in Europe

We'll summarize studies that have been undertaken to provide incidence data on WNV in Europe.

Infection outbreaks

Since the 1990's, two major human outbreaks have been reported, in Bucharest, Romania in 1996 and in Volgograd, Russia in 1999. Reinforced surveillance the following years identified some more cases each year (see the following table), suggesting that in those areas, the virus could be endemic. Human WNV infection foci have also been identified in Czech Republic, France, Hungary, Portugal and Spain. Small outbreaks involving only horses have been described in Italy in 1998 and in France along the Mediterranean cost in 2000, 2004 and 2006.

In Europe, WN disease outbreaks are erratic and spatially and temporary limited phenomena, occurring quite unpredictably.

Evidence of WNV circulation

WNV presence has been evidenced in Eastern and Southern Europe (Koopmans et al., 2007). The low rate of clinically apparent infections imposes serological surveillance of the population to evaluate true prevalence of WNV infection. Significant percentage of serologically positive persons have been found in different surveys in regions with reported WNV activity (Romania, Spain, Russia) (Lozano & Filipe, 1998, Bofill et al., 2006, Cernescu et al., 2000, Platonov et al., 2001).

A broad range of seroprevalence against WNV (1-15%) amongst horses was described in France, Spain, Croatia, Romania and Russia (Jimenez-Clavero et al., 2007, Ozkul et al., 2006, Vasil'ev et al., 2005, Madic et al., 2007, Murgue et al., 2001). Surveillance studies of neurological cases in humans and horses in the UK and The Netherlands did not find any evidence for WNV circulation (Rockx et al., 2006, Morgan, 2006). No WNV activity could be demonstrated in recent reports from Austria, Germany or the United Kingdom (Weissenbock et al., 2003, Phipps et al., 2008, Linke et al.? 2007).

Moreover, WNV has also been detected in mosquito pools in France, Portugal, Moldavia, Romania, Slovenia, Czech Republic, Ukraine and Belarus (Koopmans et al., 2007).

			Human		Horse		
Country	Year	Region	Case	Death	Case	Death	Reference
Czech Republic	1997	South Moravia	2	0			(Hubalek et al 2000)
France	2000	Camargue			76	21	(Murgue et al 2001)
	2003	Var	7	0	4	1	(Del Giudice et al 2004)
	2004	Camargue			32	7	(Zeller & Schuffe-necker 2004)
	2006	Eastern Pyrenees			5	0	(Zientara, personal communication)
Hungary	2003	southeastern region	14	0			(Bakonyi et al 2006)
Italy	1998	Tuscany			14	6	(Cantile et al 2000)
Portugal	2004	Algarve	2				(Connell et al 2004)
Romania	1996	Bucharest	393	17			(Tsai et al 1998)
	1997	Danube Valley	15	0			(Ceianu et al 2001)
	1998	Danube Valley	5	0			(Ceianu et al 2001)
	1999	Danube Valley	7	0			(Ceianu et al 2001)
	2000	Danube Valley	13	0			(Ceianu et al 2001)
Russia	1999	Volgograd	826	40			(Platonov et al 2001)
	2000	Volgograd	56				(Zeller & Schuffe-necker 2004)
	2001	Volgograd	64				(Zeller & Schuffe-necker 2004)
	2004	Novosibirsk	3	0			(Ternovoi et al 2007)
	2005	Rostov, Astrakhan	90	3			Promed notifications
	2006	Rostov	6	0			Promed notifications
	2007	Volgograd	54	2			Promed notifications
Spain	2004		1	0			(Kaptoul et al 2007)

Table : Summary of recent WNV infection outbreaks in Europe

2.4 Improvement axes

Harmonization of diagnostic tools and surveillance protocols (case definition, requirements for confirmation of WNV infection) is crucial for ensuring validity and comparability of data between European countries and for constructing a global and coordinated surveillance scheme at the european level. European networks, such as ENIVD (European Network for diagnostics of « Imported » Viral Diseases, www.enivd.de) or ARBOZOONET (Network on zoonotic arboviral infections), aim at strengthening national diagnostic capacities (formation,…), surveillance and response systems in Europe. An integrated European approach with regards to prevention and control strategy options would be a plus in WNV prevention.

Conclusion

In Europe, the disease cannot be considered as emerging, regarding the evolution of its distribution and the dynamics of its transmission. WNV is probably endemic in parts of Europe with occasional incursions and local outbreaks in areas with favourable conditions. Its future course is unpredictable and depends on ecological, biotic (hosts and vectors density and distribution) and largely unknown factors that may modify intensity of infection and/or accessibility and susceptibility of the hosts. WN disease can be difficult to monitor; the viral circulation has to be rapidly detected so that the sanitary authorities can take protective measures. More coordinated effort is needed to point out risk factors, that are important for WNV epidemiology and outbreaks incursion and to provide a reliable risk map of WNV for Europe that can be used for public health preparedness.

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Arthropod-borne viral diseases potentially at risk for introduction in European countries

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Introduction

There are many insect transmitted virus diseases, historically with a tropical and sub-tropical range, which, with the changes induced by global warming, currently present a potential threat to the more temperate countries of Europe. This has been shown by the dramatic and rapid extension of bluetongue into Southern Europe and now the United Kingdom, in an extremely short period of time. One tends to forget the extension of African Horse Sickness, another Culicoides transmitted Orbivirus, into the eastern Mediterranean in the 1960's. Fortunately, this outbreak did not extend further into Europe. The over-wintering of the bluetongue virus strain 8 in Europe during the winter of 2007-2008 emphasises, the reality that these Culicoides transmitted viruses may now become endemic in countries as far north as Britain and France. There are 25 or more serologically distinct strains of bluetongue virus in the enzootic countries of Africa, and in turn, many of these may extend their range northwards into European countries. The gradual extension of these additional strains and the development of multi-strain killed antigen vaccines for immunisation, will present a considerable challenge to animal health authorities in European countries.

Bluetongue virus occurs in domestic and wild Bovidae, Capridae and Ovidae throughout its range in sub Saharan Africa, but fortunately, most of the indigenous breeds of sheep, goats and cattle show a high degree of genetic resistance to infection with virulent bluetongue virus strains. For example, the challenge of indigenous black headed Somali type of sheep with virulent bluetongue virus, will not produce any signs of clinical disease. There may be a transient viraemia, but this will be only of short duration. Susceptible exotic wool sheep breeds imported into Africa from Europe, will however be severely affected by the same challenge, with clinical signs of the disease and some deaths. The indigenous cattle, in bluetongue enzootic countries may be shown to have antibody to many bluetongue virus strains (e.g. 6-16) at 4-5 years of age. They have not exhibited at any time in their lives, any clinical signs of a disease which might be bluetongue.

The potential for the extension of other African insect borne virus diseases into European countries has become a reality. The movement of infected vectors from enzootic areas in Africa in thermal and other air currents over considerable distances has occurred. I wish to show examples of other potential virus disease problems which could affect European countries in this way.

