Zoonotic influenza is a viral infection transmitted directly or indirectly by infected birds, pigs or horses. There are ongoing outbreaks of various subtypes of avian influenza in several Asian countries that have impacted public health, trade and economy in the affected countries. The epidemiology of avian influenza is complex and new influenza viruses transmissible to humans are evolving from time to time. Most countries in the Asia-Pacific Region are facing enzootic cycle of avian influenza in poultry populations or have high risk of avian influenza incursion from endemic countries.

FAO, OIE and WHO supported the Royal Government of Bhutan in hosting a workshop on surveillance, prevention and control of zoonotic influenza, with the aim of sharing experiences and lessons learnt on the prevention and control of avian and other influenzae of public health interest, and enhancing collaboration to improve surveillance at regional and country levels. Different tools developed for risk assessment of influenza, including the Pandemic Influenza Preparedness Framework, were discussed. Recommendations were made for Member States and partner organizations. This is the comprehensive report of the meeting.
Asia-Pacific workshop on surveillance, prevention and control of zoonotic influenza

Paro, Bhutan, 29–31 August 2016

Report of the meeting
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<th>Full Form</th>
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<tbody>
<tr>
<td>AAHL</td>
<td>Australian Animal Health Laboratory</td>
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<tr>
<td>AI</td>
<td>avian influenza</td>
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<td>AMR</td>
<td>antimicrobial resistance</td>
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<tr>
<td>APSED</td>
<td>Asia-Pacific Strategy for Emerging Diseases</td>
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<td>CCs</td>
<td>collaborating centres</td>
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<td>US CDC</td>
<td>United States Centers for Disease Prevention and Control</td>
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<td>CIP</td>
<td>collaborative investigation programme</td>
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<tr>
<td>ECTAD</td>
<td>FAO Emergency Centre for Transboundary Animal Diseases of FAO</td>
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<td>EID</td>
<td>emerging infectious diseases</td>
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<tr>
<td>EQA</td>
<td>external quality assessment</td>
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<td>EPT</td>
<td>emerging pandemic threat</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FETPV</td>
<td>Field Epidemiology Training Programme for Veterinarians</td>
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<td>GFTADs</td>
<td>Global Framework for Progressive Control of Transboundary Diseases</td>
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<td>GISRS</td>
<td>Global Influenza Surveillance and Response System</td>
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<tr>
<td>HPAI</td>
<td>highly pathogenic avian influenza</td>
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<tr>
<td>ICDDRB</td>
<td>International Centre for Diarrhoeal Disease Research, Bangladesh</td>
</tr>
<tr>
<td>IEDCRB</td>
<td>Institute of Epidemiology, Disease Control and Research, Bangladesh</td>
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<tr>
<td>ILI</td>
<td>influenza-like illness</td>
</tr>
<tr>
<td>IPC</td>
<td>Institut Pasteur du Cambodge</td>
</tr>
<tr>
<td>IVTM</td>
<td>influenza virus traceability mechanism</td>
</tr>
<tr>
<td>JRA</td>
<td>joint risk assessment</td>
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<tr>
<td>LBMs</td>
<td>live bird markets</td>
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<td>MoPH</td>
<td>Ministry of Public Health</td>
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<td>NIC</td>
<td>national influenza centre</td>
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<td>OFFLU</td>
<td>OIE FAO network on animal influenza</td>
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<td>OIE</td>
<td>World Organization for Animal Health</td>
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<td>PIPF</td>
<td>Pandemic Influenza Preparedness Framework</td>
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<tr>
<td>PVS</td>
<td>performance of veterinary services</td>
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<td>RNA</td>
<td>ribonucleic acid</td>
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<tr>
<td>RSU</td>
<td>(SAARC, FAO) Regional Support Unit</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
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<tr>
<td>RT-PCR</td>
<td>reverse transcriptase polymerase chain reaction</td>
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<tr>
<td>SAARC</td>
<td>South Asian Association for Regional Cooperation</td>
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<tr>
<td>SARI</td>
<td>severe acute respiratory infection</td>
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<tr>
<td>SIV</td>
<td>swine influenza virus</td>
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<tr>
<td>SMTA</td>
<td>standard material transport agreement</td>
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<tr>
<td>SOP</td>
<td>standard operating procedure</td>
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<tr>
<td>TADs</td>
<td>transboundary animal diseases</td>
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<tr>
<td>TIPRA</td>
<td>tool for influenza pandemic risk assessment</td>
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<tr>
<td>US</td>
<td>United States of America</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Executive summary

Zoonotic influenza is a viral infection, which is transmitted directly or indirectly by infected birds, pigs or horses. There are ongoing outbreaks of various subtypes of avian influenza (AI) in several Asian countries; these have an impact on public health, trade and economy in the affected countries. The epidemiology of avian influenza is complex and new influenza viruses transmissible to humans are evolving from time to time.

Various types of avian influenza viruses are potential sources of pandemic influenza. A multidisciplinary and multisectoral approach is increasingly being adopted to address common concerns on zoonotic diseases emerging at the human-animal interface. Zoonotic influenza, rabies and antimicrobial resistance (AMR) have been identified as priority areas for operationalization of “One Health”.

The Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE) and the World Health Organization (WHO) have institutionalized a tripartite coordination mechanism to facilitate a functional coordination mechanism between human health and animal health sectors at regional and country levels and to support the Member countries to effectively implement surveillance, prevention and control of zoonoses and emerging zoonotic diseases. As a part of the tripartite coordination in the Asia-Pacific Region, FAO, OIE and WHO supported the Royal Government of Bhutan to host an Asia-Pacific workshop on surveillance, prevention and control of zoonotic influenza.

The workshop was organized with the aim of sharing experiences and lessons learnt in the prevention and control of avian and other influenza of public health interest, and further enhancing multisectoral collaboration for improving surveillance and prevention and control of zoonotic influenza at regional and country levels. A total of 69 participants and observers from Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, the Democratic People’s Republic of Korea (DPR Korea), the Lao People’s Democratic Republic (Lao PDR), Mongolia, Myanmar, Nepal, Thailand and Vietnam, including those from FAO, OIE, WHO and partner organizations, attended the workshop.

The workshop was inaugurated by the Minister for Ministry of Agriculture and Forests and the representatives from FAO, OIE and WHO delivered welcome remarks. There were technical sessions, which included plenary, poster presentation, group exercise and panel discussion.

Most countries in the Region reported that they were facing enzootic cycle of avian influenza in poultry population or had high risk of avian influenza incursion from endemic countries due to various reasons. Highly pathogenic avian influenza (HPAI) H5 viruses have genetically diversified and re-assorted (H5N1, H5N2, H5N6, H5N8). Previously unaffected countries detected AI A(H5Nx) HPAI viruses in poultry and wild birds. Implementation of risk-based, regional AI surveillance in at-risk and affected countries is essential to enable early detection of incursion or spread of zoonotic subtypes and novel genotypes. Live bird markets (LBMs) serve as a low-cost platform for sentinel detection of novel influenza viruses of public health importance.

The Global Influenza Surveillance and Response System (GISRS) is the key laboratory network for global influenza surveillance coordinated by WHO whereas OIE FAO Network on Animal Influenza (OFFLU) is a network of animal influenza experts, established and run by FAO and OIE together for the surveillance of animal influenza viruses in particular
influenza of avian and swine origins. Building bioinformatics capacity at country and regional levels will help better understand pathogens and identify potential virological threats before they get widely spread in the human and animal populations.

Although advocacy and academic programme for operationalization of One Health have been launched in South Asia, political and policy decision-makers still do not recognize the importance of One Health and there is no funding commitment for sustainable One Health capacity-building. However, there is a prospect for operationalization of “One Health” through institutionalization of the mechanism at the country level and formalization of the “One Health” training programme at government and academic levels.

There are different tools developed for risk assessment of influenza, including the zoonotic one, by WHO, US Centers for Disease Control (CDC), WHO-FAO-OIE and others. WHO has developed a tool for influenza pandemic risk assessment (TIPRA), which helps in a qualitative analysis of the pandemic potential of novel influenza viruses, based on different virus elements that are known to affect transmissibility and spread. FAO, OIE and WHO have developed a joint risk assessment tool for conducting risk assessment of zoonotic influenza at the animal-human interface. This has undergone pilot testing in Myanmar.

