

International health threats and global early warning and response mechanisms

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Summary

The global community continues to incur the high costs of crisis mitigation and emergency response to outbreaks of emerging infectious diseases, such as those caused by the H5N1 highly pathogenic avian influenza virus, Ebola virus, Nipah virus, Zika virus or the Middle East respiratory syndrome coronavirus. These viruses are particularly dangerous in regions associated with poor development indicators and high vulnerability. The drivers of these disease crises include failures in the way that animal diseases are detected and reported and failures in the way in which disease response is implemented by animal health and public health systems. In addition, the lack of a coordinated response hampers disease control efforts.

A comprehensive approach for disease prevention, detection and response, however, requires a coordinated and joint effort among governments, communities, donors and international networks to invest effectively in prevention systems that can identify early signals of the emergence, spillover and spread of animal pathogens at the local level. These signals include trade bans, market closures, civil unrest, heavy rains and droughts associated with climate change, and livestock intensification or changes in consumer behaviour.

The global community needs to increase its investment in early warning and detection systems that can provide information that enables action to be taken at the national, regional and global levels in the event of an outbreak of a transboundary animal disease (TAD). Like any preventive measure, an early warning system requires financial resources, but these are insignificant when compared to the losses that are avoided. Building a global early warning and effective response system for outbreaks is value for money, as the benefits far outweigh the costs.

The goal of the Food and Agriculture Organization of the United Nations (FAO) is to end hunger and poverty, which is a challenging and complex task. Building global capacity to prepare for and respond to TADs is an important element of the FAO's strategic objective to increase the resilience of livelihoods to threats and crises. Each year, livestock, and the people who rely upon them for their livelihoods, are confronted with animal disease and crises. They can strike suddenly, causing obvious illness and death, or emerge insidiously and become well established before becoming apparent. Animal disease emergencies threaten the production of, and access to, food; consequently, one of the FAO's missions is to help countries to prepare for and respond to animal health disasters.

Keywords

Early detection – Early warning – Food and Agriculture Organization of the United Nations – Global health – One Health – Preparedness – Prevention – Response – Surveillance.

Introduction

An early warning system is a mechanism by which any natural disaster or biological hazard is detected and the information is provided to the population at risk to enable them to prevent, or better prepare for, the possible loss of life, livestock and property. A well-informed system is able to respond to disease threats in a timely manner, and a robust early warning system established at all levels reduces the probability of occurrence and/or further spread of disease and mitigates its impact.

Animal diseases have an impact on livestock production, farming systems, people and livelihoods. Recent global outbreaks of diseases, such as foot and mouth disease (FMD), avian influenza, contagious bovine pleuropneumonia (CBPP), and lumpy skin disease, have had unprecedented consequences for livestock keepers, food security and access to markets and trade.

The impact of FMD in endemic regions on four continents has been estimated at between US\$ 6.5 billion and US\$ 21 billion, whilst outbreaks in FMD-free countries and zones cause losses of more than US\$ 1.5 billion a year (1). The annual cost of the bacterial disease CBPP in Africa is estimated at US\$ 61.4 million per year (2). However, when communities receive early warning of possible outbreaks, losses are reduced, as it gives farmers time to be prepared and to potentially harvest some of their products before the outbreak occurs. Therefore, investing in early warning systems not only saves lives and prevents natural hazards, but also saves time and money. As preventing and managing disease risks is such a complex process, community participation is crucial, both at the early stage and during the response.

Diseases are emerging and re-emerging rapidly in different regions and ecosystems due to several different drivers, including deforestation, climate change, social unrest, and changes in land use and agroecology.

We should ask ourselves why, as a global community, we have not been effective at implementing robust global surveillance and an early warning system capable of detecting early signals of disease emergence. Why is it that we continue to incur the high costs of crisis mitigation for infectious diseases, such as those caused by the H5N1 highly pathogenic avian influenza virus, Ebola virus, Nipah virus, Zika virus or the Middle East respiratory syndrome coronavirus, particularly in regions associated with poor development indicators and high vulnerability?

What are the failings of current early warning systems?

One of the answers to this question is that there are numerous failings in the way that animal diseases are detected and the way in which a response is implemented by animal and public health systems. Over the last two decades, there has been a lack of a coordinated response from the animal and public health sectors to many disease crises, including the 2004 H5N1 highly pathogenic avian influenza (HPAI) outbreak. Outbreaks continue to have a heavy impact on affected countries because of failures in the implementation of technical strategies, poor practices and inadequate policies for disease prevention and control.

There are also failures in implementing systems that will enable us to better identify and understand specific drivers of pathogen emergence. An understanding of these drivers can help to promptly identify the action that needs to be taken to tackle the issues at their source or take corrective action so that they will not occur in the future (mitigation). For this, a multidisciplinary approach is required to build a strong network of institutions and coordinate the response to incidents that occur at the complex human–animal–ecosystem interface. This network must include local epidemiologists or public health specialists capable of conducting proper disease outbreak investigations with the support of national or regional laboratory networks.

Public health systems are improving the quality and speed of disease detection, verification and notification by strengthening local capacities in epidemiological analysis and making greater use of open-source analytical tools, geographical information systems and new technologies (e.g. mobile diagnostic devices that enable point-of-care testing).

Disease information is available and is issued every day from the media, social networks, and informal surveillance systems. It is also reported through the official systems of the World Health Organization (WHO) and the World Organisation for Animal Health (OIE). Health information must be considered a public good because of the benefits it provides in the prevention, mitigation and timely response to an event. Under the WHO International Health Regulations (IHR), Member States of WHO have an obligation to notify acute health events that compromise public health. Similarly, in accordance with OIE standards, OIE Member Countries must notify the OIE of any significant epidemiological events within 24 hours of their confirmation. However, public health and veterinary systems often report late and provide poor-quality data; consequently, the international response to health crises is slow.