African Horse Sickness

African Horse Sickness is a Culicoides transmitted Orbivirus in the family Reoviridae, which may also be transmitted by mosquitoes. The virus already has a history of extension into Europe since 1966, when it was first recognised in Spain. The virus occurs regularly in North African countries such as Libya, Tunisia, Algeria and Marocco and the extension northwards has been correlated with periods of high virus and disease activity in these countries. Extension into Spain has been an irregular occurrence since the first incursion in 1966 and has also been identified in 1987, 1989 and 1991. It also occurred in Portugal in 1989, probably by direct extension from infected foci in Spain.

The virus is highly pathogenic for horses and less so for donkeys, mules and wild Equidae. Zebra sera show that most adults in their enzootic habitat in Africa, have been challenged by several strains of African Horse Sickness virus, but no clinical disease has been identified in the field.

There are at least 9-10 distinct serotypes of African Horse Sickness virus, which are known to be active in the African continent and Arabia. It is important to mention the widespread extension of the disease, which occurred in 1959-61, when serotype 9 caused very considerable losses, principally of horses, but also of donkeys and mules in the eastern Mediterranean countries of Palestine, Syria, Lebanon and Jordan and also Cyprus. During this period, the virus infection also extended further east into Iran, Iraq, Turkey, Afghanistan, India and Pakistan. The total losses during this outbreak were considered to be at least 300.000-400.000 animals.

This highly fatal virus disease is clearly a candidate for extension into Europe, following the occurrence of more favourable climatic changes driven by global warming, which will facilitate the conditions favouring higher populations of the Culicoides vectors. It is highly likely that the Culicoides species already present in Europe will be capable of transmitting this virus, as they have been for bluetongue virus. The very large leisure horse populations associated with most rural and peri-urban populations and the thriving racing industries in France, Germany, Italy, Britain and Ireland, present large and highly susceptible target populations for African Horse Sickness virus. Clearly contingency plans should be prepared for this possibility.

Vaccine strains of African Horse Sickness virus, which have been modified by serial passage in mouse brain, have been prepared in South Africa and are available for contingencies such as this. They are attenuated strains. The sudden requirement for several million doses of vaccine, would be difficult to meet in the short term, as only inactivated products would be acceptable in such a situation. The production of several million doses of an attenuated modified live virus strain would be possible in a very short time, but this would probably not be acceptable for use in non endemic areas of Europe.

Lumpy Skin Disease

Lumpy Sin Disease (LSD) is a Capripox virus infection, which produces a severe clinical condition affecting principally the skin of cattle, where multiple nodules develop over whole or parts of the body. The morbidity rates vary from outbreak to outbreak, according to the prevailing numbers of insect vectors. It is usually in the range of 10-60% of susceptible animals. The disease has been seen sporadically or as an epizootic infection in most of the countries in Africa and in Arabia. Severe and extensive outbreaks have also occurred in Egypt, and there is some evidence, which suggests that it may have extended further into the eastern Mediterranean region.

The virus is considered to be transmitted by insect vectors, although this has proved difficult to reproduce in the laboratory. Epidemiological evidence suggests that the virus must be vector borne, for it always occurs in association with high insect populations, wet and damp seasons and is prevalent along watercourses, in valleys and at lake margins.

The skin nodules are usually 10-40 mm in diameter and may occur over the whole of the body. Their development is accompanied by a general pyrexia and depression, reluctance to feed, generalised lymphadenitis, salivation, lacrimation and generally, a muco-purulent nasal discharge. Conjunctivitis may be severe with corneal opacity and ulceration. The nodules may develop in the mouth and pharynx, and occur throughout the alimentary tract, in the muscle tissues and in severe cases, throughout the liver, viscera and other organs. Affected animals are disinclined to move and feed and rapidly lose condition. Mortality rates may be as high as 10%, but there is also consequential damage to the hides of affected animals, which greatly reduces their value to the leather industry. There is also a dramatic fall in the milk yield of affected herds, which persists for 2-3 months.

This is a highly significant economic disease problem in the infected herds and countries. The loss in milk yield, damage to hides, generalised and persistent debility in affected animals, together with other complications such as sterility in bulls affected with severe scrotal lesions and abortion and infertility in female animals.

Control of the disease can be achieved by vaccination in the known enzootic areas. These vaccines would not be acceptable for use in an extension zone for lumpy skin disease in Europe, where sheep and goat pox and lumpy skin viruses are not found

The available vaccines are prepared from strains of lumpy skin disease or sheep and goat pox virus, and these modified live vaccines usually protect against lumpy skin disease. The Kenyan 0-240 strain of sheep and goat pox has been widely used, but this can produce mild reactions in some calves, and is clearly not acceptable in countries where sheep and goat pox do not occur. The Neethling strain of LSD is used in South Africa and this is a modified live virus strain of a lumpy skin disease virus isolate, which has been passaged in embryonated eggs and is of much modified virulence for cattle.

The occurrence of lumpy skin disease in Europe would present serious control problems, and a slaughter policy might be the most effective response to its occurrence.

Rift Valley fever

Rift Valley fever presents one of the most serious threats to the European Union, should it occur in any member country. This is a mosquito transmitted zoonotic disease of the Phlebovirus group, which has hitherto been restricted in range to sub Saharan Africa, Egypt and Arabia. It has considerable importance, for whilst it is an economically important disease of sheep, goats, camels and cattle, it also causes a serious and often fatal disease in man. The EFSA has addressed this problem.

The disease was first recognised in the Rift Valley of Kenya in the 1930's, but it has subsequently been encountered throughout most of sub Saharan Africa, Egypt in 1977 and Arabia in 2000. Up to the present time, no cases have been found beyond this existing range for the disease. However, with the changes induced by global warming, this historical range may be extended. Rift Valley fever occurs in epizootics which are often followed by long periods where evidence for the virus persistence is extremely difficult to detect. Work in Kenya has shown the association of the epizootic periods with the periodic episodes of prolonged and heavy rainfall associated with the El Nino phenomena. Prediction of likely epizootic periods was possible using rainfall parameters but prediction is much more accurate when the satellite derived information systems are employed. Remote sensing satellite data such as the Sea Surface Temperatures in the Indian and Pacific Oceans (SST & SOI), Cold Cloud Density (CCD), Normalised Differential Vegetation Indices (NDVI) may be used in a model system to give close to 100% accuracy in prediction of RVF epizootics.

The virus infection in animals is characterised by abortions at all stages of gestation and a high mortality in neonates and animals in the peri-natal period. The younger age groups in general are much more susceptible than older animals but the pathogenicity declines in older animals. There are marked differences in the susceptibility of different genotypes of sheep, goats and cattle. In general, the indigenous animals are less susceptible than the breeds imported into Africa for improved production purposes. Such breeds often suffer a high mortality rate.

