OIE Regional Workshop
on Enhancing Influenza A Viruses National Surveillance Systems
OIE/JTF Project for Controlling Zoonoses in Asia under One Health Concept
Tokyo, Japan, 26-28 August 2014

Control of avian influenza and preparedness for pandemic influenza

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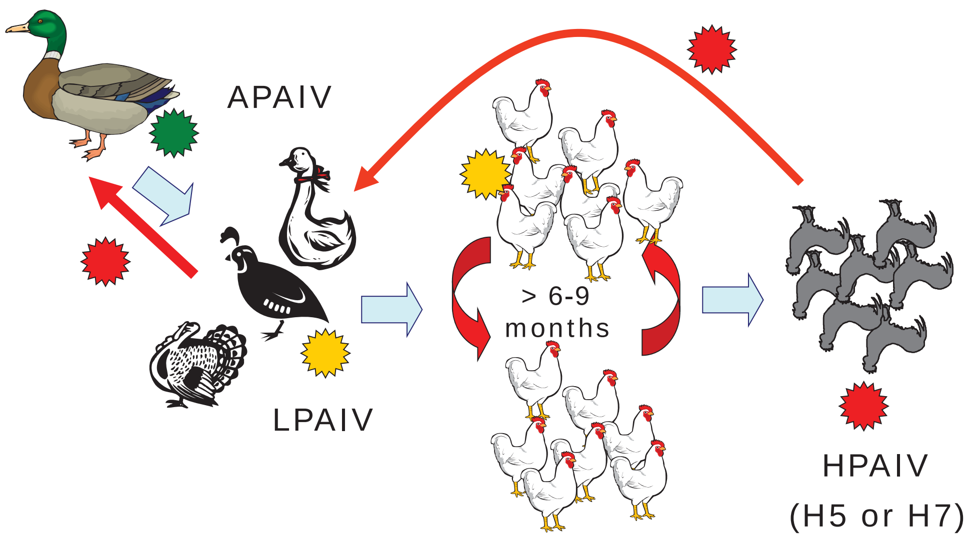
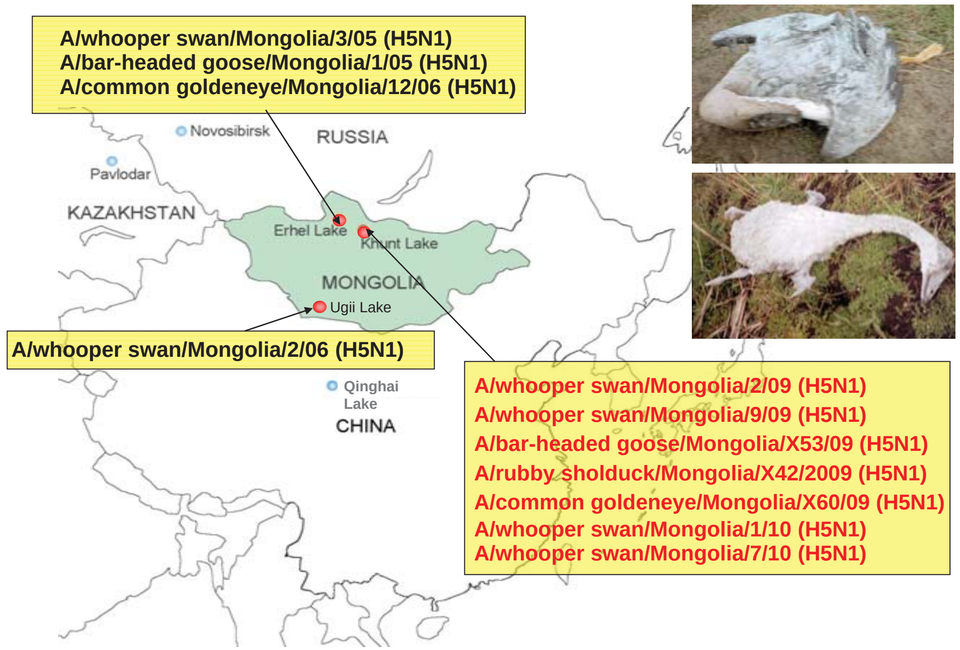
For control of avian influenza and preparedness for pandemic influenza

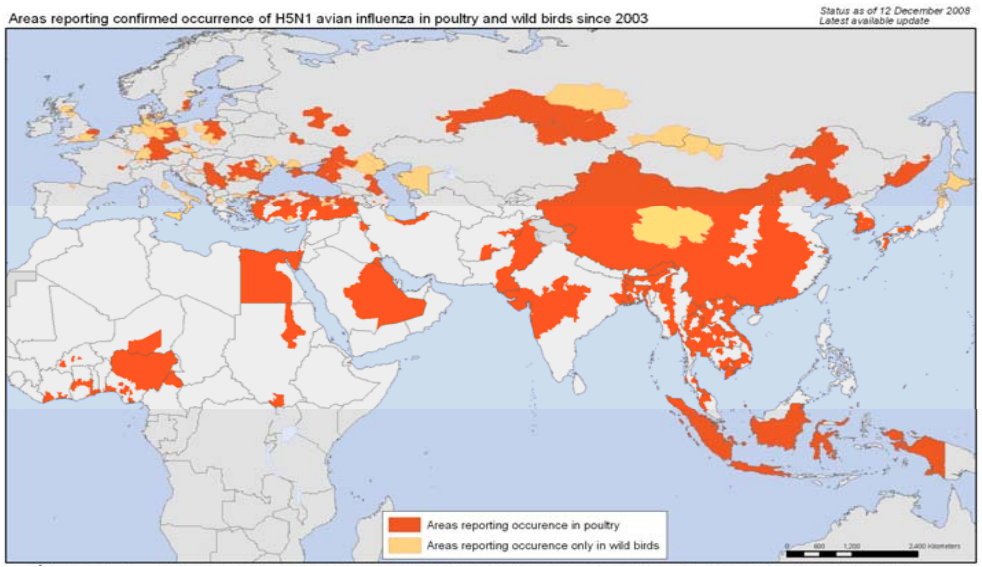
1. Is influenza eradicable ?
2. Why have the H5N1 HPAIVs persisted in poultry for 18 years and antigenic variants been selected in poultry birds ?
3. Will the HPAIVs returned to migratory birds persist in nature ?
4. How should HPAI be controlled ?
5. Does AI vaccine confer complete protective immunity in birds ?
6. Will H5N1 HPAIV and H7N9 LPAIV cause pandemic influenza ?
7. Are the measures for the control of seasonal influenza satisfactory ?

Acquisition of pathogenicity of avian influenza virus in chicken and return of the HPAIV from domestic poultry to migratory water birds



HPAI viruses isolated from wild birds in Mongolia





62 Countries where H5N1 HPAIV infections were reported in wild birds, poultry, and both

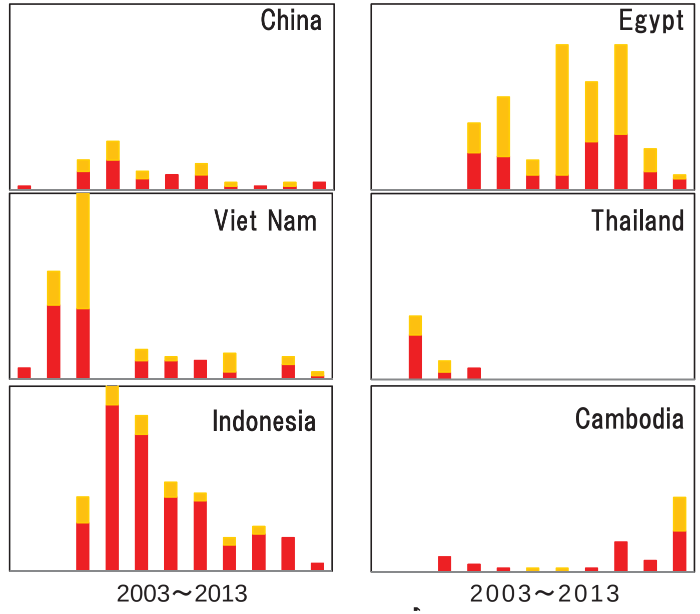
Japan, Republic of Korea, China, Mongolia, Myanmar, Lao PDR, Thailand, Cambodia, Viet Nam, Malaysia, Indonesia, Bangladesh, India, Pakistan; Afghanistan, Iran, Azerbaijan, Georgia, Iraq, Kuwait, Saudi Arabia, Turkey, Israel; Russian Federation, Kazakhstan, Ukraine, Romania, Bulgaria, Albania, Serbia, Hungary, Slovakia, Czech Republic, Croatia, Poland, Slovenia, Bosnia & Herzegovina; Greece, Switzerland, Austria, France, Italy, Germany, Netherlands, Denmark, Sweden, Spain, England, Ireland; Djibouti, Gaza Strip, Egypt, Sudan, Nigeria, Niger, Cameroon, Burkina Faso, Cote d'Ivoire

Confirmed human cases of H5N1 HPAIV infection

Country	Deaths/Cases
China	30 / 45
Viet Nam	62 / 125
Indonesia	163/195
Egypt	63 / 173
Cambodia	33 / 47
Lao PDR	2 / 2
Thailand	17 / 25
Iraq	2 / 3
Azerbaijan	5 / 8
Turkey	4 / 12
Djibouti	0 / 1
Nigeria	1 / 1
Myanmar	0 / 1
Pakistan	1 / 3
Bangladesh	1 / 7
Canada	0 / 1
Total	386 / 650

As of 24 Jan. 2014

WHO (2014), Kuribayashi



Bird flu vaccines

Vietnam:
H5N2 and H5N1
(Adjuvant inactivated vaccines)

China:
H5N1 and recombinant NDV
(Reverse genetics inactivated vaccines)

Indonesia:
H5N1, H5N2, H5N9 and recombinant H5N1
(inactivated vaccines)

Egypt: since 2006

Thailand:
Officially prohibited vaccination in 2006

As stockpiles

Singapore:
H5N2
(Inactivated, adjuvanted vaccine)

Japan:
H5N1 and H7N7
(Oil-adjuvanted inactivated vaccines)

Pakistan:
H5N1, H5N2, H5N9, and H5N3
(Water based with alum hydroxide and oil based with mineral oil)

Influenza vaccine for avian influenza

- **may prevent manifestation of disease signs and decrease the amount of virus shed, but does not confer protective immunity from infection.**
- **"Stamping-out policy" is recommended for the control of avian influenza.**
- **Vaccination was not recommended but later approved as one of the options applied only under DIVA based strategy.**
- **Country where vaccine is used is not designated as HPAI-free.**

⟶ leads silent spread of virus.

