

# TOWARDS A SAFER WORLD

## ANIMAL HEALTH AND BIOSECURITY

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### INTRODUCTION

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Pandemics, most of which have their origins in animal (non-human) species, are epidemic of infectious disease that spread through human populations across large region such as a continent, or even worldwide. Their impact in terms of health, economic and social consequences can be disastrous. There have been a number of significant pandemics recorded in human history but the frequency and impact of emerging and re-emerging animal diseases have increased over the past decades – 75 percent of emerging infectious diseases in humans have their origin in animals (and of these, wildlife represents the vast majority). There is global recognition that more animal-borne diseases can be expected in the future and handling the infectious uncertainty has become an imperative.

Increased threats to human and animal health are triggered by multiple, interrelated global factors driven by human behaviour (including processes in human and animal population demography, climatic change, increased mobility and globalization, amplified urbanization and land degradation, misuse of pharmaceuticals leading to resistance, and monoculture of domestic breeds over previously genetically diverse populations). The intensification of livestock production, the concentration of intensive production systems in close proximity to urban population centres observed in some countries, and husbandry practices with inadequate biosecurity all contribute to the emergence of diseases and their transmission, both among animals and to humans. These factors influence the dynamics of viral pathogens which adopt new behaviours such as expanding geo-ecological range, jumping species and/or changing to a higher level of virulence. It is this unpredictable nature of viral pathogens that renders all the more serious their pandemic potential.

This paper in the Towards a Safer World Initiative series provides an overview of how to approach the issue of dealing with diseases of pandemic potential and aims to identify and communicate achievements to a broad audience so that the lessons learned in facing the problem are applied locally, nationally, regionally and globally to avoid and, where necessary, deal with disasters that could give rise to a pandemic and potentially disrupt critical services.

It is based largely on experience gained with highly pathogenic avian influenza (HPAI) H5N1 because that experience helped focused attention on a number of critical factors related to the prevention, surveillance, analysis, reporting and response activities that can help improve preparedness:

- it triggered widespread interest in and attention to the concept of biosecurity.
- it generated a move towards a ‘whole of society’ approach where government, civil society, business and international organisations are involved in preparedness and response.
- it acted as a catalyst for approaching zoonoses with pandemic potential from the point of view of dealing with disease at the human-animal-ecosystems interface.

## CAPACITY TO PLAN AND COORDINATE

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Planning, including the development and approval of contingency plans for identified high-threat diseases, not only enables animal health services to be far better technically equipped to cope with a disease emergency, but also allows decisions to be made at a political level more rapidly. The HPAI crisis has generated initiatives at national and regional and global level for better planning and also better coordination.

The 'Assessment of Outcomes and Impacts of the Global Response to Avian Influenza' commissioned by the European Commission dated August 2010 shows that internationally, there has been good coordination at all levels in regard to the complex multisectoral and global nature of avian and pandemic influenza and the inherent involvement of multiple actors for effective results. The global strategy proposed by FAO, OIE and WHO at their joint conference with the World Bank on 'Avian Influenza and Human Pandemic Influenza' in Geneva in November 2005 and revised through various follow-up technical meetings was met with good political endorsement and major financial mobilization through a series of pledging meetings. It ensured high level global political engagement, as defined in the Beijing Declaration of January 2006. It led to a strong and sustained commitment and collaboration by the international community and key crisis response partners, particularly, the European Commission and the United States, but also Australia, Japan and the multilateral and regional banks.

One of the major achievements triggered by the avian influenza crisis has been the creation of multidisciplinary task forces in many countries. The establishment of national task forces or committees with technical sub-groups has improved mechanisms for coordination to ensure the inclusive and coherent involvement of all necessary actors and sectors in the definition and implementation of national strategies. Such tools have been adopted almost worldwide and have significantly enhanced:

- high level political attention and involvement with direct links to prime ministerial level in times of emergency.
- collaboration between Ministries of Agriculture and Health and a comprehensive approach from the animal and public health sectors.
- additional attention to the need for effective and harmonized public and programme communication.
- single nationally-owned strategies to tackle a multisectoral problem, where there is room for support from all actors, while avoiding incoherency and duplication.

Both political drivers and the UN system strongly supported these processes. In Asia, for example, UN Resident Coordinator Offices, supported by the United Nations System Influenza Coordination Office (UNSIIC), have been instrumental in helping provide government and partner task forces with coordinated and inclusive approaches as well as improve information sharing between them. In this context, avian and pandemic influenza has been used as a case study to define good practices of, and guidance for, UN support to coordination at country level. With the help of the World Bank, response partners and the United Nations, national plans were budgeted in detail and response partners invited to pledge in order to ensure cost efficiency through coordinated financial support.

Within countries there has been a level of inter-sectoral collaboration and coordination between national entities and response partners that had not existed before.

## CAPACITY TO RESPOND

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Preparedness is essentially all about our capacity to respond, that is about our readiness to act when an emergency occurs. In the event of a pandemic, it is clear that all attention and efforts will be focused on the response mechanism we have in place and over the last five years, thanks to the major efforts made to combat animal-based diseases with pandemic potential, our readiness to act has witnessed significant improvements.

### ‘WHOLE OF SOCIETY’ APPROACH

In response – as in tracking, finding and preventing disease – an efficient, effective and continuous partnership between the public and private sector is essential (referred to in this document as the ‘whole of society’ approach), and a key factor in designing the best response to an outbreak is ensuring that all stakeholders are convinced that their best interests are being taken care of (the ‘what’s in it for me’ factor).

The approach used in tackling avian influenza in Nigeria is a good example of a successful ‘whole of society’ approach. Nigeria notified its first outbreak of HPAI in February 2006 and there were all the signs that the disease could become enzootic, given the country’s high human population density, different poultry production systems in cohabitation, wildlife, large numbers of migratory birds and live bird markets, among others. However, there has been no further notification of HPAI outbreaks since July 2008.

#### COMBATING H5N1 HPAI IN NIGERIA

In February 2006, the first outbreak of HPAI was confirmed by Nigeria’s Chief Veterinary Officer (CVO). The Nigerian government implemented a series of activities to control the disease and it was also decided to seek assistance from the international community to conduct surveillance activities and stockpile personal protective equipment (PPE).

The government, through the President in person and various ministries (the Ministry of Agriculture in particular), engaged in HPAI control without reservation, making resources and time available in a prompt manner. These authorities were instrumental in the enforcement of culling, a plan which was generally unpopular and new to Nigeria, but which was revised as soon as it was realized that the initial plan to compensate farmers for loss of animals had its limitations. Revision of the compensation plan to render it acceptable to the private sector was probably the main instrument that induced producers to report suspected cases and was a key factor in engaging all levels of society in disease response.

The rapid establishment of an epidemiology unit and manning it with competent personnel was very important in developing surveillance and disease search plans. The creation of an open forum to discuss and develop intervention programmes with the country’s international development partners added to the willingness to discuss the country’s interests and control strategy with total transparency and the hospitable environment created by the veterinary services helped foster the full engagement of the country’s partners and donors.

The launching of an Avian Influenza Control Programme (AICP) to manage a soft credit line from the World Bank stimulated the country to act on improved biosecurity, surveillance, live bird markets (LBM) improvement and communication. The latter, particularly communication for biosecurity which had been developed during the early stages of infection, gave a clear indication of disease status and the needs of the country to eliminate HPAI. The programme has made a major contribution to limiting the possible spread of the disease through LBM improvement, distribution of disinfectants, capacity building, workshops and public awareness campaigns throughout the country. Above all, the AICP managed the plan which led to improvements in payment of compensation, and the turn-around using the additional funds obtained from the World Bank. This had a direct impact on disease reporting and subsequently on improvement of laboratory response.

Another positive and more recent example of a concerted effort to mitigate the impacts of a new disease outbreak on the economy and the functioning of society is the way government and business dealt with an outbreak of influenza A/H1N1 in turkeys in Chile in August 2009. The government, the Ministry of Agriculture, and the private sector worked together, providing a timely and consistent response and furnishing information throughout in a transparent manner, meeting with the appreciation of international organizations, avoiding potential market shocks and reassuring consumers.

## COMBATING INFLUENZA A/H1N1 IN CHILE

In August 2009, workers on two commercial breeding turkey farms in the Valparaiso region of Chile had noticed a drop in egg production. The agricultural authorities were immediately informed, the cause was identified as influenza A/H1N1, the first time the virus had been found in birds, and international authorities were quickly informed. Appropriate precautionary measures were taken – increased biosecurity for birds and people in the vicinities, control of bird movements, laboratory tests to prevent the spread of the disease and, above all, quarantine and allowing infected birds to recover instead of culling which was also sensible from the scientific point of view.

The Agricultural and Livestock Service (SAG) of the Chilean Ministry of Agriculture immediately applied protocols for prevention and control measures in line with the recommendations of relevant international organizations, thus ensuring that turkey meat products marketed domestically and on the international market were totally fit for human consumption, and the active surveillance programme set up in the immediate aftermath of the outbreak permitted the authorities to demonstrate that there was no evidence of the disease anywhere else in the country.

Sopraval SA, the Santiago-based producer of poultry, beef and pork products which was affected by the outbreak, endorsed a statement of the Agricultural and Livestock Service (SAG) of the Ministry of Agriculture indicating that the discovery of the virus in turkeys did not pose an immediate threat to human health, adding that it could continue to market turkey meat that had been hygienically processed and submitted for the relevant veterinary inspection.