The epidemic periods are of comparatively short duration, especially in semi arid zones, where they are associated with the very heavy rainfall and flooding rarely seen in such areas. The epidemic curve reaches a peak in 6-8 weeks and then declines with fewer cases after 12-14 weeks. The tail of the epizootic may persist for up to 6 months or longer in wetter ecotopes. Man becomes infected because of his close association with animals on a daily basis, when infected dead and dying animals would be handled and if fed upon by infected mosquito vectors. The disease may be severe in man in up to 10 % of cases with acute prostration, and complications such as hepatitis and encephalitis. Most severe is the haemorrhagic form of the disease which has a high fatality rate. This happens in only 1-2% of human cases. Rift Valley fever belongs to the haemorrhagic fever group of viruses like Congo-Crimean HF, Ebola and Marburg.

In high potential farming areas Rift Valley fever is important as a cause of mortality in the high input/high output livestock production systems. The high rates of abortion and mortality in the young animals constitute a significant production loss, as does the dramatic fall in milk production, which occurs on a herd basis. Infection rates may be from 30-70% during the epizootic periods.

The impact of this disease in European livestock production systems would be dramatic. Whether there are vectors capable of propagating Rift Valley fever virus in Europe is not currently known, although there are species, which appear likely to be able to do so in the Mediterranean zones. An evaluation of the relative risk presented by Rift Valley fever for introduction into Europe may be found in an EFSA publication.

Ephemeral Fever or Three Day Sickness

Ephemeral Fever or Three Day Sickness is an economically important disease caused by a Rhabdovirus, which is found throughout Africa, Asia, Japan, China and Australia, but not yet America or Europe. There have been major outbreaks in Egypt and the eastern Mediterranean. Its seasonal occurrence suggests that this is another insect borne virus. Many isolates have been made from Culicoides spp. but mosquito vectors are also suspected.

The clinical disease is characterized by a sudden onset of high fever, a dramatic fall in milk yield and acute prostration with recumbency. Abortion may occur in cattle during late pregnancy, and there are often signs of a severe pulmonary emphysema, which may emerge subcutaneously. The period of recumbency is usually from 1-3 days, and recovery is sudden and complete in most affected cattle. There is some mortality usually in the cattle which are in the best condition, and this is due to prolonged recumbency and the consequential secondary complications. Attack rates during outbreaks may be very high, 70-90%, but recovery is usually complete. Some mortality may occur (1-2%) and this is associated with periods of prolonged recumbency and /or severe emphysema.

The changes associated with global warming suggest that Ephemeral fever may extend it range into Europe. High risk areas would be in the marshland and river delta areas in Southern Europe, where rivers run into the Mediterranean. The disease causes significant economic losses, particularly in high input/high output cattle farming enterprises. Both live and killed vaccines have been successfully used for the control of the disease, but these are not usually widely, nor readily available for emergency use.

Contingency Planning, Risk Analysis and Surveillance for these Diseases

The above important virus diseases of domestic animals may be considered to present real risks of introduction into both Northern and Southern Europe,, in the same manner that bluetongue virus has spread so quickly and widely. Clearly, contingency planning, risk analysis and active surveillance are necessary for each of these highly significant economic disease problems. EFSA has addressed the problem for Rift Valley fever. It is necessary to extend these activities to the above disease problems, and focus surveillance activities in the high risk riverine/floodplain habitat in Southern European countries.

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Risk assessment of the re-emergence of bovine brucellosis/tuberculosis

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Context

Several definitions of a(n) (re-)emerging disease coexist but with a common denominator. An emerging disease is a disease of which the true incidence increases significantly in a given population and area and during a given period, in comparison with the usual epidemiological situation of this disease. This increase in true incidence is due to several factors such as the evolution or the modification of a pathogenic agent or of an existing parasite, resulting in a change of host, of vector, of pathogenicity or strain. Specific social, ecological, climatic, environmental or demographic factors precipitate the emergence of a disease, but it is difficult to establish a ranking of causes and of mechanisms [19].

Several models for understanding emerging risks are proposed such as (i) the convergence model for zoonotic diseases [10]; (ii) the pan European pro-active identification of emerging risks in food production model (PERIAPT) concerning emerging risk in the food chain [23] and (iii) the generalised model for rare events [17, 18].

Bovine brucellosis (bB) and bovine tuberculosis (bTB) are two World Organisation for Animal Health (OIE) reportable zoonoses and are of considerable socioeconomic concern and of major importance in the international trade of animals and animal products. These diseases are two of the seven neglected endemic worldwide zoonoses [25]. Despite these diseases being largely eradicated from herds in developed countries by a test-and-slaughter programme [21] their worldwide status as zoonoses remains of great concern. With these two examples, we describe some original contributions that explain the usefulness of risk assessment in the case of possible (re-)emergence of these diseases in a Member state of the European Union.

Basic facts

Bovine tuberculosis caused by Mycobacterium bovis (M. bovis) is a chronic, infectious and contagious disease of livestock, wildlife and humans. In livestock, particularly in cattle, the disease causes diminished productivity, but seldom death. Zoonotic tuberculosis is of important public health concern worldwide, especially in developing countries because of deficiencies in preventive and/or control measures. In developed countries, the disease has almost been eradicated after the implementation of appropriate preventive and control measures. The situation in the European Union (EU) is not uniform yet. Eleven Member states (MS), two non-MS and 11 provinces in Italy were Officially Tuberculosis Free (OTF) in 2006. Among these only Belgium, France and Gemany reported some positive cattle herds in 2006. The occurrence of bovine tuberculosis among cattle herds in the 13 non-OTF MS reporting tuberculosis cases was 0.66%, and there was a slight general increase in the proportion of existing positive herds in the non-free MS. The highest prevalence of bTB in the EU is registered in the United Kingdom, in the Republic of Ireland and in Northern Ireland [3, 7]. Identifications of M. bovis in other domestic animals, wildlife and zoo animals were reported by several MS indicating that some of these species can serve as a reservoir of bovine tuberculosis. In humans, the vast majority of TB cases are caused by Mycobacterium tuberculosis. However, tuberculosis (TB) can be caused by a number of other bacteria, of which M. bovis, causing bTB is one of the most prevalent and has the widest host range of all TB bacteria. TB due to M. bovis often colonises sites other than the lungs (e.g. urinary-genital tract) but in many cases is clinically indistinguishable from M. tuberculosis infection [25]. Very little is known about the share of bovine TB in the global TB epidemic, but sporadic reports of cases are received regularly from many countries worldwide (e.g. [3]). In addition, HIV is the greatest factor for progression of TB infection to active TB disease [25].