The existing poultry vaccines against HPAI do not confer protective immunity from infection. There is always a risk of persistence and silent spread of AI when poultry vaccine is used without proper sentinel surveillance. Surveillance of swine flu is crucial in countries where avian flu has not been controlled. Prompt containment and possible eradication of HPAI A(H5N1) from poultry is possible through a multipronged approach, i.e. enhanced surveillance, early detection, culling the flock, movement restriction and strategic poultry vaccination.

Pandemic influenza preparedness (PIP) is a landmark, innovative public health arrangement to increase global preparedness to respond to pandemic influenza in partnership with industries. The PIP framework has been dealing with influenza activities at the country level in five identified priority categories: “laboratory and surveillance capacity-building; burden of disease; regulatory capacity-building; risk communication; and planning for deployment”.

The annual meeting of national influenza centres (NICs) from the Asia-Pacific Region, held in Bangkok in July 2016, discussed strengthening of reporting, virus tracking and data usage in the Asia-Pacific Region, including approaches to obtaining the burden of influenza. Influenza remains important in the Region due to the impact of seasonal influenza on high-risk groups and the continuing threat of influenza viruses with pandemic potential.

There were two sets of recommendations, one for Member countries and another for partner organizations. Member countries were encouraged to share avian influenza viral material and increased contribution of genetic and antigenic data on zoonotic influenza viruses with the international scientific community and strengthen active surveillance for zoonotic influenza, using the One Health approach at the human-animal-ecosystem interface. Partner organizations were requested to continue to support Member countries to strengthen zoonotic influenza epidemiology and laboratory surveillance and networks, including policy advocacy and operationalization of One Health in tandem with existing regional strategies and policies, such as Asia-Pacific Strategy for Emerging Diseases (APSED) and Global Framework for Progressive Control of Transboundary Diseases (GFTADs).
1. Introduction

Zoonotic influenza is a viral infection, which is transmitted directly or indirectly by infected birds, pigs or horses. The epidemiology of zoonotic influenza is complex and new influenza viruses transmissible to humans from animals are evolving from time to time. There are continuing outbreaks of various subtypes of avian influenza (H5N1, H5N6, H5N8, H7N9, H9N2 and others) in several Asian countries, which have an impact on public health and trade and economy in the affected countries.

Various types of avian influenza viruses are potential sources of pandemic influenza. There are several projects designed to strengthen the surveillance of avian influenza in South-East Asia and the PIP framework has been dealing with influenza activities at the human-animal interface.

A multidisciplinary and multisectoral approach is increasingly being adopted to address common concerns on zoonotic diseases emerging at the human-animal interface. FAO, OIE and WHO have institutionalized a tripartite coordination mechanism to facilitate a functional coordination mechanism between human and animal health sectors at regional and country levels, and to support the Member countries to effectively implement surveillance, prevention and control of zoonoses and emerging zoonotic diseases at the human-animal interface.

As a part of the tripartite coordination mechanism in the Asia-Pacific Region, annual regional workshops have been organized to review progress in prevention and control of zoonoses and to define the way forward to further strengthen multisectoral coordination and collaboration. Zoonotic influenza, rabies and antimicrobial resistance have been identified as priority areas for operationalization of One Health. Facilitating a focused discussion on specific issues, such as zoonotic influenza, using the tripartite coordination mechanism, had been proposed in 2016. It was timely to provide a platform to share experience and lessons learnt in prevention and control of avian and other influenza of public health interest.

Bhutan has been in the forefront to deal with outbreaks of avian influenza (H5N1) in poultry population. It had developed a functional coordination mechanism between human and animal health sectors for prevention and control of AI in the past. This workshop provided a regional platform for focused discussion on issues, challenges and the way forward for better surveillance, prevention and control of zoonotic influenza with the involvement of both human health and animal health sectors.

The general objective of the workshop was to strengthen surveillance, prevention and control of zoonotic influenza, using the One Health approach.

The specific objectives of the workshop were to:

1. provide an update on the situation and scientific information on zoonotic influenza viruses at global, regional and country levels;
2. share knowledge and experiences of avian influenza surveillance, prevention and control; and
3. provide recommendations for Member States and international partner organizations for prevention and control of zoonotic influenza.
A total of 69 participants and observers from Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, the Democratic People’s Republic of Korea, Lao People’s Democratic Republic (PDR), Mongolia, Myanmar, Nepal, Thailand and Viet Nam, including those from FAO, OIE, WHO and partner organizations, attended the workshop.

The workshop was facilitated and funded by FAO, OIE and WHO under the PIP Framework.

2. Inaugural session

The workshop was inaugurated by His Excellency Lyonpo Yeshey Dorji, Minister for Agriculture and Forests, Royal Government of Bhutan. Other guests present included Dr Tashi Samdup, Director General, Department of Livestock, Royal Government of Bhutan; Dr Ornello Lincetto, WHO Country Representative for Bhutan; Dr Katinka de Balogh from FAO; and Dr Karma Lhazeen, Director, Department of Public Health, Ministry of Health, Royal Government of Bhutan.

In his inaugural address, the Chief Guest, His Excellency Lyonpo Yeshey Dorji, the Minister for Agriculture and Forests, welcomed the participants on behalf of the Ministry of Agriculture and Forests, Ministry of Health and the Royal Government of Bhutan. He also welcomed representatives from WHO, OIE and FAO and thanked the organizers for choosing Bhutan as the host country for holding this very important workshop on zoonotic Influenza, an emerging infectious disease of growing concern in the Region.

His Excellency stressed that the Asia-Pacific Region has witnessed several outbreaks of various subtypes of avian influenza, making a huge impact on the livelihoods of poultry farmers, public health concerns and trade and economy in the affected countries. Bhutan has not been an exception to this phenomenon. His Excellency further noted, “We live in a region where poverty is widely prevalent, given the lack of resources and increasing human population. It is now being increasingly realized regionally and globally that it would be difficult and costly for countries to control emerging diseases in isolation and therefore, a collaborative approach at all levels is needed. This is very relevant in our context given the limited resources available and the largely subsistence farming practices prevalent in our region.”

Sharing of resources and expertise available in both human and animal health sectors will help deal with emerging infectious diseases (EIDs) more effectively. Increasing interaction in the humans–animals–ecosystem interface has resulted in the emergence of new strains of avian influenza viruses and has posed serious challenges to disease prevention and control at all levels, he informed. Therefore, Bhutan has joined other nations in using the “One Health” concept as its core strategic tool and guiding principle to deal with preparedness and response against zoonotic influenza.

His Excellency called on WHO, OIE and FAO to take stock of the situation of zoonotic influenza viruses around the world, review the progress in prevention and control of zoonotic influenza and define the way forward to further strengthen multisectoral coordination and collaboration among countries at a high risk of the disease.
Dr Ornello Lincetto delivered the inaugural message on behalf of the Regional Director of the WHO Regional Office for South-East Asia (WHO SEARO), Dr Poonam Ketrapal Singh. She highlighted that tackling emerging infectious diseases requires focused, interdisciplinary action and knowledge-sharing. The experience of countries in this Region with highly pathogenic avian influenza (H5N1) and pandemic influenza (H1N1) 2009 have also reinforced the need for sustained, well-coordinated, multidisciplinary and community-based actions to address emerging disease threats that arise at the human-animal interface. She hoped that the workshop would be able to identify the optimum combination of actions and approaches that would be needed to promote the One Health approach at the human and animal interface.

The representatives from FAO and OIE, delivering welcome remarks during the inaugural session, stressed the country's commitment and political support for control of zoonoses and enhanced multisectoral collaborations and coordination for effective response to zoonotic influenza outbreaks at the human-animal interface. They emphasized the importance of capacity development and systems approach for effective control of zoonotic influenza with pandemic potential and highlighted the key elements of “One Health” – common objectives, shared benefits, building trust among sectors and calling on country- and regional-level cooperation for response to the emerging threat of zoonotic influenza.

The participants unanimously supported the proposal to nominate Dr Tashi Samdup, Director General, Department of Livestock, Ministry of Agriculture and Forest, Bhutan, as Chairperson, and Dr Woraya Luang-on, Director, Bureau of Emerging Infectious Diseases, Department of Disease Control, Ministry of Public Health (MoPH), Thailand, as co-Chairperson for the workshop. A group of One Health fellows from Bhutan agreed to serve as rapporteurs.

