

Technical Report

Technical Workshop
on Highly Pathogenic Avian Influenza
and Human H5N1 Infection

27-29 June 2007, Rome

Final Report
2 August 2007

Food and Agriculture Organization of the United Nations
World Organisation for Animal Health
World Health Organization

TABLE OF CONTENTS

FOREWORD	III
ABBREVIATIONS	IV
EXECUTIVE SUMMARY	V
1. INTRODUCTION AND BACKGROUND	1
2. AN ASSESSMENT OF THE H5N1 VIRUS SITUATION – TRENDS, ECOLOGY AND VIRUS EVOLUTION	4
2.1 HPAI situation in poultry: global distribution, epidemiology and risk assessment	5
2.2 Human infection with influenza A H5N1 viruses of avian origin	6
3. ASSESSMENT OF HPAI CONTROL EFFORTS IN POULTRY, RISK REDUCTION FOR HUMANS AND PANDEMIC PREPAREDNESS	8
3.1 Achievements and challenges: country experiences with HPAI control	8
3.2 Achievements, issues and options: strategies for HPAI prevention and control	9
3.2.1 Issues and options for outbreak control in poultry	9
3.2.2 Issues and options for global reduction of HPAI risk at poultry production and marketing levels	12
3.3 Issues and options for human pandemic preparedness	17
3.4 Communication issues.....	18
3.4.1 Communication support.....	18
3.4.2 HPAI communication	19
3.4.3 Pandemic preparedness communication	20
3.5 Assessment of institutional strengthening and support.....	20
3.5.1 Strengthening regulatory veterinary services.....	20
3.5.2 Strengthening public and private sector roles in animal health	21
3.5.3 Regional and global technical support for animal health.....	21
3.5.4 Ensuring inter-governmental support for integrated contingency planning	22
BIBLIOGRAPHY	24

FOREWORD

Over the past four years, highly pathogenic avian influenza viruses of the H5N1 subtype have spread from Asia to Europe and Africa, causing severe disease in poultry and humans. Numerous technical studies have been performed on these viruses; the disease they cause in both animals and humans; the social and economic effect of this disease and the impact of communication exercises on the disease. In addition, many meetings have addressed specific aspects of the disease in animals and humans, the threat of a pandemic, and the communication strategies needed to reduce the risk of disease in animals and humans.

This technical workshop was organised jointly by FAO, OIE and WHO in collaboration with UNICEF and the UN System Influenza Coordinator (UNSIC). It was attended by technical experts from these agencies, independent experts, representatives of regional organisations, senior veterinary officials from countries leading control measures for this disease, representatives of donor agencies in both national and international institutions as well as those in the private sector. It aimed to consolidate information and opinion derived from earlier work on the disease, examine contentious technical issues relating to disease control and, where possible, achieve consensus on the technical issues surrounding the prevention and control of H5N1 highly pathogenic avian influenza and human pandemic influenza preparedness. It also aimed to highlight areas where further work should be focused or refocused to progressively reduce the threat of the disease to poultry and humans.

The technical workshop succeeded in this regard and pointed to some shifts in emphasis that the concerned countries, supporting international agencies and donor community need to adopt in order to tackle the disease, especially in countries with entrenched infection or at high risk of infection.

This report distils the main conclusions, recommendations and outcomes of the workshop and the background papers prepared specifically for it. It is primarily directed towards participants at the next International Ministerial Conference on Avian and Pandemic Influenza planned for December 2007: to that end it highlights the recommendations and conclusions from the workshop with the greatest policy relevance. It provides background briefing on the current status of HPAI control and the issues that need to be considered in moving towards longer term support for infected countries and for countries that are not yet prepared for emergence of a novel human pandemic virus (be it an H5N1 virus, another influenza subtype or some other novel virus).

The workshop confirmed that the disease remains largely a disease of poultry, which occasionally spreads to humans and other mammals, and that the viruses that cause the disease have not yet developed the capacity for sustained human-to-human transmission. Therefore, control of the disease at source in poultry remains the priority intervention. At the same time, uninfected countries need to prepare for possible virus incursions into poultry, while all countries need to improve capacity to deal with the emergence of a novel pandemic strain of influenza virus should one arise.

Perhaps the key lesson from the workshop is that there have been many successes in controlling and preventing the disease in poultry, demonstrating that the efforts made so far by the governments of affected countries, international agencies and donors are being rewarded. However, there are a number of locations in which infection is entrenched and will remain so for some time. The reasons for this persistence are becoming clearer and this knowledge will help direct the longer-term measures needed to ensure that the gains made so far are consolidated and sustained.

Joseph Domenech
Chief Veterinary Officer, FAO

ABBREVIATIONS

AHI	avian and human influenza
AU-IBAR	African Union – Inter-African Bureau for Animal Resources
BSE	bovine spongiform encephalopathy
CAHW	community animal health worker
CMC/AH	FAO/OIE Crisis Management Centre/Animal Health
FAO	Food and Agriculture Organization of the United Nations
GF-TADs	Global Framework for Transboundary Animal Disease Control
GLEWS	Global Early Warning and Response System (for livestock diseases transmissible to humans)
Hong Kong SAR	Hong Kong Special Autonomous Region
HPAI	highly pathogenic avian influenza
IHR	International Health Regulations
Lao PDR	Lao Peoples’ Democratic Republic
OFFLU	OIE/FAO Network of Expertise on Influenza
OIE	World Organisation for Animal Health
PPE	personal protection equipment
SARS	sudden acute respiratory syndrome
TADs	transboundary animal diseases
UNICEF	United Nations Children’s Fund
UNSIIC	United Nations System Influenza Coordinator
WHO	World Health Organization

EXECUTIVE SUMMARY

During and after the International Ministerial Conference on Avian and Pandemic Influenza held in Bamako on 8 December 2006, several representatives of donor countries, agencies and international organizations including FAO, OIE and WHO identified the need for a technical workshop to review the strategies being used to address these threats. Discussions with resource-contributing countries confirmed that the meeting should take place well in advance of the Ministerial Conference to be held in New Delhi in December 2007. The workshop was organised by the three agencies, in collaboration with UNICEF and the UN System Influenza Coordinator (UNSIC), and was held in Rome from 27-29 June 2007.

Workshop participants were presented with a summary of the current global epidemiological situation of HPAI in poultry and H5N1 infections in humans, an assessment of the threat of an influenza pandemic and an analysis of countries' state of preparedness. Information was also provided on strategies and practices applied over the last three years for the control of HPAI in poultry and reduction of the associated risk of human infection including an assessment of what had been achieved and what were the constraints and failures (13). They developed recommendations for the adaptation of existing strategies within specific situations, and identified several areas in which new strategies may be required.

Situation assessment

During the workshop a rapid assessment of the constantly evolving situation and the main features to highlight since the last Ministerial meeting in Bamako were presented. It was agreed that the risk of disease in poultry and transboundary spread will persist as long as Asian lineage H5N1 HPAI viruses remain entrenched in one or more countries or sub-regions, and that elimination of infection from these is unlikely in the medium term (the next five years). However, a reduction in levels of infection in these countries is achievable provided adequate technical and financial support is available from international agencies and governments. This reduction of levels of infection is crucial for reducing the risk of human H5N1 infection and securing safe poultry production and trade. Commitment from governments, providers of external assistance (donors) and the poultry sector would include facilitating the longer-term adjustments in commercial poultry production and marketing identified through objective risk analysis.

The factors that lead to transboundary spread of H5N1 HPAI viruses include trade in poultry and other birds (especially illegal trade) and also wild bird movements. At this stage, the relative contribution of each of these factors is not clearly established.

The continued circulation of Asian lineage H5N1 HPAI viruses threatens human health through the risk of zoonotic infection and through the emergence of an influenza strain with pandemic potential.

Both types of risk are also posed by other avian influenza virus subtypes (e.g. H7, H9) that are currently circulating in animals in various parts of the world.

Although humans appear to be exposed to avian H5N1 viruses primarily through contact with infected poultry, specific risk factors and alternative sources of human exposure remain undetermined.

Though an H5N1 virus has not mutated or undergone reassortment into a strain that can be transmitted easily between humans, this risk will continue as long as influenza A viruses continue to circulate in animal populations.

The pathogenicity of an emerging pandemic virus strain cannot be predicted. If an emerging pandemic strain of H5N1 virus were to retain even some of its current high level of pathogenicity for humans, an influenza pandemic would be devastating.

Effective preparedness for an influenza pandemic results in increased resilience of local and national health systems, of national economies and of communities' capacity to respond to major crises. It leads to the creation of national infrastructure capable of reporting suspected incidences of novel influenza viruses and other threats under the WHO International Health Regulations (IHR

2005) (11). It calls for a distinctly different set of interventions and approaches from those required to prevent and control HPAI in poultry and other zoonotic infections.

Progress in the public health dimensions of this work has been substantial as evidenced by the pandemic preparedness actions that have been developed and/or implemented by different countries. However, most progress has been in establishing plans for actions at countries national levels: the work should be expanded to prepare communities and provinces especially within those countries which have significantly decentralised governance structures. There is a particular need for capacity to communicate relevant information to the public, systematically, at these sub-national levels – before and during an influenza pandemic.

Although many countries have started planning to be ready for an influenza pandemic, their plans generally apply only to the health sector. Some governments have initiated work in other sectors, such as finance. But most countries are not yet ready to mitigate the broader social and economic impact of an influenza pandemic. In addition, there has been insufficient systematic planning at the intergovernmental level to cope with regional and global disruptions in key sectors such as transport, communication, energy and finance.

Main outputs

The technical workshop aimed to identify achievements and gaps, confirm recommendations from previous meetings that are still considered to be relevant, and to highlight new recommendations that differ from those in the past. These are presented in the summary tables, boxes and notes below.