Working within a ‘whole of society’ approach requires a good understanding of the social and economic systems within which people operate, and which will need to be part of any pandemic preparedness plan. Responding, tracking and finding and preventing are all issues that require human action in order to ensure efficient disease control. At a global level, understanding food regimes and the demands society puts on its food systems, i.e. drivers, are important issues if an attempt is being made to develop the appropriate preventive measures and the right sustainable surveillance system to prevent a pandemic. At a regional level, understanding the development of trade patterns and changes in food demands and supplies is vital for understanding the circulation of a disease and therefore the ability to track it and find it to reduce the impacts on people. Information surrounding the political economy of certain livestock chains will improve the possible development of an animal health strategy within the larger political context of a country or region. At household level, understanding the motivation behind certain farming systems and livelihoods allows for better targeted interventions and the creation of equitable partnerships that improve reporting and consequently the ability to respond.

Linking value chains analyses with epidemiological analyses is central to a ‘whole of society’ approach and allows for improved and targeted animal disease risk management because this combination facilitates the viewing of interactions between animal, pathogens, people and systems. Once a value chain has been mapped, a systematic identification of critical risk points ensues, followed by enumeration and the development of possible animal disease control and management measures to be applied to bring risk(s) down to an acceptable level. Furthermore, these critical risk points are intimately linked to people, and so their incentives, motivations and practices – and respective risk profiles – can be studied in relation to their specific position in the chain.

This understanding of collective and individual decision-making assists animal and human health officials to develop socially-coherent and cost-effective interventions for improved food security and food safety.

## WORKING IN GLOBAL PARTNERSHIP

A ‘whole of society’ approach requires partnerships among all stakeholders, including among technical agencies. FAO and OIE had signed in May 2004 an Agreement on a Global Framework for Progressive Control of Transboundary Animal Diseases (GF-TADs, a joint OIE/FAO initiative), and signed with WHO in July 2006 an Agreement on Global Early Warning and Response System for Major Animal Diseases, including Zoonoses (GLEWS). Another more recent successful initiative based on a willingness to work

together towards a common solution has been the launch in April 2009 by OIE and FAO of the new joint scientific worldwide network to support the veterinary services in the control of animal influenza – the OIE-FAO Network of Expertise on Animal Influenzas (OFFLU). Members of the network collaborate with the WHO influenza network on issues relating to the animal-human interface, including early preparation of human vaccine.

#### **THE OIE-FAO NETWORK OF EXPERTISE ON ANIMAL INFLUENZAS (OFFLU)**

Through active and permanent scientific cooperation, the network develops and harmonizes synergistic research projects in different parts of the world, sharing permanently updated scientific information and expertise on efficient methods for controlling animal influenzas and providing a pro-active approach in helping infected countries to eradicate the disease and free countries to protect themselves.

In 2010, OFFLU made significant progress in identifying and addressing technical gaps, and in establishing linkages among leading veterinary institutions (it now includes all eleven OIE/FAO reference laboratories and collaborating centres for influenza, other diagnostic laboratories, research and academic institutes, and experts in the fields of virology, epidemiology, vaccinology, and molecular biology).

Interaction with the WHO Global Influenza Programme (GIP) is also a critical component and mechanisms for permanent interaction are being developed. OFFLU technical activities, led by scientists from OIE/FAO reference institutions and coordinated by OIE and FAO focal points, have been prioritized. They cover the following seven areas:

- Compilation of an inventory of commercially available kits for diagnosing avian influenza;
- Applied epidemiology to review efforts contributing to surveillance and control and explore options for linking epidemiological and virological data;
- Biosafety to draft guidance on minimum biosafety standards for handling avian influenza viruses in veterinary laboratories, particularly to provide advice for less well-resourced laboratories in developing countries;
- Vaccination, with specific reference to vaccine efficacy and quality in Indonesia and Egypt, where OFFLU national projects are being implemented;
- Evaluation of avian influenza proficiency testing coordinated by reference laboratories and development of recommendations to support harmonization between national laboratories;
- Development of standardized reference materials for sera and viral RNA;
- Establishment of a formal mechanism for coordination, collaboration and information exchange at the human-animal interface.

The proposed activities aim to improve the coordinated assessment of influenza zoonotic/pandemic risks and bridge cultural gaps between the animal and human health sectors, to promote research at the human–animal health interface and to improve linkages between regional laboratory networks.

## **CRISIS MANAGEMENT**

International organizations have played a key role in response and will continue to do so. In view of the global repercussions of transboundary animal diseases (TADs) on animal health and trade, and on human health, response efforts must be fast, well coordinated and strategically planned to help stop diseases before they spread. To this end, FAO and OIE created the Crisis Management Centre – Animal Health (CMC-AH) in late 2006 to help countries respond to TADs.

### THE FAO/OIE CRISIS MANAGEMENT CENTRE – ANIMAL HEALTH (CMC-AH)

The CMC-AH is the rapid response mechanism for transboundary animal disease emergencies. The Centre provides technical and operational assistance to help governments develop and implement immediate solutions to prevent or stop disease spread. By the end of 2010, the CMC-AH had supported over 30 countries with 50 missions deployed both for avian influenza and other diseases.

The Centre can field a rapid deployment team within 72 hours of an official request for or acceptance of assistance. Teams are composed of emergency response and animal health experts, and key activities include assessment, control measures, emergency action plan, emergency funding package, communication and compensation policies, coordination and resource mobilization. The hallmarks of the CMC-AH mode of response are close consultation, rigorous approach and the focus on high quality assessment and advice, delivered without delay. To achieve this, the CMC-AH has integrated the principles of the Incident Command System (ICS), an internationally adopted approach that is used in a wide variety of emergency situations. This approach paves the way for more traditional responses which utilize FAO's global and national resources and OIE's development of standards.

Constant collaboration is the basis of all CMC-AH operations. While the Centre enables the provision of assistance to countries facing national or regional animal disease threats, WHO with its Global Outbreak Alert Response Network (GOARN) and Alert and Response Operations (ARO) ensures quick and appropriate technical support to populations affected by human disease epidemics at a national, regional or even international level. For the control of animal disease epidemics with a public health dimension, the CMC-AH and GOARN/ARO collaborate closely to provide a global response network.

### SIMULATION EXERCISES

In the context of crisis management, FAO, OIE and WHO, in addition to other international and national agencies, have all developed simulation exercises (both real-time and table-top) to help strengthen in-country capacities in relation to emergency preparedness and response for the prevention and control of zoonotic diseases at the human-animal-environment interface. Although initially developed to improve HPAI H5N1 preparedness, they constitute a powerful tool to address emerging zoonotic threats beyond HPAI. Simulation exercises bring together representatives of the different professions involved in addressing outbreaks of zoonotic diseases that are developing in a country in human and animal populations (i.e. central, provincial and district level of Ministries of Agriculture and Health, veterinary and public health epidemiologists, laboratory diagnostic specialists, communication experts, environment services, civil defence, farmers' associations, etc.).

In FAO managed programmes, a simulation is based on a scenario describing a fictive outbreak, from the suspicion that an outbreak has occurred to its control<sup>1</sup>. Through the simulation, national capabilities in controlling an outbreak of a zoonotic disease are evaluated and the communication, coordination and institutional cooperation among the different sectors involved in addressing outbreaks in animal and human populations is explored. The strengths, weaknesses and gaps identified are used to develop an action plan with the authorities of the country to improve their preparedness and response capacity to face outbreaks of zoonotic diseases.

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<sup>1</sup> To date, FAO and its partners have held simulation exercises in Albania (national exercise in January 2008 and sub-regional exercise in December 2008), Armenia (March 2007), Azerbaijan (July 2008), Bosnia and Herzegovina (December, 2008), Egypt (February 2009), Macedonia (September 2009), Mauritania (March 2010), Tajikistan (April 2009), Ukraine (September 2009) and Zambia (September 2008).

## CAPACITY TO TRACK AND FIND

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Overall capacity to detect new disease threats has increased. Technological progress has led to improved diagnoses in field conditions, increased use of rapid diagnostic techniques, polymerase chain reaction (PCR) and molecular analysis, and the development of surveillance systems for diseases in animals and humans. At the same time, there has been a substantial increase in the awareness of communities regarding the reporting of animal diseases and there is clear evidence of a growing proliferation of informal and formal surveillance programmes at all levels over the last 10 years which can facilitate the timeliness of disease reporting. Other factors such as rapid communication channels, internet and IT technology have improved the capacity of disease surveillance systems at global level, regional or national level to rapidly communicate disease events worldwide.

The ability of a country to rapidly detect and respond to an incursion of zoonotic disease depends on the presence of surveillance systems that ensure reporting of suspicions of disease, and collection and processing of suitable samples in competent laboratories to produce a reliable diagnosis. Achieving such a surveillance system requires an alert and engaged community at all levels, trained and equipped staff to investigate reports and collect samples, and a well-equipped laboratory with trained staff to conduct reliable testing. Effective surveillance systems often include a risk assessment component to identify particular areas that deserve close monitoring (such as markets or poultry near wetlands in the case of avian influenza). Participatory disease surveillance has been used effectively in some countries.

### SURVEILLANCE SYSTEMS

Today, information on disease can be tracked instantly as a result of improved use of technologies such as electronic mail, the web and the use of geographic information systems (GIS) which are all tools that are becoming more and more accessible to society. Technological developments are also revolutionizing disease surveillance and two examples are provided below. Digital pen technology is being used for example in Southern Africa and disease notification via SMS has been tested and is being used in many locations, including Bangladesh.

#### REPORTING THROUGH SMS GATEWAY IN BANGLADESH

Bangladesh is conducting active HPAI surveillance in 150 out of 487 sub-districts as part of an USAID-funded FAO project. Under the project, a total of 450 community animal health workers (CAHWs), 50 additional veterinary surgeons and 150 upazila\* livestock officers (ULOs) are using the Short Message Service (SMS) gateway system (a method of sending and receiving SMS messages between computers and mobile phones) to collect data and report on disease and death in poultry. The SMS reporting structure is rather simple: at the end of the working day, each CAHW sends an SMS message with the total number of all investigated poultry (chickens, ducks and other birds) and their health status (the number of sick and dead birds) to the SMS gateway system.