3. Technical session

3.1 Scene setting

The session was moderated by Dr Tashi Samdup, Chairperson of the workshop. The session included a keynote presentation on the global and regional situation and scientific updates on zoonotic influenza by Dr Frank Wong, virologist from the Australian Animal Health Laboratory (AAHL), Geelong, which is the OIE reference laboratory for avian influenza and FAO reference centre for animal influenza.

The Australian Animal Health Laboratory is one of largest biosecure laboratories in the world for the safe handling and containment of viral diseases of livestock and zoonoses. Dr Wong put forth a detailed epidemiology and virological characteristics of the evolving avian influenza virus A(H5Nx) at global and regional levels. HPAI H5 viruses have genetically diversified and re-assorted (H5N1, H5N2, H5N6, H5N8) and previously unaffected countries detected AI A(H5Nx) HPAI viruses in poultry and wild birds. Several clades of A(H5N1) exist in a particular geographical range. Clade 2.3.4.4 emerged from Asian clade 2.3.4 (H5N1), re-assorting with low pathogenic avian influenza (LPAI) viruses, resulting in various subtypes, i.e. H5N8, H5N6, H5N2, H5N1 and so on, and it has already greatly diversified into multiple lineages. The efficacy of current vaccines against this clade is unknown but antigenically distant to previous 2.3.4 H5N1 viruses.
The presenter also highlighted emerging LPAI in poultry of zoonotic concern such as A(H7N9), A(H10N8) and A(H9N2). Human cases of novel avian influenza A(H7N9) and A(H10N8) have been reported from the People’s Republic of China and all cases had contact with poultry or associated contaminated environment (live bird market/live poultry market). The ecology of AI virus leading to novel re-assortants in Asia was elaborated on. Re-assortant HPAI viruses of Asian clade 2.3.4.4 H5 lineage with different NA subtypes have emerged and spread globally, threatening both poultry-dependent livelihoods and human health. The presenter highlighted contribution of AAHL to strengthening the OFFLU laboratory network. Concluding his presentation, Dr Wong stressed that implementation of risk-based regional AI surveillance in at-risk and affected countries is essential to enable early detection of incursion or spread of zoonotic subtypes and novel genotypes.

During the discussion, the participants were interested to know which subtype of avian influenza virus could be a potential candidate for influenza pandemic and how predictable the next pandemic would be. Dr Wong stressed that continuing influenza surveillance is key for antigenic characterization of novel influenza viruses as well as for effective response and management of the mutating and re-assorting influenza viruses. The discussions also took note of the preparedness as there are many circulating viruses with a possibility of spillover and concerns that mortality is caused by low pathogenic avian influenza viruses such as A(H9N2). He also informed the participants that countries with live bird markets and waterfowl population provide an enabling natural environment for re-assortment of influenza viruses.

### 3.2 Sharing experiences and lessons learnt

The session was designed to provide opportunities for countries to share experience and lessons learnt in outbreak investigation, surveillance, prevention and control of avian influenza and to facilitate interaction on issues and challenges among experts and country participants. The session was moderated by Dr Tashi Samdup. Representatives from Bangladesh, Bhutan, Cambodia, Thailand and Viet Nam shared their experiences of prevention and control of avian influenza in their respective countries.

**Avian influenza at the poultry-human interface: the Bangladesh experience** was presented by Dr Syed Sayeemuddin Ahmed, senior international fellow from the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B).

The Bangladesh experience of avian influenza surveillance in live bird markets and community-based surveillance among backyard poultry flocks were shared by Dr Ahmed. These were outcomes of the collaborative work of ICDDR,B, Institute of Epidemiology, Disease Control and Research, Bangladesh (IEDCRB) and CDC, Atlanta. Bangladesh has been experiencing outbreaks of avian influenza in poultry population since 2007 and eight human cases due to Al infection have been reported in past 10 years.

Identification and characterization of circulating avian influenza viruses in waterfowl and domestic poultry, including environmental contamination of LBM and detection of human infections with Al viruses among poultry handlers, were the main objectives of Al surveillance. In addition, community-based Al surveillance was carried out to identify backyard poultry die-off due to Al and circulating strains at the community level.
The methodology, sampling technique, laboratory investigation and outcome of AI surveillance in different settings were elaborated on. Year-round circulation of AI viruses, including H5 subtype, was observed. LBMs serve as a low-cost platform for sentinel detection of novel influenza viruses of public health importance. In heavily contaminated environments, rRT-PCR may detect avian influenza A viral RNA in human respiratory specimens in the absence of infection, but it is difficult to interpret in the absence of serological results.

**Epidemiology of avian influenza A(H5N1) in Cambodia** presented by Dr Sowath Ly, Medical Epidemiologist from Institut Pasteur du Cambodge (IPC).

IPC is WHO H5 reference laboratory as well as national influenza centre and involved in influenza-like illness (ILI)/severe acute respiratory infection (SARI) surveillance in Cambodia. Backyard poultry farming constitutes 80% of poultry production and trading in Cambodia. A total of 56 human cases due to A(H5N1) infection has been reported since 2005, 46 per cent of which were reported in 2013 alone. A dramatic increase in human infection in 2013 coincided with detection of A(H5N1) clade 1.1.2 reassortant. Community-based ILI surveillance helped detect human cases, but many cases were reported before notification of poultry die-off in the community.

Contact tracing was introduced in 2005 and there was no evidence of human-to-human transmission. Seven rounds of seroprevalence surveys were carried out from 2005 to 2014 to assess the extent of transmission among at-risk population – 0.6% seropositivity was detected. Al surveillance in LBMs was carried out by IPC in collaboration with the National Veterinary Research Institute (NaVRI). The study design was elaborated on and it was revealed that 45% of environmental and poultry specimens taken from LBMs were found to be positive for avian influenza A in 2013 and this included A(H5N1) and nine other low-pathogenic AI viruses. The result of the serology testing in a cohort of 125 poultry workers demonstrated seropositivity of 4.5% for AI A(H5N1) and 1.5% for AI A(H9N2).

The Cambodian experience shows that testing of environmental samples in LBMs is very efficient to detect AI virus circulation. High co-circulation of A(H5N1) and other AI viruses in LBMs creates excellent conditions for potential emergence of new strains of AI viruses with a high impact on human and animal health. Surveillance of poultry mortality would lead to early detection of virus circulation, but it is difficult and challenging in a setting with 80% backyard poultry farming.

**Active surveillance of avian influenza viruses in Viet Nam**, presented by Dr Nguyen Ngoc Tien, Vice-Head of the Epidemiology Division of the Department of Animal Health, Viet Nam.

Viet Nam has been facing outbreaks of highly pathogenic avian influenza A(H5N1) in poultry population since 2003 and it has a serious impact on livelihood and economy of the country. To date, Viet Nam had culled about 65 million of poultry and quails and poultry AI vaccination has been carried out using imported and locally produced vaccine with AI A(H5N1) subtype. The first outbreak of HPAI due to A(H5N6) was reported in April 2014 in the Lang Son province bordering with the People’s Republic of China. A total of 127 people had been infected with A(H5N1) virus.
Viet Nam has been conducting surveillance of avian and swine influenza viruses in LBMs and pig farms. The major focus has been on active surveillance of highly pathogenic avian influenza, namely H5 and H7 subtypes. The epidemiology and phylogenetic characteristics of circulating HPAI viruses, based on results of AI surveillance in LBMs, were highlighted. LBMs are good sites for monitoring the AI viruses. HPAI A(H5N1) and A(H5N6) viruses are circulating in poultry population and there is no evidence on the presence of AI A(H7N9) in poultry and environment despite active surveillance in high-risk areas in Viet Nam. Swine influenza viruses (SIV), such as H1N1v, H1N2v and H3N2v, have been detected in pig farms. Full genome analysis of HPAI viruses and SIVs on the same site is needed for better understanding of possible emergence of novel influenza viruses.

Survey of H5 and H7 prevalence in live bird markets, poultry workers’ vaccination and knowledge in Bangkok Metropolitan, Thailand by Dr Prabda Praphasiri, Epidemiologist from Thailand (MoPH–US CDC collaboration).

Live bird markets play a crucial role in the maintenance, amplification and dissemination of avian influenza viruses. There are nine LBMs around Bangkok where poultry, geese and ducks are brought for sale from several provinces of Thailand. Surveillance of LBMs in Bangkok was carried out to identify AI A(H7N9) and other avian influenza viruses in poultry and environmental samples and to determine knowledge of AI among poultry handlers, including determination of influenza vaccine coverage among them from 2013 to 2016.