26TH CONFERENCE OF THE OIE REGIONAL COMMISSION FOR ASIA, THE FAR EAST AND OCEANIA
Shanghai, People's Republic of China, 16-20 November 2009

RECOMMENDATION FOR THE CONTROL OF AVIAN INFLUENZA

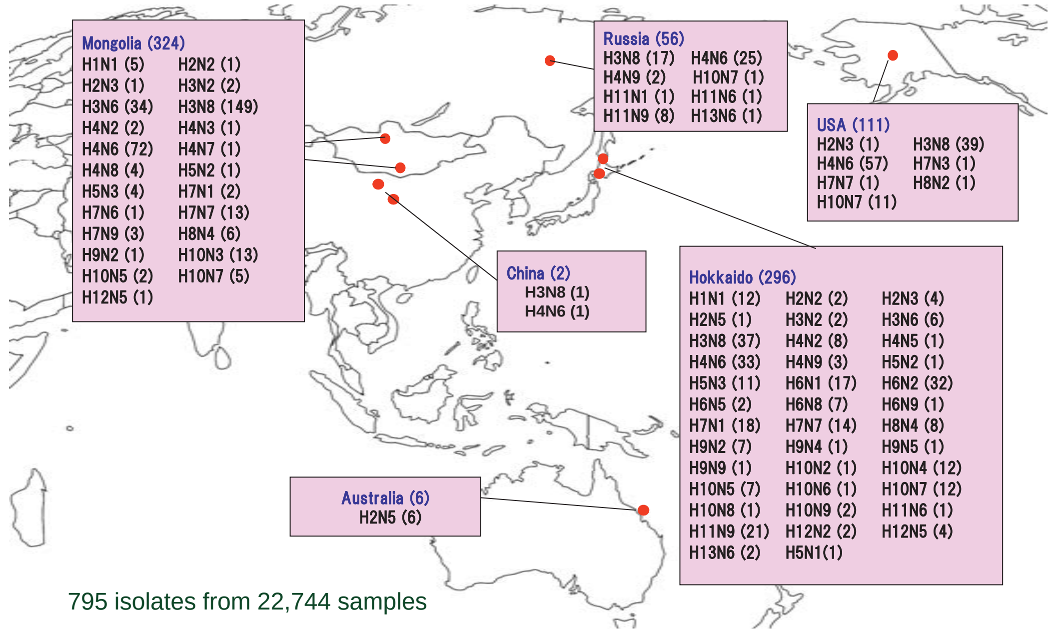
It is considered that;

- H5N1 HPAIV strains have persisted in domestic poultry for 14 years and antigenic variants have been selected due to the misuse of vaccine.
- HPAI has been put under control in several countries.
- Stamping out policy has been the most effective measures for the control HPAI.
- Vaccine is used in 4 countries where HPAI has not been controlled yet.
- Vaccine is used instead of stamping out in 2 countries and in the other 2 countries, basically in addition to stamping out.
- Sentinel bids are put in the vaccinated poultry population in Viet Nam and not in the other 3 countries where vaccine is used.
- Compensation for livestock owners is done in most countries in case of stamping out.

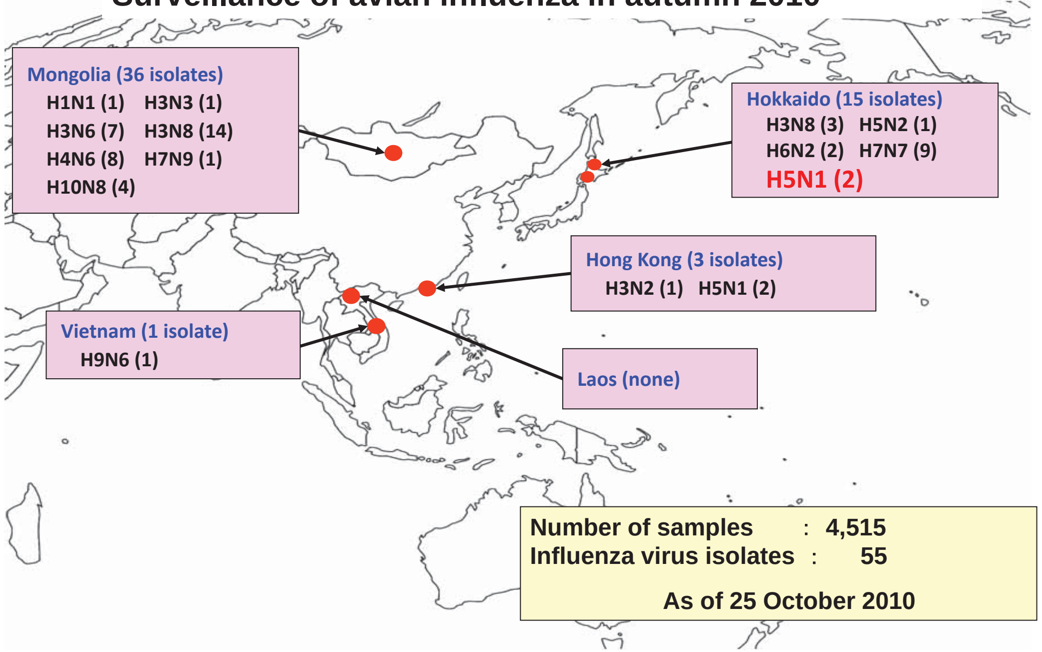
It is recommended that;

1. Since stamping out is the best and ultimate measure for the control of HPAI, vaccine should be used in addition to, not instead of stamping out.
2. The OIE should continue and develop standards on animal influenza surveillance, prevention and control.
3. For the preparedness for pandemic influenza, surveillance of swine flu is crucial in the countries where avian flu has not been controlled.

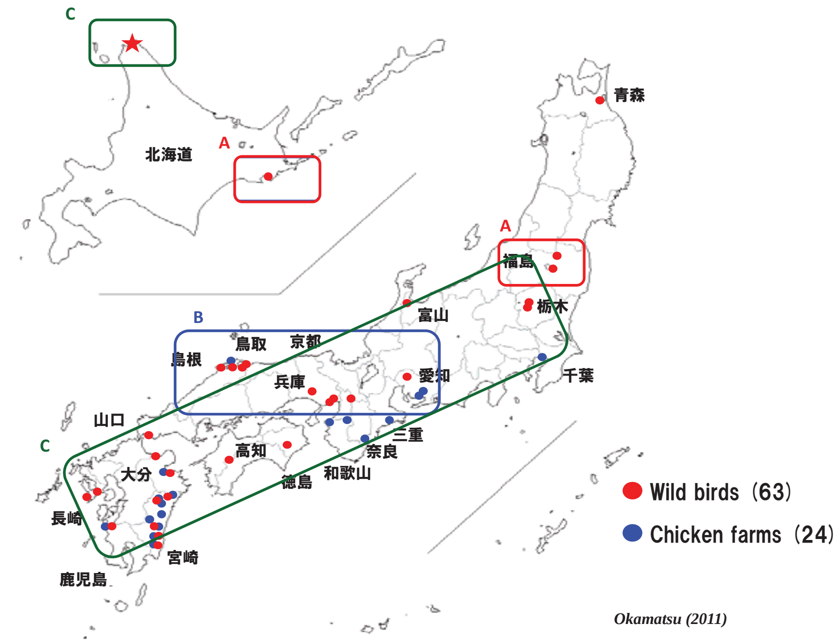
Global surveillance of avian influenza in autumn (1991～2009)



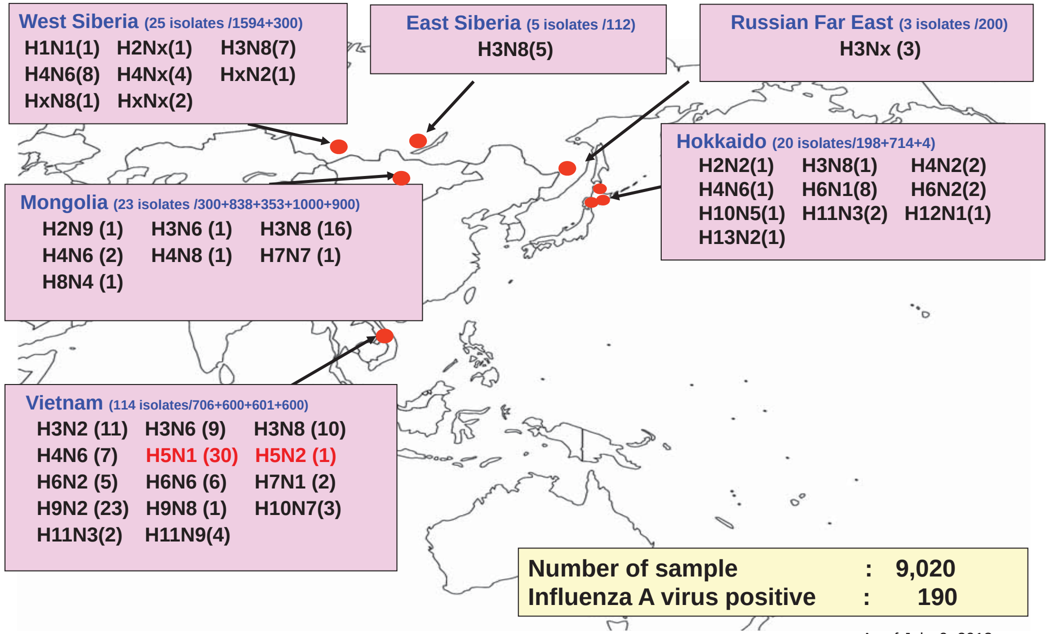
Surveillance of avian influenza in autumn 2010