Brucellosis is a widespread, economically devastating and highly infectious zoonosis. In 2006, a total of 1,033 brucellosis cases were reported in EU. The highest incidence was recorded by the MS who are not officially free of bovine and ovine/caprine brucellosis. In Greece and Spain there was a significant decreasing trend in the number of cases over the past five years. The peak in the reported cases was observed in spring and summer. In cattle, infection is predominantly caused by Brucella abortus, and is usually detected in pregnant females through abortions [21]. In 2006, 12 Member states, Great Britain, 48 provinces, one region in Italy, and the Azores in Portugal were Officially Brucellosis Free (OBF) as well as in sheep and goat. In 2006, 13 non-OBF MS reported bovine cases of brucellosis. The situation is less favourable in Southern European countries and also in the Republic of Ireland but is improving with time [3]. Generally, in most developed countries, test-and-slaughter programmes, together with compensation for farmers and accreditation and financial incentives for disease-free herds have more or less eliminated brucellosis in livestock and, consequently, in humans [25, 26]. It can be passed to people via direct contact with livestock or by drinking unpasteurized milk products from an infected animal. In people, the main symptom is recurrent bouts of high temperature, hence its other name "undulant fever" – and its tendency to be misdiagnosed as drug-resistant malaria in tropical countries. A chronic debilitating disease, it can cause a variety of other symptoms, including joint pain, fatigue and depression. It causes substantial losses to livestock farmers in herds or regions where it is endemic.

Extensive knowledge about pathogenicity, the epidemiology and the factors influencing the probability of infection for a specific disease (e.g. risk factors) are crucial in order to develop accurate risk assessment, simulation model for disease spread (Figure 1), evaluation and optimization of surveillance systems, methodology to evaluate the test strategy or to identify the high-risk strata to conduct a targeted survey.

Not a multidisciplinary but an interdisciplinary approach is requisite with the least assumptions possible.

The main risk factors for bB and bTB can be classified into three levels: animal, herd and region/country. Animal-level risk factors include: age, immunological status, body score condition but also breed and sex. Herd-level risk factors are numerous: history of the disease in the herd or in the farmer's family/employee(s), herd size, type of cattle industry, management, testing strategy, reduced human contact and handling or reduced access to veterinary services. The introduction of newly purchased cattle, animal movements and increased contacts among animals in a herd should be considered as the major risk factors in developed countries, as well as, the impact of wildlife as a reservoir. The role of the environment cannot be neglected either. At the region/country level, bB and bTB prevalences are paramount risk factors, as well as the disease antecedents registered in the area. International trade represents a significant risk of introduction of the disease into a herd, as well as animal movements and increased contacts between animals from different herds. The role played by some wildlife species as maintenance hosts must be emphasised in areas where contacts with domestic cattle are likely to occur, for example, at the proximity of national parks. Globalisation itself may be a risk factor, as worldwide travel of people originating from countries where bovine tuberculosis due to M. bovis is prevalent in cattle increases.

Most of the EU MS are now OBF and OTF. Because these diseases both have public health and international-trade implications, all Member states have an interest in obtaining and to in maintaining this freedom status.

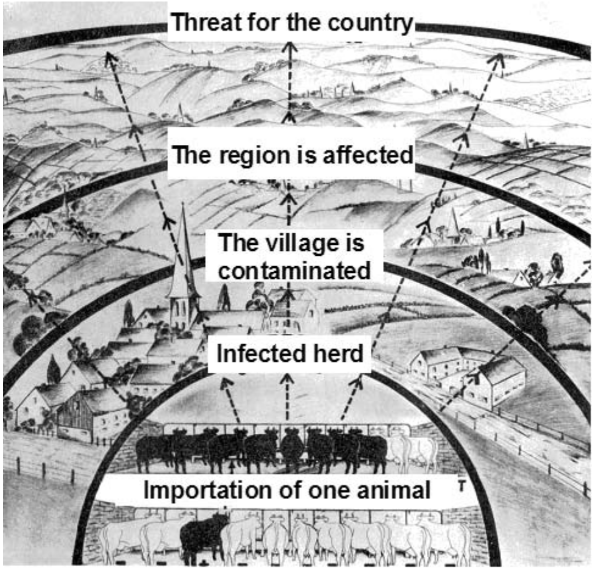

Figure 1. *Illustration of the spread of the disease after importation of an infected cattle (with the courtesy of the Regional association for animal health and identification).*

Risk assessment

Risk assessment is a tool that should be advocated to the World Trade Organisation in the context of trade policy (Agreement on the application of sanitary and phytosanitary measures). The methodology can be also used to assist in the choice of an appropriate national response strategy following an incursion of a(n) (re-)emerging disease. The choice of strategy in the affected regions should be made after an independent, scientific and collective assessment where the range and magnitude of consequences of implementing or of not implementing, measures or surveillance programmes of all susceptible domestic livestock and possibly wildlife are considered (scenario analysis). Such risk assessment should be performed taking into account current scientific knowledge, the particular local situation and uncertainties about the parameters used in the model. In addition decision trees are often used to clarify the path to appropriate measures. Analysis includes evaluation of several parameters such as the probability of exposure to infectious agent and the cost and consequences of application of the specific measure. Further animal movement controls may need to be considered [19, 20].

To illustrate this section, we present two original examples for bB. The first one is dedicated to the development of a quantitative risk assessment for the importation of brucellosis-infected breeding cattle into a Member state from other selected European countries [9] and the second to development of a simulation model of brucellosis spread in a cattle population of a Member state under several testing regimes [2].

The two examples concern Great Britain (GB) that has been declared OFB since 1993. As required by European Union regulation at least 20% of both beef and dairy cattle of more than 24 months of age are to be tested. With the new OFB status of GB the necessity of the level of bB testing is naturally being questioned.

In the first example, a quantitative risk-assessment model was developed to determine the annual risk of importing brucellosis-infected breeding cattle into GB from Northern Ireland and the Republic of Ireland (these countries exported the largest number of cattle into GB and were not brucellosis free during the development of the assessment in 2000). With this assessment, the risk to import brucellosis from Northern Ireland and from the Republic of Ireland was determined: a risk of importing bB every 2.63 and 3.23 years respectively was found. Consequently, policy-makers introduced post-calving testing for all cattle imported into British herds. Such similar decision was also applied in Belgium from 2003 after a qualitative risk assessment and expert's opinion [17, 21]. The risk estimates are sensitive to the uncertainty associated with the surveillance test sensitivities and to the assumed proportion of animals originating from OBF herds but missed during routine surveillance. Other quantitative risk assessments using a deterministic or probabilistic approach were also published (e.g. [12]). The probabilistic approach needs detailed and a larger amount of data [20].

In the second example, a simulation model to determine the rate of brucellosis spread under a variety of testing regimes was developed. If brucellosis should be imported, the reduction of testing level would have a major negative effect on the rate of spread of infection between dairy herds. For beef herds, this reduction would have much less effect. In addition, the notification of an abortion is a very important additional mean of surveillance to reduce the spread of the disease. Consequently, policy-makers decided not to reduce the level of testing and to actively promote abortion notification. The same decisions were also applied to Belgium from 2003 after a qualitative risk assessment and expert's opinion [17, 21].