The methodology of epidemiological and virological investigation was elaborated on. The surveillance result showed that all specimens were negative for influenza A virus subtypes H5 and H7. However, AI virus subtypes H4N6, H4N9 and H10N3 were detected during active surveillance in 2010 in a live bird market in Bangkok. Poultry handlers had 20% influenza vaccination coverage. Television is the most effective source for disseminating avian influenza information. In Thailand, live poultry purchasing habits, poultry handling and living conditions increase the risk of exposure to AI virus-contaminated environments. Although no AI virus was found during surveillance in LBMs, it is critical to maintain the level of biosecurity to prevent introduction and spread of AI viruses.

Management of zoonosis through the One Health approach in Bhutan by Dr Dorji Wangchuk, former Secretary of the Ministry of Health, Royal Government of Bhutan

Bhutan is rich in biodiversity and 70% of the territory is covered by forests. The country has been facing challenges of endemic, emerging and re-emerging zoonoses due to various sociocultural practices, backyard farming, import of live animals and livestock products along porous border and increased vector activity possibly due to climate change. Outbreaks of HPAI, rabies, anthrax, scrub typhus, dengue and chikungunya are classic examples. Human health and animal health sectors have been trying to establish a functional coordination mechanism to address zoonotic diseases emerging at the human and animal interface.

Priority zoonoses have been identified and a conceptual framework for operationalization of One Health has been developed, bringing human, animal and environment together. The presenter elaborated on seven strategic pillars, key achievements and the way forward. The government has endorsed the Bhutan One Health Strategic Plan (2016–20) and the ministries concerned will have to incorporate it in policies and programmes. There are challenges to sustainable funding and operationalization of One Health.
Some of the key outcomes from the discussions and sharing of experiences are as follows:

(1) need to improve poultry biosecurity in respective countries;
(2) need to include local strains of AI viruses in vaccine production as the current vaccine strain may not induce protective immunity against the circulating field strain as influenza viruses change over time;
(3) need to efficiently report poultry AI outbreaks as some countries are not able to report poultry outbreaks promptly among neighbours and to the relevant national and international agencies;
(4) need to improve information-sharing systems at the national and regional levels, gaps in knowledge hubs, disease networks and joint research programmes; and
(5) need to provide incentives for reporting and appropriate compensation policy.

The poster presentation was moderated by Dr Ronello Abila, Sub-regional Representative from OIE South-East Asia. There were 11 posters from participating countries and partner organizations, which highlighted the zoonotic influenza situation, institutional mechanism for surveillance, prevention and control of zoonotic influenza, operationalization of One Health, challenges and lessons learnt. The poster session was interactive and provided opportunities for participants to share practical experience and learn from each other.

The summary of poster presentation and discussion points is as follows:

- Most countries in the Region reported that they were facing enzootic cycle of AI in poultry population or had a high risk of avian influenza incursion from endemic countries, possibly due to the following reasons:
  - porous borders;
  - movement of poultry across borders and within (cross-border and within country);
  - changing viral characteristics of the avian influenza virus (fast evolution of multiple clades);
  - abundance of migratory birds in the Region;
  - absence of a robust surveillance system;
  - biosecurity and mixed species farming issues (traditional live bird markets, farms, slaughterhouses);
  - lack of human resources or trained manpower;
  - lack of sustainable financing for surveillance, prevention and control of AI;
  - difficult geography;
  - mixed farming; and
  - AI vaccination of ducks along borders.
However, the representative from Japan informed the floor that there were no reports of avian influenza outbreaks in poultry population, thanks to improvement of biosecurity in poultry farms in the country.

- The One Health approach is considered an effective mechanism for prevention and control of emerging infectious diseases, including zoonotic influenza. However, representatives reported that the implementation of One Health was at various stages in their respective countries. Some of the points related to adoption and implementation of the One Health approach include:
  - legislative and policy support to create an enabling environment to work together;
  - availability of adequate funds for effective implementation of activities under One Health;
  - need to promote effective multisectoral coordination;
  - need to promote active participation of the wildlife sector in One Health activity; and
  - need to promote joint outbreak investigation, research and analysis of bioinformatics and real-time data-sharing.

- Cross-sectoral issues from poster presentations:
  - absence of a platform for information and data-sharing.

### 3.3 Networking the networks

The session was moderated by Dr Woraya Luang-on. The following presentations were made mainly to provide updates and educate the participants on the existing networks and the effort made by the international organizations concerned to support effective surveillance, prevention and control of influenza and other emerging infectious diseases.

**Global Influenza Surveillance and Response System (GISRS), presented by Dr Gina Saaman, Consultant**

With the WHO Global Influenza Programme at WHO HQ

GISRS is the key laboratory network for global influenza surveillance coordinated by WHO. The network was established as the Global Influenza Surveillance Network (GISN) in 1952 and was later expanded to incorporate WHO collaborating centres, essential regulatory laboratories and national influenza centres (NICs) throughout the world. Today, there are six WHO collaborating centres, four essential regulatory laboratories and 143 NICs in 113 Member States. As a result of the network, global influenza surveillance has been strengthened in the past six decades by setting standards for influenza surveillance, providing electronic platforms for information gathering and sharing, and disseminating surveillance reports.

GISRS recommends policy and operations in areas, including laboratory diagnostics, vaccines and antiviral susceptibility, based on global monitoring of the evolution of influenza viruses. The presenter elaborated on epidemiological surveillance and virus-sharing
mechanisms for influenza, and preparedness and response to influenza viruses with pandemic potential. Poor sentinel surveillance in some regions, geographical gaps in surveillance, sustainability and funding of surveillance activity remain the key challenges.

Contribution of avian influenza data through OFFLU network, presented by Dr Gounalan Pavade, Chargé de Mission from World Organisation for Animal Health (OIE) HQ

Avian influenza is a global concern, which poses threats to both animal and human health. Considering the emergence of novel influenza viruses of avian and swine origin at the human-animal interface, which may become influenza of potential pandemic, surveillance of animal influenza is becoming increasingly important in recent years. OFFLU is a network of animal influenza experts, established in 2005 and run by FAO and OIE, and brings together 26 OIE reference laboratories for animal influenza of avian, swine and equine origins and 75 experts from all over the world.

The objectives of OFFLU include technical support for prevention, diagnosis, surveillance and control of animal influenza, exchange of scientific data and biological materials with the wider scientific community, promotion of influenza surveillance and research needs and collaboration with WHO on issues relating to the animal-human interface, including pandemic preparedness. The presenter highlighted vision, mission and technical activities, carried out by the OFFLU network.

OIE Member countries adopted a resolution at their Seventy-sixth General Assembly in 2008 for sharing material and information on AI viruses through the OFFLU network with the international scientific community. OFFLU supports proficiency testing of animal influenza laboratories and encourages Member countries to share genetic and antigenic data on avian influenza. The OFFLU network gathers and analyses information on animal influenza viruses of public health concern every six months and shares that information during the WHO vaccine composition meetings.

Regional bioinformatics network, presented by Dr Aurelie Brioudes, Regional Surveillance Coordinator with the Regional Office for Asia and the Pacific of the Food and Agriculture Organization (FAORAP).

FAO has been building bioinformatics capacity at country and regional levels under United States Agency for International Development (USAID)-funded projects to better understand existing and emerging pathogens and to identify potential virological and genetic properties of EIDs, including avian influenza. A technical consultation was organized to develop a regional plan for bioinformatics for the animal health sector in South and South-East Asia to serve better control and prevention of emerging pandemic threats in the Region.

The key benefits of strengthening bioinformatics capacities within the Region are multifold, i.e. improvement of overall understanding of the spread and evolution and ecology of pathogens, using molecular epidemiology to guide decision-makers on disease prevention and control strategies. The consultation also identified gaps and needs in bioinformatics capacities, including human resources, technology and knowledge, within the Region. It was recommended that gaps and needs must be addressed to improve the use of bioinformatics in controlling and preventing animal and zoonotic diseases.
Other relevant regional and national networks

SAARC veterinary epidemiology and laboratory networks, presented by Dr Khadak Singh Bisht, Assistant Coordinator from the Regional Support Unit (RSU) of SAARC.