Animal Health: Recent achievements, gaps, conclusions and recommendations

Recent achievements	Related gaps
<p>Enhanced surveillance and openness are providing better information and understanding on the evolution of H5N1 viruses and the epidemiology and control of HPAI.</p> <p>Improved laboratory capacity in a number of countries is assisting surveillance programmes</p>	<p>Veterinary capacity and the structure of the poultry sector in developing countries still make surveillance difficult; some countries still not sharing viruses.</p> <p>Gaps in veterinary services are being identified through the PVS process, including the quality of veterinary education and strength of the national chain of command.</p> <p>Capacity and quality management of laboratory and epidemio-surveillance services require strengthening, to cover both national systems and regional networks.</p>
<p>Detection of viruses against which current poultry vaccines do not provide protection (which was predicted to occur), although the selection pressure that led to their emergence (if any) is unclear.</p>	<p>Need for improved mechanisms to monitor these viruses and to allow rapid incorporation of new antigens into vaccines when required. Requires ongoing sample submission to reference laboratories and review of existing vaccine licensing procedures in some countries.</p>
<p>Disease has been eliminated from a number of newly-infected countries demonstrating increased preparedness and response capacity.</p>	<p>Not all countries have appropriate, tested HPAI emergency preparedness plans. These are needed because HPAI will remain a global threat so long as infection persists in some countries.</p>
<p>Recognition that the disease is not going to be eliminated in the short to medium term globally or from some countries with entrenched infection.</p>	<p>Need for longer-term strategies and work plans, evaluation and strengthening of veterinary services (including laboratories), better engagement of industry/farmers and partnership with the public sector, appropriate improvements to farm biosecurity, and modification of high-risk marketing methods.</p>
<p>Recognition that sustained control in places with entrenched infection depends on identifying and overcoming high-risk commercial production and marketing practices.</p>	<p>A large communication and regulatory gap still exists between veterinary authorities and the commercial poultry sector in some countries.</p> <p>Socio-economic factors resulting in slow or no changes to existing commercial practices, in both infected and uninfected countries.</p>
<p>Successful use of vaccination to assist in containing or preventing infection and disease, with large scale campaigns in China, Hong Kong SAR and Viet Nam noteworthy.</p> <p>Vaccination appears to have reduced levels of infection and the need to cull poultry and therefore the complications associated with compensation.</p>	<p>Difficulties of sustaining large-scale government-sponsored vaccination campaigns need to be overcome since these will be required as long as high-risk production practices exist.</p> <p>Better vaccines are required that are easier to administer than current injectible products.</p> <p>Not all countries using vaccination have prepared integrated control plans that include appropriate methods for post-vaccination surveillance and review points for assessing the need for and on-going scope of vaccination programmes.</p> <p>Communication with the commercial sector on the implementation of vaccination needs to be increased.</p> <p>Need to review currently used vaccine licensing procedures in certain countries.</p>
<p>Recognition that wild birds are playing some role in the dissemination of these viruses, especially transboundary spread.</p>	<p>Relative contribution of trade versus wild birds not always known but one cannot afford to ignore either source. Species involved in short term carriage of virus are not known. Role of wild birds as possible reservoirs unknown.</p>
<p>Improved information on social and economic effects of the disease, the control measures implemented and market shocks</p>	<p>Better information is required based on comprehensive baseline research to allow vulnerable groups to be identified and protected.</p> <p>Regional networks of socio-economists, farming system and biodiversity specialists have to be strengthened.</p>

Animal Health: Major conclusions and recommendations

Good progress has been made in control and elimination of H5N1 HPAI viruses by many countries. This demonstrates that the available tools and methods work when necessary resources (including a functioning veterinary infrastructure) are available and applied appropriately. This requires sustained commitment of both legislators and those with a stake in poultry production.

The disease remains poorly controlled in some countries, primarily because of:

- (a) lack of suitable human resources to detect and control disease – particularly the lack of effective animal health services;
- (b) lack of political commitment to apply the appropriate measures;
- (c) insufficient engagement of private entities in improving animal health; and
- (d) the pre-existing structure of the commercial poultry sector and poultry production and marketing practices, especially in those parts of production sectors 2 and 3 where biosecurity measures are not commensurate with the threat of infection.

There is firm global support for the goal of containing, and ideally eradicating, Asian lineage H5N1 viruses. It is now clear that eradication will require many years of consistent engagement in support of those countries in which the virus is entrenched (or capable of becoming so). Emergency responses can be used to contain outbreaks of HPAI in settings where it is not entrenched but a medium- to long-term approach is needed to contain it in countries or sub-regions with entrenched infection.

This requires:

- the continued building of capacities in key institutions, including better functioning veterinary services with the necessary powers to implement essential control measures and regulations;
- sustainable adjustments to the poultry sector to reduce the risks of disease in settings where commercial poultry production and marketing practices carry high risks of HPAI;
- effective engagement of private-sector stakeholders in these risk reduction efforts;
- sustained political commitment, from the highest level of government, reflected in provision of an appropriate resource allocation and regulations; and
- the application of appropriate, interim control measures, including vaccination, to contain infection.

All countries with enzootic infection must have a sound long-term technical strategy and work plan that is appropriate for local conditions and adaptively managed, addressing how the viruses will be progressively contained and high risk practices modified.

It is important to reiterate that the control and preventive methods applied must be science-based, technically feasible, grounded in an assessment of local situations, and designed to minimize gender, social, environmental and economic impacts. Planning and implementation should closely involve all key stakeholders in the poultry sector.

Special attention must be paid to alleviating the impact of control measures on vulnerable human populations, which is possible if a long term approach to disease control is adopted.

International agencies and regional organizations should focus most attention on countries and sub-regions in which infection is entrenched and on other developing countries, whether currently infected or not, that are at high risk of infection and/or establishment of enzootic infection.

International and regional coordination should be strengthened through global or regional tools, and bodies such as CMC/AH, GLEWS, OFFLU, regional animal health centres and laboratory, epidemiology and socio-economic networks.

The workshop also reaffirmed the following related to animal health:

- The current panzootic of H5N1 HPAI is unique because it is the first multi-country outbreak in the last 50 years. Unlike earlier HPAI outbreaks, by the time this disease was recognised or reported in many Asian countries, it was already widespread. As a result the use of traditional measures to control the disease reduced but did not eliminate infection.
- Domestic ducks continue to play an important role in the maintenance of these viruses, especially but not only in Asia.
- There is ample opportunity for interchange of Asian lineage H5N1 HPAI viruses between wild birds and poultry (in both directions).

- Asian lineage H5N1 HPAI viruses are being detected in dead wild birds in places with no known cases of infection or disease in poultry.
- Appropriate compensation plans are needed if stamping out is used (11) although compensation is not necessarily a sufficient incentive to report disease, as is often stated. (7)
- There is a need for emergency preparedness plans that are practical and tested, and for emergency response in the first instance in newly-infected countries.
- Investments in veterinary services are not just for improving control of H5N1 viruses but also for addressing needs for the control of all transboundary animal diseases and other emerging infectious diseases, thereby safeguarding food supply.
- Research must continue in a number of areas including the role of wild birds, of differing farming systems and of illegal trade in persistence and dissemination of HPAI viruses; better vaccines, particularly with improved delivery systems, are needed.
- International support for vaccination in circumstances of widespread, high-risk or endemic HPAI should be maintained
- All at-risk countries still require appropriate avian influenza emergency preparedness plans and it is recommended that these should be included in national disaster/emergency plans.
- Participatory methods have been successfully deployed for disease detection in some countries. The experiences in these countries should be reviewed and assessed for applicability elsewhere.

Other specific recommendations on animal health are contained in the main document.

Human Health: Recent achievements, gaps, conclusions and recommendations

Recent achievements	Related gaps
Control of infection in poultry (e.g. in Viet Nam, Thailand) has appeared to decrease the incidence of infections in humans	Disease is still poorly controlled in several countries leading to continuing exposure of humans
Specific gains made in identification of clinical human cases and clusters of H5N1 avian influenza infection in some countries	Continued difficulties in rapid clinical and laboratory identification of cases
Better data being collected from human cases of H5N1 avian influenza infection	Knowledge on risk factors and transmission factors lacking Data still missing in many cases
Increased capacity for outbreak response, social mobilization, and communications Increased disease awareness	Capacity and awareness still lacking globally
Some improved collaboration and data sharing among stakeholders	Transparent collaboration required at all levels
Increased number of countries with national pandemic preparedness plans	National capacity to implement existing plans sometimes lacking Multisectoral/ non-health aspects of plans sometimes lacking Scope may be limited to central level
Development of a rapid containment protocol	National capacity to implement protocol sometimes lacking
Development of a global plan to increase pandemic influenza vaccine supply and implementation of national vaccine production	Production capacity globally still insufficient Requires timely knowledge of circulating virus strains

Human health and pandemic preparedness: Major conclusions and recommendations

Human infection with avian influenza viruses and the emergence of a pandemic strain of influenza A are two separate yet related public health threats from HPAI A (H5N1) viruses. Previously-developed strategies to decrease the risk of human zoonotic infection, to contribute to reducing the likelihood of emergence of a pandemic strain, and to improve pandemic preparedness globally, remain appropriate but should be expanded and strengthened.

To date, the Asian lineage H5N1 viruses remain animal viruses that do not easily cross the species barrier to infect humans. Control of the disease in poultry has appeared to decrease the incidence of human infections in some countries, thus the focus of limiting the public health threats of H5N1 viruses should continue to be on control of the disease in poultry.

Specific risk factors for human zoonotic exposure need to be determined and other epidemiological, virological, and serological knowledge gaps need to be filled in order to develop and implement appropriate science-based control measures to limit exposure of humans to virus sources. Systematic epidemiological and virological surveillance, human case investigation and follow-up and additional studies and clinical research (including serological studies in populations at risk) should be initiated, continued and/or expanded, especially at the human-animal interface.

The Asian lineage H5N1 viruses continue to evolve. The evolution of these and other novel influenza viruses should be tracked to allow (1) rapid and continuing assessment of virus modifications with potential public health impact, (2) evaluation and updating of diagnostic reagents and vaccine candidates, and (3) determination of virus susceptibility to antiviral agents.

Preparedness planning improves the resilience of health and non-health systems to respond to a variety of emergencies. The international community should maintain and expand its support for preparedness planning for pandemic human influenza while recognizing that H5N1 viruses are not the only potential source of a human pandemic influenza strain. Implementation of the International Health Regulations (IHR 2005 (11)) should be ensured, including assisting resource-poor environments to meet their core capacity obligations for infrastructure, surveillance and reporting systems, which are essential for the detection of human infections with novel influenza viruses and other public health events of international concern.

Pandemic preparedness should increasingly focus on implementation aspects at the local level, on flexibility in responding to different scenarios, on including the private and non-health sectors, and on coordination between health and other sectors at and between national, regional, and international levels. Preparedness planning should consider implementation of non-pharmaceutical measures as well as the availability of antiviral and vaccine stocks.

Collaboration and coordination between the human and animal health sectors is essential to effective control of zoonotic diseases, and fits within the *One Health* concept. Intersectoral aspects should be promoted at country, regional and international levels, and can be facilitated by establishment of formal mechanisms for collaborative interaction. Specifically, multisectoral collaboration and joint standard operating procedures to ensure early disease detection and response in human and animal populations should be enhanced.