Outbreaks of HPAI caused by H5N1 viruses in Japan in 2010-2011 winter

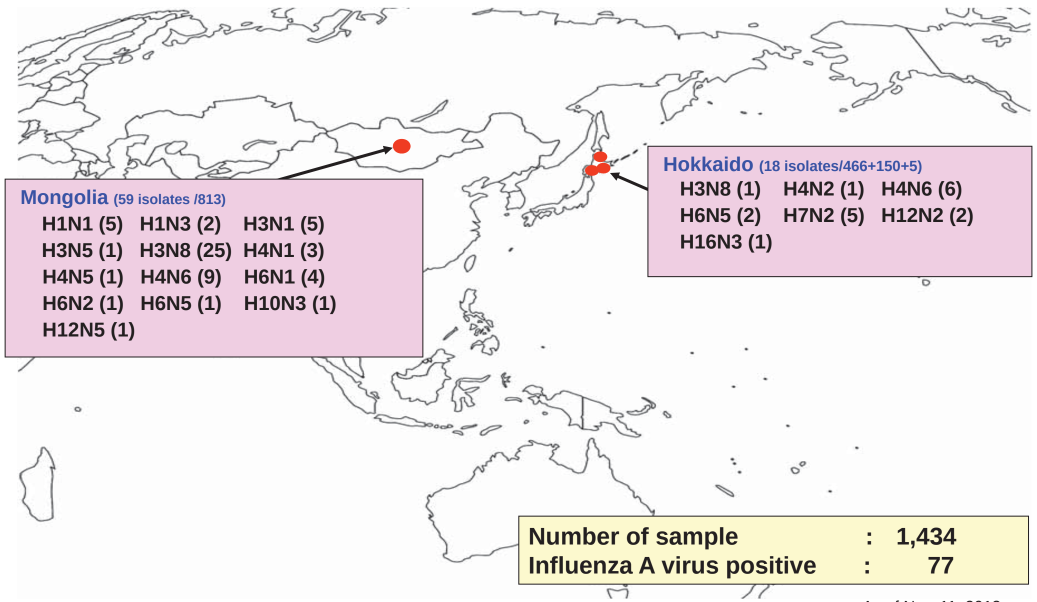


Global surveillance of avian influenza in 2012



As of July. 9, 2013

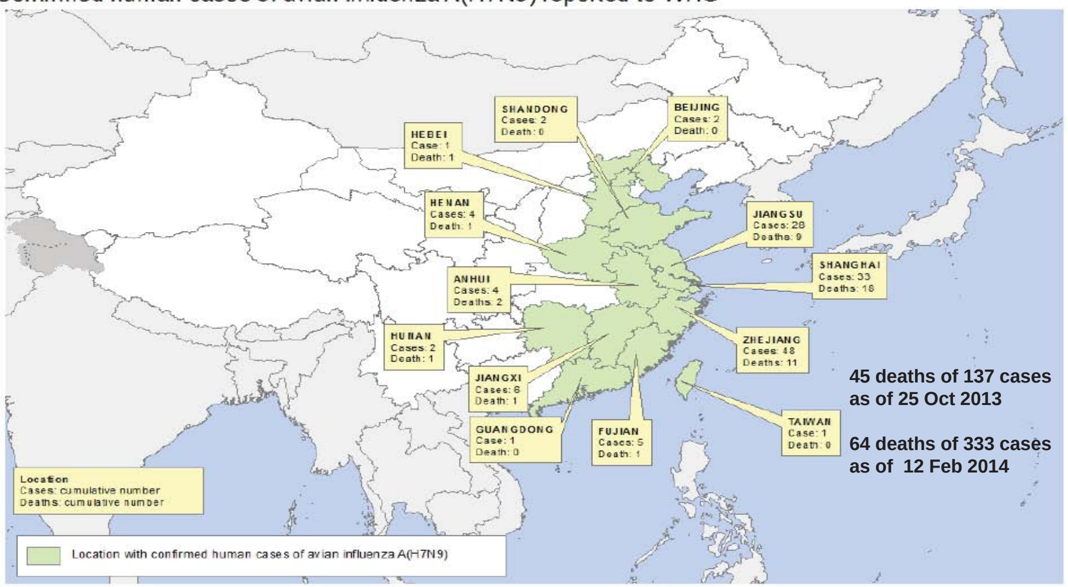
Global surveillance of avian influenza in 2013



As of Nov. 11, 2013

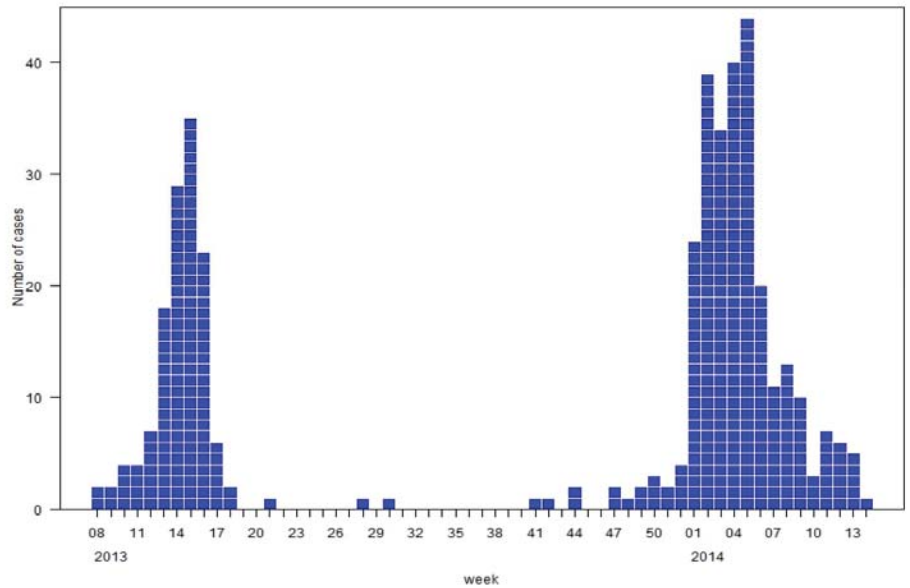
Geographical location

Confirmed human cases of avian influenza A(H7N9) reported to WHO



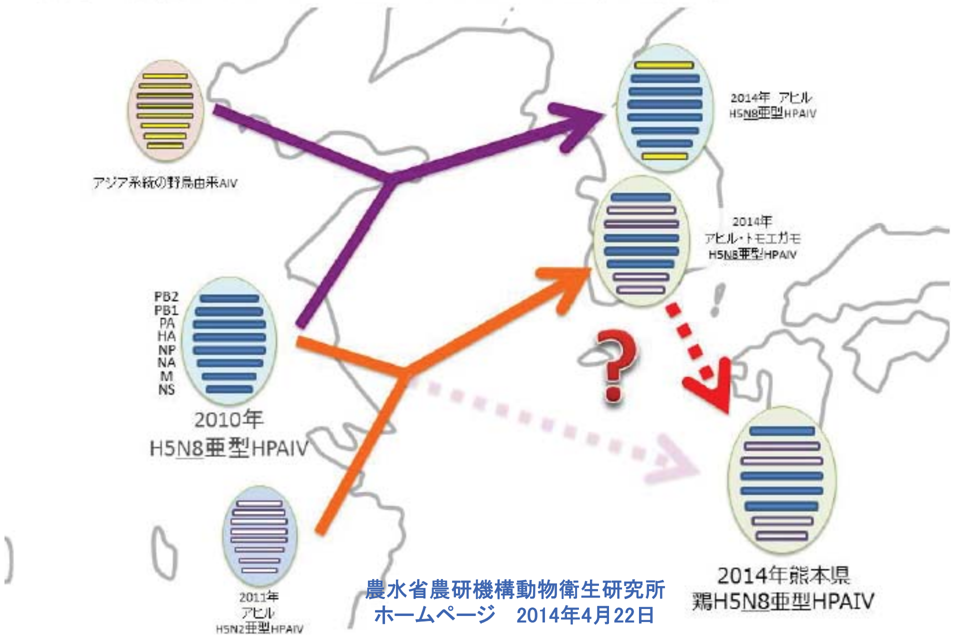
Data as of 25 October 2013, 8:00 GMT+1
Source: WHO/GIP

Number of Confirmed Human H7N9 Cases by week as of 2014-04-08



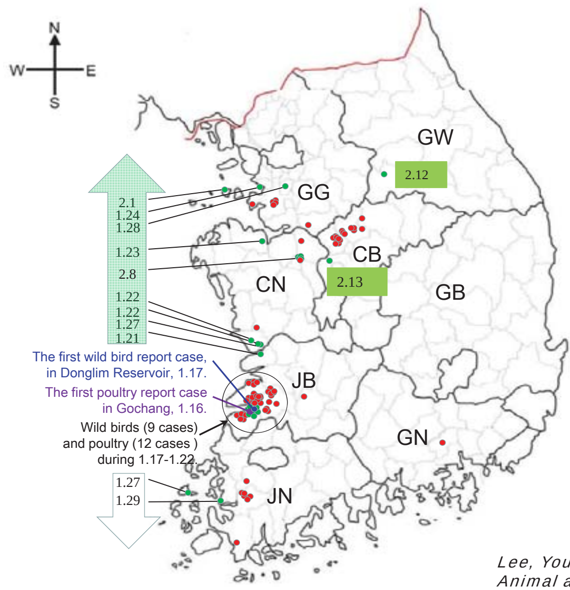
World Health Organization

熊本で分離されたH5N8亜型HPAIVの遺伝的由来



農水省農研機構動物衛生研究所
ホームページ　2014年4月22日

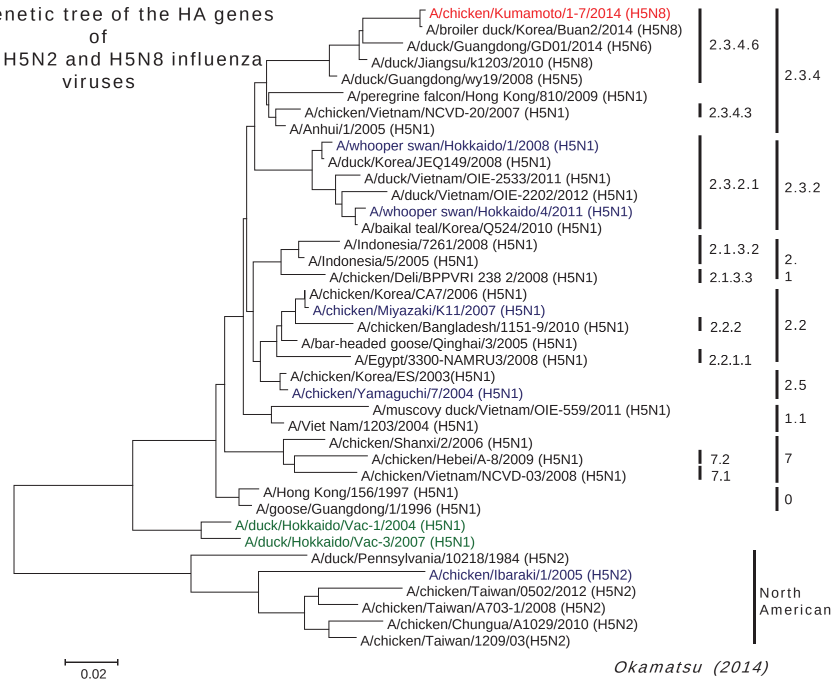
H5N8 HPAI outbreaks



Phase I
- During 1.16-1.22
- Poultry farms(12cases) & wild birds(9cases) around Donglim reservoir in JB province

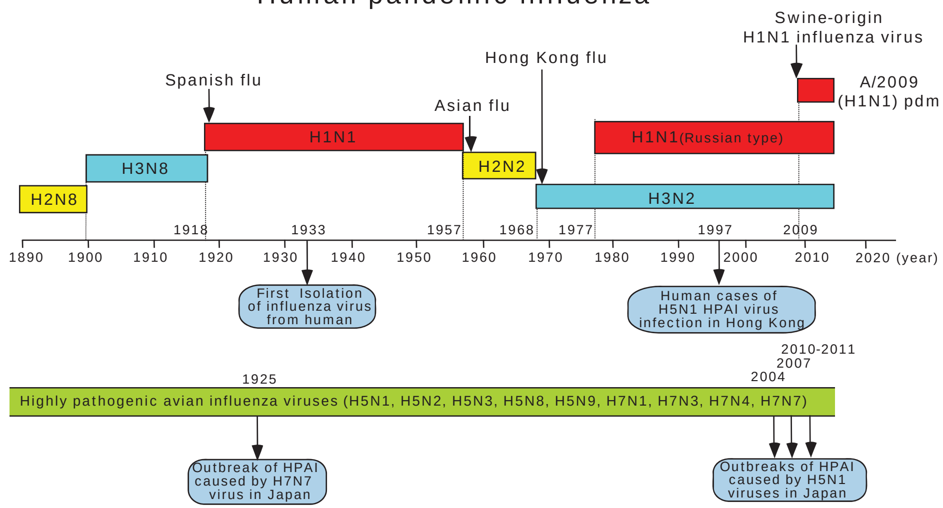
Lee, Youn-Jeong (2014); Avian Influenza Lab. Animal and Plant Quarantine Agency, Korea