RSU is the first institutional mechanism to deal with transboundary animal diseases (TADs) and other EIDs at the SAARC level. There are epidemiology and laboratory networks, and HPAI, foot-and-mouth disease and Peste Des Petits Ruminants (PPR) have been identified as priority TADs for regional cooperation. The High Security Animal Diseases Laboratory, Bhopal has been designated as the OIE reference laboratory for avian influenza whereas the Project Directorate of foot- and-mouth disease (FMD), Mukteswar has been recognized as the FAO reference centre. SAARC chief veterinary officers (CVOs) are meeting regularly to discuss the challenges of TADs and other aspects of livestock. The presenter elaborated on regional information-sharing and capacity-building activities.

One Health South Asia networks – prospects and challenges, presented by Dr Sithar Dorjee, Coordinator from One Health Epidemiology Fellowship Programme, South Asia.

The Massey University of New Zealand has been running a multicountry and multidisciplinary One Health programme for seven SAARC countries under funding support of the European Union in first phase of the academic One Health programme. Introduction of a collaborative investigation programme (CIP) and establishment of the Regional South Asian One Health Network were the key achievements. Based on past experience and commitment to adopting more practical and field-based approach, i.e. integration of education and action, the One Health Epidemiology Fellowship Programme has been launched for participants from Afghanistan, Bangladesh, Bhutan and Nepal through designation of regional coordinator and host institutions in the respective countries since 2014.

There are challenges to implementation of the One Health approach in South Asia as political and policy decision-makers still do not recognize the importance of One Health, and there is no funding commitment to continued and sustainable One Health capacity-building. There is a regional prospect for promotion of One Health through institutionalization of One Health mechanism at country level and formalization of One Health training programme at government and academic levels.

3.4 Pandemic influenza preparedness and response

The session was moderated by Dr Tashi Samdup and Dr Woraya Luang-on. The keynote presentation on control of avian influenza and preparedness for pandemic influenza was made by Professor Hiroshi Kida from the Hokkaido University of Japan.

Professor Kida elaborated on scientific thoughts on emergence, maintenance and periodic mutation of avian influenza viruses in Nature and the role of migratory birds, domestic poultry, pigs and humans in evolution of novel influenza virus of pandemic potential. Epidemiological evidence shows that migratory duck is the natural host of influenza A viruses. AI viruses are preserved in frozen water of lakes, where ducks nest in summer and in winter, such as those in Siberia, Alaska and Canada. He also highlighted divergence of AI viruses in waterfowl, migratory birds and domestic birds, based on surveillance data and antigenic characterization of AI viruses in Asia and the Far East.
Considering historical data and information on AI and types of poultry AI vaccines used for containment of poultry outbreaks, he stressed that existing poultry vaccines against HPAI do not confer protective immunity from infection. There is always a risk of persistence and silent spread of AI when poultry vaccine is used without proper sentinel surveillance. He mentioned that poultry AI vaccine has been used in four countries, where HPAI has not been controlled due to persistence of AI virus. Highly pathogenic avian influenza A(H5N1) virus strains have persisted in domestic poultry for the last couple of decades and antigenic variants have been selected mainly due to the inappropriate use or misuse of poultry vaccine.

He reiterated that the stamping-out policy has been the most effective measure for the control of HPAI. Surveillance of swine flu is crucial in countries, where avian flu has not been controlled. Concluding the presentation, he urged for prompt containment and possible eradication of HPAI A(H5N1) from poultry in Asia through enhanced surveillance, early detection, culling the flock and movement restriction. Poultry vaccine should be carefully used in addition to, not instead of, stamping out. He was confident that it is unlikely that AI A(H5N1) or AI A(H7N9) viruses may become a pandemic influenza virus. A wide range of questions and queries were raised after the keynote presentation as all participating countries had experienced outbreak of HPAI. Some of the points raised and discussed in the presentation include:

1. The participants asked for the opinion of the prominent international experts on poultry vaccination against HPAI as a control strategy. Professor Kida responded to the queries saying that countries make their own recommendations and country-specific decisions, based on their own context. He also informed the participants that vaccination was one of the options, as per OIE Terrestrial Animal Health Code, but he reiterated that HPAI vaccine should be carefully used in addition to, not instead of, stamping out. The participants were also informed that OFFLU provides options for controlling animal influenza as well.

2. Dr Nguyen Ngoc Tien, Vice-Head of Epidemiology Division from Viet Nam, shared the experience of the use of poultry vaccine for control of HPAI in country. He said that the large population in backyard setting and the high risk of influenza proved vaccination was a better option for Viet Nam as improving biosecurity was not possible in such settings. Thus, Viet Nam follows poultry vaccination along with compensation and stamping out to control HPAI outbreaks. However, poultry vaccination is based on risk assessment and the trend of HPAI vaccination in Viet Nam has been decreasing. He also informed the participants that Viet Nam does not use HPAI vaccine in broiler farms. Viet Nam specifies high-risk groups for vaccination, such as ducks and backyard poultry. Vaccination of backyard poultry is carried out on request of farmers and risk assessment.

3. Dr Muhammad Azhar, Senior Veterinary Officer, Directorate of Animal Health from Indonesia, also shared country experience on the use of HPAI vaccine and vaccination strategy. He said Indonesia followed mass vaccination during initial outbreaks, using imported vaccine. However, as the vaccine strain was not matching with the field strain of HPAI, Indonesia reviewed the existing vaccination strategy. He also said that Indonesia had followed OFFLU recommendations since 2009 and changed the strategy to targeted and strategic
vaccination in commercial poultry farms. Since 2011, Indonesia had stopped use of imported poultry vaccine and initiated local production of vaccines against HPAI, using local strains of HPAI. Improved biosecurity, focal culling and strategic vaccination had been used to control HPAI and proper use of HPAI vaccine, timing and method of vaccination reduced the number of HPAI outbreaks.

(4) Dr Min Thein Maw, Deputy Director of the Livestock Breeding and Veterinary Department from Myanmar, informed the participants that Myanmar used poultry vaccines for control of HPAI. However, field experience shows that there is an issue of proper matching of vaccine strain with circulating field strain and it is a challenge to executing poultry AI vaccination.

(5) Dr Md Nasir Ahmed Khan, Deputy Programme Manager, Communicable Diseases Control from Bangladesh, informed the participants that there were no reports of human mortality due to AI A(H5N1) infection. Professor Kida clarified that human mortality due to AI A(H5N1) infection differs from country to country as different strains of HPAI viruses are circulating. So far, there is no evidence of efficient and sustained human-to-human transmission of AI A(H5N1) infection.

(6) Dr Mala Chhabra, Joint Director, Division of Zoonosis from India, informed the participants that India did not detect any case of human infection due to AI A(H5N1) mainly due to an effective contingency plan in poultry and an efficient culling system, and pre-exposure prophylaxis of high-risk groups, such as veterinarians and cullers, might have prevented human infection.

(7) There were constructive discussions on challenges posed by emerging avian influenza clades and effectiveness of poultry vaccination. Professor Kida informed the participants that stamping out is the best control strategy for subsequent eradication of HPAI, it is expensive in the short term but rewarding in the long term. Poultry AI vaccination should only be used as supplementary to stamping out, not as a substitute, as it reduces poultry mortality, but it may lead to persistence of AI viruses and induces emergence of new field strains of AI viruses.

(8) Dr Sothyra Tum, Director, National Veterinary Research Institute from Cambodia, informed the participants that backyard poultry vaccination against HPAI was not easy in Cambodia due to a high population turnover and providing effective vaccination coverage was a challenge to ensuring herd immunity in poultry population.

An introductory presentation on the PIP Framework was made by Professor Tjandra Y. Aditama, Technical Adviser at the World Health Organization’s Regional Office. The PIP Framework is a landmark, innovative public health arrangement to increase global preparedness to respond to pandemic influenza in partnership with industries. The Framework has two “Standard Material Transfer Agreements” (SMTAs). The SMTA type 1 applies solely to transfers of PIP biological materials among laboratories within the GISRS network whereas SMTA type 2 applies to transfers of biological materials to entities outside the GISRS network.

He also explained the mechanism for virus-sharing, benefit-sharing and capacity-building in priority Member countries in priority areas. The PIP framework has been dealing with influenza activities at the country level in five identified priority categories: laboratory and surveillance capacity-building; burden of disease; regulatory capacity-building; risk
communication; and planning for deployment”. Member countries are eligible for receiving funding support for whole or one of the identified priority activities from the PIP project.