The rapid spread of lumpy skin disease (LSD) from Africa into Europe in 2015 is just one example of how a livestock disease can spread quickly as a result of slow reporting and poor-quality information. LSD, traditionally endemic in Africa, had in recent decades been moving quickly northwards, spreading into the Middle East region and Europe and posing the threat of further spread. The causes of the untimely reporting and poor-quality data were:

- structural failures in disease surveillance, particularly syndromic surveillance
- a lack of warning systems and diagnostic capacities
- a lack of networks to detect disease and perform proper disease diagnosis
- farmers' fears of the measures that could be implemented (e.g. culling without compensation)
- farmers' lack of confidence in human health and veterinary systems.

Since its re-emergence in northern Greece in early April 2016, and in southern regions of the Russian Federation in May 2016, LSD has been spreading on two fronts. From Greece it has spread northward, with incursions and further spread into Bulgaria, Serbia, Montenegro, Albania and the Former Yugoslav Republic of Macedonia. In the Russian Federation, the disease has spread from south to north and east to west within the country, affecting 15 administrative divisions. In addition, LSD incursion was reported in Kazakhstan, close to the western border with the Russian Federation.

Some examples of human health and animal health events reported recently, and for which a concerted response was needed, are shown in Table I. A concerted response, however, requires a coordinated and joint effort among governments, communities, donors and international networks to invest effectively in prevention systems that can identify early signals of the emergence, spillover and spread of animal pathogens at the local level. These signals include trade bans, market closures, civil unrest, climate change signals such as heavy rains or droughts, and changes in livestock production dynamics or consumer behaviour. Cost-benefit analysis of early warning systems indicates that it is always better to prevent or detect a disease event that has consequences for human or animal health, or both, at an early stage. A bottom-up approach to increase the sensitivity of surveillance and to capture information in real time in the field is required, as this will improve planning and preparedness and facilitate a rapid response to those unexpected and unknown events.

Disease intelligence is required if we are to respond to a disease event in its early stages; consequently, a global and intelligent early warning system is needed to capture and analyse national and regional information, and transform data into information that can be used effectively for the early detection of signals related to the emergence, spillover and spread of disease.

A business-as-usual approach to risk management no longer suffices. Human action (and inaction) are driving the increase in pathogen emergence, spread and persistence at

Table I
Disease events of international concern (animal health and/or human health) in 2014/2016 and timelines for reporting and response

| Disease | Region/country | Date of onset | Date of reporting (official) | Action |
|--------------------------|---|--|--|--|
| Ebola | West Africa (Guinea, Liberia, Sierra Leone) | December 2013 | 21 March 2014 (WHO) 30 March 2014 (WHO) 1 May 2014 (WHO) | On 8 August 2014: the Director-General of WHO declared the EVD outbreak a public health emergency of international concern. Global response April 2015 |
| Lumpy skin disease | Greece | August 2015 | 6 April 2016 (OIE, EU) | Regional response from the European Commission, which provided the vaccine to livestock farmers in Europe |
| H5N1 Nigeria/West Africa | West Africa | 24 December 2014 | 16 January 2015 (OIE) | FAO is providing assistance to Nigeria and other affected and at-risk countries in West Africa |
| Foot and mouth disease | Rodrigues, Mauritius | 9 August 2016 | 17 August 2016 (OIE) | Vaccine provided to respond to outbreaks in a previous FMD-free territory |
| Rift Valley fever | Niger | Human: 2 August 2016 Animal: 4 September 2016 | Human: 30 August 2016 (WHO) Animal: 19 September 2016 (OIE) | WHO and FAO support to response |
| Anthrax | Russian Federation | 16 July 2016 | 5 August 2016 (OIE) | The Government delivered the vaccine to be used in wildlife and livestock around the outbreaks |

EU: European Union
EVD: Ebola virus disease

FAO: Food and Agriculture Organization of the United Nations

FMD: Foot and mouth disease
OIE: World Organisation for Animal Health

WHO: World Health Organization

the human–animal–ecosystem interface, and this causality has to be acknowledged and addressed (3, 4). A more driver-conscious risk assessment entails the consideration of the full chain of causation, from incubation to emergence, spread, persistence and/or recrudescence. Such assessment will enable the required shift to the left on the disease outbreak timeline (Fig. 1) and therefore mitigate the disease impacts (5).

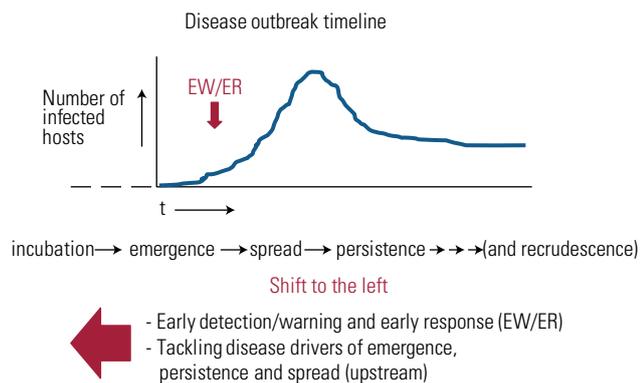


Fig. 1

A new paradigm for disease surveillance/detection

Source: Food and Agriculture Organization of the United Nations (5)

Global animal disease surveillance and reporting systems are notably weak in developing countries due to insufficient resources, limited technical capacities and weak surveillance infrastructure. Evaluations carried out using the OIE Performance of Veterinary Services Tool and Joint External Evaluations under the IHR are two processes that provide an assessment of those capacities, help to identify the gaps, and determine what is needed to make improvements (6).