Communication: Recent achievements, gaps, conclusions and recommendations

Recent achievements	Related gaps
<p>Most countries affected by outbreaks have sought to establish active inter-sectoral partnerships including national inter-agency communication taskforces, and They have advocated with relevant ministries to develop and implement communication plans.</p>	<p>Preliminary research in a number of affected countries indicates that although public awareness of avian influenza is quite high, this has not necessarily translated into a reduction in risky behaviors or practices among vulnerable populations, due to a number of socio-economic barriers. The risk with regard to avian and pandemic influenza is generally not well understood among both the public and national decision makers.</p>
<p>In countries where there have been advance preparations, the emergency communication responses to new outbreaks (in the form of Outbreak Communications) have often been very effective in supporting the management of media and, to a certain degree, promoting public trust and compliance in prevention/control efforts, to rapidly stamp out the disease.</p> <p>Communication interventions, some of which have been led by the private sector, have also helped countries recover from market shocks (e.g. Turkey, Thailand).</p>	<p>The ongoing public confusion in distinguishing among avian influenza (HPAI) in poultry, human zoonotic infections with avian influenza H5N1 viruses and human pandemic influenza remains a communication challenge.</p> <p>In countries where HPAI has either already become, or could become, entrenched concerted communication efforts will be needed for at least another 5 – 7 years.</p> <p>There will need to be a shift from short-term emergency communication campaigns, to significant mid- to long-term investments in better communication capacities across key ministries - animal health, human health and communication/information.</p> <p>Inputs from robust multi-disciplinary research are needed to build effective communication strategies.</p>
<p>Recognition of the need for enhanced cooperation between communication professionals and technical experts, and the need for a shared understanding of issues and barriers to change.</p> <p>Recent discussions among communicators and technical partnersⁱ, have underscored that controlling HPAI requires particular attention to animal health communication issues.</p>	<p>The actions to be taken by poultry farmers, transporters and marketers to reduce the risks of HPAI transmission among poultry are complex and communication interventions need to be crafted specifically for different occupational groups.</p> <p>Communications strategies require further elaboration especially in settings where HPAI is entrenched.</p> <p>Communicators and veterinarians and public health workers need to work jointly in determining the appropriate behaviours that should be promoted in resource poor settings, especially for production Sectors 3 and 4.</p>

ⁱ FAO/OIE Communication Roundtable (April 2007, Rome)

Communication: Major conclusions and recommendations

National governments should ensure capacity for communicating measures through which risk of human infection can be avoided in the event of outbreaks of HPAI in poultry, sporadic human cases of H5N1 infection or pandemic human influenza.

Communication efforts need to be planned and implemented in coordination with the technical programme aspects such as strengthened veterinary sectors, a responsive surveillance system and just compensation policies. Failure to do so will result in low compliance with recommended actions by individuals and communities. To this end, both veterinary and medical services should establish communication teams and ensure they work together effectively.

Communication strategies should reflect realities and needs at the community level and should involve individuals, communities and specific occupational groups. Strategies should be jointly developed through forging partnerships between national and sub-national governments, NGOs, and UN and international donor agencies responsible for controlling HPAI.

Communication strategies that would contribute toward reducing transmission of HPAI among poultry and for reducing human risk have to be designed and adapted for specific occupational groups (farmers, transporters, workers in live animal markets, poultry-owning households, animal health professionals, etc.) and different poultry production sectors.

This requires a review of existing communication strategies, especially in places with entrenched HPAI infection. The overall objective is to identify feasible and replicable behavioural/production practices that minimize the risk of infection with HPAI in each poultry production sector and along the market chain and to adjust/re-formulate communication strategies and messages to promote these.

National-level planning processes should be supported through a global, transdisciplinary and inter-agency Technical Advisory Group on HPAI and pandemic communication with responsibility for ensuring a unified vision and long-term strategic communication framework.

National governments, technical agencies and the international community need to increase their investments in national communication expertise and capability, especially within the Livestock and Public Information departments of national governments and their provincial or regional counterparts.

National governments, when preparing for an influenza pandemic, should ensure that adequate communications' capacity – extending from the national level to local communities – is developed, tested and modified as necessary. The functioning of channels for communication between countries also needs to be tested and, in many instances, will require improvement.

1. INTRODUCTION AND BACKGROUND

In late 2003 and early 2004, when H5N1 highly pathogenic avian influenza (HPAI) was reported almost simultaneously in a number of Asian countries, there were two immediate concerns. The first was the threat to poultry industries in countries where it was already occurring and in those to which it might spread. The second was the occurrence of severe disease in humans due to infection with H5N1 viruses of avian origin. This cross-species transmission raised concerns about the potential for emergence of a human pandemic influenza virus strain. These two concerns were the stimulus for a concerted international response to the disease by animal health and public health agencies and by donor countries.

Three and a half years later, these concerns remain, but much has changed in the global HPAI situation. Spread of the virus out of Asia in late 2005 and early 2006 to Europe, the Middle East and Africa demonstrated the global threat that H5N1 HPAI represents. However, these outbreaks also showed that countries can control and eliminate infection if they are properly prepared and do not have the combination of risk factors that contribute to establishment of enzootic disease, and which prevail in many Asian and African countries. Due to these factors, there are now a small number of countries, including Indonesia and Egypt, in which HPAI is entrenched and disease outbreaks in both humans and poultry continue to occur. Managing the response in these countries is a major challenge for both the human and animal health sectors. H5N1 HPAI viruses are also entrenched and/or new strains are being introduced to other countries, including parts of Viet Nam and China. These countries are maintaining a high level of control but have not yet fully implemented methods to achieve long-term, sustainable prevention, control and elimination of Asian lineage H5N1 HPAI virusesⁱⁱ.

Pledging conferences in Beijing in January 2006 and Bamako in December 2006 showed the strong political commitment of the international community with its generous financial pledges. An increasingly comprehensive international partnership has developed. On the UN side, the UN System Influenza Coordinator (UNSIC) is ensuring that the UN system works in synergy and towards an integrated approach, with WHO and FAO leading the human and animal health sectors, UNICEF developing communications initiatives, and humanitarian agencies working together on non-health aspects of pandemic preparedness. OIE and FAO are collaborating closely on animal health issues and jointly with WHO on issues at the animal-human interface. The World Bank is playing a key role in coordinating funding arrangements, assisting countries to develop integrated plans and supporting emergency programmes. Individual donor countries and agencies are supporting both multilateral initiatives and bilateral programmes, through international and regional organisations or directly with recipient countries.

During and after the International Ministerial Conference on Avian and Pandemic Influenza held in Bamako on 8 December 2006, several representatives of donor countries, agencies and international organizations including FAO, OIE and WHO identified the need for a technical workshop to review the strategies being used to address these threats. Discussions with resource-contributing countries confirmed that the meeting should take place well in advance of the Ministerial Conference to be held in New Delhi in December 2007. The workshop was organised by the three agencies in collaboration with UNICEF and the UN System Influenza Coordinator. It was held in Rome from 27 to 29 June 2007.

The workshop was planned to review the progress made to date in prevention and control of HPAI in poultry, in H5N1 infections in humans and in human pandemic influenza preparedness, to identify the weaknesses and to propose short to long-term strategies.

ⁱⁱ Throughout this document the term 'Asian lineage H5N1 HPAI viruses' is used to describe related viruses that were first identified in Asia in 1996.

The specific objectives were to:

- 1) review the best available scientific, technical and operational evidence to date on the nature of HPAI, on H5N1 infection in humans and on its prevention and control, and provide an authoritative assessment of risk;
- 2) provide strategic guidance to partners on technical and policy options for cost-effective and cost-efficient measures for the effective prevention and control of highly pathogenic avian influenza and associated human infections;
- 3) identify the current state of pandemic influenza preparedness in the context of H5N1 human infections; and
- 4) identify and build consensus on geographical and thematic priorities and key constraints that need to be overcome, in the immediate, medium and longer term, to effectively address highly pathogenic avian influenza and associated human infection.

The workshop built on the considerable body of work that had been conducted previously, including specific technical meetings on vaccination of poultry against AI and on the role of wild birds in the spread of H5N1 HPAI viruses, and other papers and documents, including the global strategy of FAO/OIE (5) and the WHO strategic action plan for pandemic influenza (12).

In January 2007, the United Nations and the World Bank released a progress report (10) that examined key issues relating to control and preparedness for avian and human influenza. This contained conclusions from a Senior Officials Meeting held in Vienna in 2006 which were:

- a strong commitment to ensuring their implementation at the highest political level, accompanied by effective leadership of all concerned stakeholders;
- clear procedures and systems for managing the rapid implementation of priority actions; primary attention to improved functioning of veterinary and human health services at all levels, with a transparent approach to the sharing and dissemination of information about suspected disease outbreaks, immediate efforts to establish their cause, and prompt responses (including restriction of movement of animals that are at risk);
- incentive and/or compensation schemes combined with effective communication to communities on the importance of immediately reporting disease outbreaks in animals to responsible authorities;
- effective mobilisation of civil society and the private sector; and
- national mass communication campaigns that promote healthy behaviour and focus on reducing the extent to which humans might be exposed to HPAI viruses.

The report made the following recommendations for 2007:

- sustain the political commitment for national and international action: avoid the dangers associated with complacency;
- distribute capacity for rapid reporting and response more equitably across countries and regions than is currently the case;
- because of the wide variation in mass communications activity and social mobilisation on avian and human influenza (AHI), identify and implement optimal methods for ensuring a sustained impact on behaviour;
- there is much scope to build on social mobilisation to promote engagement of government with non-governmental sectors in policy planning and implementation;
- the joint UN system and World Bank approach has a strong influence on the ways in which governments and the international community operate, and it is critical to coordinated implementation support;
- the evident limitations in human and technical capacity argue for concerted international action on rapid detection methods, response implementation protocols, and approaches to mitigate the adverse social impact of measures particularly among vulnerable groups; and
- the international community is asked to pledge and then commit additional funds that will permit the maintenance – and intensification – of the efforts described in this report.

Similarly, the WHO strategic action plan for pandemic influenza (12), developed after the November 2005 meeting, identified five elements to be adopted by all nations:

- 1) reduce human exposure to the H5N1 virus;
- 2) strengthen the early warning system;

- 3) intensify rapid containment operations;
- 4) build capacity to cope with a pandemic; and
- 5) contribute to coordinated global scientific research and development.

Participants in the Rome workshop analysed achievements over the last three years. They concluded that recommendations of previous meetings and strategic documents remain relevant but also identified a number of areas in which a shift in emphasis is required if sustained control of Asian lineage H5N1 viruses is to be achieved.

This Technical Report has been prepared to summarise the main conclusions and recommendations from the June 2007 Rome workshop with a specific focus on areas that mark a departure from or refinement of the approaches defined in earlier documents and meetings.

The full proceedings of the Technical Workshop, including the background papers presented at the meeting, are available separately (13).

2. AN ASSESSMENT OF THE H5N1 VIRUS SITUATION – TRENDS, ECOLOGY AND VIRUS EVOLUTION

Asian lineage H5N1 highly pathogenic avian influenza (HPAI) viruses have been circulating in poultry for at least 10 years and have spread from their origin in Asia across three continents, making this the first confirmed panzootic of HPAI. At least some of these Asian lineage H5N1 HPAI virus strains circulating in birds can cause disease in mammalian species, and some have caused severe disease and death in humans. At present, the viruses are entirely of avian origin and the disease in humans remains a zoonosis with a low attack rate, but as long as the viruses continue to circulate in poultry, providing ongoing opportunity for exposure and infection in mammalian hosts, the chance always remains that a human pandemic strain could emerge through host adaptation (via genetic mutation and selection) or virus reassortment. If the emerging virus were to retain its current capacity to cause severe disease in infected patients, the global consequences to human health could be devastating.