The system then automatically contacts the ULO in the same area by SMS, who initiates an investigation by sending a veterinary surgeon or visiting the suspect outbreaks him/herself. After the investigation, ULOs and veterinary surgeons send an SMS message to the gateway server to declare the suspect outbreak as negative or report that it may require further (diagnostic) tests.

Specialized staff monitor the change in mortality and morbidity rates and perform spatial and temporal analysis against concurrent HPAI outbreaks and monitor the number of suspect cases and the results of the investigations carried out by ULOs and veterinary surgeons. The result of the analysis is submitted to the Chief Veterinary Officer, used in workshops to sensitize staff and farmers, presented to donor meetings and documented in periodic project reporting.

This real-time reporting using SMS has been contributing to effective HPAI outbreak response and control. The key to the success may be its simple approach and clearly defined work-sharing through the use of a familiar instrument (the mobile phone).

Since October 2008, 21 HPAI outbreaks out of a total of 35 have been detected through this active surveillance programme.

\* The districts of Bangladesh are divided into sub-districts called upazilas or thanas. Upazilas are the country's second lowest tier of administrative government.

## DIGITAL PEN TECHNOLOGY IN SOUTHERN AFRICA

FAO and the Southern African Development Community (SADC) have come together to introduce digital pen technology (DPT) to seven SADC member countries as a means of strengthening preparedness against the spread of transboundary animal diseases. Essentially, DPT permits rapid collection, transmission and processing of data by using a digital pen to “write” information on a customized form and transmit this form via Bluetooth technology to a central database over the internet.

The advantages of DPT include the following:

- there is little change in existing workflow processes in the field (pen and paper still used);
- a low level of technical training is required at field level;
- the speed of capture and transmission of data is greatly improved;
- a paper back-up copy is always available;
- data quality checks are built into the system;
- there is easy interaction with other data management systems;
- it is possible to access the system securely from anywhere in the world.

The introduction of DPT in the Southern African context was mainly aimed at controlling epidemic foot and mouth disease and contagious bovine pleuropneumonia (CBPP), but the technology is highly relevant for any disease, including those with pandemic potential.

Today, there is recognition that efficient surveillance requires close collaboration among all actors – government, business and civil society. Participatory disease surveillance (PDS) has been developed to integrate civil society into surveillance activities. The PDS approach was refined in Africa as an accurate and rapid method to understand the distribution and dynamics of rinderpest in pastoral areas. PDS relies on traditional livestock owner’s knowledge of the clinical, gross pathological and epidemiological features of diseases that occur locally. The PDS approach has gained respect for its ability to understand disease patterns and identify effective intervention strategies<sup>2</sup>.

For example, FAO launched a PDS programme in Indonesia in early 2006 with financial support from Australia, Japan and the United States. It injected a new lease of life into the understanding of, and responsiveness to, the animal health constraints of many rural and urban communities through its application by provincial and district livestock services and has strengthened the capacity of Indonesia’s local animal health services.

Another benefit of the PDS method is the very fact of participation in itself. Participatory processes build trust among stakeholders – between animal health workers and local communities, as well as between national and local governments. Participation facilitates more inclusive decision-making within a decentralized political system and mobilizes veterinary services in a manner which empowers communities to prevent and control disease.

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<sup>2</sup> In the case of rinderpest, it was also recognized as an important instrument of verification of rinderpest eradication for the purpose of accreditation by the OIE.



## **PARTICIPATORY EPIDEMIOLOGY**

Participatory epidemiology (PE) is the use of participatory approaches and methods to improve understanding of animal diseases and veterinary services, and to design solutions to disease problems with livestock keepers. PE draws heavily on systems of learning and action such as Rapid Rural Appraisal and Participatory Rural Appraisal and works on the principle that livestock keepers often possess detailed knowledge on animal diseases and can conduct their own problem analysis and research. Livestock workers can use PE as a stand-alone approach, or PE can be combined with conventional veterinary investigation and research methods.

Participatory epidemiological approaches to surveillance are well suited for tracking high risk behaviour and for obtaining primary data on the incentives and drivers shaping risk behaviour. By involving key informants at all levels, from policy-makers to actors in production systems and value chains for high risk products, it is possible to highlight the interactions among policy, incentives and behaviour. Participatory approaches are also valuable for syndromic surveillance activities and can greatly enhance the targeting of biological testing to potential emerging pathogenic events. The Epidemiology Network for Animal and Public Health (PENAPH) facilitates research and information sharing among professionals interested in participatory approaches to epidemiology and risk-based surveillance. PENAPH was set up in 2007. The six PENAPH partners are the African Union Inter-African Bureau for Animal Resources (AU-IBAR), FAO, OIE, the International Livestock Research Institute (ILRI), the Royal Veterinary College of London University (RVC), Vétérinaires Sans Frontières-Belgium (VSF-Belgium) and Veterinarians Without Borders-Canada (VWB-VSF-Canada).

The early detection of animal diseases also calls for competent veterinary field epidemiologists who know how to rapidly gather information from animal owners and wildlife experts in the field, and to investigate, assess, analyze and report the findings of outbreak investigations effectively. The battle against HPAI starkly highlighted the dearth of field epidemiologists within veterinary infrastructures and the urgent need to build such a capacity. An initiative which has addressed this need is the Field Epidemiology Training Programme for Veterinarians (FETPV). The programme, which is modelled after the Field Epidemiology Training Programme (FETP) for medical doctors, is designed to develop the capacity of veterinarians to trace and control animal diseases that could possibly spread to human beings. It focuses on the causes, distribution and control of diseases and also includes opportunities for joint training of human and animal medical professionals.

### **FETPV IN ASIA**

One region which has launched an FETPV is Asia where FAO's Emergency Centre for Transboundary Animal Diseases (ECTAD) Regional Office for Asia and the Pacific based in Bangkok, with financial support from USAID and in cooperation with Thailand's Department of Livestock Development in the Ministry of Agriculture and Cooperatives, inaugurated the programme in 2008 in Bangkok.

By 2010, the FETPV was already serving Cambodia, China, Indonesia, Lao Republic, Malaysia, Mongolia, Myanmar, the Philippines, Thailand and Viet Nam and had built on the well established foundation of Thailand's FETP programme which has been training field medical doctors in epidemiology since 1980. As a branch of FETP Thailand, the FETPV is also promoting 'training through service', the guiding principle of all FETP programmes. The regional FETPV has gained the support and endorsement of the Chief Veterinary Officers of all participating countries.

## **DIAGNOSTIC CAPACITY**

The world's capacity to find diseases relies heavily on the diagnostic capacity of national laboratories which, in turn, is based on their resources and equipment but also on their human capital.

National veterinary diagnostic laboratory capacities in countries affected by and at risk from HPAI have often been (and often still are) poorly developed and resourced. However, in a number of countries they have been strengthened considerably over the last five years.

The OIE has developed the concept of twinning<sup>3</sup> between its reference laboratories or collaborating centres with candidate national laboratories to help them to improve their diagnostic capacity and expertise, and to provide support to other countries in their region. The aim is to eventually ensure an even geographical distribution of expertise and reference laboratories allowing easier access to experts and rapid detection and diagnosis of disease. The ultimate aim is for candidate laboratories to reach OIE reference laboratory status.

Networking among laboratories has already proved to be an excellent tool to increase capacity for diagnosis. For example, one of the most significant achievements claimed by the West and Central Africa Veterinary Laboratory Network for Avian Influenza and other Transboundary Disease (RESOLAB)<sup>4</sup> set up by FAO has been that it has reduced the time necessary for laboratory confirmation of HPAI H5N1 from an average of 30 days in 2006 to two days (Togo) and one day (Nigeria) in 2008, thanks to the local collaborative arrangements it has succeeded in putting in place.

#### **RESOLAB: Networking in West and Central Africa**

RESOLAB was inaugurated in December 2007, following a joint FAO-USDA/APHIS<sup>1</sup> inception workshop. Coordinated by the regional office of ECTAD-FAO at the Regional Animal Health Centre (RAHC) in Bamako, Mali, its immediate objectives are to enhance the effectiveness and efficiency of its 23 national veterinary diagnostic laboratories, improve communication between laboratories and with national epidemiological networks, stimulate regional laboratory expertise related to avian influenza and other transboundary animal and zoonotic diseases, and thereby improve the quality of disease diagnosis.

RESOLAB is technically assisted by the Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe) of Padua in Italy and agencies or organizations such as USDA/APHIS, Agricultural Research for Development (CIRAD), France Vétérinaire International and USAID. So far, it has been funded by various donors, including Canada, France Sweden, the United Kingdom and the United States.

Early, rapid and accurate detection is a key component of strategies to contain, halt or mitigate disease transmission. Efficient diagnosis of diseases such as HPAI and other emerging and transboundary diseases is essential to protect animal and human health in the event of a major outbreak. In this context, FAO and the Division of Nuclear Techniques in Food and Agriculture of the International Atomic Energy Agency (IAEA) are cooperating on early and rapid diagnosis of avian influenza.

#### **FAO/IAEA COLLABORATION ON ANIMAL DISEASE DIAGNOSIS**

FAO and the Division of Nuclear Techniques in Food and Agriculture of the International Atomic Energy Agency (IAEA) held the Final Research Coordination Meeting of the Coordinated Research Project (CRP) on 'Early and Rapid Diagnosis of Emerging and Transboundary Animal Diseases' in May 2010 in Rome, in which seasoned veterinary laboratory practitioners and diagnostic experts shared their knowledge and expertise as the scientific and technical basis for developing or modifying the early and rapid diagnosis of avian influenzas.