Another problem with existing surveillance systems is that official disease reporting is limited to diseases which are a priority for a specific country, part of a specific project, or of interest to donors. The lack of incentives for farmers and communities to report animal disease problems affects the amount, quality (e.g. sensitivity and specificity) and timeliness of disease reporting at multiple levels. Moreover, surveillance at the human–animal interface is often neglected or entirely absent.

The consequences of the above-mentioned weakness/limitations have an impact on early warning and effective risk management.

Improving disease surveillance

The FAO provides regular policy and technical advice to countries on how to prevent, control or eradicate animal

diseases. It also assists countries to improve national surveillance, early warning, risk assessment and disease intelligence capacities by providing technical support in the use and development of new and innovative approaches to surveillance. It has developed mobile devices to enhance disease surveillance and rapid reporting and improve communication between stakeholders in the animal health sector. Examples include an SMS alert system to help to combat avian influenza in Bangladesh ('SMS Gateway') and devices based on digital pen technology to facilitate the reporting of priority transboundary diseases in Africa. The latter were introduced in 2008 to provide an innovative way of collecting and sending animal disease surveillance data from remote areas in the field to central epidemiology units for analysis and decision-making. One of the most important devices FAO has developed is the Event Mobile Application (EMA-i), which is an android app for data collection and real-time disease reporting (Fig. 2). EMA-i has been used in some districts of Uganda since 2013 and, recently, a project implemented by FAO on the island of Zanzibar (Tanzania) included the use of EMA-i. A similar project will soon be starting in Mali.

In addition to developing mobile devices, FAO has also introduced some specific approaches for implementing participatory disease surveillance. These approaches have been introduced in Indonesia to support the Veterinary Services to improve the existing disease-reporting system for H5N1 HPAI. Teams trained in the Participatory Disease Surveillance and Response (PDSR) method use a two-step process to diagnose the disease based on clinical case definition and rapid antigen detection. The advantage of this methodology is that it provides



Fig. 2

The Event Mobile Application: EMA-i

The android app developed by the Food and Agriculture Organization of the United Nations for data collection and real-time disease reporting

rapid field diagnosis to enable timely outbreak response. Moreover, this approach is efficient and, above all, it is participatory. Those who report animal disease outbreaks or human cases of zoonotic diseases may not necessarily be professionals, but participating/reporting in this way creates a sense of ownership, and this helps to ensure a more sustainable system.

The FAO has also been involved in supporting the long-term development of national surveillance capacity in countries throughout Asia and Africa through field epidemiology training programmes for veterinarians. Linking veterinary epidemiology and laboratory networks to gather and share disease and non-disease data, as well as linking outbreak information with data related to the pathogen characteristics, can help in describing epidemiological and genetic dynamics in a spatial and temporal context. Strengthening existing national or regional networks promotes rapid detection, information-sharing, the harmonisation of control methodologies and the development of new strategies for disease control (to better consider trans-border threats). It also builds trust among neighbours. Technical networks that bring together institutions across the globe, including FAO/OIE Reference Centres in veterinary epidemiology, risk analysis, bioinformatics or epidemic intelligence, can support this process with expertise and effective training.

The FAO works closely with the OIE and WHO to improve surveillance, as all three organisations recognise that they have a joint responsibility to minimise the health, social and economic impact of diseases arising at the human–animal interface. They do this by working to prevent, detect, control, eliminate and reduce disease risks to humans originating directly or indirectly from domestic or wild animals and their environments. An important aspect of efforts to mitigate potential health threats at the human–animal–ecosystem interface is early warning, supported by robust risk assessment. This will inform decisions and actions and ensure timely communication between agencies and sectors responsible for human health, animal health, wildlife, and food safety. In 2006, in response to health threats such as H5N1 HPAI and severe acute respiratory syndrome (SARS), the three organisations consolidated efforts to establish a Global Early Warning System for Health Threats and Emerging Risks at the Human–Animal–Ecosystems Interface (GLEWS+) (Fig. 3) (7).

GLEWS+ is the successor to the Global Early Warning System for Major Animal Diseases, the system through which the OIE, FAO and WHO have been coordinating their efforts since 2006. The new and improved system has become one of the mechanisms used by the three organisations to monitor data from the existing event-based surveillance systems (e.g. the OIE World Animal Health Information System [WAHIS] and the FAO’s Global



FAO: Food and Agriculture Organization of the United Nations
GLEWS: Global Early Warning System

UN: United Nations
WHO: World Health Organization

Fig. 3
The Joint Global Early Warning System of the World Organisation for Animal Health, the World Health Organization and the Food and Agriculture Organization of the United Nations

Animal Disease Information System [EMPRES-i]) and to track and verify relevant animal and zoonotic events. This mechanism has provided a global platform, hosted by FAO, that brings together expertise, data, functional networks, operational systems and stakeholders to improve inter-organisational coordination and thereby improve support for Member Countries/States in detecting, preventing and controlling threats to health and the food chain. It has reinforced complementarities and synergies, increased harmonisation between the organisations and reduced duplication and gaps. GLEWS+ is a unique cross-sectoral and multidisciplinary collaborative tool for addressing health risks at the human–animal–ecosystem interface. Over the years since its establishment, GLEWS+ has become a powerful mechanism to bring together the information and expertise that exists in the three organisations and associated networks to conduct cross-sectoral, iterative risk assessment when issues emerge at the human–animal–ecosystem interface that would benefit from the agencies working together.