The outcome of the biregional meeting of national influenza centres, held in Bangkok, from 25 July to 28 July, 2016, was presented by Dr Gyanendra Gongal, Scientist, WHO SEARO.

WHO Regional Offices for South-East Asia and Western Pacific hosted the Tenth Biregional Meeting of NICs in Bangkok, which was attended by 86 participants from 14 countries, WHO collaborating centres for influenza and partner organizations. The overall objectives of the workshop were to strengthen influenza virus detection, isolation and sharing and reporting and data usage, and to strengthen and develop influenza vaccine policies in Member countries. The meeting discussed strengthening of reporting, virus tracking and data usage in the Asia-Pacific Region, including approaches to obtaining the burden of influenza.

Influenza remains important in the Asia-Pacific Region due to the impact of seasonal influenza on high-risk groups and the ongoing threat of influenza viruses with pandemic potential. Influenza surveillance, laboratory and GISRS networks in the Asia-Pacific Region continue to play a critical role in laboratory diagnostics, vaccines, antiviral susceptibility and risk assessment for policy- and decision-making. Efforts to assist Member countries to quantify and describe the burden (including economic burden) of influenza should continue, as should efforts to strengthen the sentinel surveillance sites they are based on. The Asia-Pacific Strategy for Emerging Diseases and Public Health Emergencies is a useful strategy to enhance influenza surveillance and response, going forward.

The meeting came up with two sets of recommendations, one for Member countries and another for WHO. Member countries were requested to continue to strengthen influenza surveillance systems, sharing of national epidemiology and laboratory surveillance data and use of surveillance data in risk assessment and decision-making.

They were encouraged to continue to strengthen and/or maintain laboratory capacity for the detection of influenza viruses and ensure laboratory quality through participation in external quality assessments (EQA). WHO was requested to continue to support Member countries to strengthen influenza epidemiology and laboratory surveillance and networks, including the burden of influenza activities. In addition, WHO was also requested to support Member countries through their NICs and national influenza laboratories to maintain laboratory quality; and encourage influenza virus detection, isolation, characterization and sharing.

3.5 Existing tools for zoonotic influenza risk assessment

There are different tools developed for risk assessment of influenza, including the zoonotic one, by WHO, US CDC, WHO-FAO-OIE and others. There were presentations on two risk assessment tools for influenza.

*Tool for influenza pandemic risk assessment, presented by Dr Gina Saaman, Consultant WHO Global Influenza Programme, WHO HQ.*

The tool for influenza pandemic risk assessment (TIPRA) supports timely and updatable hazard risk assessment for influenza viruses with pandemic potential, excluding seasonal
influenza viruses. TIPRA focuses on the qualitative pandemic potential of a virus, as evaluated by experts, based on different virus elements that are known to affect transmissibility and spread. The processes and key risk elements and triggers of pandemic risk assessment were elaborated on. The utility of TIPRA greatly depends on Member States and international partnership, i.e. investment in influenza surveillance, research and collaboration at the country level and networks, such as GISRS and OFFLU.

The participants were interested to know whether individual countries could use TIPRA for pandemic influenza risk assessment. The presenter explained that TIPRA can be used at the national level, but with caution, to consider globally available data on the virus and to adhere to the TIPRA steps, as per the guidance document. This is to minimize conflicting risk assessment outputs by different groups assessing the same virus. Since TIPRA focuses on hazard risk assessment and has less emphasis on assessing context and exposures, the presenter stressed that Member States should take these components into consideration before making risk management decisions.

The presenter added that TIPRA in itself is not a software but a written tool for risk assessment and countries could use the guidance for coming up with risk scores. The participants also asked the presenter whether the pandemic risk of circulating AI A(H5N6) in several Asian countries could be known. The presenter clarified that from a hazard risk assessment perspective, the AI A(H5N6) virus was deemed to have a moderate risk of emerging as a pandemic strain; however, the countries should put more emphasis on recommendations and less on TIPRA scores. On the issue of selecting viruses for risk assessment using TIPRA, the presenter clarified that TIPRA was designed to assess the hazard risk to a specific level, i.e. at the virus clade/strain level, rather than at the level of generic groups of viruses.

**Joint risk assessment for zoonotic influenza at the animal and human interface, presented by Dr Yooni Oh, Regional Project Coordinator, OIE Regional Representation for Asia and the Pacific.**

Dr Yooni Oh presented on behalf of the tripartite group. The objective of a joint risk assessment (JRA) is to provide technical tools for conducting risk assessment of zoonotic influenza at the animal-human interface in order to design disease management programmes, prioritize resources and inform prevention and surveillance.

The development of JRA tool was realized in the context of emerging avian influenza viruses at the human-animal interface, such as AI A(H5N1), AI A(H7N9) and others. The draft methodology of JRA was developed by the tripartite group and international experts and pilot-testing of the tool was conducted in Myanmar. It was planned to review and finalize the JRA methodology by 2016. JRA consists of human health and animal health components and it can be carried out jointly or in a coordinated manner.

### 3.6 Group work

A series of technical presentations and poster presentations was provided to the participants to better understand the ground reality, key issues and challenges to surveillance, prevention and control of zoonotic influenza. Group work was important to encourage the participants to share their thoughts, interact and prepare the groundwork for practical recommendations.
The following thematic issues were discussed in groups:

**Theme 1: Ways of improving zoonotic Influenza surveillance in the Region (challenges and solutions)**

The major challenges to surveillance of zoonotic influenza were listed as follows:

- No surveillance system for wildlife diseases in many countries.
- Cross-border movement, informal and illegal trade across border.
- Lack of trained human resources and technical capacity.
- Inadequate community participation in zoonotic influenza surveillance – early detection.
- SARI samples not collected at hospitals/health centres.
- Lack of incentives to report for service providers and service users.
- Use of poultry value chain analysis in policy- and decision-making.
- Conflict of interest in reporting, as this may have a socioeconomic impact.
- Under-reporting in the animal health sector due to economic and trade concerns.

**Opportunities for strengthening surveillance of zoonotic influenza**

- Pilot projects for surveillance of avian and swine influenza viruses in several countries.
- Surveillance of avian influenza in live bird markets (LBMs), generated evidence-based information for policy action.
- Methodology and techniques available for proper sampling of poultry infection and environmental contamination.
- Phylogenetic analysis of AI viruses providing origin and movement of AI viruses.
- Compensation leading to timely reporting and early detection of HPAI outbreaks.

**Proposed solutions to fill the gaps**

- Advocacy for domestic funding to sustain surveillance activity initiated through international funding.
- Promotion of ILI/SARI surveillance, event-based surveillance activities.
- Promotion of short-term and long-term field epidemiology, outbreak investigation and response training programme.
- Promotion of joint risk assessment and joint outbreak investigation through tabletop and simulation exercise.
- Networking of epidemiological and laboratory institution at national and international levels.
Theme 2: Laboratory diagnosis and sharing of zoonotic Influenza data (including sequence) for pandemic preparedness (barriers and solutions)

Challenges to laboratory investigation

- Diagnostic capacity not uniform – some countries lack virus isolation and characterization.
- Level of diagnostic tests conducted at national and subnational levels.
- Funding, availability of kits, reagents and retention of trained manpower.
- Sample referral – funding and biosecurity issue for shipment.
- Participation in proficiency testing, such as EQA.
- Constraints in referring infectious samples aboard.
- Virus-sharing with international laboratory with permission from higher level.

Challenges to data-sharing

- Lack of trust and institutional understanding for information and data sharing.
- Difficulty in sharing data between animal health (AH) and public health (PH) within the country.
- Economic or public health impact of data sharing.
- Lack of a structured platform for sharing of laboratory data between human health and animal health.
- Lack of a structured platform for sharing of epidemiological information and laboratory data in regional and neighbouring countries.
- Data being a state secret.