Currently, there is no evidence of increased transmissibility of the H5N1 HPAI viruses from animals to humans or between humans, nor evidence of any increased ability to cause human infection or disease. Although genetic differentiation of the Asian lineage H5N1 HPAI viruses into at least 10 clades has occurred, and despite multiple opportunities for host adaptation or reassortment during known human infections, there is no evidence that currently circulating viruses have mutated to become more adapted to humans or undergone reassortment with human viruses.

Little is known about the viral properties or combination of events required of avian influenza viruses to develop the capacity for sustained human-to-human transmission. Thus, although the currently circulating Asian lineage HPAI H5N1 viruses still have the greatest likelihood of undergoing these changes by virtue of their global prevalence, other avian or human influenza viruses could also be precursor viruses for the next human influenza pandemic and thus should always be considered. Building appropriate national infrastructure for pandemic response promotes the resilience of health systems and other sectors of society to respond to other public health emergencies as required under the framework provided by the WHO International Health Regulations (IHR 2005).

Recommendation

The international community should maintain and expand its support in preparedness for pandemics and recognise that H5N1 viruses are not the only potential source of a human pandemic influenza strain.

The two main concerns for Asian lineage H5N1 HPAI viruses as a human pandemic threat are their prevalence and pathogenicity to humans, although there is no guarantee that the latter property would be conserved if a virus developed the capacity for rapid human-to-human transmission. It is well accepted that the best way to limit the threat is to reduce the prevalence of infection in poultry. Field experience (for example, in Viet Nam) shows that taking steps to minimise clinical HPAI in poultry, without necessarily reaching total eradication of the virus, appears to greatly reduce the incidence of human infections. HPAI also has a severe impact on the economic security of poultry farmers and sellers in affected countries, although in many cases the greater detrimental impacts arise from the imposition of control procedures, the market shocks that occur when infection is publicised and impact on international trade.

Recommendations

The focus of limiting the pandemic threat of H5N1 viruses should continue to be on prevention and progressive control of HPAI in poultry.

Methods applied to HPAI control must be science-based, technically feasible, based on a situation assessment and consider gender, social, environmental and economic impacts.

2.1 HPAI SITUATION IN POULTRY: GLOBAL DISTRIBUTION, EPIDEMIOLOGY AND RISK ASSESSMENT

Although knowledge is incomplete, the factors that predispose exposure of poultry to Asian lineage H5N1 HPAI viruses and subsequent maintenance of HPAI in a country or region are becoming better understood based on experiences over the last 10 years (2). At present, the risk of exposure appears to depend on:

- whether neighbouring (or nearby) countries are infected;
- whether wild *Anatidae* (ducks, geese, swans) travel from these countries; and
- the levels of imports of poultry, poultry products or other birds (including pet and game birds), especially if from known or recently infected countries and imported illegally (not according to OIE standards).

Once infection occurs, the prospect of eradication from a country appears to be low if there is:

- poor governance, including the lack of a clear national chain of command and inability of veterinary services to implement and enforce appropriate regulations;
- dispersal of poultry within millions of highly concentrated commercial smallholder flocks (which leads to complex, poorly structured value chains);
- a mismatch between the level of threat of infection and the biosecurity measures practised on farms (in all production sectors/systems);
- a large population of domestic ducks reared outdoors; and
- production and marketing practices that result in poorly-controlled movement of live poultry via large numbers of middlemen through poorly regulated live poultry markets.

The presence of large numbers of game birds may also reduce the likelihood of elimination.

In infected countries in which these conditions exist, H5N1 viruses often remain entrenched. In some of these, disease in poultry remains poorly controlled while in others disease has been contained and levels of infection have been reduced. Countries (and sub-regions) in which H5N1 viruses remain entrenched include Indonesia, Egypt and Nigeria. China and Viet Nam have controlled the disease but the virus still circulates in parts of them. Bangladesh, which has recently reported infection, also meets these criteria and the likelihood of infection becoming entrenched there is also high.

In some countries with entrenched infection, progress in reducing levels of infection and disease in poultry and humans has been slow. This is due mainly to the limited reach and capacity of veterinary services, the lack of engagement of veterinary authorities with the commercial poultry industry, the structure of the poultry industry, and in some cases, insufficient political will and insufficient financial resources to tackle many of the difficult issues that lead to persistence of infection.

In infected countries or areas within countries in which some of the above conditions do not exist, for example in Lao PDR and Niger, especially where the poultry population and density are low, HPAI transmission may not be sustained. Other countries that have experienced outbreaks of H5N1 HPAI have eradicated the disease, usually because their well developed veterinary services had detected infection early and were able to implement effective control measures rapidly. These countries include the Republic of Korea, Japan, Turkey and the European countries.

No country is free from the possibility of HPAI introduction. However, if virus enters countries that do not possess a combination of the risk factors described above they are likely to eliminate infection fairly readily, especially if infection is detected early and the response is fast. Countries currently unaffected but which meet the criteria described above need to be especially vigilant, both to prevent incursions via trade and to recognise them when they occur.

Global eradication of the disease is a distant and unlikely prospect as long as veterinary services in infected countries remain weak and high risk production systems, particularly in commercial systems without adequate biosecurity conditions and where high-risk marketing practices persist. This prospect is now accepted in most countries with entrenched infection but requires wider recognition and acceptance by the donor community.

There is firm global support for the goal of containing, and ideally eradicating, Asian lineage H5N1 viruses. It is now clear that eradication will require many years of consistent engagement in support of those countries in which the virus is entrenched (or capable of becoming so). Emergency responses can be used to contain outbreaks of HPAI in settings where it is not entrenched but a medium- to long-term approach is needed to contain it in countries or sub-regions with entrenched infection.

This requires:

- The continued building of capacities in key institutions, including better functioning veterinary services (including laboratory services) with the necessary powers to implement essential control measures and regulations and the appropriate national chain of command;
- Sustainable adjustments to the poultry sector to reduce the risks of disease in settings where commercial poultry production and marketing practices carry high risks of HPAI;
- Effective engagement of private sector stakeholders in these risk reduction efforts;
- Sustained political commitment, from the highest level of government, reflected in provision of an appropriate resource allocation and regulations; and
- Application of appropriate control measures, including vaccination, to contain infection.

Recommendations

Global H5N1 HPAI eradication will require a long term effort by national governments; in countries with entrenched infection it can only be achieved through shifting from an emergency response to a medium to long-term approach, which makes sustained changes to both the poultry industry and veterinary services, including laboratories.

Intergovernmental bodies – whether Global or Regional in their reach - should focus most attention on countries and sub-regions in which infection is entrenched and on other developing countries, whether currently infected or not, that are at high risk of infection and/or establishment of enzootic infection.

These two recommendations have implications for the prioritisation of scarce international resources.

2.2 HUMAN INFECTION WITH INFLUENZA A H5N1 VIRUSES OF AVIAN ORIGIN

Human infection with avian influenza viruses and the emergence of a pandemic strain are two separate yet related public health threats from HPAI A (H5N1) viruses (1). Our knowledge of the risk of zoonotic infection indicates:

- Disease incidence appears low compared to potential human exposure.
- The case fatality rate remains over 60%.
- No specific risk factors for human infection (beyond general contact with infected birds) have been established. For some cases, no potential source of exposure has been identified. Exposure during certain common activities (home slaughter of poultry) seems likely.
- Disease distribution, modes of transmission, and pathogenesis are still not completely understood and an optimal treatment regimen has yet to be established.

Recommendations

Systematic investigation of human cases and clusters of H5N1 HPAI virus infection should be expanded and improved, and additional epidemiological and serological studies and clinical research initiated, especially at the human-animal interface.

Technical agencies should collaborate to assess exposure risk variables and to implement science-based measures to limit exposure of humans to virus sources.

Currently, Asian lineage HPAI H5N1 viruses can be ordered into at least 10 clades, but all remain of entirely avian origin, with no evidence of increased transmissibility from animals to humans or between humans, nor evidence of any increased ability to cause human infection or disease.

Continued evolution of influenza viruses of the H5N1 and other subtypes can affect the sensitivity of diagnostic tests (both molecular and antigenic) and can reduce both the effectiveness of poultry and prototype pandemic human vaccines, and the susceptibility of viruses to anti-viral agents.

Recommendations

Virological and epidemiological surveillance in both humans and animals should be enhanced and free sharing of viruses and data should be encouraged.

The evolution of circulating H5N1 viruses and other novel influenza viruses should be tracked to allow both (1) rapid and ongoing assessment of virus modifications with potential public health impact and (2) evaluation and updating of diagnostic reagents and vaccine candidates.

3. ASSESSMENT OF HPAI CONTROL EFFORTS IN POULTRY, RISK REDUCTION FOR HUMANS AND PANDEMIC PREPAREDNESS

3.1 ACHIEVEMENTS AND CHALLENGES: EXPERIENCES WITH HPAI CONTROL IN CASE STUDY COUNTRIES

Five countries (Egypt, Nigeria, China, Viet Nam and Indonesia) which have experienced multiple widely dispersed cases of avian influenza in poultry and/or humans in the last 2-3 years gave presentations at the workshop. These countries all have large poultry populations that have increased markedly in the past 10 years. This expansion has resulted in a mix of intensive and extensive poultry farms with the sale of many poultry, including broilers, through poorly regulated live poultry markets. All but Nigeria have a large population of domestic ducks, with some 75 percent of the world's ducks reared in China and Viet Nam.

The country presentations provided insights into the different strategies adopted by the five countries, again demonstrating that a single strategy for control and prevention of this disease, appropriate to all places, does not exist. Nevertheless some key messages emerged.

The need to enhance veterinary capacity was a recurring theme in all of these presentations as was the need for enhanced appropriate legislation to assist in controlling the disease and better capacity to enforce this. For example, in Nigeria, implementation of movement controls by national quarantine authorities was deemed to be weak. Engagement with and regulation of the large commercial sector are also generally weak in some of these countries.

Viet Nam and China have both adopted large-scale vaccination programmes to reduce the levels of infection. When disease occurs it is mainly found in unvaccinated flocks. There is no indication that vaccination programmes can be stopped in the short to medium term, which means that authorities will need to find funds for vaccination campaigns for some time to come, while making other changes that will help to reduce reliance on vaccination over time.

Examples of changes in progress in China and Viet Nam are modifications to the way poultry are marketed with, for example, moves to central slaughtering around Ho Chi Minh City and improvements in market hygiene in many parts of China. Both countries have multi-layered veterinary services and although some improvements are apparent in communication capacities up and down the chain of command; this is still an area that warrants additional attention. Both countries are undertaking surveillance programmes to monitor response to vaccination and detection of viruses. These need to continue and should be reviewed regularly. Egypt and Indonesia are also using vaccination but both countries have difficulties in conducting effective national programmes due in part to the large number of smallholder and household flocks.