Cross-sectoral collaboration and partnerships, multidisciplinary approaches, development and maintenance of databases containing both health data and risk-factor information related to trade and climate, the development of platforms for sharing information, and the development of tools for surveillance, reporting and design are prerequisites for improving global disease surveillance at all levels and conducting disease intelligence activities and risk assessments that support effective disease prevention.

What are the basic pillars of a functional early warning system for animal disease threats?

Screening of raw data and information

With greater Internet access and use and 24/7 informal reporting networks, information on disease outbreak occurrences is increasingly being shared at the first indication of an event through unofficial channels. Real-time information about infectious disease outbreaks is increasingly found on Web-based platforms. This includes the websites of official disease-reporting organisations such as the OIE, but also includes social media sites, ranging from blogs and individual accounts on chat rooms to informal news and unofficial information collected and disseminated by the public (8). The Program for Monitoring Emerging Diseases (ProMED-mail) and the Global Public Health Intelligence Network (GPHIN) are two examples of non-official systems.

One of the first steps in the disease intelligence activities of organisations such as FAO, the OIE and WHO is to systematically screen and review all the disease information that they receive, be it official reports submitted by Member Countries/States or the data they generate themselves, either by implementing technical projects and capacity-building activities or tracking rumours of disease on the Internet and in newspapers. This process of the systematic screening of information increases the sensitivity of an early warning system and its ability to provide timely information to users for better planning and response. As part of their screening activities, the OIE and FAO track rumours in several languages and verify disease events with their respective networks on a daily basis. The FAO regularly tracks and verifies disease events that can potentially affect livestock production, human health, food safety, food security and livelihoods through a network of 194 Member States and FAO representations. In addition, a triage mechanism with specific criteria is in place to decide whether or not an event requires additional analysis. If it is decided that more information is needed, a risk assessment will be performed. If the assessment shows that action is required to prevent disease dissemination or further spread, FAO will provide early warning of the risk to Ministries of Agriculture and Livestock Development worldwide.

Triage of relevant information and risk assessment

An important step in an early warning process is to avoid overwhelming the system with unnecessary information by carefully selecting the data that need additional analysis or information. Data analysis and epidemiological interpretation must be focused on detecting abnormal events and associated risk factors that may cause disease in animals or humans or changes in morbidity and mortality rates.

The GLEWS+ framework has been providing FAO, the OIE, and WHO with health event information since its inception and serves as a mechanism for information-sharing and verification. So far, risks associated with these health events have been assessed according to immediate needs (i.e. the need to know if a specific health event poses a threat to livestock production and trade). These assessments have taken place on an *ad hoc* and informal basis, but a systematic and standard process for risk assessment should be in place in order to have a consistent, structured and harmonised approach that allows robust and timely assessments to be carried out. The FAO is intending to develop a standard procedure and to provide countries with guidance, training and tools that will enable them to conduct a rapid risk assessment (RRA) for animal health events. This will contribute to the development of joint risk assessment guidelines within the GLEWS+ framework.

Risk assessment is a powerful tool for evaluating the likelihood of the entry, establishment and spread of a hazard and assessing the likely biological and economic consequences. Rapid risk assessment is the evaluation (often qualitative) of the likelihood that an event will present an urgent threat for animal/human health. An RRA is typically delivered in a few hours (24–48 hours) or several days (1–2 weeks) and it aims at providing decision-makers with useful science-based information that will enable them to properly identify and select the most efficient/effective management (prevention or control) measures.

The steps proposed by FAO for conducting an RRA are as follows (Fig. 4):

- Evaluate whether or not an observed threat requires risk assessment and, if it does, identify the type of assessment needed. A standardised triage algorithm (Table II) has to be followed for performing this first preliminary evaluation.
- Establish a risk assessment team.
- Formulate risk questions, taking into consideration the risk management needs and the necessity of providing useful and practical indications for the control or prevention of the risk. A risk profile is a useful tool for facilitating the formulation of appropriate risk questions.
- Formulate related sub-questions (specifying the types of data required for each one), draw up a list of possible data sources and consider which data analysis methods should be used.

- Perform a literature review and collect data in order to identify possible values (and ranges/intervals) of those variables identified in the previous step.

- Carry out the risk assessment. All members of the risk assessment team must be involved. Expert knowledge elicitation (EKE), with local, regional and global experts, can be used at this step to fill possible data gaps and/or to estimate the values of the final risk for each sub-question.