Status of data-sharing and major constraints in selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>In-country</th>
<th>Regional level</th>
<th>Global</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhutan</td>
<td>Yes (e-bulletin, FluvIEW, respective web pages, text messages, joint investigations)</td>
<td>No platform</td>
<td>OFFLU WAHIS</td>
<td>No common platform between AH and PH</td>
</tr>
<tr>
<td>DPR Korea</td>
<td>Information-sharing system exists for sharing AH-PH</td>
<td>-</td>
<td>WAHIS OFFLU</td>
<td>Not efficient networks between AH and PH</td>
</tr>
<tr>
<td>India</td>
<td>Good system in place, however data sharing between AH and PH networks not efficient</td>
<td>-</td>
<td>WAHIS OFFLU</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Sharing between AH and PH</td>
<td>WAHIS OFFLU</td>
<td>No sharing of data from universities</td>
<td></td>
</tr>
</tbody>
</table>
Opportunities

- Advocacy at the highest level for a pandemic threat, i.e. ministerial conference, technical workshops.
- Establishment and/or strengthening of coordination between AH and PH through development of national avian and pandemic influenza preparedness and response planning.
- Frequent outbreaks of highly pathogenic and low pathogenic avian influenza triggering better coordination and collaboration between AH and PH sectors.
- Tripartite coordination mechanism in place at the regional level and zoonotic influenza identified as a priority for operationalization of One Health.
- More and more countries participating in GISRS, OFFLU and WAHIS for data- and information-sharing.
- Commitment and engagement of international partners in capacity-building and strengthening laboratory capacity through PIP Framework, EPT, GFTADs, APSED.
- Novel influenza viruses of animal origin detected and reported as country capacity for laboratory investigation and antigenic characterizations has improved.

Solutions to fill the gaps

- Strengthen good communication between AH and PH.
- Develop or adapt sample shipment protocol (International Air Transport Association).
- Make use of the diagnostic algorithm of FAO.
- Develop protocol for sharing respective strain of virus (OIE/FAO/WHO to lead).
- Engage international and regional organizations in data-sharing.
- Support proficiency testing – WHO/OIE/FAO (all to be included).
- Promote laboratory twinning – GISRS and OFFLU to take initiative.
- Establish or strengthen laboratory networking.
- Establish or strengthen regional platform for data-sharing – optional (countries to decide).
- Encourage the national laboratory to establish linkage with referral labs (WHO CCs or OIE reference laboratory).
- Build trust and understanding through four-way linking project, i.e. human health versus animal health, epidemiology versus laboratory.
- Strengthen capacity (laboratory) in order to fortify outbreak response.
- Advocate virus-sharing between AH and PH as it will help in preparedness and response.
- Ensure promotion of whole genomic sequencing, bioinformatics and GIS to better understand disease epidemiology and to influence policy decision.
Theme 3: One Health approach for prevention and control of zoonotic Influenza at the country level (what needs to be done)

Challenges
- Different perspectives cloud the understanding of “One Health”.
- Institutionalization and operationalization of One Health is very weak despite high-level advocacy.
- There is competing interest between different sectors – priority issues between different sectors.
- Wildlife and environment sector are weak and under-represented in the One Health group.
- There is a lack of ownership, leadership and partnership at the country level.
- There is a lack of appropriate policy, strategy and institutional set-up for operationalization of One Health at the country level.
- There is a lack of sustainable support (man, money and material) for operationalization of One Health at national and subnational levels.
- The One Health programme is fragmented and active through international funding.
- There is a lack of sustainability of One Health practices.

Opportunities
- Promote advocacy for One Health at national, international and global levels.
- Since 75% of emerging infectious diseases are of animal origin, there is a demand for intersectoral coordination and collaboration.
- National One Health coordination bodies have been established and are operational in many countries.
- International funding for One Health activities at the national and international levels has been secured.
- There is the emergence of local champions/One Health practitioners at national and international levels.
- One Health policy and strategies have been developed in many countries.

Solutions to fill up the gap
- Ensure more advocacy at the policy level for One Health at the country level.
- Ensure international support for development of legal, institutional and operational framework for One Health at the country level.
- Create an international platform for sharing good practices in operationalization of One Health.
- Promote capacity-building through joint training, such as the Field Epidemiology Training Programme for Veterinarians (FETPV), and others.
- Involve and encourage active participation of wildlife and environment sectors in One Health business.
- Organize simulation exercises to test functionality of One Health or operationalization of One Health in peacetime.
- Ensure that the tripartite group continues to support One Health activities at the country level together.

3.7 Panel discussion on partnerships for surveillance, prevention and control of zoonotic influenza

Dr Hirofumi Kugita, Regional Representative, OIE Regional Representation for Asia and the Pacific, conveyed the OIE perspectives on prevention and control of zoonotic Influenza. He informed the participants that OIE is a technical agency committed to strengthening surveillance, prevention and control of transboundary animal diseases, including zoonotic influenza. OIE has been supporting technical missions to evaluate performance of veterinary services in Member countries and working with WHO to implement the International Health Regulations’ Performance of Veterinary Services (IHR-PVS) operational framework for good governance at the human-animal interface.

OIE has been executing the One Health project, supported by the Japan Trust Fund, and rabies and zoonotic influenza have been identified as priority areas. He said that OIE Tokyo is also a secretariat to regional GFTADs and OIE in collaboration with FAO was coordinating a subregional meeting with SAARC countries in early 2017. OIE has been providing capacity-building to national veterinary services in Member countries through training of OIE national focal persons in various subjects such as wildlife, laboratory, epidemiology and zoonoses. He pledged that OIE would continue working together with tripartite partners to operationalize One Health at regional and country levels.

Dr Katinka Balogh, Senior Animal Health and Production Officer with FAORAP, on behalf of FAO highlighted the FAO activities in surveillance of zoonotic Influenza and informed the participants that FAO was working to link human-animal-wildlife for better surveillance of zoonotic influenza in Viet Nam and the People’s Republic of China. FAO in collaboration with USAID-funded PREDICT II partners is using PREDICT testing protocols for synchronized surveillance of zoonotic influenza in Indonesia, Laos and Thailand, and it will be expanded to Nepal. She also informed the gathering that FAO was organizing a training workshop to adopt PREDICT protocols and support FETPV. FAO has developed a package for simulation exercise for zoonotic Influenza.

Dr Gyanendra Gongal on behalf of WHO elaborated on surveillance, preparedness and response to emerging infectious diseases, including zoonotic influenza in the Asia-Pacific Region, and provided details of the pandemic influenza preparedness (PIP) framework. Considering the need to strengthen regional and country-level preparedness for enhanced surveillance and response to emerging public health threats, the WHO Regional Offices for South-East Asia and Western Pacific developed a joint strategic framework, known as APSED. Zoonoses control is one of the priority areas of APSED, which focuses on developing
and further strengthening the functional coordination mechanism among human health, animal health and other sectors for the prevention and control of zoonoses. It also serves as a roadmap to ensure that all countries in the Region, without exception, are able to establish the core capacities required to implement IHR (2005).

The PIP Framework is designed to improve and strengthen the sharing of influenza viruses with human pandemic potential and to increase the access of developing countries to vaccines and other pandemic-related supplies. The Framework provides greater support for strengthening laboratories and surveillance of influenza in resource-poor countries with partnership contributions from the industry. He said that the Global Health Security Meeting, held in Bali in June 2016, had reiterated the need for strengthening multisectoral collaboration and adopting the One Health approach to preparedness and response to zoonotic and influenza with pandemic potential. He also highlighted that WHO had been working with FAO and other partners to strengthen surveillance of avian and swine influenza in Bangladesh, the People’s Republic of China and Viet Nam and to bolster AI (H7N9) surveillance, preparedness and response in Myanmar, Lao PDR and Viet Nam under the Emerging Pandemic Threat (EPT) Project, funded by USAID.

Dr Daniel Schar, Senior Regional EID Adviser, USAID, highlighted main programs and activities supported by USAID in countries of the Asia-Pacific Region. The EPT programme has been designed to strengthen prevention, detection and response to emerging zoonoses and accelerate progress in achieving WHO IHR and OIE PVS capacities. Identification of sociocultural behaviours associated with spillover, amplification and spread of zoonotic pathogens at the human-animal-ecosystem interface, enhancing targeted active surveillance through epidemiological and laboratory capacity-building and development of risk management measures are key activities under EPT programme. USAID is committed to continue working with partners in the Region through operationalization of One Health and introduction of the Global Health Security Agenda.

All partner organizations provided clarification on queries of international concern and operationalization of One Health.

### 3.8 Conclusions and recommendations

As a part of the tripartite coordination in the Asia-Pacific Region, the Food and Agriculture Organization of the United Nations, World Organization for Animal Health and World Health Organization supported the Royal Government of Bhutan to host the Asia-Pacific Workshop on surveillance, prevention and control of zoonotic influenza.