Evaluation and optimization of surveillance systems for rare and (re)-emerging infectious diseases

Most (re-)emerging infectious diseases, like bB or bTB are zoonoses, affecting both human and several animal populations. Such diseases cause difficulties for veterinary authorities that are confronted not only with animal but also with public health issues. Moreover these diseases are especially challenging because they are initially rare and therefore difficult to detect [6]. Despite the low prevalence of the emerging infectious disease at the time of its' incursion, the surveillance system should be able to detect its' presence as early as possible [6, 19]. Any delay in the detection of the disease compromises the anticipated result of control measures. Indeed, without early detection, emergence can pass unperceived as long as a factor of amplification does not reveal it. Detection is often too late from the risk control point of view. In particular if the disease, before expressing itself clinically, passes through an incubation period, a delayed detection allows its' diffusion into the sensitive population and outside the contaminated areas by means of animal sale. Improvement of identification tools and the swiftness of detection are essential [19].

The key point for early detection is the sensitivity of the surveillance system (e.g. [13, 14, 21]), i.e. the ability to detect an outbreak as soon as possible [6].

In addition, because of decreasing resources for animal health surveillance, current surveillance strategies need to be evaluated and optimized in terms of surveillance performance in relation to costs.

In this section, we present two original examples for bTB [6, 8]. The first one is dedicated to the development of an evaluation and optimization of surveillance systems for bTB and the second to the development of an original and useful methodology to evaluate the skin test practices in different regions or countries. This second example was performed by an anonymous postal questionnaire dispatched to veterinary bovine practitioners [8].

In the first example, using scenario tree modelling, the sensitivity of passive and active surveillance system components can be quantified and an optimal, cost-effective surveillance system developed considering the contributions of each surveillance system components. In Switzerland the surveillance system for bTB consists in meat inspection at the slaughterhouse and in passive clinical surveillance on farms and of human cases (also named continuous surveillance). Thus, in this country, the sensitivity of the clinical surveillance is quite negligible and disease awareness increases the sensitivity of the meat inspection at the slaughterhouse from 56% to 80%. In addition, a hypothetical random survey was also compared with a targeted survey in high-risk strata of the cattle population (herds with contact to wildlife and with a high number of animal movements). The targeted survey seems more appropriated because of its' 1.17-fold increased sensitivity compared to the random survey. This late result confirms that targeted sampling is an appropriated tool for rare or (re-)emerging diseases [17].

Some future prospects

The common concept of zoonoses in the modern World is changing and veterinary public health needs to do likewise. The hazards, the risk and the transmission modes could be changing in time and space. Our understanding is evolving. Food production (including primary production) and food consumption seems also to be changing. We asked why the veterinary profession was not. The veterinary public health needs to be more than a reactive response to human needs; it also needs to have a proactive input [1]. The development and implementation of clinical support tools (passive surveillance), risk assessment, simulation modelling of disease spread, evaluation methods and optimization of surveillance systems are tools that are starting to have a positive influence. However, an accurate operation needs to have good quality assessors in veterinary public health (e.g. knowledge of clinical presentations of diseases, pathogenicity, qualitative and quantitative epidemiology, statistics and the factors influencing the probability of infection for a specific disease).

The fact that passive surveillance is considered of low or negligible sensitivity for the detection of emerging infectious diseases (e.g. [6]) should be taken with caution. In the past, most of the emerging diseases were detected in first instance by passive clinical surveillance performed by veterinary practitioners. Bovine spongiform encephalopathy in 1986 [24] or bluetongue in northern Europe in 2006 [5] are both examples of detection by passive clinical surveillance. In fact passive clinical surveillance is not devoted to one emerging disease but to all potential emerging diseases and merits more attention in the future worldwide. The development of permanent awareness and the training of veterinary practitioners, including field and meat inspectors, would emphasise the great importance of passive clinical surveillance [22]. The development of clinical decision tools would improve early detection of clinically emerging diseases [11, 16]. In addition epidemiology and risk analysis should be included as a basic education for all veterinary and medical students.

Quantitative epidemiology including risk assessment needs a lot of accurate and current (in case of emerging diseases, change is the rule) information data from the veterinary and medical worlds. In this context, communication is crucial. It is a rational process to convey a representative picture of objects or situations when having to perform a concerted action between several partners. Several levels of communication should be maintained (i.e. inside and outside of the epidemiological network). Concerning international trade, a clear, accurate and immediate communication in the framework of animal disease notification is essential to limit the spread of the disease (e.g. World Animal Health Information System) and to ensure the mutual trust between countries. A clear communication about uncertainties in all phases of the decision process is also important.

Risk assessment and the other means described above should be performed by independent scientific assessors. Collective assessments are necessary to minimize the weight in an advice of only one assessor and to taken into account of the interdisciplinary approach. The results of each means described above should therefore be evaluated regularly and performance indicators must be set beforehand. Moreover, the strategy must be adjusted not only depending on the epidemiological situation, but also by taking into account new scientific knowledge (also the rule for emerging infectious diseases).

In the case of re-emerging diseases, it is necessary to improve the knowledge and awareness of these diseases by an effective transmission of experience between mature and young veterinarians, inspectors, assessors and decision makers.

For diseases, such as bB and bTB, an attractive option would be to include worldwide veterinary control/eradication of (re-)emerging diseases in the Millenium Development Goals. The cost-benefit of a worldwide veterinary approach instead of an exclusively human approach would probably be considerably advantageous but worldwide concerted action is essential for such a program to be successful. Finally emerging infectious diseases are a challenge but represent also new opportunities for both veterinarians and physicians.

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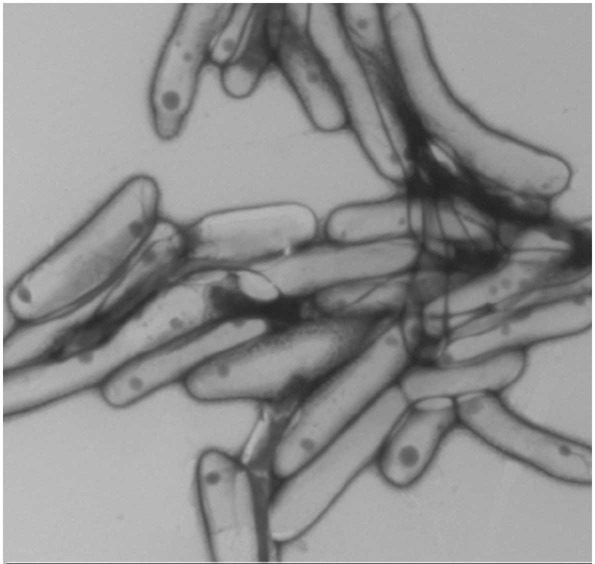

Mycobacterium bovis (Bovine tuberculosis)

Colloquium
"Emerging Animal Diseases:
from science to policy"

Synthesis and conclusions

Synthesis and conclusions – What did we learn today?

X. Van Huffel, FASFC, Brussels

P. Mortier, FASFC, Brussels

Introduction

The Belgian Federal Agency for the Safety of the Food Chain (FASFC), together with its Scientific Committee, took the challenging initiative to organise an international colloquium on "Emerging Animal Diseases".

This colloquium is to be situated in the yearly communication activity of the Scientific Committee of the FASFC where mainly national scientific experts, risk assessors, policy makers, risk managers and stakeholders come together to be informed and discuss a current topic.