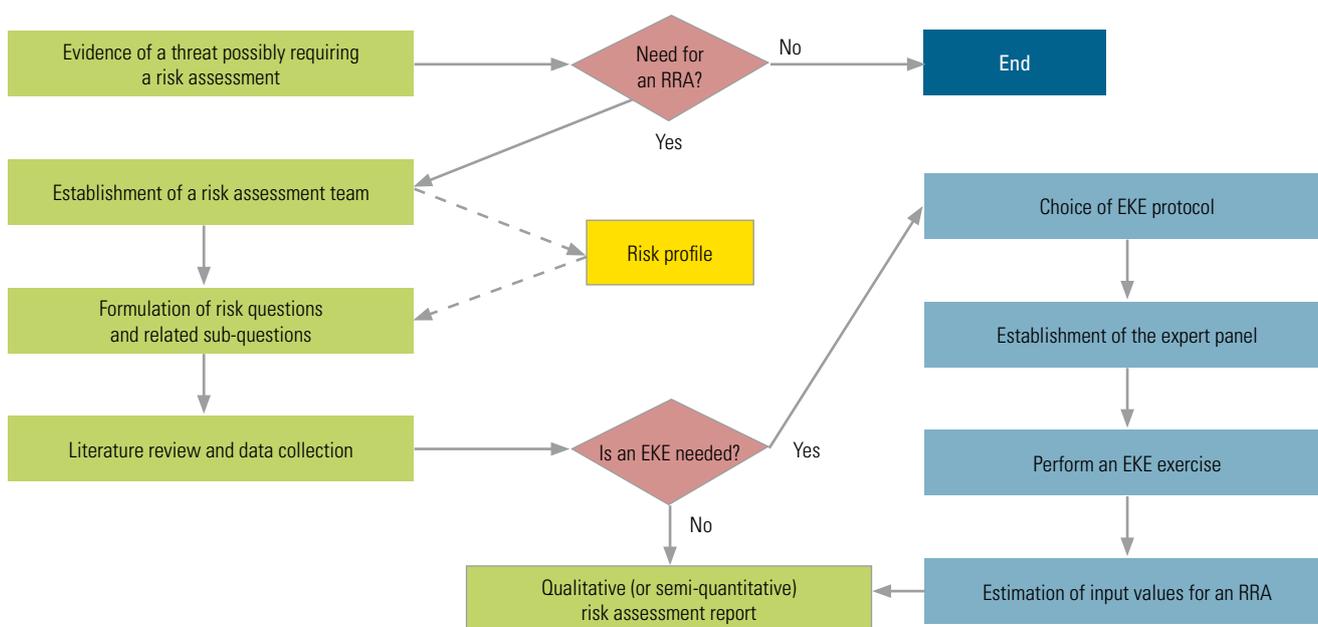
- Prepare the draft report of the risk assessment for internal and external revisions. In this phase, the source of uncertainties related to the input data and the methodology used must be assessed. A clear list of assumptions on which the assessment is based must be provided.

- Prepare the final report for official endorsement.

A consequence assessment is an important step in risk assessment, and the impact on public health, livestock, food safety, security and livelihoods needs to be assessed and documented. Consequence assessment (i.e. an evaluation of the impact of the threat on production, health, environment, etc.) can be expressed in qualitative terms.

Alert/early warning

Early warning is the process of rapidly detecting disease phenomena with the potential to have serious socio-economic consequences or to be an international public



EKE: expert knowledge elicitation
 RRA: rapid risk assessment

Fig. 4
Proposed steps for conducting a rapid risk assessment (Food and Agriculture Organization of the United Nations)

Table II
Triage criteria for the evaluation of the need for a rapid risk assessment (RRA) for a health threat

| Criteria | Scoring (Yes = 1; No = 0) |
|---|--|
| 1. Relevance of the information sources | |
| Has the event been reported or confirmed by an official source (e.g. animal health authorities, FAO offices, OIE, WHO, etc.)? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has the event been reported by multiple independent sources (e.g. media, animal health authorities, FAO offices, OIE, WHO, etc.)? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Does the event description include details about time, place and animal/human population(s) involved? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Sub-total score (minimum to proceed with the RRA = 1): | |
| 2. Relevance of the disease | |
| Has the international spread of the disease (via live animals or their products, vectors or fomites) been proven? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Is it a zoonosis associated with severe consequences for public health? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has the disease been shown to have a significant impact on the health of domestic animals at multi-country level? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has the disease been shown to have a significant impact on animal production and/or trade with possible detrimental economic consequences for the affected countries? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has the disease been shown to have a significant impact on the health of wildlife, or on the environment, including biodiversity? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has the causative agent developed resistance to treatments and therefore become a significant danger to public and/or animal health? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Sub-total score (minimum to proceed with the RRA = 3): | |
| 3. Relevance of the event | |
| Is the event possibly linked to the evolution or change of an existing disease agent? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Is the event related to a known disease spreading to a new geographic area, species or population? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Is the event related to a known disease occurring with an increased incidence or morbidity in host population(s)? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Is the event caused by an unrecognised or a previously unrecognised disease agent? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Is the disease affecting vulnerable groups of the population, e.g. infants or the elderly, who are or are likely to be disproportionately affected? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Is the event characterised by a high actual or potential level of media interest or public concern? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Sub-total score (minimum to proceed with the RRA = 1): | |
| Total score = | |

FAO: Food and Agriculture Organization of the United Nations
 OIE: World Organisation for Animal Health
 WHO: World Health Organization

health concern and alerting those who are likely to be affected so that they can ensure an adequate and timely response. The OIE's early warning system disseminates information on outbreaks of OIE-listed diseases that it receives from Member Countries, which send immediate notifications of significant epidemiological events and provide follow-up reports on the development of the situation. The FAO's Early Warning System activities include the communication of messages and alerts by using different mechanisms. These include technical reports and risk assessments that recommend specific action that national animal health authorities can take to enhance prevention, preparedness and contingency planning for potential outbreaks occurring in animal populations.

Early warning systems should be action oriented and should focus on prompting a rapid response. Early warning

messages sent by national, regional and international organisations include recommendations on how to respond to the event; these recommendations should be implemented as quickly as possible. The recommended actions may include carrying out rapid disease outbreak investigations, delivering veterinary drugs (including vaccines) or establishing good emergency management practice (GEMP) for animal disease control. Action should also be taken to gather additional information in order to monitor the evolution and impact of the disease event. All this is part of the overall response, and early warning should be seen as a key component of a systematic response for health threats at the human–animal–ecosystem interface.

Risk communication is an essential component of early warning, and the audience and message should be carefully designed when an early warning message is released

by a competent authority or regional or international organisation.