Phylogenetic tree of the HA genes of H5N1, H5N2 and H5N8 influenza viruses



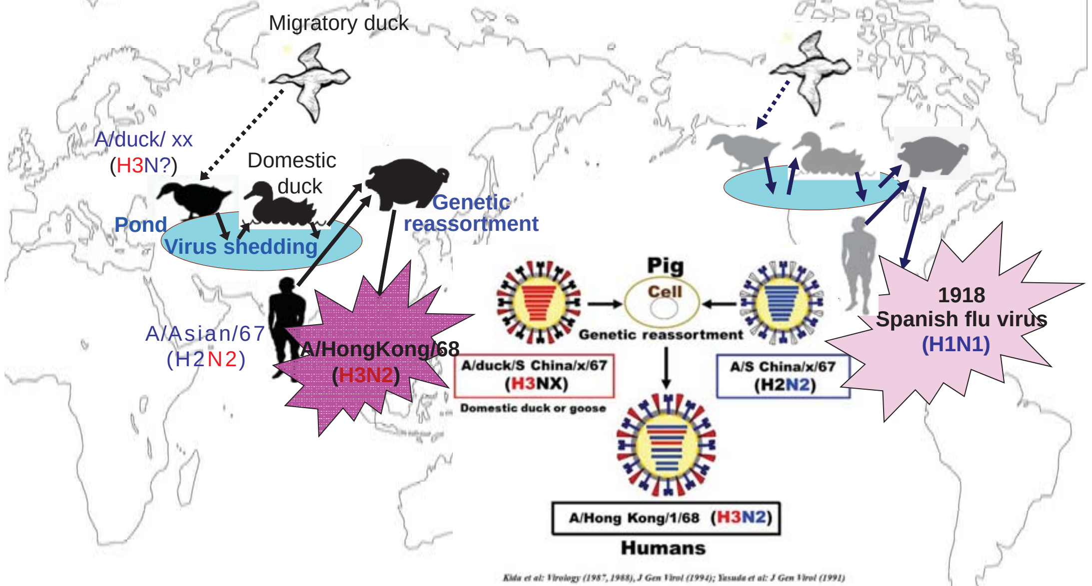
Okamatsu (2014)

Human pandemic influenza



Highly pathogenic avian influenza

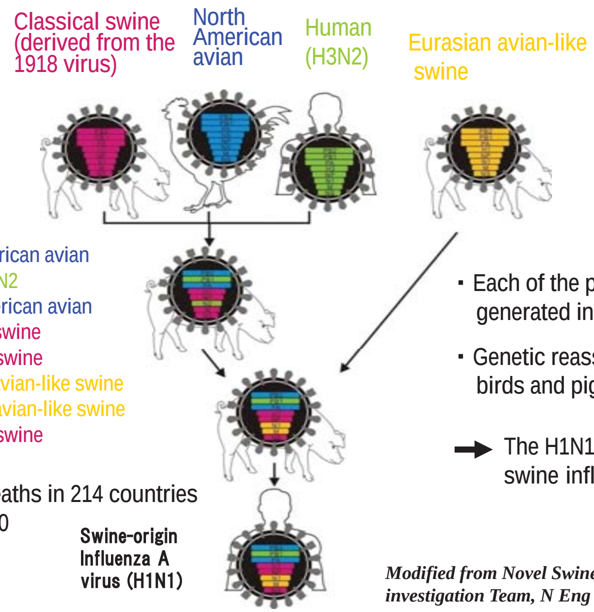
Rout of transmission of the genes of pandemic strains



1957 Asian virus (H2N2), 2009 pdm H1N1 strain and even 1918 Spanish flu virus (H1N1) must have appeared similarly.

Kida et al (1987, 1988, 1994) Virology, J Gen Virol

Gene derivation of the swine-origin influenza A (H1N1) virus



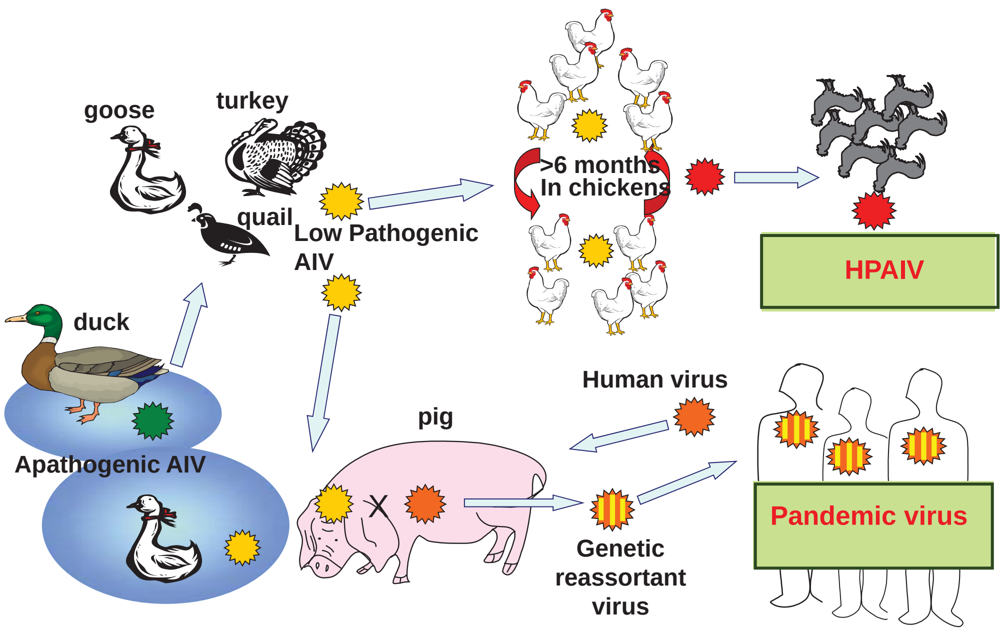
PB2 - North American avian
PB1 - Human H3N2
PA - North American avian
H1 - Classical swine
NP - Classical swine
N1 - Eurasian avian-like swine
M - Eurasian avian-like swine
NS - Classical swine

At least 18,366 deaths in 214 countries as of 18 July 2010

- Each of the pandemic strains has been generated in pigs.
- Genetic reassortment often occurs in birds and pigs.

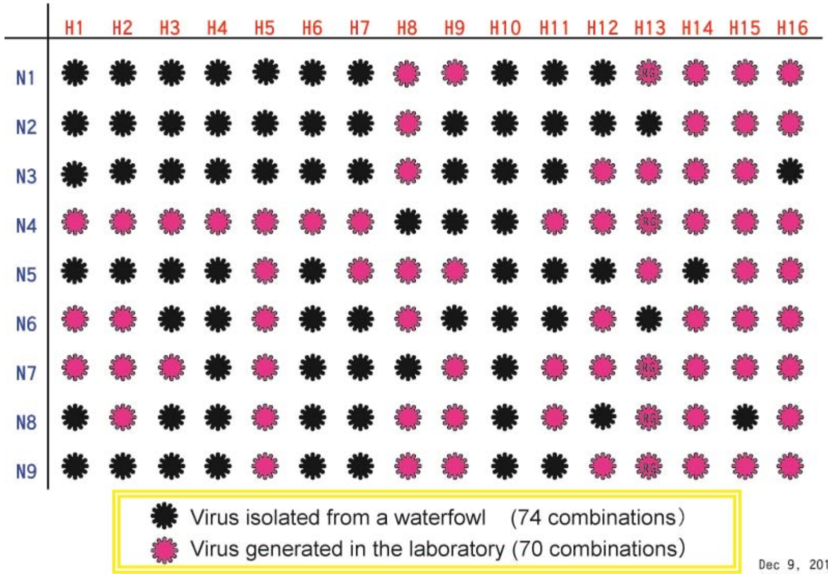
➡ The H1N1 strain is a genuine swine influenza virus.

Modified from Novel Swine-Origin Influenza A (H1N1) Virus investigation Team, N Eng J Med, 2009



HPAI virus and human pandemic virus strains

Library of vaccine strain candidates



Influenza viruses of 74 combinations of the HA and NA sub-types have been isolated from fecal samples of ducks in Alaska, Siberia, Mongolia, Taiwan, China, and Japan. (black)

70 other combinations have been generated by genetic reassort-ment procedure in the laboratory. (red)

Dec 9, 2013

Thus, 1,900 avian influenza viruses of 144 combinations of HA and NA subtypes have been stocked as vaccine strain candidates. Their pathogenicity, antigenicity, genetic information and yield in chicken embryo have been analyzed, data-based, and opened for Web site (http://virusdb.czc.hokudai.ac.jp/vdbportal/view/index.jsp).

How should we control HPAI and prepare for pandemic influenza?

1. **Is influenza eradicable ?** No, influenza is a typical zoonosis.
2. **Why have the H5N1 HPAIVs persisted in poultry for 17 years and been antigenic variants selected ?** Misuse of Vaccine.
3. **Will the HPAIVs returned to migratory birds persist in nature ?** Started contamination of HPAIVs in the nesting lakes of migratory ducks. Eradication of the H5N1 HPAIVs from poultry throughout the world, therefore, is urgently needed.
4. **How should avian influenza be controlled in poultry ?** Enhanced surveillance, early detection, culling the flock, movement restriction, and strengthening hygiene without misuse of vaccine to contain the infection just in birds
5. **What are the advantage and disadvantage of the use of vaccines ?** Vaccine should be carefully used in addition to, not instead of stamping out.
6. **Will H5N1 HPAIV and H7N9 LPAIV cause pandemic influenza?** It is unlikely, but may occur via pigs. H5N1 or H7N9 AIVs are not only candidates of pandemic strain.
7. **Are the measures for the control of seasonal flu satisfactory ?** How to control pandemic influenza should be based on the measures for the control of seasonal influenza. Especially seasonal flu vaccine should be much more improved.

★ Global surveillance of avian, swine and human influenza, and drastic improvement of seasonal flu control measures by international collaboration under the One Health concept are of crucial importance.

Control of avian influenza and preparedness for pandemic influenza

1. For control of highly pathogenic avian influenza, Stamping-out policy that contains enhanced surveillance, early detection, culling, restriction of movement, and improved hygiene practices without too much reliance on vaccination should be applied to restrict infection to domestic birds.
2. The genes of all influenza viruses in birds and mammals including humans have originated from those circulating among the natural host reservoir, water fowls.
3. All of the 4 pandemic influenza virus strains that have emerged in the last 100 years must have been transmitted from pigs as genetic reassortants between avian and human strains. The HA genes of these strains are closely related to those of viruses circulating in the natural host, migratory ducks.
4. Pigs are susceptible to infection with avian influenza virus strains with each of the HA subtypes generating reassortants. This indicates that none of the 16 HA subtype viruses can be ruled out as candidates for future pandemic strains.
5. Methods for control of pandemic influenza should be based on the same measures for the control of seasonal influenza. For this reason, seasonal flu vaccines should be greatly improved.