The rapid molecular technology platforms developed and fine-tuned by the CRP has allowed improved turnaround time: early, rapid, and confirmed diagnosis has moved from weeks to a day or two, which has in turn improved field cooperation with surveillance programmes. At the same time, the avian influenza technology has been shared with public health laboratories where possible, and this has allowed new cooperation and collaboration between the public health and veterinary diagnostic community. The associated molecular diagnostic training has also allowed improvements to laboratory capability and capacity-building. The sharing of information between the CRP members has assisted in the development of a better understanding of avian influenza diagnosis through molecular techniques including an increased knowledge about the disease's epidemiology, transmission and risks.

<sup>3</sup> Recent developments in the global animal health scene with an increase in the potential rapid global spread of animal diseases and pathogens, calls for a new urgency to not only further develop the Laboratory Twinning programme's concept but also to implement it. For more on twinning, see [http://www.oie.int/fileadmin/Home/eng/Support\\_to\\_OIE\\_Members/docs/pdf/A\\_Twinning\\_Guide\\_2010.pdf](http://www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/docs/pdf/A_Twinning_Guide_2010.pdf)

<sup>4</sup> For more on RESOLAB, visit [www.fao-ectad-bamako.org/fr/-RESOLAB,27-](http://www.fao-ectad-bamako.org/fr/-RESOLAB,27-).

## INFORMATION SYSTEMS

Early warning is of paramount importance for reducing the risks and consequences of disease outbreaks. Timely information of disease events is needed to know the disease situation, support decision-making, prevent potential disease incursion and respond quickly in an emergency situation.

In recent years, there has been a multiplication of tools developed for the collection and dissemination of information on animal health. They include the World Animal Health Information System (WAHIS), EMPRES Global Animal Disease Information System (EMPRES-i) and GLEWS to name just three<sup>5</sup>.

In accordance with the relevant chapters of the Terrestrial and Aquatic Animal Health Codes, the 178 Member countries of the OIE are obliged to immediately report to the OIE outbreaks of notifiable animal diseases occurring in their territories and to provide regular follow-up reports. This information is stored in the World Animal Health Information Database (WAHID). In April 2006, the OIE launched a secure web application called the World Animal Health Information System (WAHIS), an interface with WAHID and an online disease notification system for member states. It constitutes a major achievement in the worldwide use of information technology and modern communication techniques and their applications, but it is also a two-way communication system offering countries easy access to information about the current animal health/disease situation in other countries. Capacity building of OIE national focal points for disease notification, which are mainly the responsible of epidemiology and surveillance units in OIE Member countries that started since 2005 (383 country officers trained between 2005 & 2010), has improved transparency and the quality of data provided by countries. In 2010, 192 alert messages from 79 Members on 51 different diseases were disseminated by the OIE. For 2009, 173 Members and non OIE members have provided annual information on the presence and absence of OIE-listed diseases.

WAHIS uses only official information and meets a specific need. In an era of global communication and in the interest of society as a whole, an information system is necessary that brings together not only official notification from countries on OIE-listed diseases but also information available from other sources.

The FAO managed EMPRES Global Animal Disease Information System (EMPRES-i) is a web-based application that compiles, stores and verifies animal disease outbreak data (including zoonoses) from numerous sources: country or regional project reports, field mission reports, partner non-governmental organizations (NGOs), cooperating institutions, OIE-WAHID, agriculture and health ministries, in-country representations of FAO or other United Nations agencies, public domains, the media and web-based health surveillance systems. For verification purposes, EMPRES uses not just official, but also unofficial sources of information (such as in-country assistance projects and personal contacts with NGOs and other institutions). This information is used to generate and disseminate early warning messages, but it is also fed into the EMPRES-i database and disseminated (when confirmed or denied) in a structured and comprehensible format to the public.

GLEWS combines information available on animal diseases with information available on human diseases. GLEWS builds on the added value of combining the alert mechanisms of FAO, OIE and WHO through an agreement signed in July 2006, thus enhancing early warning capacity for the benefit of the international community. Through sharing of information on disease alerts, unjustified duplication of efforts is avoided and the verification processes of the three organizations is combined and coordinated. For zoonotic events, alerts of animal outbreaks can provide direct early warning so that human surveillance can be enhanced and preventive action taken. Similarly, there may be cases where human surveillance is more sensitive and

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<sup>5</sup> Other systems include for example Animal Disease Notification System (ADNS), Biportal, Continental System of Epidemiologic Information and Surveillance (SivCont), Global Public Health Intelligence Network (GPHIN), Program for Monitoring Emerging Diseases (ProMeD), Regional International Organization for Plant Protection and Animal Health (OIRSA), and Veterinary Epidemio-surveillance Network (REPIVET).

alerts of human cases precede known animal occurrence of disease. GLEWS really came into its own with the outbreaks of HPAI H5N1 but rapidly became recognized as an important instrument for reporting other diseases.

In 2009, USAID launched the Emerging Pandemic Threats (EPT) programme to build on disease surveillance, training and outbreak response, particularly for addressing avian and pandemic influenza. The focus of the programme is to pre-empt or combat, at their source, newly emerging diseases of animal origin that could threaten human health in hotspots. One component of EPT called PREDICT aims to help fill the gap in surveillance of animal diseases that can infect humans. PREDICT was launched online to enable scientists and the public to track outbreaks of animal diseases that might jump to humans. It monitors data from 50,000 web sites, World Health Organization (WHO) alerts, online discussions by experts, wildlife trade reports and local news. Institutions behind the project include the UC Davis School of Veterinary Medicine, Global Viral Forecasting Inc., the Wildlife Conservation Society, Ecohealth Alliance (formerly known as Wildlife Trust), and the Smithsonian Institution and National Zoo.

We can conclude that there have been some significant improvements in terms of pandemic preparedness thanks to surveillance and early warnings systems. In their final report of August 2010 on the outcome and impact assessment of the global response to the avian influenza crisis commissioned by the European Commission, the evaluators reported the following:

- countries have an increased probability of detecting cases of avian influenza and to a lesser extent pandemic influenza.
- countries have benefited from faster reporting systems.
- the routine surveillance systems of countries are stronger and this also has an impact on surveillance of other communicable diseases beyond influenza.
- the capacity to quickly confirm suspected cases of HPAI H5N1 through reverse transcription polymerase chain reaction (RT-PCR)<sup>6</sup> has significantly increased and has therefore improved the capacity for early detection and confirmation of human cases of avian influenza nationally, regional and internationally; this capacity could be easily extended to other infectious diseases.
- due to the global response to the avian influenza crisis, in countries where laboratory capacity exists at national level, the time between the identification of a suspected case, the reporting to central level and the laboratory confirmation of an infection by HPAI H5N1 through RT-PCR has been significantly reduced.

All the above elements have strengthened the global early warning system and this has supported acceleration of countries' compliance with the International Health Regulations (2005).

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<sup>6</sup> Reverse transcription polymerase chain reaction (RT-PCR) is a variant of polymerase chain reaction (PCR), a laboratory technique commonly used in molecular biology to generate many copies of a DNA sequence.

## CAPACITY TO PREVENT

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Prevention of animal diseases can and has been addressed through better management practices on farms and along marketing chains, with biosecurity as a major area of work. The term 'biosecurity' has been used in many different ways: "measures taken to reduce the risks posed by biological attacks, epidemics, and other destabilizing events, and to improve resilience in the face of such events"; "laboratory safety and security"; and "strategic and integrated approach to analyse and manage risks in food safety, animal and plant life and health, and biosafety" are just three. This latter definition is used here.

Prevention is also addressed through more efficient use of vaccines. In combination with the implementation of effective biosecurity measures, vaccination can prevent the introduction of viruses, or alternatively reduce their spread, minimize the negative impact on production and decrease potential economic losses. Moreover, the risk of human exposure to viruses with zoonotic potential and the consequent human cases may be reduced by vaccinating animals.

Finally, prevention also requires efficient and effective veterinary services.

### BIOSECURITY

'Biosecurity' is the 'whole of society' approach "par excellence". Biosecurity is, in one of its narrower definitions, the implementation of measures that reduce the risk of the introduction and spread of disease agents on a farm or along a value chain. The three principle elements of biosecurity are segregation, cleaning and disinfection. The details of how biosecurity is applied will depend on the type of production system in question.

Biosecurity encompasses the provision of a policy and regulatory framework to improve coordination and take advantage of the synergies that exist across sectors, helping to enhance protection of human, animal and plant life and health, and facilitate trade. Australia<sup>7</sup> and New Zealand<sup>8</sup>, for example, have developed units, groups or services within their ministries in charge of agriculture to work on biosecurity issues across sectors (animals, plants, food, emergency preparedness and outbreak response). While they apply to all sectors, increased concerns about security threats worldwide – but also recent outbreaks of HPAI H5N1 and influenza A/H1N1 – have led recent efforts to focus mainly on biosecurity for national security and global control and prevention of emerging pandemic threats.

Designing feasible biosecurity programmes requires working with all stakeholders to ensure that those who have to implement the measures accept and see the need to do so and the benefits in doing so. Activities are developed by animal health and production specialists, socio-economists and communications specialists working with farmers and traders at all levels along the market chain to develop and implement appropriate measures. This creates responsibility for those involved in production and marketing for more biosecure animal production and marketing through greater public awareness and improved capacity for appropriate technical responses.

In recent years, major efforts have been invested in the development of community-based training, utilizing both private and public sectors and the promotion of producer associations or cooperatives for collaboration to improve biosecurity, including contract production for larger commercial sectors. Collaboration with industry was also strengthened together with the development and implementation of

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<sup>7</sup> See [www.daff.gov.au/bsg](http://www.daff.gov.au/bsg).