Effective response

Following the international concern over the potential H5N1 HPAI pandemic in 2004, FAO and the OIE decided to join together to form the Crisis Management Centre – Animal Health (CMC–AH). The purpose of the Centre, which was officially established in 2006, is to increase the capacity of animal disease emergency management at the global level, and provide timely support to countries preparing for or experiencing animal health emergencies. Affected countries require support in containing animal disease outbreaks, as well as preparing for future emergencies. If not addressed, diseases affecting animal populations can have a devastating impact on livelihoods, trade and food security. The CMC–AH is a valuable resource for FAO and OIE Member States/Countries that must implement an emergency response to eradicate the incursion of TADs or zoonoses and prevent their spread.

The CMC–AH consults experts from around the world who can help to prepare for and manage outbreaks of animal diseases such as HPAI, FMD, Rift Valley fever, peste des petits ruminants, classical swine fever, African swine fever, rabies and many others. As of September 2016, the CMC–AH had deployed a total of 84 missions in support of 45 countries in Asia, Africa, the Near East and Latin America. Approximately 46% of missions were associated with zoonotic HPAI, 20% with other zoonoses and 34% with other TADs (9).

The CMC–AH continually monitors the global animal disease situation (predominantly through disease intelligence provided by FAO/GLEWS) and plans potential deployments when animal disease emergencies appear imminent. Following a government request for assistance, the Centre is capable of responding and fielding missions quickly. By consulting the most suitable experts from the world’s leading international institutions, the CMC–AH provides rapid and targeted assistance to help to assess the situation and deliver immediate recommendations. The CMC–AH deploys multidisciplinary teams of experts to provide technical and operational assistance to affected governments so that they may, in turn, better control outbreaks or prevent disease spread. Missions are designed to assess the epidemiological situation and diagnostics and provide prevention and control strategies through practical recommendations and resource mobilisation.

The collaboration between FAO, the OIE and their partners is essential for effective CMC–AH operations. The FAO and the OIE work closely with WHO for a ‘One Health’ approach in the event of a zoonotic disease outbreak. Complex disease emergencies often require a coordinated,

multidisciplinary response. Mission teams deployed in the field work hand in hand with governments, laboratories, the private sector and regional organisations. The mission teams also consider the transition that is needed to move from emergency response to medium- and long-term recovery efforts. The FAO helps to facilitate the mobilisation of local and international resources for follow-up projects in affected countries that need continued assistance to rapidly implement recommendations. Although specific options and results often vary from country to country, in many cases CMC–AH missions have facilitated improvements in legislation related to One Health and disease response and surveillance. They have also enabled improvements in Veterinary Services and governance, including the enhancement of public–private collaboration.

The CMC–AH supports the FAO’s strategic objectives by assisting countries to increase the resilience of households, communities and institutions, thereby enabling them to more effectively prevent and cope with threats and disasters that impact agriculture, food security and nutrition.

Preparedness

The FAO advocates the adoption of best practices and actively supports countries to improve preparedness. The CMC–AH joins this effort by training countries to prepare for animal health emergencies and facilitating FAO workshops that provide training in GEMP (Fig. 5).

The GEMP approach to the management of disease emergencies was created to promote better practices in preparing for and responding to animal disease outbreaks.

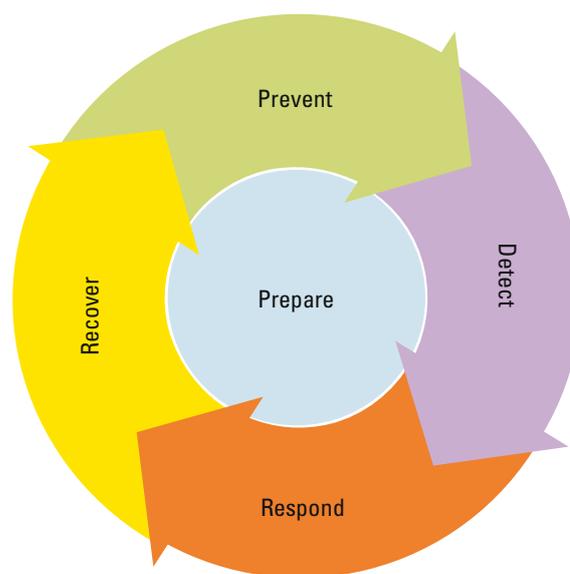


Fig. 5
The phases of good emergency management practice

This concept was developed under the One Health banner. The FAO guide *Good Emergency Management Practice: the Essentials* is used as a tool for workshops on animal disease emergency preparedness and response that are run by FAO offices and international partners as part of disease outbreak support (10). From 2011 to 2016, a total of 24 workshops were conducted across Africa, Asia and the Middle East, involving 685 trainees from 58 different countries. The target group for this training should include not only animal health professionals but also policy-makers and communities at large. Since the nature of risks and problems changes from time to time, the training process should be dynamic so as to respond to the emerging threats or prevailing trends.

Preparedness planning is essential in sustaining human and animal health, food security and food safety and may be essential to a country's ability to participate in the international trade of animals and animal products. The CMC-AH, in collaboration with FAO regional, sub-regional and country offices, as well as with other partners, conducts GEMP workshops at both the regional and national levels. These workshops are conducted over two-and-a-half to three days and are divided into modules, including group discussions and simulation exercises. They are designed to provide an opportunity to improve country preparedness plans for priority diseases (including zoonoses) and, consequently, equip the trainees with a reference guide for early warning, preparedness and outbreak response during the emergencies. Veterinarians and other professionals involved, either directly or indirectly, in the emergency management of disease outbreaks of concern are the target point for these workshops.