OIE STANDARDS ON EVENT BASED AND ACTIVE SURVEILLANCE OF AVIAN INFLUENZA VIRUSES

WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future

Dr Gounalan Pavade
OIE regional workshop, Tokyo, 26-28 August 2014

GENERAL MANDATE OF THE OIE

To improve animal health and welfare and veterinary public health worldwide

One of the OIE's main objective

⇩

To ensure transparency in the global animal disease situation, including for zoonosis

Notification of Animal Diseases, including Zoonoses

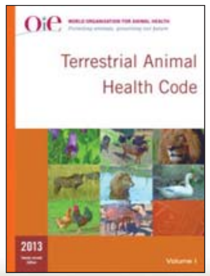
Legal obligations by Members

- Since its creation in **1924** both the OIE and its Members have unconditional duties to disclose all relevant information about animal diseases

- These obligations are stated in the OIE Organic Statutes

OBLIGATION FOR NOTIFICATION

By deciding to join the OIE, a Member agrees to fulfil its international commitment to notify to the OIE as laid down in the Chapters 1.1. of the OIE's *Terrestrial animal health code* ("Notification and Epidemiological Information")



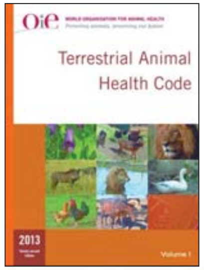
OIE standard setting process

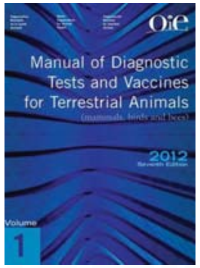
• Specialized Commissions: Code Commission, Biological Standards Commission, Scientific Commission

• Ad Hoc Groups and Working Groups

• Proposed Standards sent to all OIE Delegates
- Comments from all OIE Delegates
- Consultation of major partners
- Second round of discussions with Commissions…

- Adoption in General session
- Vote of Delegates
- OIE standards are recognised by the WTO as international reference standards





Global disease surveillance and transparency

OIE Members are responsible for global disease surveillance and report significant disease events to OIE

•Outbreaks of OIE listed diseases on a regular basis

•Significant epidemiological events including emerging diseases

OIE disseminates these official reports from Members to all Members via an alert system and to the public via WAHID

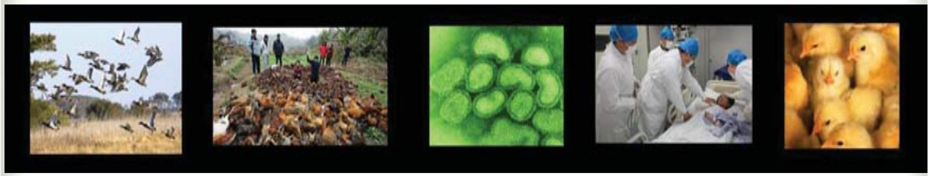
Joint tracking OIE, FAO, WHO - GLEWS

Animal Health Surveillance

- Chapter 1.4 of the Terrestrial Animal Health Code
- 7 Articles which defines the objectives, principles and critical elements in the surveillance system
- Methods of surveillance
- Surveillance procedures according to various situations
- Chapter provide guidance to the type of outputs that a surveillance system should generate
- Provide recommendations to assess the quality of surveillance systems

Infection with avian influenza viruses

Considerable economic losses for the poultry industry



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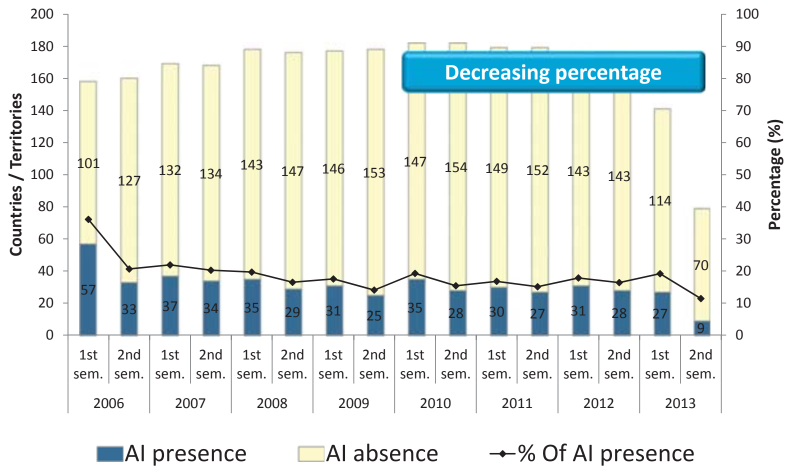
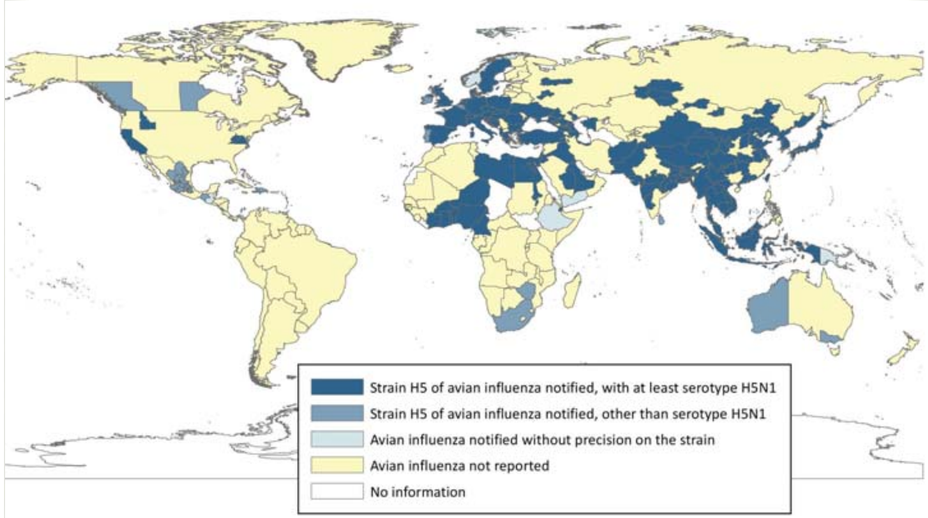
Potential threat to public health

➢ ***What is the overall trend in the temporal evolution of infection with avian influenza viruses worldwide ?***

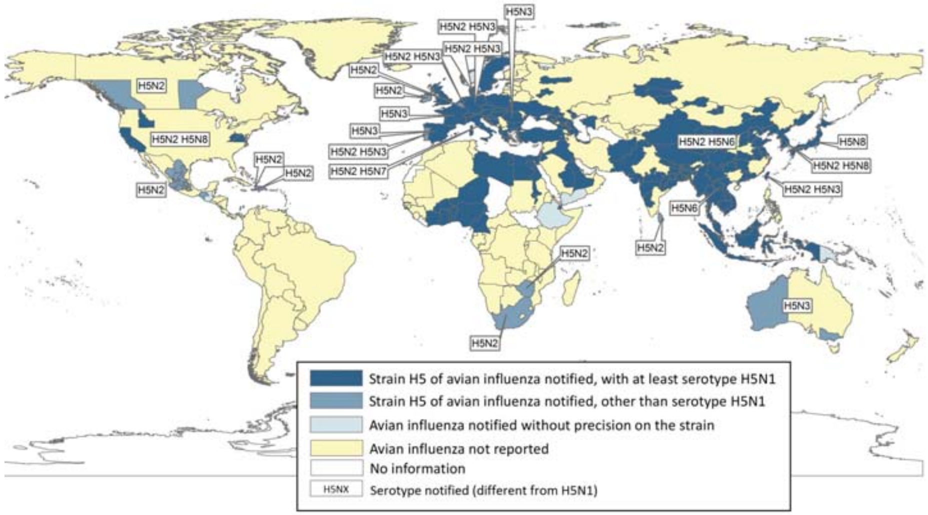
OIE-reporting countries affected by avian influenza virus subtypes H5 and H7 (2006 – 2013)



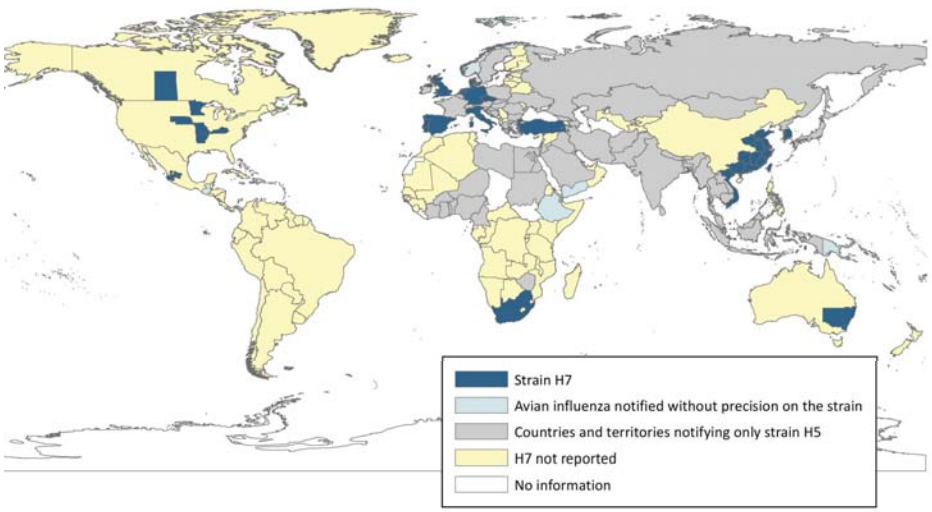
Cumulative distribution of infection with avian influenza viruses of subtype H5 (2006 – May 2014)



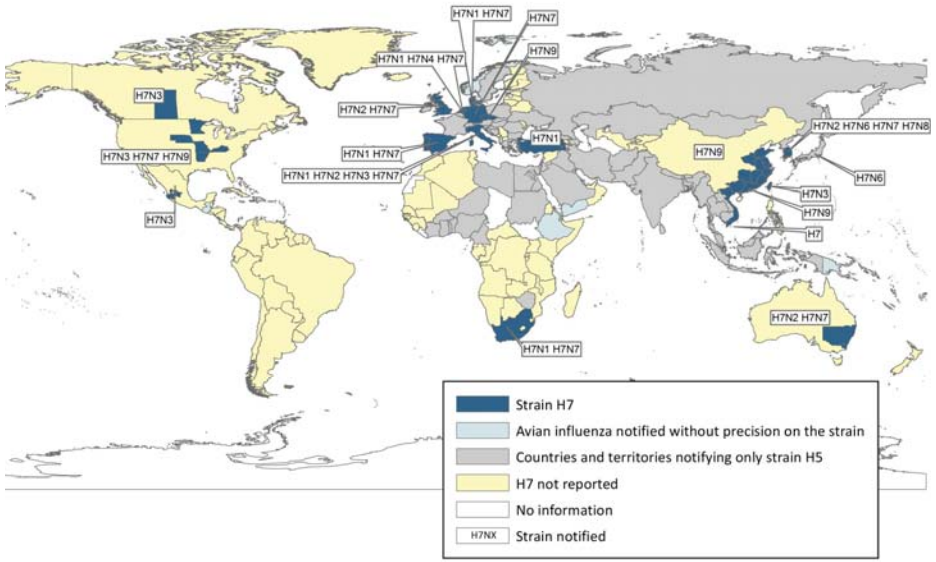
Cumulative distribution of infection with avian influenza viruses of subtype H5 (2006 - May 2014)



Cumulative distribution of infection with avian influenza viruses of subtype H7 (2006 - May 2014)



Cumulative distribution of infection with avian influenza viruses of subtype H7 (2006 – May 2014)



OIE International standards and guidelines on Infection with Avian Influenza Virus

OIE standards and recommendations act as the front-line of prevention and control against the spread of disease and related challenges.

Infection with Avian Influenza Virus (Chapter 10.4)

- 33 articles including :

- 1 article on general provisions: pathogenicity and criteria for notification, incubation, case definition…

- 6 articles for importing safe commodities after destruction of the virus

- 3 article on determination of self AI status for a country/zone/ compartment

- 14 articles on recommendations for importing of commodities

- 2 articles on inactivation of the virus

- 7 articles on surveillance (Articles 10.4.27 to 10.4.33)

- The articles on surveillance define the principles and provides a guide for the surveillance of AI in accordance with Chapter 1.4.