This year's topic "Emerging Animal Diseases" – intrinsically unaffected by national borders – inspired the FASFC to aim for an international organisation and audience. Experts in the field of risk assessment and risk management accepted to share us their own vision or the vision of the international body which they represent on emerging animal diseases.

On a worldwide scale many players deal with the subject of "emerging animal diseases". International bodies such as the World Health Organisation (WHO), the World Organisation for Animal Health (OIE), the Food and Agriculture Organisation (FAO), the European Food Safety Authority (EFSA), the European Commission,… are all confronted with emerging risks in general and emerging animal infections in particular. New strategies are in the process of being developed and, on occasions like this, a broader audience, representing many stakeholders of the food chain, is informed about the actual situation and about the future perspectives in regard to emerging animal diseases.

Highlights of the colloquium

The programme of this colloquium was divided into three main parts: risk assessment, risk management and applications to specific animal diseases at risk of emergence or re-emergence.

Theme 1: risk assessment of emerging animal diseases

Dr. Caroline Planté (OIE, Brussels) introduced the subject of this colloquium by explaining the current position of the OIE on the approach of emerging animal diseases. The OIE attaches a great importance to the strengthening of veterinary and public health governance and infrastructure worldwide in order to manage new risks at the human/domestic animal/

wild animal/pathogen interface. Specific guidelines for that purpose are emitted by interdisciplinary advisory groups.

Dr. Lonnie King (CDC, Atlanta) explained the particularities of the driving forces behind animal and human disease emergence and taught us to view disease emergence as a consequence of changing human behaviour and social economic forces creating a new ecology for infectious diseases. In this complex context, attaining optimal health for people, animals and the environment, demands new approaches to risk assessment and management considering the "One World of One Health" principle.

Dr. Hubert Deluyker (EFSA, Parma) explained how EFSA was asked by the European Commission to lead the epidemiological investigations of the 2006 Bluetongue outbreak with the aim to rapidly inform the risk managers on different aspects of the disease. Events like this learned that a pro-active approach has to be developed in order to anticipate emerging risks affecting the food chain. EFSA has taken the initiative to develop a comprehensive methodological approach for the implementation of a Global System for the identification of Food-related Emerging Risks. An Emerging Risk Unit was recently set up by EFSA for this purpose.

Prof. Jean-Pascal Van Ypersele (UCL, Louvain-La-Neuve) made us aware that climate changes are happening now and that impacts as well on human as on animal health should not be underestimated.

Theme 2: Management of emerging animal diseases

Dr. Bernard Van Goethem (EC, Brussels) talked about the EU policy on emerging animal diseases. The EU has made considerable progress in harmonising the measures. The Animal Disease Notification System (ADNS), the SCOFCAH (Standing Committee on the Food Chain and Animal Health) and the Community Veterinary Emergency Team are valuable instruments in that respect. The Commission has launched a new strategy for animal health based on the principle "prevention is better than cure". The aim is to put greater focus on precautionary measures, disease surveillance, controls and research. The action plan is built on different pillars: defining priorities of animal disease risks, developing an EU Animal Health Law, encouraging the on farm bio-security, developing the ADNS towards an ADIS (Animal Disease Information System), improving identification and traceability, improving the surveillance at the EU external borders, reinforcing antigen and vaccine banks, promoting research and innovation in collaboration with the industry, etc….

Dr. Pierre Kerkhofs (CERVA-CODA, Brussels) accentuated the crucial importance of early identification of the responsible pathogen of an emerging disease. Hence the need for a well-functioning animal health network in the field, transmitting crucial information and samples to the first-line diagnostic laboratories and the reference laboratory. The latter needs substantial financial support from the authorities to develop and maintain a high-tech laboratory infrastructure and expertise to enable rapid and sensitive identification of emerging pathogens. Whenever necessary, international collaboration is established with foreign laboratories.

Theme 3: Examples of animal diseases at risk of (re)-emergence

Dr. Frank Koenen (CERVA-CODA, Brussels) talked about the continuous challenge for the animal health sector to prevent re-emergence of classical swine fever. Sporadic outbreaks of this well-known virus occur regularly and the virus mainly persists in the wild boar populations and in backyard pigs in new EU member states. Controlling classical swine fever virus circulation in wild boar by oral vaccination has been shown to be very effective to protect domestic pigs from infection. On farm bio-security measures are also very important to diminish the risk of introduction and spread of the virus into the domestic swine population. Early diagnosis of classical swine fever remains a big challenge however as the virus may circulate in the population for several weeks before being detected.

Dr. Sylvie Lecollinet (AFSSA, Maisons-Alfort) spoke about the zoonotic West-Nile virus infection which has become a major public health and veterinary concern in Europe as well as in the USA. West-Nile virus is maintained in nature through a transmission cycle involving birds and mosquitoes. Humans and other mammals, in particular horses, can become infected. West-Nile virus is probably endemic in parts of Europe with occasional incursions and local outbreaks in areas with favourable conditions. Identifying the risk factors to better understand the West-Nile virus epidemiology may help to better prepare the public and animal health sector. West-Nile virus is difficult to monitor. Harmonization of diagnostic tools and surveillance protocols on a European scale is necessary.

Dr. F. Glyn Davies (FAO) explained that the overwintering of bluetongue virus strain 8 has shown that Culicoides transmitted viruses have the potential to become endemic in countries as far north as the United Kingdom and the Netherlands. Other examples of arthropod-borne viral diseases potentially at risk for introduction in Europe are African Horse Sickness, Lumpy Skin Disease, Rift Valley Fever and Ephemeral Fever, … Dr. Davies recommended contingency planning, risk analysis and active surveillance for each of these highly significant economic disease problems.

Dr. Claude Saegerman (ULg, Liège) discussed two neglected worldwide endemic zoonoses, bovine brucellosis and bovine tuberculosis, and illustrated the usefulness of risk assessment in the case of possible (re)emergence of these diseases in a Member State of the European Union. Two examples of the risk related to the re-emergence of bovine brucellosis were assessed: risk of importation and risk of spread. Consequently policy makers introduced respectively post-calving testing for all imported cattle and abortion notification as management decisions to control outbreaks. In the case of bovine tuberculosis risk assessment led to the decision that targeted sampling is an appropriate tool for early detection of rare or (re)-emerging infectious diseases.

Lessons learned

Many examples of outbreaks of animal diseases (BSE, Foot-and Mouth disease, Classical Swine fever, Avian influenza, Bluetongue,…) have shown the dramatic consequences which those incidents in the food chain may have on society. The time has come to reconsider animal health control plans in the perspective of a global changing world with increased risk of (re)emerging animal diseases in general and emerging zoonoses in particular.

Improved pro-active management of emerging diseases

There is a need for a more pro-active approach to animal disease control. Crisis should be prevented rather than managed. Risk-evaluation procedures need to be applied in order to focus the efforts of policy makers on the diseases with major priority.