Different topics are developed during the training, all of which are based on the five phases of the cycle of good emergency management planning and disease control: prepare, prevent, detect, respond, and recover.

After completing the training, all participants are expected to be equipped with the fundamental skills and knowledge needed for disease emergency preparedness and planning. They should be able to effectively respond to and control animal diseases within their home countries, using better-designed contingency plans and specific related standard operating procedures (SOPs). Specifically, they should be able to:

- understand GEMP principles and key elements of an emergency preparedness plan
- create awareness of the key components of a contingency plan and operations manuals
- identify the appropriate roles and responsibilities of an emergency management system

- adapt GEMP principles for use at the country level
- promote the implementation of GEMP principles in their respective countries.

The GEMP approach provides a solid foundation from which to build additional preparedness tools. FAO Member States have identified the type of support they need to help to increase their resilience to existing or potential animal health threats. The CMC-AH vision is to provide technical and operational support to assist countries to better define, draft, propose and test contingency plans and related SOPs; increase capacity-building in the risk analysis process by providing training in risk assessment and risk communication; establish and test emergency operation centres; and increase resource mobilisation. These activities will be carried out using a GEMP+ approach in parallel with traditional GEMP training at the regional or national level.

Recommendations/conclusions

Even with global initiatives such as GLEWS+ and the proliferation of informal reporting systems such as ProMED-mail, EPI Core (<https://epicore.org/#/home>), GPHIN and Health Map (www.healthmap.org), there are still important gaps in the global knowledge of animal diseases, disease reporting and the context in which diseases occur. The diseases that are reported are just the tip of the iceberg. Technology, communication and reporting incentives, such as compensation, can help to give us a better understanding of the true disease situation and the real risks and associated drivers of emergence and spread. The lack of sensitivity and specificity in national surveillance systems, together with the absence of real incentives for stakeholders to report animal and human health events, results in delays in disease detection. The lack of political will and of support for sharing and reporting disease information makes this process very complex. The global community needs to invest in local early warning systems that can provide information for national, regional and global action in the event of an outbreak of a transboundary disease. Like any preventive measure, early warning systems require financial resources, but the sums needed are insignificant when compared to the losses that are avoided. Building on global early warning and effective response systems for outbreaks is value for money, as the benefits of such systems far outweigh the costs.

Early warning requires good coordination at all levels and this requires a global partnership that is given enough authority and funding to be effective. Early warning systems should be supported by regulatory frameworks, legislation and institutions and provided with the resources they need to enable fast decision-making at the national, regional and global levels. One of the challenges in developing

early warning systems is to expand investment in research and development and clarify regulatory pathways for developing new tools and approaches. Another challenge is to improve detection and develop new laboratory systems, including scalable everyday systems that can be expanded during an epidemic. To meet these challenges, it will be necessary to train personnel and volunteers, strengthen health systems in low- and middle-income countries, and carry out preparedness exercises to identify the ways in which the response system needs to improve. Communication between partners is essential for an effective and timely response in the field. In addition, coordination between agencies at the national level and cooperation with regional bodies or international agencies, such as the OIE, FAO or WHO, play an important role in ensuring the effectiveness of the response efforts. To make a response mechanism sustainable and effective, the main actors in providing the prompt response should be under the authority of public/animal health systems supported by the existing mechanisms of regional and/or international organisations such as WHO, FAO and the OIE. The private sector also plays a determining role. Another key element of an effective response mechanism is providing the public, farmers, livestock transporters, and other stakeholders along the food value chain with timely messages on good prevention/mitigation.

In summary, an early warning system should be both sensitive and specific. Out of the thousands of threats it detects, it must be able to identify those that require further verification and analysis in the form of a risk assessment that evaluates the context and dynamics of the threat. This provides early warning of the risks for people, animals and ecosystems and enables an effective response tailored to the socio-economic context in which these events occur. Focusing on understanding the drivers of disease emergence will help to anticipate the occurrence of disease threats and improve preparedness.

Good communication throughout this process between all the actors involved is essential. It is important to target specific audiences with the right messages to ensure practical behavioural changes that will lead to effective prevention and mitigation efforts.

Achieving FAO's goal of ending hunger and poverty is a challenging and complex task. Building global capacity to prepare for and respond to TADs is an important element of the FAO's strategic objective to increase community resilience to threats and crises. Each year, livestock, and the people who rely upon them for their livelihoods, are confronted with animal disease and crises. They can strike suddenly, causing obvious illness and death, or emerge insidiously and become well established before becoming apparent. Animal disease emergencies threaten the production of, and access to, food. The FAO's mission is to help countries to prepare for and respond to animal health disasters, and global surveillance, early warning and response mechanisms are key to ensuring that it can carry out this mission effectively.

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Les menaces sanitaires de portée internationale et les mécanismes mondiaux d'alerte précoce et de réponse

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Résumé

La communauté mondiale continue à supporter le coût élevé de l'atténuation des crises ainsi que des réponses apportées en urgence aux foyers de maladies infectieuses émergentes, par exemple les infections dues au virus H5N1 de l'influenza aviaire hautement pathogène, au virus Ebola, au virus Nipah, au virus Zika ou au coronavirus responsable du syndrome respiratoire du Moyen-Orient. Ces virus sont particulièrement dangereux dans les régions les plus vulnérables et dont les indicateurs de développement sont bas. Les défaillances dans la détection et la notification des maladies animales jouent un rôle déterminant dans ces crises sanitaires, de même que l'incapacité des systèmes de santé animale et publique à mettre en œuvre une réponse sanitaire appropriée. En outre, l'absence de coordination dans les réponses apportées affaiblit les efforts pour lutter contre les maladies.