Article 10.4.27

- Surveillance for AI should be in the form of a continuing programme
- Establish country/zone/compartment is free from AI infection
- Surveillance strategies should be adopted to the local situation
- Member countries should prove the absence of AI infection at an acceptable level of confidence through scientific data

Article 10.4.28

- A surveillance system in accordance with Chapter 1.4
  - A formal and ongoing system for detection and investigation of outbreaks
  - A procedure for rapid collection and transport of samples to a laboratory
  - A system for recording and analysing diagnostic and surveillance data
- The AI surveillance programme should include:
  - An early warning system throughout production, marketing and processing for reporting suspicious cases
  - Regular and frequent clinical inspection and serological and virological testing of high risk groups of animals

Article 10.4.29

- Surveillance strategies
- Cover all the susceptible poultry species within the country/zone/compartment
- Random and targeted approaches using molecular, virological, serological and clinical methods
- Active and passive surveillance should be ongoing
- Design the surveillance programme through competent professionals and according to prevailing epidemiological situation
- Clinical, virological, serological surveillance
- Virological and serological surveillance in vaccinated populations

Article 10.4.30

- Documentation of freedom from AI or HPAI in poultry

❑ Additional surveillance requirements for MC declaring freedom of the country, zone or compartment from AI or HPAI in poultry

✓ Provide evidence for the existence of an effective surveillance programme

✓ Demonstrate absence of infection during the preceding 12 months in susceptible poultry populations (vaccinated and non-vaccinated)

❑ Additional requirements – that practice vaccination

✓ Virological and serological tests to ensure absence of infection

✓ Tests repeated every six months or at shorter intervals

✓ Evidence to show the effectiveness of vaccination programme

Article 10.4.31

❑ Additional surveillance requirements for countries/zone/ compartment declaring that they have regained freedom from AI or HPAI following an outbreak

✓ Provide evidence for the existence of an effective surveillance programme to demonstrate absence

✓ Surveillance incorporating virus detection and antibody tests

✓ Randomized representative sample of the populations at risk

✓ Report the results of the surveillance programme

Article 10.4.32

- Additional surveillance requirements for AI free establishments
  - ✓ Demonstration of absence of infection with AI viruses
  - ✓ Birds in these establishments should be randomly tested using virus detection or isolation tests and serological methods
  - ✓ Frequency of testing should be based on the risk of infection and at a maximum interval of 21 days

Article 10.4.33

- The use and interpretation of serological and virus detection tests
  - ✓ Procedure in case of positive test results if vaccination is used
  - ✓ Procedure in case of test results indicative of infection with AI viruses
  - ✓ Schematic representation of laboratory tests for determining AI infection through serological surveys in unvaccinated and vaccinated populations (DIVA)
  - ✓ Schematic representation of laboratory tests for determining infection through virological methods

Thank you for your attention!

WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future

FAO initiatives on control of Influenza A viruses

OIE Regional Workshop
on
Enhancing Influenza A viruses National Surveillance Systems
Tokyo, Japan, 26th August 2014

Acknowledgement

- FAO teams at country, regional and HQ levels
- Colleagues from national authorities
- National and international experts

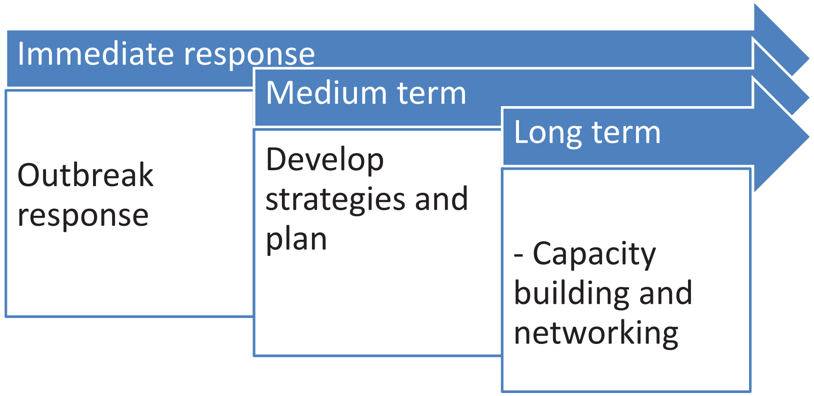
Update on Activities Related to Avian Influenza (AI)

- Background of FAO activities related to HPAI control
- On-Going activities
- Current regional strategies
- Key findings
- FAO H7N9 activities
- Moving toward One-Health and Global Health Security Agenda

FAO Activities Related to AI Control

- Since 2004 FAO has been at the forefront of the fight against highly pathogenic avian influenza (HPAI) and other influenzas in over 95 countries. FAO has mobilized over USD 445 million to combat influenza and emerging disease threats through prevention, surveillance, and control at the country, regional and global levels.

FAO Activities Related to HPAI Control



FAO Immediate Response to HPAI

Objective:

- To assist countries to contain outbreaks at timely manner to minimize the clinical loss

Activities:

- Inform and communication
- Coordinate with the international, regional and national agencies
- Provide technical and operational assistance assist countries to contain the outbreaks
- To assist understanding disease epidemiology

Technical and Operational Assistance

- National level
  - Assess country disease situation
  - Support diagnostic and surveillance
  - Guide and design strategies
  - Tools for outbreak investigation and management
  - Provide equipment and laboratory consumables

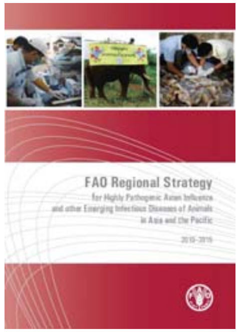
- Regional level
  - Emergency regional coordination assistance for control of AI in Southeast, South and East Asia
  - Emergency regional support for post AI rehabilitation
  - Strengthening AI control through improved transboundary animal disease information management system in Asia
  - Sub-Regional surveillance and diagnostic laboratory network
- Global level
  - Emergency Center for Transboundary Animal Diseases

FAO Medium Term HPAI Activities

- Assist the country in develop national strategies, action plan and contingency plan with the focus on better coordination mechanisms between animal health and public health sectors
- Support regional organizations to develop the regional strategic frameworks related to HPAI control
  - ASEAN Task Force for HPAI Control and Prevention
  - ASEAN HPAI Road Map – being revised to accommodate other animal influenzas

Current Regional Strategies

- Strategic Approach to HPAI Prevention and Control 2010 – 2015
  - Gaining better understanding of risk factors for HPAI transmission and maintenance
  - Improving HPAI outbreak response
  - Reducing HPAI incidence by risk management
  - Collaborative regional activities



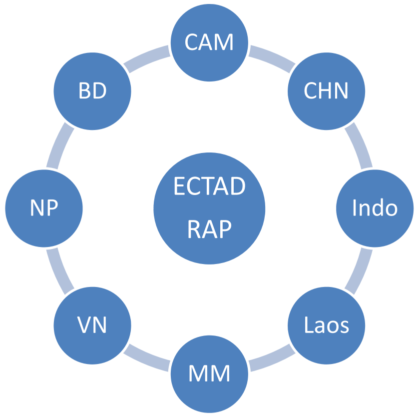
FAO Long Term HPAI Activities

- Strengthen disease control related systems of veterinary services from central level to the field
  - Improve/develop legislation and policies towards preparedness purpose
    - Support design and implementation of compensation
  - Strengthen surveillance
  - Strengthen reporting system and data flow
    - Improve communication
    - Community animal health workers

FAO Long Term HPAI Activities

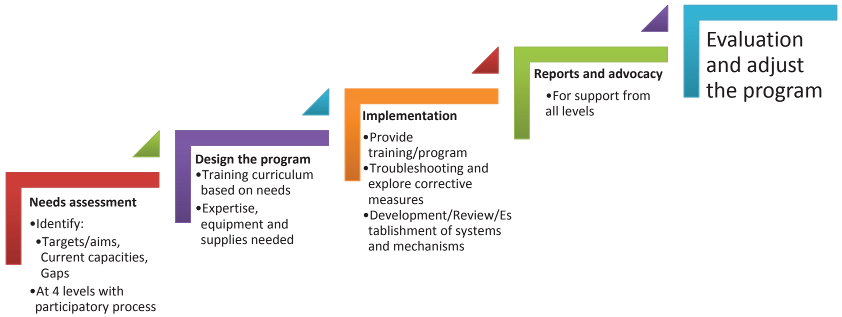
- Improve understanding of disease epidemiology including risks and drivers
- Improve HR capacities
- Facilitate surveillance and laboratory networking
  - Sharing of information and biologic materials
  - Sharing experience
  - Sharing resources
- Facilitate cross-border dialogue to manage risks of HPAI spread across the border

On-Going Activities



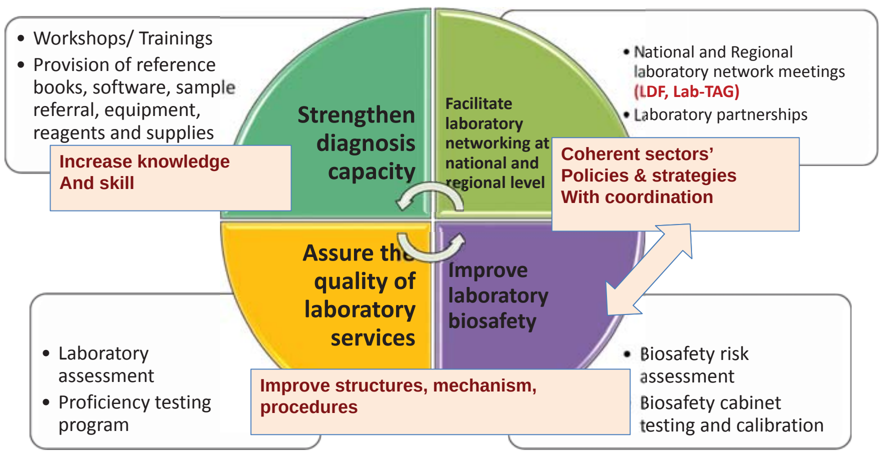
- Regional and country programmes
  - Support planning and coordination
  - Strengthen field epidemiology
  - Strengthen laboratory diagnosis
  - Surveillance
  - Risk management at cross-border