Indonesia has introduced participatory approaches for case detection but this has not yet resulted in noticeable changes in the incidence of infection and disease. Provincial autonomy was highlighted as a constraint to disease control in a number of countries but appears to be a particular issue in Indonesia.

Egypt and Nigeria are the two worst-affected African nations, with the former still reporting human cases. Social and economic factors and political interference still limit the applicability and implementation of control measures. Vested interests can at times interfere with veterinary decisions, such as those relating to market management and market closures.

Overall, these presentations supported the main conclusions from the meeting that control of HPAI is a long-term process in places with recurrent/entrenched infection. Investment in veterinary services and addressing high risk production and marketing practices are required if sustained gains in reducing levels of infection are to be achieved.

3.2 ACHIEVEMENTS, ISSUES AND OPTIONS ON STRATEGIES FOR HPAI PREVENTION AND CONTROL

3.2.1 Issues and options for outbreak control in poultry

Good progress has been made in control and elimination of H5N1 HPAI viruses by many countries. This demonstrates that the available tools and methods work when necessary resources (including a functioning veterinary infrastructure) are available and applied appropriately: this requires the sustained commitment of both legislators and those with a stake in poultry production.

In developing prevention and control programmes for HPAI, technical and socio-economic issues should be addressed together.

The main factors resulting in the disease remaining poorly controlled in some countries include:

- (a) the lack of suitable human resources to prevent, detect and control disease – particularly the lack of effective animal health services;
- (b) the lack of political commitment to apply appropriate measures, which can be complicated by decentralisation of authority;
- (c) insufficient engagement of private entities in improving animal health; and
- (d) the pre-existing structure of the commercial poultry sector and poultry production and marketing practices, especially in those parts of production sectors 2 and 3 where biosecurity measures are not commensurate with the threat of infection and allow persistence of infection.

This may be affected through sustainable changes in the practices or, where this is not possible for technical, social, economic or environmental reasons, by using alternative interventions to contain the disease, such as vaccination. All of these issues must be addressed if sustainable gains in control of the disease are to be achieved. They also demand a longer-term approach. The process of re-focusing support over a longer time frame has already begun but requires sustained support from donors.

The issue of specific approaches to control HPAI outbreaks has been clouded by a tendency to regard different interventions as alternative rather than complementary options. In fact, an efficient and effective disease control campaign for the disease must include multiple measures and approaches, determined by the disease situation in the country, local factors relating to the structure of the poultry industry and the stage of the control campaign. It is also misleading to consider vaccination as just one single approach, given that vaccination can be applied in at least three different ways (large-scale vaccination to reduce viral load; tactical ring/emergency vaccination to limit spread from a focus of infection; and preventive vaccination in high-risk places) to meet different objectives. Wherever feasible, this should be combined with other control methods appropriate to the local situation and production system. Vaccination programmes should contain an exit strategy which results in termination of vaccination. However, termination of vaccination depends on regular reconsideration of the conditions that prevail at the regional and national level.

There is no single approach to HPAI control and prevention that suits all circumstances, because this depends on whether it is a question of a new virus incursion or whether viruses are entrenched in the country and the specific circumstances in the country (poultry production sectors, veterinary services etc). This means that a single set of specific recommendations on control cannot be developed or applied to all countries.

Many earlier recommendations relate mainly to emergency situations, best suited to recently infected countries but less so to those with entrenched infection (6).

All at-risk countries still require appropriate avian influenza emergency preparedness plans and it is recommended that these should be included in national disaster/emergency plans.

Recommendation

Each country with enzootic infection should have a sound long-term technical strategy and work plan that is appropriate for local conditions and adaptively managed, indicating how the viruses will be progressively contained and high risk practices shall be modified.

Stamping out

Incursions of virus into new places or countries justifies an emergency response, involving stamping out or modified stamping out (following OIE welfare standards), including culling of infected and in-contact poultry, quarantine, movement control and surveillance in a surrounding control zone. However, experience has shown that in situations of entrenched disease where there is a high incidence of HPAI outbreaks and infection, veterinary services sometimes do not have the capacity to identify more than a small proportion of infected flocks (i.e. most infected flocks escape detection) and therefore stamping out of only these flocks has a limited effect on the overall prevalence of infection.

Classical stamping out operations in which a large ring of culling is applied severely disrupts livelihoods, and the prospect of these losses can discourage poultry owners or communities from reporting disease. During this workshop, there was considerable debate on issues relating to culling in enzootically-infected countries. In such circumstances, especially those where stamping out will not achieve elimination of infection, a balance needs to be struck between the public health implications associated with known infected flocks and the size of culling operations around infected flocks to avoid the current limited effectiveness of culling operations in reducing the overall levels of infection. Further analysis and discussion on this issue are required. Culling also carries the burden of compensation issues and raises legitimate animal welfare concerns. In countries with entrenched infection, unless the factors that resulted in the outbreak are identified and modified, recurrence at the same location or in farms with similar risk profiles elsewhere is likely. Compensation plans should be developed for each country according to best practices (10).

Where possible, the amount of culling should be limited to the minimum required to control the disease and should aim to prevent infected poultry from entering markets and food chainsⁱⁱⁱ.

At present culling of poultry in many developing countries is often undertaken by means that do not comply with international animal welfare norms. Methods described in the OIE standards and applied in developed countries are often not available or easily suitable for use in developing countries. Alternative means of destruction of poultry appropriate to developing countries need to be tested as a matter of urgency.

Recommendation

Low cost methods for humane culling of poultry that can be applied in developing countries should be tested under field conditions and recommended methods promoted.

When conducting culling and other operations on infected premises, current recommendations are for staff to always use appropriate PPE. However, the currently available PPE is not well adapted for use in hot and humid conditions.

Recommendation

Alternative PPE suitable for use in hot weather is required for staff exposed to potentially infected poultry working outdoors or in poultry houses.

ⁱⁱⁱ In many countries with enzootic infection, veterinary services have reduced the levels of infection but do not have the capacity to detect and eliminate all infected poultry before being sold through markets to consumers. To protect public health, people purchasing live poultry and those butchering poultry and handling raw poultry and poultry products should be reminded to take appropriate preventive actions to reduce the risk of exposure to viruses.

Vaccination of poultry

The use of vaccination in the control of avian influenza was discussed at the recent conference on avian influenza vaccination held in Verona in 2007^{iv}. This conference affirmed that use of vaccination should be considered as an emergency measure around outbreak sites, as a preventive/control measure in high risk places and when infection is widespread as can occur when detection of infection is delayed or when stamping out fails.

Transition points from classical to control without vaccination to those including vaccination should be defined in emergency preparedness plans. Most countries would benefit from appropriate decision support mechanisms for this process^v.

Large-scale vaccination, as applied for example in China and Viet Nam, appears to have been highly effective in reducing viral load, limiting HPAI incidence and ultimately minimising the incidence of human infections. Recent outbreaks of disease in Viet Nam occurred mainly in unvaccinated ducks suggesting these were not due to vaccine failure but failure to vaccinate. There is no evidence to suggest that vaccination has caused or is likely to cause the emergence of strains of H5N1 virus with any increased capacity for human infection or human-to-human transmission.

Vaccination must be carried out effectively, otherwise the investment is wasted. This includes the development of a vaccination plan in which the objective is stated, use of good quality vaccines produced and tested according to OIE guidelines and licensed and controlled by regulatory agencies, proper storage and delivery of vaccines and vaccination campaigns that are designed to achieve the best possible coverage of the target population. Village chickens, because they are often widely dispersed in relatively low density, can be more difficult to vaccinate than large commercial flocks although in some circumstances (such as remote villages with no linkages to urban markets and traders), they may also represent a lower risk for developing HPAI. Implementation of vaccine efficacy monitoring is highly recommended through specific targeted post-vaccination surveillance programmes aimed at detecting and characterising circulating viruses. This should aim to detect any antigenic variants against which existing vaccines do not provide adequate protection. Populations of free-ranging ducks are a high risk because of their capacity to maintain and spread virus. They should be a particular target for vaccination.

Reduction in the levels of H5N1 HPAI viruses is a global public good and contributions to vaccination (and other programmes) from donors is therefore warranted.

Recommendation

International support for vaccination in circumstances of widespread, high risk or endemic HPAI should be maintained.

Large-scale government-sponsored vaccination can be difficult to sustain for a number of reasons, including availability of funds and enthusiasm of local authorities responsible for implementation, especially in circumstances where overt disease is uncommon, providing limited incentives for farmer cooperation. It should therefore be applied as part of an integrated, planned strategy, targeted on the basis of risk and subject to periodic assessment. This periodic assessment should be used to determine when vaccination is no longer required (complying with the requirement for an exit strategy).

Solutions need to be found to the considerable costs and logistic challenges of large-scale vaccination, including improved targeting of vaccination based on enhanced understanding of the epidemiology of the disease and if possible, development and validation under various field

^{iv} The following site contains the conclusions and recommendations from the Verona vaccine conference. As these are available in this document, only some key recommendations from this are reiterated here. . http://www.oie.int/eng/info_ev/Other%20Files/A_Guidelines%20on%20AI%20vaccination.pdf

^v See the following example from Canada. Such plans if developed, need to address local factors. <http://www.inspection.gc.ca/english/anima/heasan/disemala/avflu/plan/plan-appoe.shtml>

conditions of alternative robust and effective vaccines that can be applied in hatcheries or delivered as recombinant live viruses.

Recommendation

The strengths and limitations of large-scale vaccination must be appreciated. Research directed to applying and developing alternative vaccines should be given a high priority. Countries should be assisted with development of vaccination strategies appropriate to the stage of the control programme that aim to achieve specific objectives and are subject to regular assessments of the necessity and scope of the program (the exit strategy).

Avian vaccines against influenza viruses usually provide good cross protection against a range of strains of virus of the same HA subtype. However antigenic variants of H5N1 viruses have emerged that resulted in vaccines in use giving sub-optimal protection. (e.g. Shanxi in 2006).

Recommendation

There is an urgent need to continue monitoring viruses and to determine the extent of vaccine protection against currently prevalent virus strains and to strengthen coordination and support for continuous monitoring for antigenic change in circulating H5N1 viruses.

Socio-economic impacts

Generally, the impact of HPAI control measures and market shock from consumers turning away from poultry products has had more impact on poultry trade and farmer livelihoods than has the disease itself. Rapid and effective response to outbreaks and measures to support rehabilitation of affected communities can lessen the impact. Care is required to avoid precipitating market shock by ensuring that public communication messages are technically sound. Proposals for industry restructuring measures could disadvantage poorer farmers and may selectively disadvantage women who constitute the main poultry rearing workforce and ownership.

Recommendations

Evaluation of options for HPAI control should consider the distribution of economic costs and benefits across communities and poultry production sectors.

Special attention must be paid to the impact of measures on economically vulnerable groups, highly reliant on poultry for income. A long-term approach to disease control should therefore be taken.

Communication strategies that have resulted in minimal market disruption in the face of disease outbreaks should be used as models for other countries on which to build similar locally adapted programmes.