The overwintering of bluetongue virus strain 8 has shown that Culicoides transmitted viruses have the potential to become endemic in northern Europe. Other examples of arthropod-borne viral diseases potentially at risk for introduction in Europe have been given. The acquisition of basic knowledge about the characteristics, pathogenesis and risk factors of these emergent diseases has to be encouraged and diagnostic and strategic control plans have to be worked out.

The development of a higher immunological status of the animal (wildlife) population to infectious diseases with major risk of introduction is also important. Strategic vaccine banks have to be build up and new vaccines have to be developed. The public sector and the pharmaceutical industry have to work together in that respect.

Think globally - act locally

It was shown that globalisation, climate change, … have a major impact on human and animal health and on emergence and re-emergence of animal diseases and zoonoses.

The approach of mankind towards emerging diseases has, on one hand, to be on a global scale necessitating an interdisciplinary approach, international collaboration, information exchange and development of trans-boundary control strategies. On the other hand much attention has to be paid to the management of the local situation in regard to animal and public health surveillance, control of the food chain, diagnostic infrastructure, preparedness for crisis situations, rapid decision models,…

A world of one health

Zoonoses have had an important share in the (re)-emergence of infectious diseases during the last decades. The interaction between human and animal health is an important phenomenon to be considered when dealing with emerging diseases.

An interdisciplinary approach in dealing with these new challenges to the animal and public health sector is therefore necessary. An efficient collaboration between the veterinary and medical profession needs to be installed as well in the field, in the administration, in research as in the advisory bodies.

Maintain a high level of laboratory infrastructure, make available efficient diagnostic tools and establish a well-functioning information exchange network

Early diagnosis is the mayor key to successful control and management of emerging diseases. The response capacity of a country towards emerging animal diseases largely depends upon availability of good veterinary infrastructure, expertise, diagnostic laboratories, short decision procedures and good surveillance capabilities as a whole.

Information exchange needs to be encouraged: i.e. GLEWS (Global Early Warning System for animal diseases including zoonoses) a joint OIE/FAO/WHO initiative, aims at improving information exchange on animal disease outbreaks and epidemiological analysis.

Also on a national level there is a great need to have a well functioning disease surveillance network for emerging issues in production animals as well as in wildlife. The animal producer and the practicing veterinary surgeon have a key role in recognizing emerging issues or diseases and in informing – as soon as possible - the public authorities. Vice-versa a constructive relationship between animal and public health officials and professionals in the field has to be established. Adequate continuing education has to be foreseen in order to instruct the professionals in the field to recognize emerging issues and animal diseases. Veterinary schools play an important role in that respect.

Research related to the food chain in general and to animal health in particular is of strategic importance to society

Several speakers addressed the importance of scientific research to study the new challenges facing animal and public health in order to be able to develop a pro-active disease control approach. Research is a vital instrument to build knowledge in order to make substantial progress in the identification of emerging hazards and the understanding of the host/pathogen relationship.

There is an urgent need:

- to better understand the mechanisms that underlie emerging and re-emerging infectious diseases, their epidemiology and transmission dynamics,
- to develop new tools for rapid, massive and global identification of emerging pathogens,
- to develop methods to worldwide observe and predict new global trends which may affect the human/animal/environment bond,
- to study vector ecology, virus reservoirs and pathogens circulating in wildlife,
- to develop new multivalent vaccines and therapeutic molecules,…

As scientific development of new diagnostic tools and veterinary vaccines and drugs is very expensive and as economical benefits in the veterinary and animal sector have been borderline, there is an urgent need for efficient investment of public money in prioritized research topics (especially those dealing with emerging animal diseases and zoonoses, vector transmitted infections or with wildlife associated pathogens), on a European and national scale, in order to give the necessary impulses to the scientific world and the sector. A better coordination of research programmes between different public funders in that respect seems necessary.

Samenvatting

Voor het jaarlijks communicatie event van het Wetenschappelijk Comité van het FAVV werd, in samenwerking met het Directoraat-generaal Controlebeleid, gekozen voor de organisatie van een internationaal colloquium met als thema "Opkomende dierziekten: van wetenschap tot beleid". Het programma was opgebouwd rond drie hoofdthema's: risico-evaluatie van opkomende dierziekten, risicomanagement en voorbeelden van opkomende dierziekten.

Gerenommeerde sprekers werden uitgenodigd om de visie van verschillende internationale organisaties op dit uitdagende thema toe te lichten.

Tijdens het eerste gedeelte kwam het aspect van risico beoordeling van opkomende dierziekten aan bod. Dr. C. Planté (OIE) hechtte veel aandacht aan het wereldwijd versterken van de diergeneeskundige en medische infrastructuur teneinde de nieuwe pathogene organismen die zich manifesteren op het grensvlak tussen mens, huisdier en wilde fauna te beheersen. Dr. L. King (CDC) ging dieper in op de onderliggende oorzaken achter het opkomen van nieuwe ziekten die vaak te maken hebben met sociaal-economische krachten en aanpassingen van het menselijke gedrag. Om in deze context een optimale gezondheid voor mens en dier te kunnen bereiken zijn nieuwe globale benaderingen van risico-evaluatie en risico management noodzakelijk. Dr. H. Deluyker (EFSA) gaf meer uitleg over de coördinerende activiteiten van EFSA bij de risico-evaluatie en epidemiologische studie van de recente Blauwtong uitbraak en benadrukte het belang van een pro-actieve benadering van opkomende gevaren in de voedselketen. EFSA heeft een speciale eenheid opgericht die zich zal bezighouden met opkomende risico's. Prof. J.-P. Van Ypersele (UCL) gaf meer uitleg bij het effect van klimaatverandering op het opkomen van ziekten bij mens en dier.

In het tweede deel werd dieper ingegaan op de aspecten van risico beheer. Dr. B. Van Goethem (EC) sprak over het vernieuwde EU beleid in verband met dierziektebestrijding waarbij het accent zal gelegd worden op een meer preventieve aanpak ondersteund door prioriteitsstelling, een gemoderniseerde regelgeving, betere opsporing en bewaking van dierziekten, waakzaamheid voor opkomende dierziekten en meer aandacht voor wetenschappelijk onderzoek en innovatie. Dr. P. Kerkhofs (CODA) benadrukte het cruciale belang van een vroegtijdige opsporing van opkomende dierziekten waarbij verschillende actoren in de voedselkolom grote verantwoordelijkheid dragen. Goed uitgeruste diagnostische laboratoria spelen hierbij een sleutelrol.