1. Various subtypes of avian and swine influenza A viruses, including H5N1, H5N6, H9N2, H7N9 and H3N2v, have been reported that are transmissible from animals to humans, i.e. zoonotic influenza.

2. The continuing outbreaks of avian influenza since 2004 are having an impact on the public health, animal health, trade and economy of several Asia-Pacific countries.

3. There are 29 NICs, seven H5 reference laboratories and three collaborating centres for influenza under WHO, and four OIE reference laboratories and two
FAO reference centres for avian influenza in the Asia-Pacific Region, which continue to play a vital role in strengthening influenza surveillance, antigenic characterization, laboratory diagnostics and virus-sharing for candidate vaccine development.

4 The Global Influenza Surveillance and Response System (GISRS) is the key laboratory network for global influenza surveillance, which is coordinated by WHO. The OFFLU network, coordinated by FAO and OIE, aims to reduce the undesirable impacts of animal influenza viruses through promotion of effective collaboration between animal health experts and human health experts. The OFFLU network contributes avian influenza data to the bi-annual WHO vaccine composition meetings for pandemic preparedness.

5 Global influenza surveillance under human and animal health has been strengthened over the past few years. However, challenges still exist, and these include poor sentinel surveillance in some areas with good laboratories, geographical gaps in surveillance and ensuring sustainability in areas with resource constraints.

6 Laboratory capacity for detection and isolation of emerging influenza viruses, timely sharing of isolates and specimens and participation in external quality assessments, such as proficiency testing, are essential. Laboratory twinning is the best option for strengthening laboratory diagnostic capacity and quality assurance in countries with limited resources.

7 Bioinformatics and genomic characterization of animal and human influenza viruses are of increasing value to understand disease ecology. This can be used to better inform policy decisions at the interface for the control and prevention of animal and zoonotic influenza.

8 The tool for influenza pandemic risk assessment (TIPRA) supports a timely and updatable hazard risk assessment for influenza viruses with pandemic potential. Risk assessments are carried out by focusing on the qualitative pandemic potential of a virus, as evaluated by experts. Outputs of TIPRA are available to be incorporated into national risk assessments that also consider the context and exposures of a country.

9 FAO, OIE and WHO are working to develop a joint risk assessment tool, which will provide a technical basis to assess the risks of zoonotic influenza, emerging at the human-animal interface. It had been pilot-tested in Myanmar.

10 The pandemic influenza preparedness (PIP) framework is coordinated by WHO with preparedness and response activities for influenza of pandemic potential at the country level in five identified priority categories: “laboratory and surveillance capacity-building; burden of disease; regulatory capacity-building; risk communication; and planning for deployment”.

11 The One Health approach is increasingly being recognized at international and country levels for avian and pandemic influenza preparedness and response over the last 10 years. Several Asian countries have demonstrated good practices for institutionalization of One Health. However, there is a lack of understanding of the One Health concept and acceptance in different sectors.
(12) Although the approach was promoted to address emerging zoonoses, such as avian influenza at the human-animal interface, there is a broader scope of expanding the One Health concept to food safety, antimicrobial resistance, climate change and disaster management.

(13) There is a need of advocacy for One Health promotion at a higher level, including generation of evidence-based information to convince policy-makers. Ownership, trust-building, collaborative activities for operationalization of One Health and sustainable funding remain a challenge.


(15) The Asia-Pacific workshop on multisectoral collaboration on prevention and control of zoonoses, organized by FAO, OIE and WHO, serves as an appropriate platform for advocacy and operationalization of One Health by sharing updated information and country experience.

**Recommendations**

Member countries are requested to:

(1) Ensure that influenza viruses of pandemic potential are shared by NICs with WHO CCs and by national veterinary laboratories with OIE reference laboratories and FAO reference centres for confirmation and further characterization; and use the Influenza Virus Traceability Mechanism (IVTM), where appropriate.

(2) Encourage sharing of avian influenza viral material and increased contribution of genetic and antigenic data on zoonotic influenza viruses with the international scientific community through the OFFLU network.

(3) Continue participating in influenza proficiency testing at regional and global levels; and encourage development of standard operating procedures for sample shipment in line with international standards/guidelines.

(4) Strengthen active surveillance for zoonotic influenza, including influenza-like illnesses and severe acute respiratory infection surveillance.

(5) Promote passive surveillance for highly pathogenic avian influenza reporting, especially at community levels (through public awareness and provision of incentive to farmers to report events).

(6) Involve the environment and/or wildlife sector for enhanced surveillance for zoonotic diseases in wildlife through high-level policy advocacy, involvement of key stakeholders and capacity-building.

(7) Reduce the risks of disease spread from movements of animals and their products across borders through regular bilateral consultations for surveillance, prevention and control of transboundary animal diseases, including zoonoses.
(8) Strengthen border health control as per International Health Regulations (2005) requirements and certification of imports/export of animals and animal products as per OIE requirements.

(9) Develop a national One Health strategy with action plan, timeline and costing along with performance indicators and take initiative to institutionalize a One Health coordinating unit at a higher level, considering the country-specific situation.

(10) Consider organization of IHR-PVS bridging workshop in order to improve better understanding of core capacities required for implementation of International Health Regulations (2005) and International Animal Health Code.

(11) Organize One Health workshops regularly at national and subnational levels to enhance coordination and collaboration amongst One Health stakeholders.

Partner organizations are requested to:

(1) Continue to support Member States to strengthen zoonotic influenza epidemiology and laboratory surveillance and networks, including economics and burden of zoonotic influenza activities.

(2) Facilitate and/or support cross-border and regional dialogue to reduce the risk of disease spread through animal movements by enhancing surveillance through the “epidemiological zone” approach and establishing a platform for timely information-sharing and trust-building.

(3) Continue data-sharing and collaboration between the OFFLU network and GISRS on emerging zoonotic influenza viruses at the human-animal interface.

(4) Coordinate the integration of zoonotic influenza in the existing regional strategies, such as APSED and GFTADs, for its surveillance at the human-animal interface, including capacity-building through laboratory twinning process.

(5) Urge to take global stewardship for promotion of One Health (advocacy, capacity-building and resourcing), including development of a tool for advocacy on One Health and its operationalization.

(6) Appeal to regional and subregional organizations, networks and academia to organize workshops and conferences on a regular basis to facilitate sharing of the country’s experiences of operationalization of One Health and networking.

3. Closing session

While the participants and the international organizations appreciated the warm hospitality, Dr Tashi Samdup, Director General, Department of Livestock, on behalf of the Ministry of Agriculture and Forests and the Royal Government of Bhutan, thanked the donors and the organizers for hosting the meeting in Bhutan. Among the workshop activities, the poster session was very useful for interacting and learning practical experiences of surveillance, prevention and control of avian influenza of economic and public health importance.
Annex 1

Agenda

- Inaugural session
- Technical session
  - Scene setting
  - Sharing experience and lessons learnt
  - Networking the networks
  - Pandemic influenza preparedness and response
  - Existing tools for zoonotic influenza risk assessment
  - Group work
  - Panel discussion on partnerships for surveillance, prevention and control of zoonotic influenza
  - Conclusions and recommendations
- Closing session
Annex 2

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Zoonotic influenza is a viral infection transmitted directly or indirectly by infected birds, pigs or horses. There are ongoing outbreaks of various subtypes of avian influenza in several Asian countries that have impacted public health, trade and economy in the affected countries. The epidemiology of avian influenza is complex and new influenza viruses transmissible to humans are evolving from time to time. Most countries in the Asia-Pacific Region are facing enzootic cycle of avian influenza in poultry populations or have high risk of avian influenza incursion from endemic countries.

FAO, OIE and WHO supported the Royal Government of Bhutan in hosting a workshop on surveillance, prevention and control of zoonotic influenza, with the aim of sharing experiences and lessons learnt on the prevention and control of avian and other influenzae of public health interest, and enhancing collaboration to improve surveillance at regional and country levels. Different tools developed for risk assessment of influenza, including the Pandemic Influenza Preparedness Framework, were discussed. Recommendations were made for Member States and partner organizations. This is the comprehensive report of the meeting.

Asia-Pacific workshop on surveillance, prevention and control of zoonotic influenza

Paro, Bhutan, 29–31 August 2016
Report of the meeting