3.2.2 Issues and options for global reduction of HPAI risk at poultry production and marketing levels

In countries with entrenched infection with HPAI viruses and in countries at risk with multiple risk factors that enable the spread and persistence of the virus, sustainable progress will not be made in preventing and controlling the disease without reducing or mitigating these risk factors. Factors that can most reasonably be addressed are mismatches between threat of infection and the level of biosecurity practised on poultry production enterprises, enhancements to market hygiene and management of the movement of poultry, especially through markets.

Improving biosecurity of poultry production

Enhancing biosecurity levels in poultry production units requires a combination of physical facilities and management practices to prevent the entry of influenza (and other) viruses. Since industrial poultry production (Sectors 1 and 2) is undertaken in specialised accommodation that in many situations can be largely isolated from the external environment, good biosecurity should be

achievable by implementing measures commensurate with the expected level of threat. Commercial incentives for such practices are already present and as these are largely a private good, producers should be expected to fund their requirements.

However, commercial poultry production units, including those at the industrial level, should be subjected to regulatory control to ensure that they do not represent a threat of HPAI maintenance and dissemination.

Concentration of commercial poultry farms is an important issue in many developed and developing countries that has arisen through the uncontrolled growth of the poultry sector. Measures implemented to reduce poultry density have not generally been successful.

Recommendation

Industrial poultry production units should ensure that they meet and maintain appropriate biosecurity standards and should be subjected to regulatory control.

Backyard poultry and production systems where poultry are allowed to forage and graze are not normally biosecure and only minor improvements to biosecurity can be made without significantly altering the production system. If flocks in these production sectors represent a risk for HPAI maintenance and dissemination, this must be addressed in other ways (e.g. vaccination, segregation, movement controls). In many circumstances, especially in rural areas (3) with relatively low poultry density and limited movement of such poultry to markets, these may pose a relative low risk.

Commercial production using low level biosecurity measures (Sector 3) represents the greatest challenge. Often, low operating margins and limited cash reserves discourage capital investment in improving biosecurity. Risk diversification also discourages moves to potentially safer *all-in-all-out* systems. Some Sector 3 producers (and their associated market operators and traders) will be able to upgrade (perhaps in some cases through contract arrangements with larger producers) and benefit from sector adjustments, while others will not and may suffer considerable losses.

It is recognized that Sector 3 poultry keeping (commercial production with low biosecurity) and urban and peri-urban backyard Sector 4, may need specific support on biosecurity and hygiene, and affected producers may require 'safety nets'. In urban and peri-urban Sector 4, there are certain highly vulnerable groups, including some households primarily supported by women that are highly dependent on poultry and have limited coping strategies to deal with the loss of poultry. This implies that activities may need to be put in place to support the development of alternative livelihoods for these groups or to otherwise provide support for loss of livelihood if disease risk assessments do not produce feasible alternatives to banning or restricting such production practices.

Backyard poultry and grazing duck husbandry systems are not normally biosecure. There are usually means to deal with the risk that they represent to other poultry and to humans, other than their elimination.

Recommendation

A major focus of active engagement in HPAI risk reduction in poultry production should be the small commercial (Sector 3) production systems with poor biosecurity. The social and economic environment in which they operate presents challenges to structural change which will not be easily overcome.

Managing the poultry marketing chain

As industrial poultry production moves towards centralised slaughtering away from sales through poorly regulated live poultry markets, the risk of dissemination of HPAI and other poultry diseases will diminish. However, this change will not occur rapidly especially in places where consumers prefer to purchase poultry from live bird markets.

Many changes can be implemented to market management that can reduce the levels of infection in markets, including segregation of species, market 'rest' days (in which all remaining poultry are

sold and slaughtered and the market is thoroughly cleaned and disinfected) or controls over the sources of poultry.

Livestock movement control is generally the weakest component of epidemic disease control in developing countries and rigorous domestic control of the movement of poultry in most countries is almost impossible under prevailing conditions and with limited veterinary resources. Most poultry movements are linked to marketing, and movement of live birds represents the highest risk. The best prospect for achieving some level of management of poultry movements is to put in place appropriate systems of certification of poultry for movement to certain markets, since markets represent a finite number of locations at which certification can be verified. Poultry sourced from known HPAI-free flocks should have greater freedom of movement than those from uncertified flocks.

Recommendation

It should be accepted that in many countries live bird markets will remain a preferred means of marketing poultry, especially outside major urban areas, for some years to come. Scientifically sound systems of certification that enable management of movement of poultry to these markets coupled with improved management of markets represent the best means of achieving some level of control over spread of infection through domestic movement of poultry and the exposure of humans to infection.

In direct response to HPAI, some countries and local authorities have initiated planning or implemented policies for moving or banning certain poultry production or marketing systems in specified areas. These measures are intended to enhance human safety and a perceived lack of biosecurity in production systems. These actions – often termed ‘restructuring’ – have been implemented with considerable urgency.

Evidence however indicates that, unless rationalised, clearly communicated and carefully prepared, such drastic actions can 1) have undue impacts on the livelihoods of vulnerable groups, and 2) lead to negative responses by producers and traders that may increase rather than diminish disease risks (e.g. driving trade underground).

Recommendation

It is recommended that poultry sector interventions to reduce the threat of HPAI are designed with a thorough understanding of the key risk points for spread and maintenance of infection. This means that planning of adjustments should be preceded by a review of the structure and operation of poultry market chains and an objective assessment of associated risks at all points along the chains.

Any proposed changes should be designed on the basis of actual public health and national and international animal health risks, and should be compared with alternative risk reduction options.

Adjustments to production and marketing systems or markets do not necessarily have to be drastic. By far the most realistic approach is to have a strategy of slow process of change but if risk assessment indicates the need for major changes (e.g. shifts from live poultry sales in urban areas or segregation of poultry species) a medium- to long-term timetable should be set for implementation; both approaches will allow affected stakeholders to adapt their livelihoods accordingly.

Proposed changes can be aligned better with private sector supported incentives which fit with more gradual market driven ‘structural change’, often driven by changing consumer choices.

Recommendation

Any poultry sector adjustment plans will need to be developed and implemented together with the private sector, to develop an overall long-term strategy, articulated in relation to other control and prevention tools.

Sustainable long-term changes to the poultry sector can only be developed through a combination of public sector, private sector and community actions where risks and responsibilities as well as costs are shared. Wider sector considerations arising out of adjustment will also have to be taken into account, for example, credit and land ownership – and their responsible agencies engaged. A monitoring plan is essential to ensure that adjustments actually lead to risk reduction, and to mitigate negative livelihood impacts if they arise. Enhanced animal health capacity and leadership building, development and measured enforcement of appropriate regulations and an appropriate communication strategy are needed to both address the planning process as well as support/induce the sector to make adjustments.

Recommendation

It will be necessary to prepare for and deal with the possible socio-economic consequences of adjustment in poultry sector structure, which will both depend on the measures to be implemented and is likely to vary from location to location.

HPAI surveillance in animals, disease diagnosis and veterinary laboratory capacity

An effective disease surveillance system incorporates both 'passive'^{vi} and active surveillance components. While passive disease surveillance (i.e., systems for reporting suspicions of HPAI outbreaks) plays an essential part in HPAI control, active surveillance systems for actively seeking the presence of infection or disease are essential to effective epidemiological monitoring. The direct involvement of farmer representatives, and individual producers and traders has to be obtained. These also include but are not limited to the participatory disease search being applied in Indonesia, market surveillance in Hong Kong SAR and so-called 'X-ray' surveillance carried out in Thailand. There needs to be a stronger emphasis on developing and supporting active surveillance systems and ensuring their sustainability.

In recent years, international agencies have given considerable attention to establishing and maintaining cadres of paraveterinarians or community animal health workers (CAHWs), often in response to failures of official veterinary services to provide clinical veterinary services to rural communities. These CAHWs can perform valuable roles in passive surveillance as the primary source for reports of suspected disease outbreaks. They can also be recruited into active surveillance programmes but only in support of, not as a replacement for, regular regulatory veterinary service personnel, who should be responsible for their supervision.

Recommendation

While continued support for passive surveillance for reporting of suspect outbreaks of HPAI should be strongly encouraged, greater emphasis on strengthening and sustaining active surveillance mechanisms is required, to provide greater discipline in epidemiological analysis and enable detection of virus in those circumstances when clinical disease is not evident (e.g. grazing ducks and live poultry markets).

Properly planned and executed studies on infection in wild birds should continue to be carried out but given the low sensitivity of such testing for detecting virus incursions surveillance for infection in at risk countries should focus on investigation of dead wild birds and outbreaks of disease in poultry consistent with HPAI.

Recommendation

Countries at risk of HPAI incursion should be encouraged to direct their attention to improving disease surveillance of domestic poultry and dead wild birds as the most productive means of early warning of infection.

^{vi} The term *passive surveillance* is used in this document because it is still widely adopted. However the process is only passive in the sense that the veterinary services do not initiate the surveillance. The term *scanning surveillance* has been used as an alternative.

There have been some unsubstantiated reports of possible circulation of H5N1 virus strains that are of reduced virulence for chickens (or perhaps this reflects increased resistance of certain breeds of poultry to these viruses). If confirmed, this would have important implications for control of the disease^{vii}. Again, it is essential to strengthen efforts to continuously monitor the pathogenicity of circulating field viruses so that disease surveillance and control programmes can be appropriately adjusted.

This is an area of common interest with public health authorities, since there is a need to also monitor circulating H5N1 viruses for evidence of changes that may precede increasing adaptation to humans as a host.

Recommendation

There needs to be improved coordination and support to National and Regional Networks of laboratories and epidemiology teams for monitoring of circulating H5N1 viruses, to enable detection of changes in antigenicity and virulence, that could have major implications for HPAI surveillance and control (see above, section on vaccination) and for human pandemic risk.

There has been substantial international support to the development of national veterinary epidemio-surveillance and laboratory capacity and capabilities that has resulted in marked improvements in surveillance programmes. There are several issues of concern:

- the sustainability of maintaining expensive and sophisticated facilities, equipment and diagnostic testing procedures;
- the lack of complete consensus on solutions for providing appropriate biosecurity and personnel protection in laboratories;
- development and maintenance of suitable quality management systems;
- provision of support, including laboratory reagent supplies and epidemiology tools through international reference laboratories and epidemiology centres and availability of funds from national authorities for human resources and running costs; and
- development and maintenance of regional epidemio-surveillance and laboratory networks for the improvement of quality and transparency of surveillance, diagnostic and reporting of HPAI and other TADs.

Recommendation

International agencies should urgently address the need to improve coordination and to consider sustainability issues in their support of national veterinary laboratory and epidemio surveillance team activities.

There is a shortage of well-qualified epidemiologists and laboratory diagnosticians available to support countries. The OFFLU network, established largely to provide support to national veterinary laboratories, and to collect, share and monitor virus strains for suitability as human vaccine candidates and to strengthen epidemio-surveillance, is compromised by insufficient funding, a lack of cohesive institutional arrangements and over-commitment of its scientific committee.