In het derde gedeelte werden enkele voorbeelden toegelicht van opkomende dierzieken. Dr. F. Koenen (CODA) sprak over de voortdurende dreiging die uitgaat van klassieke varkenspest en dit ondermeer als gevolg van persistentie van het virus bij wilde varkens. De vroegtijdige diagnose van klassieke varkenspest blijft bijzonder moeilijk. Hij benadrukte tevens het belang van vaccinatie van de wilde varkenspopulatie. Dr. S. Lecollinet (AFSSA) ging dieper in op het zoönotische West-Nijl virus dat endemisch voorkomt in bepaalde regio's in Europa. Dr. F.G. Davies (FAO) gaf meer uitleg over een ganse reeks van virale dierziekten die via insecten worden overgedragen. De overwintering van het blauwtong virus heeft aangetoond dat de insleep van een aantal exotische

virale dierziekten, die worden overgedragen door Culicoïdes, niet meer denkbeeldig is. Dr. Cl. Saegerman (ULg) ging dieper in op twee endemische zoönotische ziekten met name runderbrucellose en -tuberculose, die al te vaak verwaarloosd worden, en op het belang van risico-evaluatie in het geval van het mogelijk heropkomen van deze ziekten.

Tijdens dit colloquium werden een aantal belangrijke punten onder de aandacht gebracht door de verschillende sprekers.

Opkomende dierziekten (en vooral zoönosen) dreigen in de toekomst meer en meer onze aandacht op te eisen en dit onder andere door een aantal risico factoren die te maken hebben met klimaatverandering, complexere samenleving, meer handel en verkeer, veranderende voedingsgewoonten en levensomstandigheden, …

Het is van groot belang om de nodige instrumenten te ontwikkelen om aan opkomende dierziekten het hoofd te bieden. Het ontwikkelen van een aangepaste strategie dient gericht te zijn op risico-evaluatie, prioritisatie, preventie, waakzaamheid, gegevensuitwisseling, vroegtijdige detectie, efficiënt beheer, kennisontwikkeling, interdisciplinariteit en samenwerking. Het in stand houden of uitbouwen van een goede diergeneeskundige en humaan medische infrastructuur op wereldschaal verdient zeer grote aandacht. Het wetenschappelijk onderzoek speelt een belangrijke rol en dient voldoende financieel ondersteund te worden door de overheden zodat nieuwe strategische kennis kan worden opgedaan over opkomende dierziekten en hun bestrijding. Deze kennis dient snel door te stromen naar de beroepssectoren en in de vorming dient meer aandacht besteed te worden aan opkomende dierziekten.

Résumé

Pour l'événement de communication annuel du Comité scientifique de l'AFSCA, il a été décidé, en collaboration avec la Direction Générale Politique de Contrôle, d'organiser un colloque international intitulé « Maladies animales émergentes : de la science à la politique ». Le programme a été élaboré autour de trois thèmes principaux : l'évaluation des risques des maladies animales émergentes, la gestion de ces risques et des exemples de maladies animales émergentes.

Des orateurs renommés ont été invités afin d'expliquer la vision de diverses organisations internationales sur ce thème d'avenir.

Durant la première partie, l'aspect « évaluation du risque des maladies animales émergentes » a été traité. Dr. C. Planté (OIE) a porté une grande attention au renforcement mondial de l'infrastructure vétérinaire et médicale afin de maîtriser les nouveaux organismes pathogènes qui se manifestent à la frontière entre l'homme, l'animal et la faune sauvage. Dr. L. King (CDC) a approfondi les causes sous-jacentes à l'émergence de nouvelles maladies, qui concernent souvent des aspects socio-économiques et des changements dans le comportement humain. Des approches nouvelles et globales d'évaluation et de gestion du risque sont nécessaires afin de pouvoir atteindre une santé optimale pour l'homme et pour les animaux dans ce contexte. Dr. H. Deluyker (EFSA) a donné plus d'explications sur les activités coordonnées de l'EFSA lors de l'évaluation du risque et de l'étude épidémiologique de l'épidémie récente de Bluetongue, et a insisté sur l'importance d'une approche proactive pour les dangers émergents dans la chaîne alimentaire. L'EFSA a mis en place une unité spéciale qui va s'occuper des risques émergents. Prof. J.-P. Van Ypersele (UCL) a donné plus d'explications sur les effets du changement climatique sur l'émergence de maladies humaines et animales.

Durant la seconde partie, l'aspect « gestion du risque » a été approfondi. Dr. B. Van Goethem (CE) a expliqué la nouvelle politique de l'UE en rapport avec la lutte contre les maladies animales, où l'accent sera mis sur une approche plus préventive soutenue par l'établissement de priorités, une réglementation modernisée, un meilleur dépistage et une meilleure surveillance des maladies animales, une certaine vigilance concernant les maladies animales émergentes et plus d'attention pour la recherche scientifique et l'innovation. Dr. P. Kerkhofs (CERVA) a mis l'accent sur l'importance cruciale d'un dépistage précoce des maladies animales émergentes pour lequel différents acteurs de la chaîne alimentaire jouent un rôle. Des laboratoires de diagnostic bien équipés jouent ici un rôle-clé.

Durant la troisième partie, quelques exemples de maladies animales émergentes ont été discutés. Dr. F. Koenen (CERVA) a expliqué la menace continue émanant de la peste porcine classique et qui est due, entre autres, à la persistance du virus chez les sangliers. Le diagnostic précoce de la peste porcine classique est particulièrement difficile. Il a également mis l'accent sur l'importance de la vaccination des populations de sangliers. Dr. S. Lecollinet (AFSSA) a approfondi le sujet du virus zoonotique West Nile qui est présent sous forme endémique dans certaines régions d'Europe. Dr. F. G. Davies (FAO) a donné plus d'explications sur toute une série de maladies animales d'origine virale et qui sont transmises par des

insectes. La capacité de survie hivernale du virus de la Bluetongue a démontré que l'introduction d'un certain nombre de maladies animales virales exotiques, qui sont transmises par les Culicoïdes, n'est plus illusoire. Dr. Cl. Saegerman (ULg) a approfondi deux maladies zoonotiques endémiques, la brucellose et la tuberculose bovine, qui sont trop souvent négligées, et a démontré l'intérêt de l'évaluation de risque dans le cas d'une éventuelle ré-émergence de ces maladies.

Lors de ce colloque, un certain nombre de points d'attention importants ont été mis en évidence par les différents orateurs.

Les maladies animales émergentes (et principalement les zoonoses) menacent qu'à l'avenir notre attention soit de plus en plus mobilisée par un certain nombre de facteurs de risque liés au changement climatique, une société plus complexe, à davantage de commerce et de transport, à des changements dans les habitudes alimentaires et les conditions de vie, etc.

Il est très important de développer les instruments nécessaires pour faire face aux maladies animales émergentes. Le développement d'une stratégie adaptée doit être basé sur l'évaluation du risque, la prioritisation, la prévention, la vigilance, l'échange d'informations, la détection précoce, la gestion efficace, le développement des connaissances, la pluridisciplinarité et la collaboration. Le maintien ou le développement d'une bonne infrastructure vétérinaire et médicale à l'échelle mondiale mérite une très grande attention. La recherche scientifique joue un rôle important et doit être suffisamment subventionnée par les autorités publiques afin d'acquérir de nouvelles connaissances stratégiques sur les maladies animales émergentes et leur contrôle. Ces connaissances doivent être diffusées rapidement aux secteurs professionnels et, concernant la formation, davantage d'attention doit être prêtée aux maladies animales émergentes.

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