La mise en place d'une méthode de prévention, de détection et de réponse intégrée face aux maladies exige que les gouvernements, les communautés, les donateurs et les réseaux internationaux associent leurs efforts et se concertent afin d'investir efficacement dans des systèmes de prévention capables de détecter à l'échelle locale les tout premiers signes d'émergence d'un agent pathogène chez les animaux, de sa transmission à d'autres espèces et de sa propagation. Parmi ces signes révélateurs on peut citer certaines interdictions d'importer, mais aussi la fermeture des marchés, l'existence de troubles civils, les changements climatiques tels que de fortes précipitations ou une sécheresse prolongée et la modification de certaines tendances en production animale ou du comportement des consommateurs.

La communauté mondiale doit investir davantage dans des systèmes d'alerte précoce et de détection afin d'obtenir l'information nécessaire pour prendre des mesures appropriées, à l'échelle nationale, régionale et mondiale, en cas d'apparition d'une maladie animale transfrontalière. Comme toute mesure de prévention, les systèmes d'alerte précoce doivent être correctement financés, mais cet effort est insignifiant lorsqu'on le compare aux pertes qu'il permet d'éviter. La création d'un système mondial d'alerte précoce et de réponse en cas de foyers constitue un investissement rentable, qui génère des bénéfices bien supérieurs à ses coûts.

L'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) a pour objectif de mettre un terme à la faim et à la pauvreté dans le monde, ce qui constitue une tâche complexe et difficile. Le renforcement des capacités mondiales de préparation et de réponse en cas de maladies animales transfrontalières est un aspect important des objectifs stratégiques de la FAO visant à accroître la résilience des moyens d'existence face aux crises et aux menaces. Chaque année, le cheptel domestique et les personnes qui en tirent leur subsistance sont confrontés à des maladies animales et à des crises sanitaires. Celles-ci peuvent se déchaîner brutalement et présenter un tableau clair de morbidité et de mortalité, ou bien émerger de manière insidieuse et se propager avant l'apparition de signes manifestes. Puisque la production et l'accès aux denrées alimentaires sont menacés par les catastrophes sanitaires dues aux maladies animales, l'une des missions de la FAO consiste à aider les pays à répondre à ces catastrophes et à s'y préparer.

Mots-clés

Alerte précoce – Détection précoce – Organisation des Nations Unies pour l'alimentation et l'agriculture – Préparation – Prévention – Réponse – Santé mondiale – Surveillance – Une seule santé.



Amenazas sanitarias internacionales y mecanismos mundiales de alerta y respuesta rápidas

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Resumen

La comunidad mundial sigue soportando los elevados costos de las actividades de atenuación de crisis y de respuesta de emergencia ante brotes de enfermedades infecciosas emergentes como los causados por el virus de la influenza aviar altamente patógena H5N1, el del Ébola, el Nipah, el Zika o el coronavirus del síndrome respiratorio de Oriente Medio. Estos virus resultan especialmente peligrosos en regiones que presentan indicadores de desarrollo mediocres y un elevado nivel de vulnerabilidad. Entre los factores que subyacen a estas crisis sanitarias están las deficiencias en la forma de detectar y comunicar estas enfermedades y la inadecuada aplicación de medidas de respuesta por parte de los sistemas de salud pública y sanidad animal. Por añadidura, la ausencia de una respuesta coordinada lastra también las actividades de lucha.

Un trabajo integral de prevención y detección de enfermedades y de respuesta a ellas exige sin embargo un esfuerzo coordinado y conjunto de gobiernos, poblaciones, donantes y redes internacionales para invertir eficazmente en sistemas de prevención que sirvan para detectar las señales precoces de aparición, extensión y propagación de patógenos animales a nivel local, señales como prohibiciones comerciales, cierres de mercados, desórdenes civiles, cambios climáticos como lluvias o sequías intensas o modificación de la dinámica de producción ganadera o los patrones de consumo.

La comunidad mundial debe invertir en mayor medida en sistemas de alerta y detección rápidas que aporten información que pueda traducirse en acciones de ámbito nacional, regional y mundial en caso de brote de una enfermedad animal transfronteriza. Como toda medida de carácter preventivo, un sistema de alerta rápida requiere recursos económicos, pero su cuantía resulta insignificante en comparación con las pérdidas que se evitan. La construcción de un sistema mundial de alerta rápida y respuesta eficaz en caso de brote ofrece gran rentabilidad, por cuanto los beneficios superan holgadamente los costos.

La Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO) persigue el objetivo de poner fin al hambre y la pobreza, empresa harto difícil y compleja. Dotar al mundo de la capacidad de preparación y respuesta ante enfermedades animales transfronterizas es un elemento importante del objetivo estratégico de la FAO de lograr que los medios de sustento gocen de mayor resiliencia ante crisis y amenazas. Cada año, los rebaños de animales domésticos y las personas que dependen de ellos para vivir hacen frente a enfermedades y crisis zoonos sanitarias, que pueden golpear de forma súbita y extender abiertamente la enfermedad y la muerte o, por el contrario, surgir insidiosamente y arraigar antes de que su presencia resulte patente. Las emergencias zoonos sanitarias hacen peligrar la producción de alimentos y el acceso a ellos. Una de las misiones de la FAO, por consiguiente, es la de ayudar a los países a prepararse para episodios de catástrofe zoonos sanitaria y a responder a este tipo de eventos cuando se produzcan.

Palabras clave

Alerta rápida – Detección precoz – Organización de las Naciones Unidas para la Alimentación y la Agricultura – Preparación – Prevención – Respuesta – Salud mundial – Una sola salud – Vigilancia.



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