Recommendation

Greater support of the OFFLU network and regional networks of laboratories and epidemio-surveillance teams is required to enable them to fulfil their functions.

^{vii} So far all Asian lineage H5N1 viruses tested have been highly pathogenic for chickens. Genbank now contains over 1500 HA sequences of Asian lineage H5N1 viruses linked to the original isolates from geese in 1996. All retain the molecular signature of highly pathogenic viruses.

3.3 ISSUES AND OPTIONS FOR HUMAN PANDEMIC PREPAREDNESS

The threat of an influenza pandemic originating from avian influenza A/H5N1 has resulted in increased global interest and substantial progress towards global pandemic preparedness. However, progress has been uneven across countries and across non-health sectors. Although avian influenza H5N1 virus is currently the most visible pandemic threat, it is not the only threat and pandemic preparedness activities can give broad, tangible, long-term benefits to national and regional health and non-health emergency management systems. In the face of both competing health priorities and resources and of waning global interest in pandemic planning in some sectors, this fact could be used to sustain momentum for greater and sustained preparedness planning.

The experience gained in pandemic preparedness has identified areas requiring further activity:

- Advocacy for, and justification of, sustained and expanded resources for pandemic preparedness planning in the face of continued risk.
- Ensuring that all countries have implementable preparedness plans that are flexible enough to be applied to various scenarios (including response to other emerging infectious diseases especially zoonoses).
- Consideration of the non-health aspects of pandemic planning, with a focus on continuity of key sectors (transportation, water, telecommunications, energy, financial sector). The private sector must be included in the design and testing of pandemic preparedness plans.
- Expansion of planning to support local communities and integration of pandemic planning at all levels of government and society, including operational aspects.
- International coordination and communication to support cross-country linkages among key sectors.
- Integration of pandemic plans and existing disaster management plans.
- Inclusion of a Rapid Containment Protocol in national plans.
- Development of rapid self-assessment tools and testing of pandemic plans through exercises.
- Stronger focus on the resilience of health systems (e.g. surge capacity, continuity of normal health services).
- Development and distribution of simple tools to maximize community mitigation and compliance with control measures.
- Advocacy for the wider and equitable availability of anti-virals and vaccines to respond to a pandemic.
- Exploration and open discussion of ethical issues that will arise from inequitable access to therapeutic and prophylactic measures and the role and obligations of health-care workers during a pandemic.
- Ensuring implementation of the International Health Regulations (IHR 2005), including assisting resource poor environments to meet their core capacity obligations for infrastructure, surveillance and reporting systems, which are essential for the detection of novel influenza viruses and other pathogens of national and international concern.

Recommendation

Pandemic preparedness activities should be strengthened at all levels of government and coordinated at national, regional and international level. Planning needs to be comprehensive, covering health and other key sectors and involving all concerned stakeholders.

3.4 COMMUNICATION ISSUES

There is now global agreement among all partners that stopping H5N1 HPAI 'at source' (i.e. in poultry) is critical to minimize its impact on the poultry sector, including effects on livelihoods, and to reduce the threat of human disease.

To date, most communication initiatives have been based around the specific behavioural interventions endorsed at the WHO/UNICEF/FAO ad hoc Inter-agency Meeting of March 2006 (i.e. 'Report, Separate, Wash and Cook'). These were designed primarily to enhance disease prevention in humans and emergency disease responses in the event of outbreaks in poultry.

These communication interventions may have helped prevent animal-to-human transmission of the virus, and perhaps will prevent human-to-human transmission in the future, but infection remains entrenched in a number of countries and sub-regions. Approaches to disease control in these places will likely require adjustments to production and marketing methods. Achieving these will require communication strategies that are designed and adapted for specific occupational groups (farmers, transporters, etc.) and different poultry production sectors, taking account of realities in the field.

Entrenchment of infection in a number of countries and sub-regions, reinforces the need for a strategic communication framework, guided by epidemiological data and knowledge of production and marketing practices, to help prevent the spread of these viruses.

3.4.1 Communication support

Despite competing national priorities, most countries affected by outbreaks have sought to establish active inter-sectoral partnerships including national inter-agency communication taskforces, and have advocated with relevant ministries to develop and implement communication plans.

At the global level, the main thrust of communication initiatives has been advocacy and capacity-building for national communication plans for promoting the needs of HPAI prevention and control, reducing the risk of human H5N1 virus infections, and preparedness for pandemic human influenza. At the national level, the main objectives are to encourage behaviour change in individuals and communities, especially vulnerable groups, to avoid practices that represent a risk for the spread of the virus among poultry and transmission of the virus to humans, and to promote responsible reporting within the news media.

Emerging data clearly suggest that where the virus load from/in poultry has been shown to be highest, the number of human cases is high, indicating the need to prevent infection in animals. Conversely, wherever the outbreaks in poultry has declined, so have the number of human cases. At the same time, preliminary research in a number of affected countries clearly indicates that while public awareness of avian influenza is quite high, the same has not necessarily translated into a reduction in risky behaviours or practices among vulnerable populations, in part because some of these require investment of money and resources that are not available to poor producers.

Separately, a key challenge for communication is the ongoing confusion between two very distinct issues: avian influenza and emergence of a human influenza pandemic virus.

Recommendation

A formal, global-level, trans-disciplinary and inter-agency Technical Advisory Group on HPAI communication should be established so as to coordinate and guide communication action research, analysis and the development of a unified vision and long-term strategic communication framework/plan for the prevention and control of HPAI among animals and subsequent transmission to humans.

3.4.2 HPAI communication

In the context of HPAI H5N1, there is a very complex interrelationship between disease epidemiology, farming and marketing systems, and individual/community behaviour. A key emerging lesson is the need for enhanced cooperation between communication professionals and technical experts to identify those priority behaviours and actions that are required to prevent and control of avian influenza in each poultry production sector. At the same time, these behaviours must be feasible and amenable to change through communication initiatives. Experience suggests the disease situation will likely change over time. Therefore, these need to be kept relevant through ongoing dialogue with decision-makers and communities. Furthermore, recent discussions among communicators and technical partners, including the FAO/OIE Communication Roundtable (April 2007, Rome), has underscored that controlling HPAI requires particular attention to animal health communication issues.

Greater emphasis needs to be placed on developing appropriate communication support for HPAI prevention and control, relevant to specific target groups (e.g. producers, transporters poultry sellers, households rearing poultry). This requires a review of the existing communication strategies especially in places with entrenched infection. The overall objective is to identify feasible and replicable behavioural/production practices that minimize the risk of infection with HPAI in each poultry production sector and along the market chain and to adjust/re-formulate communication strategies and messages to promote these.

Recommendations

A comprehensive global communication strategy and action plan should be developed in order to address the animal health aspects of HPAI H5N1 transmission: it should include the creation of communication tools for immediate use and longer-term approaches to sustain positive and behavioural change.

Furthermore, existing communication strategies in places with entrenched infection should be reviewed and modified as necessary following a comprehensive, multi-disciplinary analysis of emerging field data on knowledge and practices relating to HPAI and ways in which communication, especially how this relates to and can influence disease epidemiology, socio-economics, poultry flock biosecurity and poultry production/ marketing practices.

In countries where there have been advance preparations, the emergency communication responses to new outbreaks (in the form of *outbreak communications*) have often been very effective in supporting the management of media and, to a certain degree, promoting public trust and compliance in prevention/control efforts, to rapidly stamp out the disease. Concerted and timely communication interventions, some of which have been led by the private sector, have also helped countries recover from market shocks (e.g. Turkey, Thailand), from which many lessons can be learned.

However, in a number of countries, the disease has either already become or could become entrenched. In such countries, it is almost certain that alongside technical interventions, concerted communication efforts will be needed for at least another 5-7 years as part of medium to long-term strategies aimed at controlling and, where possible, eliminating the disease. Thus there will need to be a shift from short-term emergency communication campaigns, to the mid to longer-term communication approaches, led by the already under-resourced veterinary and animal health sector.

Recommendation

Increased national and international support is required – immediately – to ensure adequate investment in stronger communication capacities and expertise, especially within national veterinary services and Ministries of Agriculture/Livestock: to ensure sustainability and continuity of interventions over the long-term, these capacities and expertise should be integrated into existing programmes.

3.4.3 Pandemic preparedness communication

Pandemic preparedness, including preparations for communicating during a pandemic, calls for a distinctly different set of interventions and approaches. Progress in this area of work has been substantial as evidenced by the number of country plans and communication tools that have been developed and implemented. However, there is very real danger of complacency setting in among national authorities, in the face of other competing health priorities and a drop in risk perception.

Recommendation

To ensure clarity of public understanding on pandemic risk and on the need for pandemic preparedness (whether catalyzed by the H5N1 virus or another virus) public, media and political opinion, should be monitored continually, and advocacy efforts, especially among policy-makers and decision-makers at community level, should be refined as necessary.

While progress in pandemic communication planning has moved forward very substantively at the central/national levels among most countries, there is now an urgent need to expand this to provincial and community levels, and especially among those countries which have significantly decentralized governance structures.

Recommendation

While strengthening national pandemic preparedness plans, also increase focus on, and include communication initiatives for, the sub-national levels.

3.5 ASSESSMENT OF INSTITUTIONAL STRENGTHENING AND SUPPORT

3.5.1 Strengthening of regulatory veterinary services

The main constraints for national veterinary services in developing countries are lack of appropriate legislation, human and financial resources (often, even compared with counterpart public health services), lack of technical capability and difficulties in maintaining good communication and lines of command from national to field level in decentralised systems where authority has devolved to local government levels. Added to this is the challenge in most developing countries of gaining essential community support in an environment in which peoples' priorities are directed to the immediate needs of their own families.

Support to date has been provided by way of provision of technical advice in countries and national or regional training programmes to meet immediate knowledge and skill enhancement needs and promote between-country communication. What is needed now is a greater focus on a long-term systematic approach, providing technical training (starting from the undergraduate level), advice for the upgrading of legislation and assistance with establishing effective systems for disease surveillance and response. These are generic needs and an attempt to focus narrowly on addressing specific HPAI control issues will compromise success. The OIE has developed the 'Performance, Vision and Strategy' (PVS) tool which addresses needs on a broad basis and is the appropriate starting point to determine needed investments and develop national programmes to improve veterinary service capacity. A focus on HPAI control can be achieved by directing this broad approach to support for those countries in which HPAI prevention and control is most constrained by weak veterinary services.

Recommendation

The international community should recognise weakness of veterinary national services as one of the key factors in compromising HPAI control. Efforts should be focussed on those countries in which it is a major constraint to preventing and controlling the disease. Support in such countries should be based on an evaluation of the compliance to the OIE standards through the use of the PVS tool and a longer term, broad and sustainable approach to strengthening veterinary services.

Good governance and administration are also critical issues for strengthening of veterinary services. They include the need for commitment from governments to make appropriate resource allocations to veterinary authorities and, in many countries, the need to address the disruption of the chain of command and information flow resulting from decentralisation of veterinary services under structural adjustment programmes.