<sup>8</sup> See [www.biosecurity.govt.nz](http://www.biosecurity.govt.nz).

auditable biosecurity standards for industrial farms and systems for demonstrating ongoing freedom from HPAI H5N1. Simple, low input systems have been developed and tested that result in the rearing and sale of infection-free poultry from small farms, with special emphasis on native poultry and grazing ducks.

Eventually, it is the people themselves that make biosecurity work as a prevention and control measure. Together with OIE and the World Bank, FAO has prepared two reference documents on biosecurity for animal production – ‘Biosecurity for highly pathogenic avian influenza: Issues and options’ (2008) and ‘Good practices for biosecurity in the pig sector: Issues and options in developing and transition countries’ (2010) – and ECTAD at FAO is implementing a number of projects to improve biosecurity in production systems. Examples include testing of biosecurity measures in small scale production systems (Egypt and Nigeria) and capacity-building for stakeholders along production and marketing chains (East, Central and West Africa, Egypt, Bangladesh and Indonesia).

#### EGYPT’S FARMERS TURNING TO BIOSECURITY

Entesar Mohammed el Hol lives to the north of Cairo and keeps 50 chickens, ducks and pigeons on her roof and uses the eggs and meat to feed her four children. She has now become accustomed to sample her birds to check whether there are signs of avian influenza. Entesar was one of those who have been taught by FAO and government staff the importance of simple hygiene measures. “We listen to the vet’s advice. I have learned how to clean everything properly, clean out the cages and wash down the coops. I also tell my neighbours what the vet tells me. I want to protect myself and my family,” says Entesar.

Another poultry keeper who has changed his pattern of behaviour in terms of hygiene is Mohtan El Shazly’s who lost all his birds in a 2006 cull and had to start from scratch. Now, no one enters his farm without washing their shoes and donning protective clothes. El Shazly says these measures are the result of a combined effort. “It’s the first time we see that FAO, the government and us are dealing together, to work it out. Before that, it was only one man’s decision, or one statement or decision. But now it’s different.”

The current Egyptian strategy for combating avian and human influenza has two main objectives: management of the movement of poultry and products along the value chain to minimize the opportunities for spread of HPAI viruses; and improvement of biosecurity in poultry production to progressively reduce the incidence of HPAI.

On the other hand, the ECTAD Regional Unit for West and Central Africa based in Bamako, Mali, has been implementing biosecurity initiatives since December 2006 to help stakeholders heighten their awareness of biosecurity benefits by developing a mutually profitable public-private partnership.

#### BIOSECURITY CENTRAL TO PREPAREDNESS IN WEST AND CENTRAL AFRICA

The activities of the ECTAD Regional Unit for West and Central Africa include capacity building (training and sharing of useful information), implementation of pilot operations in selected countries (Benin, Burkina Faso, Côte d’Ivoire and Togo), and development of biosecurity decision-making tools (such as biosecurity and communication toolkits).

In addition, the unit has drafted a charter for good biosecurity practices in live bird markets (LBMs) that must be complied with by the 40 or so poultry sellers of Koumassi market in Abidjan, Côte d’Ivoire and, in July 2010 with financial support from USAID, published a ‘Good Practices Guide for Live Bird Markets’ in French (‘Guide de Bonnes Pratiques sur les Marchés de Volailles Vivantes’)\*.

Thanks to the efforts of the unit, biosecurity issues are now an integral component of preparedness and contingency plans in West and Central Africa, and in Ghana, for example, messages such as “No compensation for farmers without biosecurity” and “Make farm biosecurity your priority” are being conveyed widely to stakeholders and policy-makers alike.

\* The document can be downloaded from <http://www.fao-ectad-bamako.org/fr/Guide-des-bonnes-pratiques>.

Village-based biosecurity is making inroads in Asian countries such as Indonesia where it has been recognized that the prevention and control of HPAI should not be addressed on an individual disease-specific basis alone. As a result, a complementary village-based biosecurity education and communication

(VBEC) programme has been developed to help promote specific changes in husbandry practices that prevent disease transmission in general.

#### **INDONESIA'S 'BOTTOM-UP' APPROACH TO BIOSECURITY**

Indonesia's VBEC programme began in August 2009 with a qualitative and quantitative socio-cultural assessment in six pilot villages to allow better comprehension of community understandings, beliefs and practices with regards to poultry keeping, poultry disease and its movements. During this process the role of PDS officers or local livestock services staff is to provide technical assistance and improve awareness as well as dispel misconceptions and ingrained cultural beliefs about how viruses move and how diseases may be prevented.

This approach is 'bottom up', where the local community takes the initiative of working together to implement a series of HPAI prevention and control activities that are realistic and in line with local conditions. The resulting action plans are agreed in each village with the involvement of a district livestock services staff member to ensure continuity, feedback and technical soundness. Information, education and communication (IEC) activities targeted existing community groups such as Posyandus (village integrated health services), religious and devotional groups, self-help and women's groups, churches and mosques, elementary, junior and high school students, and other miscellaneous community gatherings. In villages where commercial poultry producers exist, specific technical extension messages are provided including technical discussions covering management issues, poultry anatomy and practical biosecurity pertinent to the levels of production systems present.

But the concept of Biosecurity is also crucial for laboratory work to be carried out with a minimum of risk to the health of the staff and the environment. This requires careful consideration of the risks involved in a particular procedure, followed by appropriate measures to minimise the risk of human disease and of possible release into the environment. OIE Member countries have adopted OIE Standards for biosafety/biosecurity in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals. Existing national and international reference laboratories have considerable experience in the operation of safe working practices and provision of appropriate facilities. The laboratory capacity building activities in biosafety/biosecurity carried out in cooperation between FAO, OIE and WHO must also be underlined. The three parties organised a Biosafety and Laboratory Biosecurity Meeting for Animal and Human Health Stakeholders in Paris, France from 29 June to 2 July 2009 which was attended by participants from 16 countries, together with representatives of intergovernmental organizations, biosafety associations and other non-governmental organizations.

## **VACCINATION**

Much has been learned about poultry vaccination strategies since the HPAI H5N1 outbreaks began in 2003. While a number of commercial vaccines have the potential to reduce the level of circulating virus in poultry flocks, there are a number of challenges that have an impact on vaccination strategies. For example, in order to achieve significant reductions in circulating virus, a sufficiently high vaccination coverage level should be reached (50 to 90 percent immunization of at least 50 percent of all flocks at risk of infection) with a vaccine that protects against most circulating viruses. This proves difficult for technical, logistical and cost-related reasons, and calls for careful targeting of vaccination spatially, temporally, and/or by production system to maximize its impact and cost-effectiveness. Effective targeting, however, requires sound risk assessments, for which data and expertise are often lacking. Strengthening of the epidemiological capacity of national animal health systems is a major prerequisite for large-scale use of vaccination in the control of HPAI.

For better preparedness, the concept of 'vaccine banks' has been used, for example by FAO's Animal Production and Health Commission for Asia and the Pacific, and by OIE. Vaccine banks ensure the rapid supply of emergency stock of vaccines to infected countries in order to vaccinate animal populations at risk and progressively achieve eradication wherever possible. Through the creation of virtual rolling stocks, vaccine suppliers either produce vaccines when needed or retain stocks of vaccines at their own risk, which are renewed on a rolling basis under terms and conditions contractually defined.

At the start of the wave of avian influenza outbreaks in the mid-2000s, the OIE set up a regional vaccine bank for avian influenza vaccines in Africa funded under the European Union Pan African Programme for the Control of Epizootics (PACE). A global vaccine bank was also established for avian influenza vaccines funded by the Canadian International Development Agency (CIDA). In addition to avian influenza, the regional vaccine bank in Asia has been extended to target foot and mouth disease, rabies and other pathogenic emerging and re-emerging transboundary diseases. A portion of the budget for vaccine banks has been set aside as a reserve for 'other vaccines' for non-identified highly pathogenic emerging and re-emerging animal diseases. This concept of banking vaccines for an array of diseases represents an important development in moves to counter the spread of transboundary animal diseases globally.

## STRENGTHENED VETERINARY SERVICES

The PVS Pathway (Evaluation of Performance of Veterinary Services (PVS) and PVS Gap analysis proposed by OIE is a good example of a tool designed to assess levels of compliance of national veterinary services (NVS) with existing international standards in order to promulgate health standards for the safety of international trade in animals and animal products (within the OIE-WTO mandate) and for animal disease surveillance through a science-based approach.

The OIE and the Inter-American Institute for Cooperation on Agriculture (IICA) have joined forces to develop the initial tool, which has been designed to assist veterinary services in establishing their current level of performance, to identify gaps and weaknesses regarding their ability to comply with OIE international standards, to form a shared vision with stakeholders, and to establish priorities and carry out strategic initiatives. More than a diagnostic instrument, the tool promotes a culture of raising awareness and continual improvement, which can be used either passively or actively depending on the level of interest, priorities and commitment of the veterinary services and their stakeholders. Continuity of this process requires a true partnership between the public and the private sectors, and leadership on the part of the public sector is a fundamental and critical determinant of success.

### **THE OIE PVS PATHWAY: EVALUATION OF PERFORMANCE OF VETERINARY SERVICES (PVS) AND PVS GAP ANALYSIS**

The OIE PVS Pathway is accepted as the global process to assist countries in reaching international Veterinary Services (VS) standards. The PVS Pathway is a global programme for the sustainable improvement of a country's Veterinary Services' compliance with OIE standards on the quality of Veterinary Services. This is an important foundation for improving animal and public health and enhancing compliance with SPS standards, at the national, regional and international level.