Recommendation

Sustained political commitment, backed by the highest level of government and provision of an appropriate resource allocation are essential to the success of efforts to improve the capacity and capability of national veterinary services.

3.5.2 Strengthening public and private sector roles in animal health

The combination of public and private good accruing to livestock (and zoonotic) disease control can best be achieved by seeking synergy between public veterinary authorities and animal health services available in the private sector. The public veterinary authority has the responsibility for regulatory control and for providing leadership and vision for a national animal health system. The private sector is involved in disease surveillance (for example in commercial farms including in-house tests performed by laboratories belonging to large companies and through community animal health workers) and in managing biosecurity in poultry production units and assisting with veterinary hygiene compliance in the marketing chain. In a disease control situation, private providers can deliver vaccine under regulatory supervision and provide mechanisms for compensation disbursements.

Recommendation

Veterinary regulatory authorities should consider the benefits of strengthening synergistic roles with private industry to increase the effectiveness of national animal health systems.

3.5.3 Regional and global technical support in animal health

Before the extensive recognition of transboundary spread of H5N1 HPAI in late 2003, FAO and OIE, as the key international animal health agencies with a mandate to support livestock disease control, developed a Global Framework for Transboundary Animal Disease Control (GF-TADs), with WHO as a critical partner for zoonotic diseases. This was developed with a strong emphasis on partnership with key regional organisations, including ASEAN and AU-IBAR.

GF-TADs has been an effective platform to implement global and regional coordination and collaboration of international and regional bodies in support of national authorities engaged in the prevention and control of HPAI. Several tools have been developed, and applied, including:

- a) the FAO/OIE/WHO Global Early Warning System (GLEWS) to provide disease intelligence and modelling for disease outbreak early warning;
- b) the FAO/OIE Crisis Management Centre, for provision of a rapid response to disease events, for countries requesting support;
- c) OFFLU, a network of expertise on avian influenza including the OIE and FAO influenza reference laboratories, and groups with HPAI epidemiological expertise, which provide technical advice and training to national laboratories, undertake research and assist in human vaccine development;
- d) the OIE World Trust Fund for Animal Health and Animal Welfare for support to projects of international public good; and
- e) a wildlife surveillance programme to improve understanding of the role of migrating birds and other avian and mammalian species in the dissemination of HPAI supported by FAO.

FAO and OIE, together with regional agencies including AU-IBAR in Africa, are collaborating in the development of regional animal health centres to ensure that technical and operational staff are accessible to national authorities to provide support in disease prevention and control programmes. Centres have already been established in Nairobi, Bamako, Tunis, Gaborone and Beirut.

Regional and sub-regional networks are being established and extended, engaging national laboratory, epidemiology personnel and socio-economic, farming systems and biodiversity experts in forums in which they can exchange experience, ideas and information in order to strengthen national capabilities and improve the quality and transparency of disease surveillance, detection and reporting. There is a need to strengthen these networks and to make them viable.

Recommendation

These global and regional initiatives, having been established, require continuous support and improvement to ensure their long term sustainability and improve their effectiveness.

3.5.4 Ensuring inter-governmental support for integrated contingency planning

A Partners' Meeting in November 2005 focused on livestock and health sector outcomes required at the country level to respond to HPAI in poultry, reducing the risk of human H5N1 virus infection and preparing for the next human influenza pandemic. During 2006, UN and World Bank analysis made it clear that as well as pursuing these outcomes and subsequent strategies derived from them by UN system agencies and their partners, six additional factors are key to effective implementation of national HPAI control strategies at country level.

- a) strong and sustained prime ministerial and/or presidential commitment to, and engagement in, implementation of an integrated strategy for HPAI control, prevention of human H5N1 infection and influenza pandemic preparedness;
- b) capacity for a surge in responses to suspected HPAI outbreaks and to suspicions of human-to-human transmission of a potential pandemic virus;
- c) effective joint working between government departments responsible for livestock and human health;
- d) incentives for livestock producers – whether engaged in large commercial operations or keeping small backyard flocks – and human health professionals to seek to prevent disease, report outbreaks promptly and control disease effectively;
- e) effective engagement of civil society and the private sector in the control of HPAI and preparations for the next pandemic; and
- f) intensive communication on best practices in avian influenza and pandemic preparedness in order to mobilise both the general public and specific target groups.

Experiences during 2007 have confirmed the importance of these success factors, but revealed the absolute need to pursue them in synergy by groups of countries as well as within individual countries. There is a need for effective intra-governmental and inter-governmental work to ensure that government departments responsible for livestock and human health within individual countries, and among neighbouring countries, work together efficiently and effectively at local, national and international levels.

The UN System Influenza Coordinator and the World Bank will continue to track what is being done with the funds pledged in Beijing and Bamako, and will assess the extent to which there are still serious shortcomings in national, regional or global responses to the current epizootic of HPAI and the threat of an influenza pandemic.

Collaborative aspects and synergies

Intersectoral collaboration is essential for effective control and prevention of zoonotic diseases, including avian influenza H5N1. Over the past 10 years, the relationships among international and regional human and animal health agencies and other sectors has improved, due in part to continued challenges presented by zoonotic and transboundary diseases, including BSE, SARS and avian influenza. The 'One Health' concept for developing strategies and implementing activities, including disease detection and communication strategies, could be used to focus this collaboration. However, to combat ongoing real and perceived blocks to intersectoral collaboration, formalised communication mechanisms must be established.

Early disease recognition and response capacity at the level of initial detection of animal or human disease could be enhanced by establishing:

- joint training in areas of synergy;
- joint implementation of early recognition programs (e.g. disease awareness, surveillance);
- local and regional emergency data exchange mechanisms; and
- joint public health/animal health standard operating procedures that outline specific roles and responsibilities for case reporting and emergency/follow-up response.

Understanding and controlling infection could be enhanced by establishing formal mechanisms for intersectoral interaction between governments and agencies at country, regional, and international levels including:

- joint public health/animal health task-oriented or advisory bodies;
- mechanisms for rapid sharing, analysis and interpretation of epidemiological and other disease-related information (including continued improvement and expansion of GLEWS);
- joint public health/animal health surveillance projects and sharing of surveillance data;
- mechanisms for timely sharing of viruses and virus information, including continued improvement of relationship between OFFLU and the WHO Global Influenza Surveillance Network;
- joint public health/animal health regional discussion of cross-border issues (e.g. animal and human movement);
- mechanisms for joint engagement in communication/media advocacy and disease awareness activities;
- balanced public health/animal health resource allocation at every level; and
- policy, and if necessary legislation, that enables and promotes coordination between sectors.

In addition, governments, academic institutions and funding agencies could promote and facilitate implementation of multisectoral collaborative research to fill knowledge gaps at the human-animal interface and academic institutions should promote synergies between human and veterinary medical curricula.

Recommendation

Stakeholders should embrace and take ownership of collaborative aspects of the control of this disease at every level, including working to reduce blocks to intersectoral collaboration and seeking common ground in all sectors and at all levels.

Formal mechanisms should be established for intersectoral interaction between governments and agencies at country, regional and international levels.

National governments should ensure early disease recognition and response capacity at the level of initial detection of animal or human disease (e.g. by establishing joint training and standard operating procedures for case reporting and emergency/follow-up response).

Multisectoral collaborative research should be facilitated and funded and academic institutions should promote synergies between human and veterinary medical curricula.

International and regional coordination should be strengthened through global or regional tools and bodies such as CMC/AH, GLEWS, OFFLU, regional Animal health centres and laboratory, epidemiology and socio-economic networks.

BIBLIOGRAPHY

1. Croisier, A. Mumford E and Fukuda K (2007), Highly Pathogenic Avian Influenza A (H5N1) & Risks to Human Health Workshop paper, Technical Workshop on highly pathogenic avian influenza and human H5N1 infection Rome, 27-29 June 2007. Available at: <http://www.fao.org/docs/eims/upload//229346/ah654e.pdf>
2. Domenech J, Sims L, Slingenbergh J and Lubroth J (2007) Trends and dynamics of HPAI – epidemiological and animal health risks Workshop paper, Technical Workshop on highly pathogenic avian influenza and human H5N1 infection Rome, 27-29 June 2007. Available at: <http://www.fao.org/avianflu/en/conferences/june2007/documents/2.1b.pdf>
3. Edan, M., Bourgeois Luthi, N. Gautier, P. and Guerne-Bleich, E. (2006). Free ranging ducks and risks in Avian Flu disease in Vietnam Proceedings ISVEE XI. Available at: http://www.sciquest.org.nz/crusher_download.asp?article=10003445
4. FAO, OIE, WHO (2007) Proceedings of Technical workshop on highly pathogenic avian influenza and human H5N1 infection Rome, 27-29 June 2007. Available at: <http://www.fao.org/avianflu/en/conferences/june2007/documents.html>
5. FAO/OIE, (2007). The Global Strategy for Prevention and Control of H5N1 Highly Pathogenic Avian Influenza – Global Strategy Revision . FAO and OIE in collaboration with WHO. March 2007. Available at: http://www.fao.org/docs/eims/upload/210745/glob_strat_HPAI_apr07_en.pdf
6. FAO (2006) Preparing for highly pathogenic avian influenza. Available at: http://www.fao.org/docs/eims/upload/200354/HPAI_manual.pdf
7. McLeod, A. and Hancock, J. (2007) Evidence on and lessons from short-term socio-economic impacts of HPAI. Workshop Paper Technical workshop on highly pathogenic avian influenza and human H5N1 infection Rome, 27-29 June 2007. Available at: <http://www.fao.org/docs/eims/upload//229372/ah657e.pdf>
8. Petrini, A. (2007) Global situation: HPAI outbreaks in poultry- a synthesis of country reports tithe OIE Workshop paper ,Technical Workshop on highly pathogenic avian influenza and human H5N1 infection Rome, 27-29 June 2007 Available at: <http://www.fao.org/docs/eims/upload//229338/ah652e.pdf>
9. UN System Influenza Coordinator and World Bank. Responses to avian and human influenza threats – July – December 2006. Available at: http://www.undg.org/archive_docs/9045-Part_1_Progress_Analysis_and_Recommendations.pdf
10. World Bank, Food and Agriculture Organization, International Food Policy Research Institute and Office International des Epizooties (2006) Enhancing control of highly pathogenic avian influenza in developing countries through compensation Issues and Good Practice. Available at: http://siteresources.worldbank.org/INTARD/Resources/HPAI_Compensation_Final.pdf
11. World Health Organization (2005) International Health Regulations. Available at: <http://www.who.int/csr/ihr/en/>
12. World Health Organization (2006) Strategic Plan. Available at: http://www.who.int/csr/resources/publications/influenza/StregPlanEPR_GIP_2006_2.pdf
13. Other background papers prepared for this Technical Workshop are available at: <http://www.fao.org/avianflu/en/conferences/june2007/documents.html>