To help ensure the effective performance of the Veterinary Services of Member Countries, the OIE has dedicated two Chapters<sup>1</sup> of the OIE Terrestrial Animal Health Code (the Terrestrial Code) to the Quality of Veterinary Services. The OIE international standards and guidelines constitute the basis for independent external country evaluations of the quality of Veterinary Services and Animal Health Systems and have been adopted by all OIE Members. A specific methodology has been developed and the OIE has published the "OIE Tool for the Evaluation of Performance of Veterinary Services" as the basis for evaluating performance against the international standards published in the Terrestrial Animal Health Code. (A similar tool is available for the evaluation of Aquatic Animal Health Services).

Experience has shown that countries which are recognized by stakeholders, trading partners and other countries as having credible veterinary services have developed these services around four fundamental components: i) human and financial resources; ii) technical capabilities; iii) interaction with stakeholders; and iv) access to markets – the four fundamental components that comprise the basic structure of the PVS tool. Six to eight critical competencies have been elaborated for each of these fundamental components and for each critical competency, qualitative levels of advancement are described. The OIE has trained a cadre of veterinary experts who are prepared to assess veterinary services from countries which officially request a PVS evaluation.

During 2006-2010, the OIE has progressively developed the OIE PVS Pathway which takes the country PVS Evaluation using the OIE PVS Tool and PVS Gap Analysis missions as first steps and integrates them into a comprehensive, staged approach providing targeted support for the systematic strengthening of Veterinary Services based on international standards.

Projects are ongoing to strengthen veterinary governance and services in Africa and Asia.



## THE WAY FORWARD: RECOGNIZING THE GAPS

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Scientists spot a new human infectious disease roughly every four months on average. Most are trivial but a minority, such as HIV/AIDS, H5N1 avian influenza and severe acute respiratory syndrome (SARS), are grave threats. Animals seem to be the main source of new infectious disease in man: in general around 60 percent of human pathogens originate from animals; among new diseases, the rate is about 75 percent.

Human and veterinary medicine have long spoken to each other, but with the emergence of SARS and HPAI H5N1, a realization that these two disciplines needed to closely interact became absolute. This is the perfect case that illustrates how health within medical communities was seen then, and how it is perceived now. We can no longer address health independently. The simple truth is that there is only one health.

While there have been many success stories in recent years in the fight to prevent pandemics and to contain outbreaks of animal disease with pandemic potential, much remains to be accomplished and action is required to overcome many shortcomings. At the same time, much of what has been achieved and many of the lessons learned contain elements that could profitably be considered for preparedness planning in other fields. This chapter summarizes a number of the gaps in current pandemic preparedness planning and practice. The next chapter suggests areas of achievement that could be built on by extending their application to those engaged in preparedness for other disasters and threats.

### **Regional coordination**

Ideally, pandemic planning should be coordinated at regional level because of the cross-border impact of disease. However, while international and national preparedness has progressed well, cross border preparation still needs further development. Evidence from a survey of Middle East and North African Integrated National Action Programmes (INAPs) to fight avian and human influenza has shown that only 44 percent (7 out of 16) of the plans have included details about regional/cross-border preparations. Similarly, an analysis of national plans by the London School of Hygiene and Tropical Medicine showed that only a few African countries have entered into collaborative agreements with their neighbours. By contrast, the European Centre for Disease Prevention and Control has reported that 64 percent of European countries have undertaken joint policy work with neighbouring countries. Regional coordination has been relatively difficult to achieve, mainly because of a lack of sufficient management capacity at the level of regional organizations such as the Association of South East Asian Nations (ASEAN), the South Asian Association for Regional Cooperation (SAARC) or the African Union (AU). More efforts are required in this area.

FAO and OIE work jointly under the Global Framework for the Control of Transboundary Animal Diseases (GF-TADs) which serves as a facilitating mechanism to empower regional alliances in the fight against transboundary animal diseases and assist in establishing programmes for their specific control.

The Regional cooperation programme on highly pathogenic and emerging and re-emerging diseases financed by the European Union is addressing regional coordination in Asia.

## **REGIONAL COOPERATION PROGRAMME ON HIGHLY PATHOGENIC AND EMERGING AND RE-EMERGING DISEASES IN ASIA (HPED)**

Some member countries of the Association of South-East Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) regularly suffer from varying incidence of outbreaks of Highly pathogenic emerging and re-emerging diseases (HPED) at national levels. It is essential that capacities in the region are strengthened, to assure the functioning of prevention and response systems. The specific objective of this programme is to strengthen in a sustainable manner the institutional capacities of ASEAN and SAARC and their secretariats to control HPED and improve epidemic and pandemic preparedness in the region. The intended support to regional response capacity will not be solely limited to the reaction to concrete and specific diseases but will also cater support to health systems and care services to the fight against diseases with high prevalence in the region.

This EU programme is in line with the Paris Declaration on Aid Effectiveness that promotes a model of partnership to improve country ownership, transparency and accountability on the use of development resources. The Regional Strategy for Asia 2007-2013 includes a specific item on "crossborder cooperation in animal and human health", addressing HPED. Furthermore, ASEAN and SAARC are identified as the key dialogue partners for regional integration and dialogue in Asia. ASEAN and SAARC have each developed strategic plans for emerging disease control. The European Commission will support improvement of prevention, control and eradication methods of HPED in ASEAN and SAARC countries.

This programme is consistent with the agreement reached with ASEAN and SAARC member countries under the GF-TADs framework. The project is based on the ASEAN Regional Strategy for the Progressive Control and Eradication of HPAI (2008-2010), and the ASEAN strategy for HPED control in the Region. For SAARC, it is in accordance with the agreement between FAO and SAARC. Concerning Human Health, the EU support is in line with the Strategic Framework for Prevention and Control of Zoonoses, the Asian Pacific Strategy on Emerging Diseases (APSED), and the International Health Regulation (IHR). The WHO has also signed one Memorandum of Understanding with ASEAN and one with SAARC for cooperation on prevention and control of communicable diseases.

### **Capacity of public services – Public-private collaboration**

Traditionally, formal animal health services in developing countries were provided largely by government veterinarians employed within the public sector. During the 1980s, greater reliance was placed on private enterprise and market forces for the provision of animal health services, as in the supply of other goods and services. However, in many countries, attempts at privatization of veterinary services have brought few improvements in service provision. Experiences with recent outbreaks of transboundary animal diseases have emphasized the importance of public veterinary services. Tasks such as surveillance, prevention, control and eradication of highly contagious diseases with serious socio-economic, trade and public health consequences, quarantine and movement control, emergency responses, disease investigation and diagnosis, and vaccination and vector control in relation to these diseases require public intervention and are unlikely to be adequately provided by private enterprise alone. Public and private sector objectives are often complementary and only differ in focus.

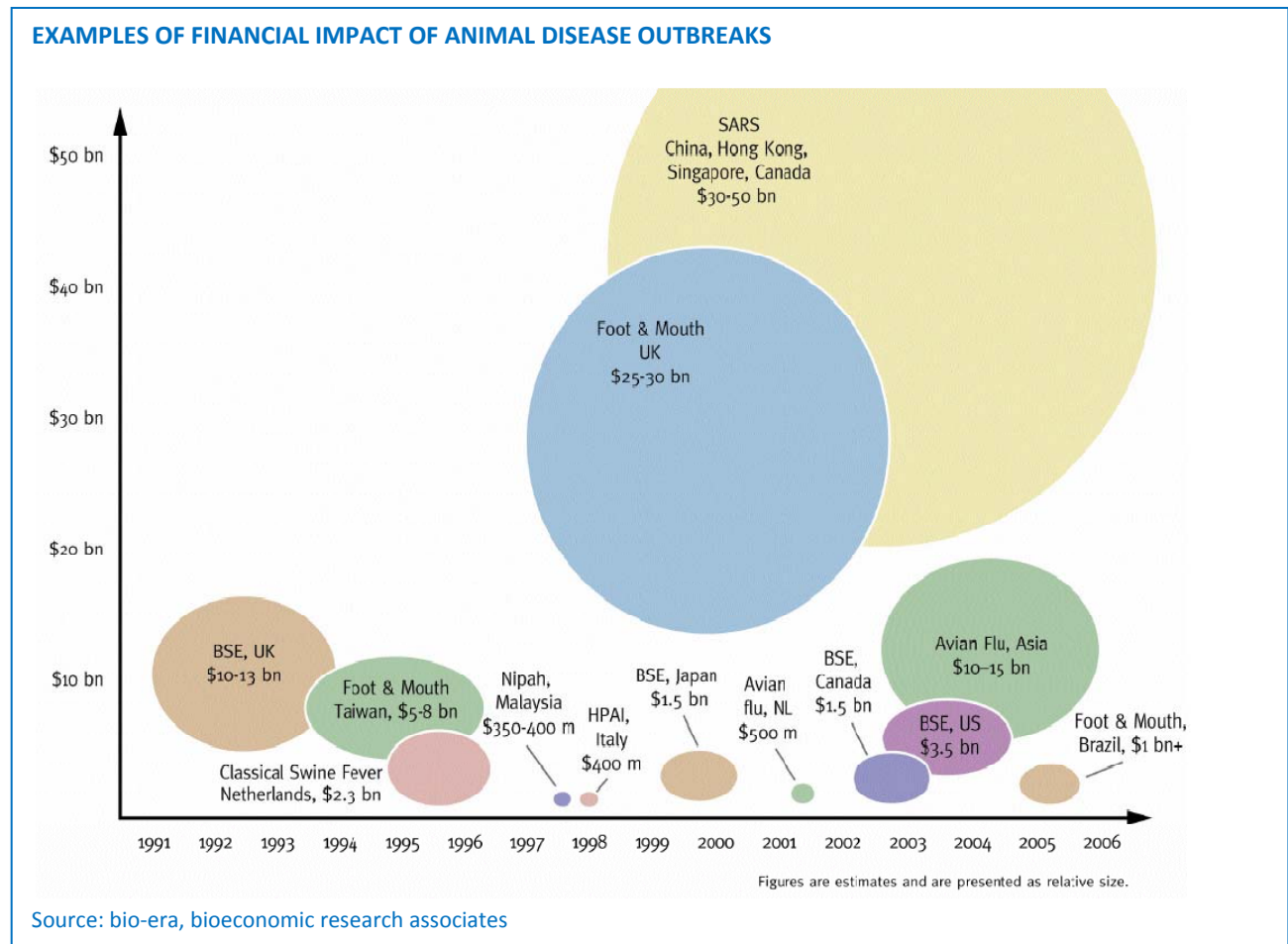
In a conducive 'enabling environment', there are opportunities for public-private sector partnerships (PPPs) in the area of disease control that offer 'win-win' benefits and can make a substantial contribution to food safety and better public health, but also better animal health. There is still limited capacity within the public services to develop these 'win-win' collaborations and partnerships with the private sector. The reinforcement of the capacity of animal health services to address the tasks mentioned above and also work more closely with the private sector and through a 'whole of society' approach is still necessary.

### **Information on impact of animal diseases**

Despite advances in information systems for tracking and finding disease, there are serious shortcomings in the official statistics on the impact of animal diseases. No authority is at present producing statistics on the numbers of animals actually affected by diseases, on the value of these losses, or on the total economic impacts of animal diseases. There are special studies of high-profile outbreaks (see below), but even these results do not appear in international official datasets produced by the international agencies. For instance, the number of poultry lost due to HPAI H5N1 and the attendant economic costs have not been estimated by any official agency, despite the high public profile of the disease. For other diseases, there is

similar neglect, so the total global burden of diseases is at present largely unknowable. This shortcoming should be remedied because policy-makers need to have a good basis on which to decide how much and where to invest.

Data on the incidence of animal diseases must be supported by studies to estimate their dual health burden on people and on livestock and identify communities and groups at risk. The magnitude of the problem is not yet fully understood.



### Data sharing and information systems

Obstacles still remain in the surveillance and reporting of diseases with or without pandemic threat such as the absence in many countries of a formal mechanism for reporting local outbreaks to regional and international organizations, the failure of surveillance systems to gather disease outbreak data in standard formats – notwithstanding the availability of standardized forms for disease notification - and an unwillingness to report outbreak events to the international community (often through fear of potential repercussions on trade) or to report animal diseases that are not a priority for the national authorities and other stakeholders in some countries.

There are many gaps that still need to be filled in the quality and efficiency of information systems. Challenges remain related to the sensitivity of surveillance systems to capture information on the emergence of new pathogens. The increase observed in the last few years comes with an increasingly efficient use of new technologies. But it also comes with new requirements for data and the need to harmonize standards. Overlapping between national, regional and global information systems is not uncommon; often data is entered at these different levels with frequent duplication.

Sharing of virus samples and sequence information has occurred globally, but networking needs to be improved further because not all contentious issues regarding sharing of virus genome data have been resolved. Some countries are unwilling to forward the viruses isolated in their territories to appropriate centres. One of the reasons is that there is a potential for profit and other benefits to be obtained from materials and vaccines produced from their isolates.

### **Addressing the root causes of pathogen evolution, establishment and persistence**

The drivers of disease emergence and pandemic risks await clarification in order to be able to prevent public health threats (upstream action to combat the emergence of disease) and restore sustainable and safer animal agriculture and associated feed and food supplies. This implies understanding the dynamic evolution of pathogens of animal origin circulating in livestock and wildlife, the modalities of their transmission and the underlying agro-ecological and socio-economic factors favouring their emergence and persistence.

As global public health is repositioned in international agendas, it is imperative for disease emergence not be looked at in isolation, but systematically viewed alongside dynamic changes in farming landscapes, animal agriculture intensifications, natural resource depletions, land utilization patterns, trade globalization, human behaviours, food consumption, and evolving trends in agricultural production, distribution and marketing systems. Attention to and analysis of these changes will reveal the feasible and viable options to address the root causes that underpin pathogen evolution, establishment and persistence.

### **Capacity to prepare, prevent, control and respond**

In some countries, multidisciplinary involvement in planning exercises has been limited to the animal and public health sector with an inherent impact on the comprehensiveness of the approach to effectively tackle the problem of avian and pandemic influenza. In addition, in many countries, coordination has not reached further than the central level.

National, regional and global capacity to prepare and respond with multidisciplinary actions addressing disease threats at the animal-human-environment interface must be enhanced, including the capacity to develop safer agricultural and environmental practices, food chains and farming landscapes. Of particular importance is the emergence of wildlife pathogens as a concern to food safety and public health hazard. Animal health systems must be strengthened so that they can address existing diseases and respond to unpredictable health risks. This implies the reinforcement and capacity-building of public health and veterinary services but also other sectors directly or indirectly linked to the prevention and control of major health hazards.

Quality data based on livestock and poultry production system stratification is important because of the distinct sets of management factors associated with each, and the substantial differences in their socio-economic, marketing, biosecurity and other disease risk attributes. There is a narrowing gap between the understanding of what needs to be done in the area of biosecurity and what is communicated to the various stakeholders in a move to understand feasibility and affordability. However, there is still a huge gap between what is communicated to farmers and any behavioural change to respond to biosecurity messages. It is acknowledged that people's behaviour is dependent on a multitude of factors, including longstanding cultural and social practices, and promoting change requires a deep understanding of these. The implementation of biosecurity measures in resource limited circumstances will require sustained efforts over a long period of time.

Filling these gaps calls for multidisciplinary collaborations through partnerships among medical, veterinary and environmental agencies. Filling these gaps also calls for greater transparency.

## THE WAY FORWARD: BUILDING ON ACHIEVEMENTS

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The Australian government, among others, has made significant investment in avian and pandemic influenza preparedness over the last five years to boost both domestic capabilities and those of its regional neighbours to prevent or effectively respond to a potential influenza pandemic<sup>9</sup>. It is illustrative to highlight some of the lessons learned from this experience.

First, creating opportunities for stakeholders to own and drive the process for improving preparedness (rather than just contributing to government processes) has contributed markedly to the success of preparedness initiatives that have involved elements of behavioural change at the grass-roots level. Processes that empower those who can directly influence change, to lead and tailor approaches to suit the unique needs and interests of their group of their stakeholders, leads to practical, sustainable change and real adoption at the farm level. Integral to this process is a willingness from government agencies to engage stakeholders in a way that facilitates their leadership.

Second, differences in motivations, drivers, goals, restraints, risk appetite and resources between stakeholders and institutions are inherent. The need to work more efficiently across sectors has highlighted the need to revisit basic relationship management principles. Policies and preparedness arrangements need to be created that acknowledge differences and allow them to co-exist. Policies that – wherever possible – allow some degree of flexibility for each party to adapt the arrangements to suit their unique needs and motivations will have a greater chance of successful and sustainable implementation.

Third, fostering a forward-looking culture and capability within an organization can help build resilience and flexibility which is critical to withstanding the ambiguous and uncertain future – particularly as it relates to animal and human health. The use of foresight is of particular value when seeking to enhance cross-sectoral collaboration in combating the threat of emerging infectious diseases.

Finally, true learning only occurs when the ‘lessons learned’ are made a reality and institutionalized through active and prescribed changes to approaches, systems and processes.

These provide sound bases on which to plan for the future and must go hand-in-hand with the fact that substantial consensus now exists among informed human and animal health authorities, scientists and policy-makers that effective prevention and control measures against emerging and re-emerging infectious diseases call for strategies that involve all sectors of society (from individuals and local communities up to national governments) and cut across all professional disciplines (primarily those in the animal and human health sectors).

Here, we focus on two critical components that now form part of current thinking but which even just ten years ago had not received the appropriate degree of recognition: the need to work in partnership at the global level and the need to work across disciplines. In the case of pandemic preparedness, one should work at the human-animal-ecosystem interface as illustrated by the “One Health” approach.

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<sup>9</sup> Based on a contribution by the Australian Government Department of Agriculture, Fisheries & Forestry (DAFF), the Australian Government Agency for International Development (AusAID) and the Australian Government Department of Health and Ageing (DoHA).

## **Working in partnership**

In an unprecedented effort to combine knowledge and harmonize response to a global threat, H5N1 HPAI triggered a movement of collaboration that had not existed before. OFFLU is one example but most recently the three international agencies working on the frontline of the human-animal interface – FAO, OIE and WHO – have shown that partnership is very much on the agenda.

On the occasion of the International Ministerial Conference on Animal and Pandemic Influenza in Hanoi in April 2010, the Directors-General of FAO, OIE and WHO submitted a tripartite concept note entitled 'The FAO-OIE-WHO Collaboration – Sharing responsibilities and coordinating global activities to address health risks at the animal-human-ecosystems interfaces'. That note contains the conceptual basis for the preparation of corporate strategies which map out each organization's responsibilities. Since then, initiatives have been taken to harmonize approaches with the World Bank and UNSIC.

Improved coordination through partnerships among public, veterinary, and ecosystem health agents will rely on various measures, including the following which are not exclusive to pandemic preparedness:

- consultation on priority setting.
- joint preparedness planning.
- communicating consistent messages.
- strengthening education.
- providing the appropriate incentive framework.
- advocacy, funding and strengthening research capacity.

Through this shared approach, it is envisaged that further linkages among expert institutions through global networks within both the animal and health sectors will enable new real-time systems where methodology, data availability and responsibilities are shared both horizontally and vertically, and that such improved networking among countries will promote trust, transparency and cooperation. The momentum for partnership created in the wake of HPAI H5N1 should not be lost.

On the other hand, partnership between international agencies and national governments entails the recognition that national governments are the principal agents for effective prevention and control measures against emerging and re-emerging infectious diseases. International agencies play a largely supporting role. The higher is the commitment to prevent and control risk, the better.

Many countries have set up multidisciplinary task forces to respond to pandemics and pandemic risks. Preparedness planning, including the development and approval of contingency plans for identified high-threat diseases not only enables government services to be far better technically equipped to cope with a disease emergency, but also has other benefits. Prior negotiation and approval of plans allow decisions to be made at a political level more rapidly. This, in turn, should enable funds for the control campaign to be released by government more quickly, and for any necessary assistance to be made available more easily from other government agencies. Farming communities are also more likely to cooperate in an emergency disease control programme if it is seen that quick, decisive action is being taken that will ultimately be of benefit to them. This is even more so when they have been actively involved in the preparation of plans so that they have a degree of shared ownership of what will then be implemented.

## **Working across disciplines**

Briefly, the emergence of zoonotic diseases such as Nipah virus in 1999 in Malaysia, SARS in 2002 in China, monkey pox in mid-2003 in the United States, HPAI H5N1 since early 2004 mainly in Southeast Asia but also in Europe and Africa, and influenza A/H1N1 in 2009 in North America have heightened public awareness of the multidimensional linkages among wild animals, livestock production and global public health.

Until recently, approaches to animal disease prevention and control were based mainly on disease transmission disruption (through stamping out, vaccination, quarantine, etc.). The approaches have proved efficient and one example, if not the best, is the global rinderpest eradication to be declared in 2011; however some cases have proved less successful as shown by the current persistence of HPAI in a few countries despite significant national and international efforts. Furthermore, these approaches do not confront the root causes of disease emergence, which if addressed, could counter the progressive flare-up of disease at the animal-human-environment interfaces: no recent pandemic event and threat – HIV, SARS, HPAI H5N1, influenza A/H1N1 – had been anticipated.

These conventional approaches also tend to promote ‘silo behaviours’, with strong veterinary science and medicine disciplines mostly applied in isolation of other relevant disciplines, such as economics, sociology, anthropology, communication, and ecology and land management. There is therefore a need to include approaches and tools additional to the conventional health protection measures, not only, but particularly in the case of zoonotic diseases.

#### **WORKING AT THE HUMAN-ANIMAL-ECOSYSTEM INTERFACE**

The international community is increasingly converging on a multidisciplinary approach to addressing the increasing disease threats. In some circles, this approach has been termed ‘One Health’. However known, this approach is based on a collaborative, international, cross-sectoral way of addressing threats and reducing risks of infectious diseases at the animal-human-ecosystem interface.

The initial concept of ‘One World One Health’ was based on a set of principles, the ‘Manhattan Principles’ agreed in a meeting organized in New York in 2004 by the Wildlife Conservation Society and the Rockefeller University. It then evolved and has been further translated into strategies and policies. At the third International Ministerial Conference on Avian and Pandemic Influenza (IMCAPI) meeting in New Delhi (December 2007), the concept was put forward for further development on the initiative of the Commission and the United States, in coordination with UNSIC. A joint strategic framework was subsequently developed early 2008 by FAO, WHO, OIE, UNSIC, the UN Children’s Fund (UNICEF) and the World Bank. It was presented at the October 2008 IMCAPI in Sharm El Sheikh. On the initiative of the Public Health Agency of Canada, an expert meeting was conveyed in March 2009 in Winnipeg to put the concept into practice. The commitment to One Health was reiterated through the unanimous adoption of the Hanoi Declaration in April 2010.

While some regions are bound to benefit more than others, it is expected that the potential for One Health approaches to reduce disease burdens might be greater in specific hotspots such as the Congo, Mekong and Amazon basins.

The NGO community has also taken the One Health concept on board. For example, in a publication entitled ‘One Health for One World: A Compendium of Case Studies’<sup>1</sup>, the Veterinarians without Borders/ Vétérinaires sans Frontières – Canada (VWB/VSF) NGO has brought together studies of a number of the initiatives that have been informed by one health thinking.

The One Health approach is thus increasingly being acknowledged as a feasible and viable model to address the multidimensional challenges that are rapidly evolving in a changing world. It is no longer just a question of adopting a veterinary or medical (or combined veterinary-medical) approach to animal-based disease. It is necessary to widen perspectives to involve all sectors affected or potentially affected by outbreaks of disease with pandemic potential.

Other achievements mentioned earlier in this paper are highlighted below. They all, in one way or another, contribute to the two components above – recognition that partnering and working across disciplines is not only wishful thinking, but should and will happen when preparing for and responding to pandemic threats.

#### **Transparent, real-time information**

The quality and opportunity of animal and non-animal disease data is essential for disease analysis, early warning and forecasting activities at all levels. Early warning and early detection are of paramount importance for reducing the risks and consequences of disease outbreaks, and global and regional early warning systems are highly dependent on the quality of the animal disease information data available to

them. Timely information of disease events is needed to know the disease situation, support decision-making, prevent potential disease incursion and respond quickly in an emergency situation.

In an era of global communication and in the interest of society as a whole, information systems are required that bring together not only official notification but also information available from other sources such as country or regional project reports, field mission reports, non-governmental organizations (NGOs), diverse institutions, government ministries of agriculture and health, the in-country representations of international agencies, public domains, the media and web-based health surveillance systems.

Today, information on disease can be tracked instantly as a result of improved use of technologies such as electronic mail, the web and the use of geographic information systems (GIS) which are all tools that are becoming more and more accessible to all. Technological developments are also revolutionizing disease surveillance. In recent years, there has been a multiplication of tools developed for the collection of information on animal health, and all have made a significant contribution to timely reporting of animal disease events. Some of the systems in place are moving towards prevention. The SMART surveillance approach of the PREDICT project is designed to detect novel diseases with pandemic potential early, giving health professionals the best opportunity to prevent emergence and spread. These systems exist and should be maintained.

### **People-centred approaches**

The limitations of public services to respond to emergencies has led to increased reliance on society as a whole. In preparedness, prevention and response, an efficient, effective and continuous partnership between the public and private sector is essential ('whole of society' approach). A key factor in designing the best response to an outbreak is ensuring that all stakeholders are convinced that their best interests are being taken care of.

There has been a substantial increase in the awareness of communities regarding the reporting of animal diseases. Participatory disease surveillance (PDS) has been developed to integrate civil society into surveillance activities. Biosecurity – the implementation of measures that reduce the risk of the introduction and spread of disease agents – has also gained in importance as a way civil society can prevent and prepare for animal diseases of pandemic potential. Biosecurity requires the adoption of a set of attitudes and behaviours by people to reduce risk in all activities involving animals and their products. Designing feasible biosecurity programmes requires working with all stakeholders to ensure that those who have to implement the measures accept and see the need to do so and the benefits in doing so. The implementation of biosecurity and other measures to prevent pandemics is the responsibility of individual countries through the leadership of national governments, the active participation of all national stakeholders and the informed awareness of civil society. In this sector, the responsibility of the international community, and multilateral institutions and technical and financial agencies in particular, is to support national initiatives.

An equitable compensation plan for losses occurred is one of the first important steps to engage society as a whole within any animal disease control system. It has proved to be an important tool in ensuring cooperation of the owners of animals when dealing with disease control. Early identification of disease and the immediate culling of diseased or suspected animals are critical elements in reducing the risk of disease spread. Compensation represents an important incentive for obtaining acceptance of and participation in pandemic preparedness.

### **Simulation exercises to check, learn and become aware**

Simulation exercises have already proved their value in response to threats of an H5N1 pandemic and should be a crucial component of preparedness for any type of pandemic. They serve to:



- verify the major components of plans that have been put in place, such as command and control, communications, and animal and human health technology.
- provide experience and practice to those who may be involved in response, giving them the opportunity to explore their roles and the expectations of response plans, and the plan's managers the occasion to identify and correct knowledge gaps and poor functionality.
- raise awareness among and provide assurance to stakeholders on the preparedness plan: communication and witnessing of simulation exercises is a good way to inform all stakeholders of the existence of plans, and what they may be required to do during major events.

## CONCLUSION

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As the human population expands, economic development proceeds in certain sub-sectors of the population and new technologies arise, societies around the globe face more complex and previously unknown challenges. Without a doubt we are experiencing a rapidly evolving world: a place where domestic struggles meet regional priorities that are moulded by international concerns and global issues. We now face climatic change, energy insecurity, nuclear proliferation, hegemonic contestation, deepening regionalism, international terrorism, radicalism, a new multipolar order and novel diseases. This last challenge is the one we are concerned with here and lessons learned over the past five years on the fight against novel diseases could prove useful for other types of disasters or threats.

In years to come, an important challenge in veterinary public health will be to balance the need for adequate population intake of animal-source protein and essential nutrients with the rapid selection, amplification and spread of pathogens in animal production systems. Evidently, addressing disease burdens on host populations must also consider livelihoods, poverty alleviation, food security, and environmental stewardship while constantly reassessing successes, failures, threats and opportunities.

The numerous challenges faced by the international health community are daunting, yet not impossible to overcome. A principal obstacle is to rightly position the impacts of emerging zoonotic diseases on animal and human populations as a salient theme in global agendas, especially as it competes with other equally important and pressing priorities weighed by influential countries.

Fortunately, the last decade has witnessed an upsurge of narratives and discourses calling for a paradigm shift from selfish divergence towards unified, coordinated and interdisciplinary mechanisms across agricultural, ecological, nutritional, public health, scientific and veterinary communities worldwide, with the goal of making our world a safer place to live in.

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