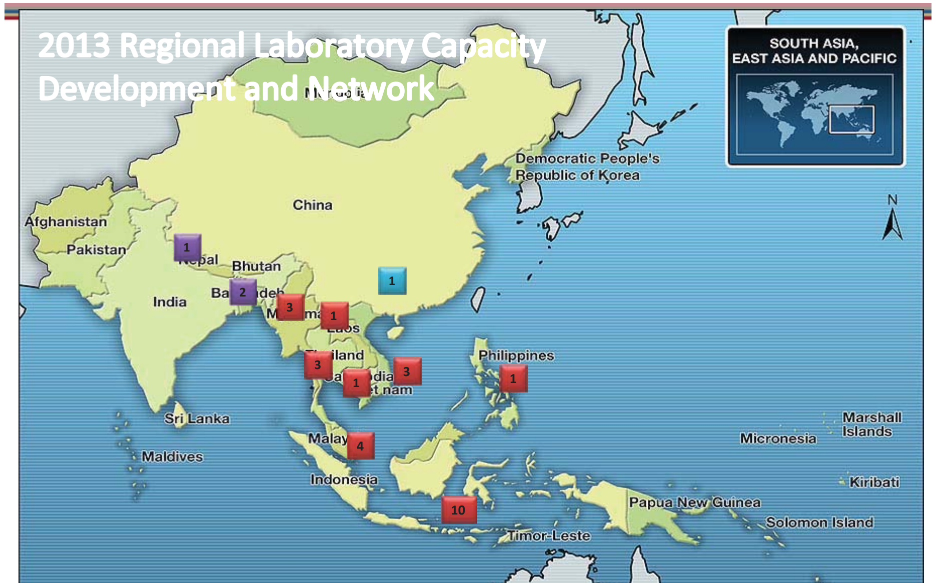
5-Step Capacity Development Program



Laboratory Component

Technical Scopes of Laboratory Component





12 countries (SEA 8, SA 3, EA 1)
30 laboratories,
6 Regional Leading Laboratories: VRI- Malaysia (AI), FMD– Thailand (FMD), RAHO6-Viet Nam (Swine Diiseases), Pakistan (HPAI), India (FMD), Bangladesh (PPR)

Strengthen Linkage and Communication Pathway across Network of Laboratories FAO-OIE-WHO Collaboration

Partners engagement

- Technical Advisory Group (TAG) Meeting
  - Donors, Implementing partners, including the Director of the Regional Reference labs and RRL
- Technical Meeting and training
- Joint Animal Health and Public Health Laboratory Meeting

Policy advocacy

- Laboratory Directors' Forum Meeting
  - Directors of the RLN members,, RRL, RLDL

Regional Strategic Framework for Animal Health Laboratory Capacity Building



The 6 key strategic goals of the SEA Laboratory framework

1. Development of regionally-coherent, national **laboratory strategies and policies**
2. **Allocation and mobilisation of resources** to support implementation of national strategies for efficient and cost-effective delivery of laboratory services
3. Strengthening of ASEAN Member States capacity to provide **acceptable quality and proficient laboratory services**
4. Enhancement and promotion of **acceptable biosafety and biosecurity practices and environment** in laboratory settings
5. Enhancement and promotion of **linkages and sharing of information** among laboratories and stakeholders to ensure rational use of laboratory services
6. Strengthening of ASEAN Member States capacity on planning, coordinating, and implementing research activities under **standard ethical research conducts**

Epidemiology Component

Regional Epidemiology Training Programme

- Regional Inventory of EPI Training
- One Health Approach for Country Needs Assessments
- University, Country and International Partnerships
- FETPV, AVET Curriculum Development
- Program Development and Adaptation
  - Regional FETPV
  - Country FETPV
    - China
    - Lao PDR
    - Cambodia
    - India
    - Indonesia
  - SAARC FETPV
  - AVET
    - Philippines
    - Viet Nam

Building Epidemiology at Organizational, Society and Higher Level

2004-2009
- Regional Epidemiology Trainings and Networking with consortium

2010
- CVOs meeting identified the needs to develop a regional strategy

2011
- Meeting among experts and regional resource persons to initiate the development

2012-3
- Consultative workshop among AMS was organized
- Regional Framework and roadmap are drafted and endorsed by ASEAN



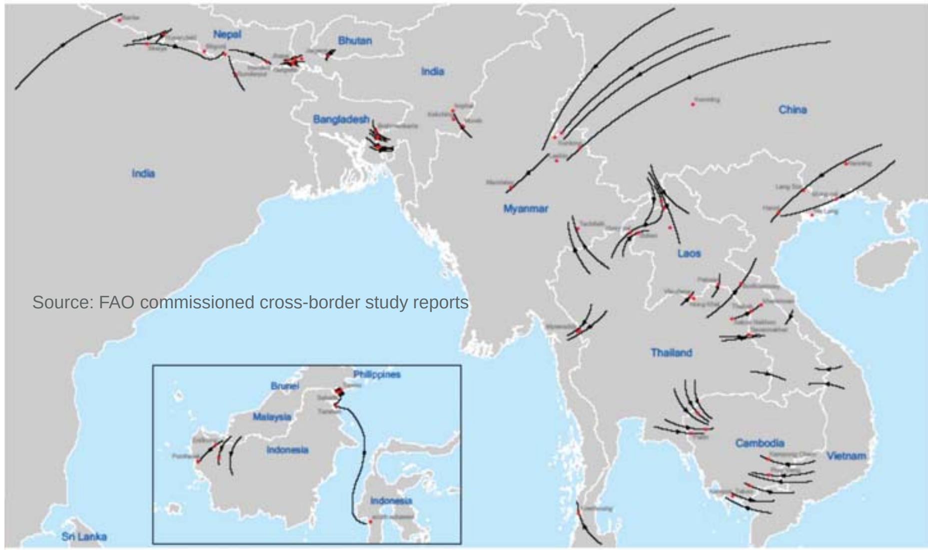
Regional Capacity and Networking for Epidemiology 4 Strategic Goals

- Development of regionally-coherent, national organizational structures and systems to support functions of veterinary epidemiology
- Enhancement and promotion of linkages, partnerships, networks, coordination and collaboration among AMS, development partners and stakeholders to maximize efficient and sustainable uses of available resources
- Strengthening human resources capacity and management to ensure effective use of trained veterinary epidemiologists and to effectively deliver national animal health programs in compliance with international standards
- Enhancement and promotion of awareness and understanding of veterinary epidemiology to provide support, to ensure science base decision-makings, and to efficiently mobilize resources based needs

Consolidation and Application of Capacities for AI Surveillance and Control

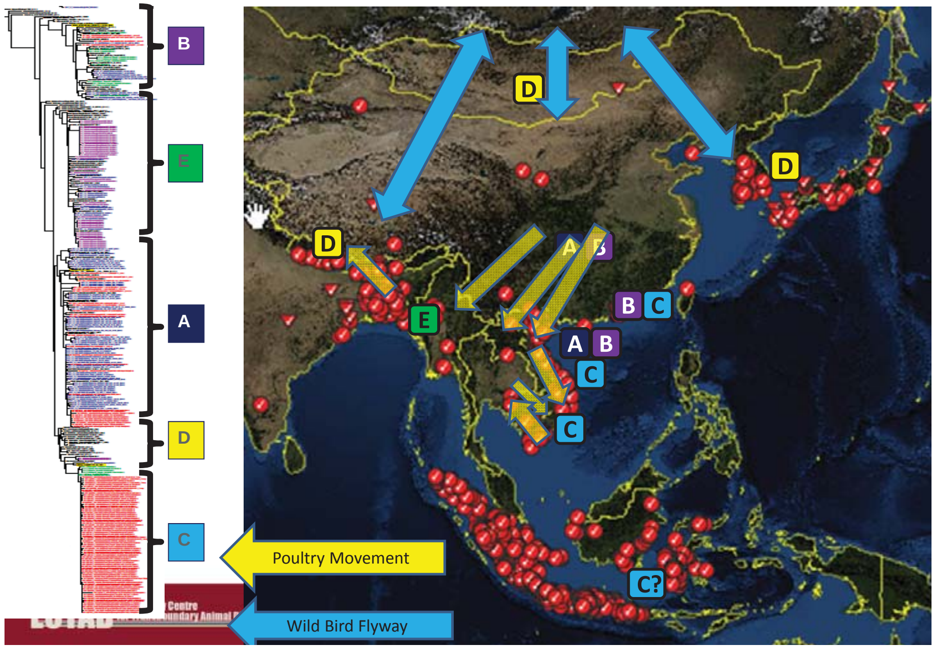
- Risk assessment
  - Baseline information – animal population/census
  - value chain
  - social network analysis
  - Ecological studies – dog and wildlife
- Risk-based surveillance
- Planning for risk management – field, national, cross-border levels

Regional Poultry Supply Chain



Source: FAO commissioned cross-border study reports

Linking Molecular Epidemiology and Value Chain Data



Key Findings

- Capacity on laboratory and epidemiology of human resources in the region has been improved;
- Better understanding of risks – trade & clade
  - Capacity built to be able to update risk information

Key Findings

- Ability to apply both lab and epidemiology capacity to other emerging diseases as well as high impact endemic diseases: H7N9, FMD, ND, Rabies, PRRS, Anthrax, etc.
- Existing regional networks for epidemiology and laboratory for HPAI should be good platform for future emerging diseases for the region e.g. existing HPAI H5N1 capacity and infrastructure allowed for rapid deployment of surveillance and other emergency measures for H7N9

FAO H7N9 activities (Regional level)

- Value chain analysis – to identify markets trading birds coming from affected areas in China and identify CCPs
- Contingency planning assistance (AH and PH) and desk-top simulation exercises;
- Communication and awareness materials/campaigns;
- Joint animal/public health risk assessment (JRA) methodology.

FAO H7N9 activities (Global level)

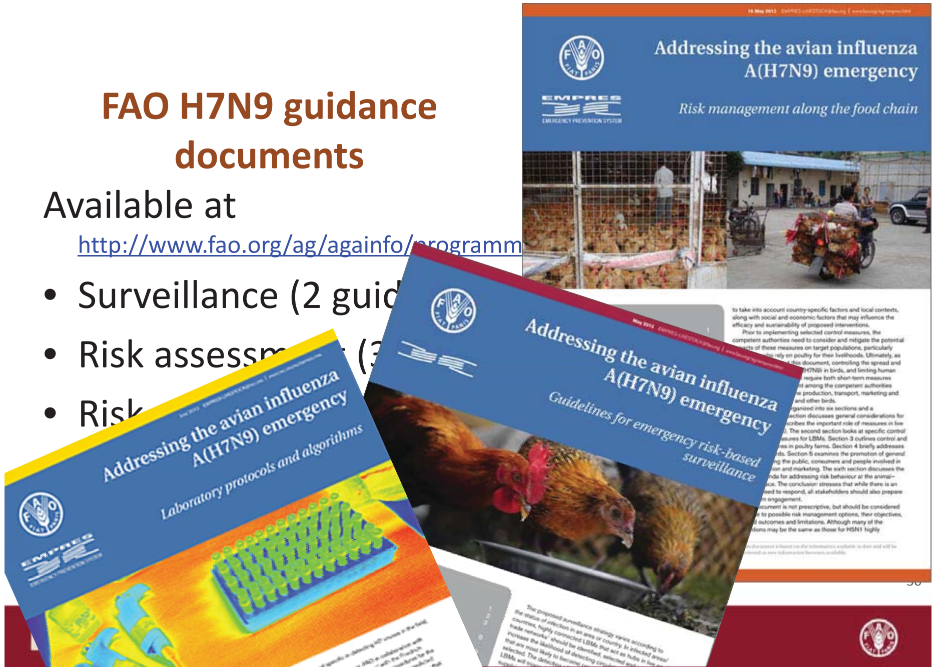
- Emergency consultations with international and regional experts;
- Distribution of technical updates and information sharing through daily e-mails and regular skype conferences;
- Data sharing coordinated between international experts and country teams;
- Tripartite collaboration and consultation;
- Guidelines;

FAO H7N9 guidance documents

Available at

http://www.fao.org/ag/againfo/programm

- Surveillance (2 guid
- Risk assessm (3
- Risk



Moving Toward One-Health/ Global Health Security Agenda


Contributing to
One World, One Health*

A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface

14 October 2008

Consultation Document

Produced by:

World Health Organization

unicef

UN System Influenza Coordination

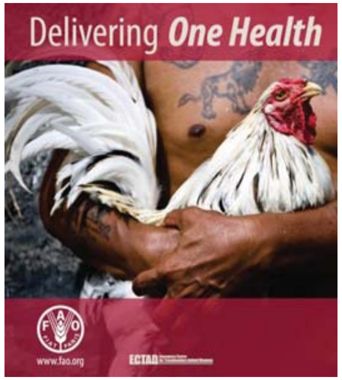
THE WORLD BANK

- Diminish and minimize global impact of epidemics and pandemics due to emerging infectious diseases of humans and animals
- Address health risks at the animal-human-ecosystems interfaces

FAO Role in One Health/GHSA

- FAO seeks to operationalize thinking that disease emergence needs to be addressed together with
  - Poverty
  - Natural resource management
  - Sustainable agriculture and farming system
  - Rural development
  - Building generic One Health capacity
  - Blending insights gained from epidemiology, agro-ecology, socio-economics and communication

Delivering One Health/GHSA



- Advocacy
- Strengthen coordination and collaboration across sectors and disciplines
- Capacity building
  - Long term approach
  - Immediate to produce scientific evidence for prevention purpose

Promoting Public Health Security Addressing Avian Influenza A Viruses and Other Emerging Diseases

Masaya Kato, WHO Viet Nam

OIE Regional Workshop on Enhancing Influenza A viruses National Surveillance Systems
26-28 August 2014, Tokyo, Japan

World Health Organization

Influenza pandemics: Health Security Threats

Credit: US National Museum of Health & Medicine

1918: “Spanish Flu”	1957: “Asian Flu”	1968: “Hong Kong Flu”
20-40 million deaths	1-4 million deaths	1-4 million deaths
A(H1N1)	A(H2N2)	A(H3N2)

What we aims to achieve

To build sustainable national and regional capacities and partnership to ensure public health security through preparedness planning, prevention, early detection and rapid response to emerging diseases and other public health emergencies.

Goal, Asia Pacific Strategy for Emerging Diseases 2010

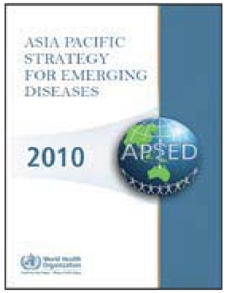
Overview

1. WHO – Strategy and approaches for emerging diseases
2. Influenza surveillance – Standards, case definitions, lessons learned
3. Case study – A/H7N9

International Health Regulations (IHR) 2005 as Global Instrument

- A global legal framework for protecting global public health security
- In force since June 2007
- Facilitate strengthening of countries' core capacity to detect, assess, notify and respond to public health threats.
- All human infections with non-seasonal influenza viruses are notifiable to WHO under the IHR (2005)

Asia Pacific Strategy for Emerging Diseases APSED 2010

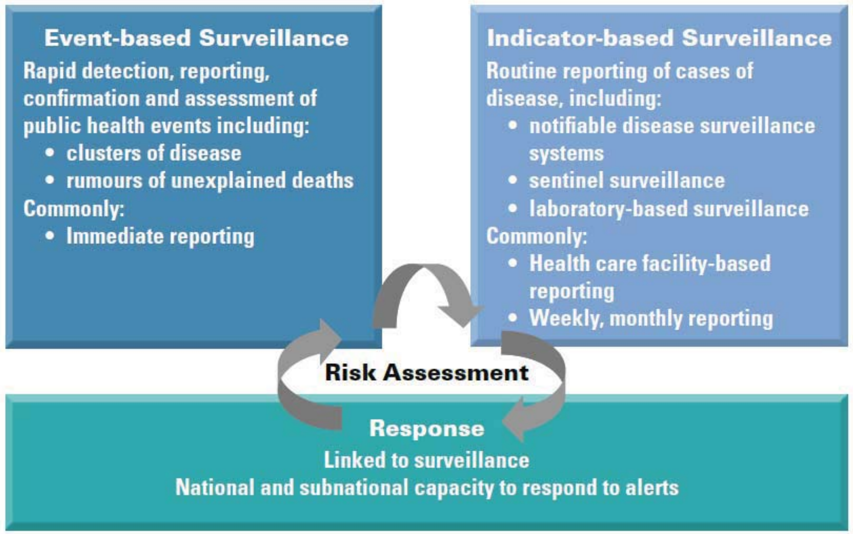


- A regional tool to help two WHO Regions (SEAR and WPR) meet IHR core capacity requirements
- Developed in 2005 and updated in 2010
- A common framework highlighting a shared vision and a set of agreed priorities
- To ensure public health security through ***preparedness planning, prevention, early detection and rapid response*** to emerging diseases and other public health emergencies

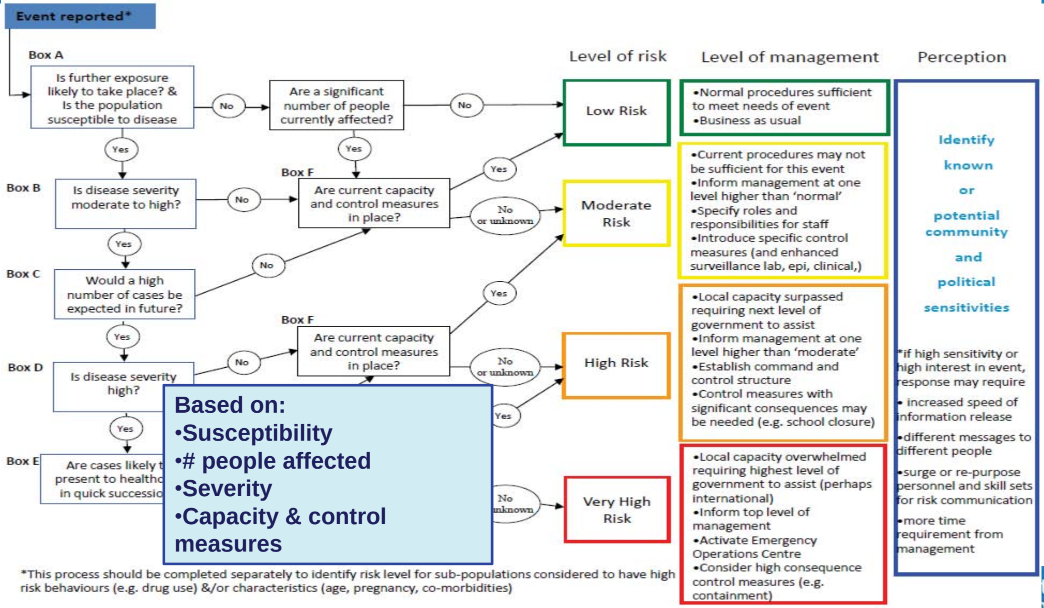
APSED 2010: Priority areas for investment

1. Surveillance, Risk Assessment and Response
2. Laboratory
3. Zoonosis
4. Infection Prevention and Control
5. Risk Communication
6. Public Health Emergency Preparedness
7. Regional Preparedness, Alert and Response
8. Monitoring and Evaluation

APSED 2010: Surveillance, risk assessment and response framework

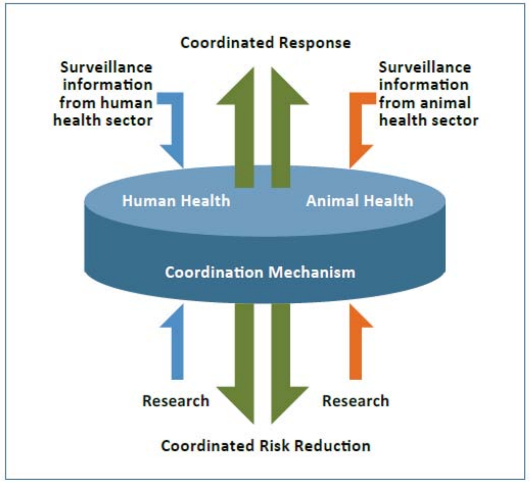


Risk assessment: Regional risk assessment algorithm



Zoonosis: Coordination between animal health and human health sectors

- Sharing of surveillance information
- Coordinated response
- Risk reduction



World Health Organization

WPRO's response to Outbreaks & Emergencies

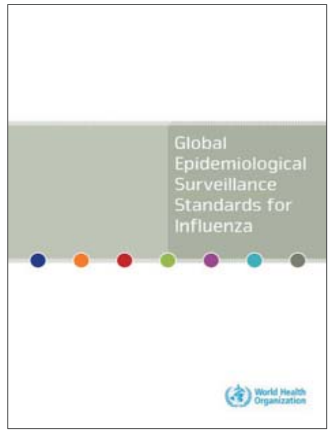
- WHO Emergency Response Framework (ERF):
  - Clarifies WHO's roles and responsibilities and provides a common approach and standards for its work in emergencies

- WPRO Emergency Operation Center (EOC):
  - Provides a hub and technical platform to support and conduct event management during outbreak and health emergencies

World Health Organization

WHO: Global Epidemiological Surveillance Standards for Influenza (2014)

- Background: Historically, influenza surveillance focused on virological monitoring and collection of specimens to guide vaccine strain selection.
- Global standards for the collection, reporting, and analysis of seasonal influenza epidemiological surveillance data.
  - Case definition, site selection and sampling, minimum data set
- Enable countries to compare epidemiology, transmission, and impact of influenza with those of other countries



World Health Organization

WHO: Global Epidemiological Surveillance Standards for Influenza (2014)

	Influenza-like illness (ILI)	Severe acute respiratory infection (SARI)
Case definition	An acute respiratory infection with: • measured fever of ≥ 38 C°; • and cough; • with onset within the last 10 days.	An acute respiratory infection with: • history of fever or measured fever of ≥ 38 C°; • and cough; • with onset within the last 10 days; • and requires hospitalization.
Intended settings	outpatient treatment centres	inpatient hospital settings

Country experiences in identifying novel respiratory viruses

Indonesia A(H5N1)

- First case identified by an ICU physician in a private hospital
- Most H5N1 have been severe cases admitted to ICU, only 3/197 cases detected through ILI surveillance

Bangladesh A(H5N1)

- First case was identified in 2008 in one of the largest urban slums in Dhaka, during seasonal surveillance activities

China A(H5N1) and A(H7N9)

- Most cases identified through Unknown Aetiology Pneumonia Surveillance, conducted in all public hospitals
- Some mild H7N9 cases identified through ILI surveillance

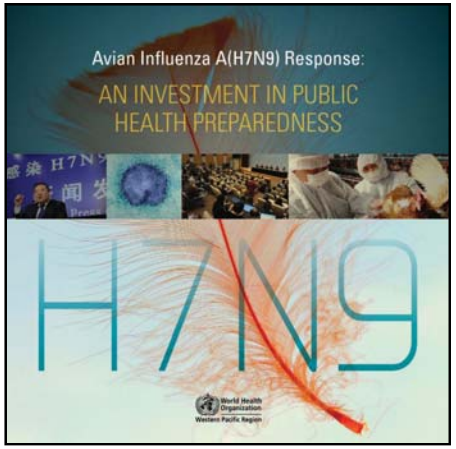
Malaysia A(H7N9) and MERS-CoV

- Both cases detected by healthcare workers using national case definitions

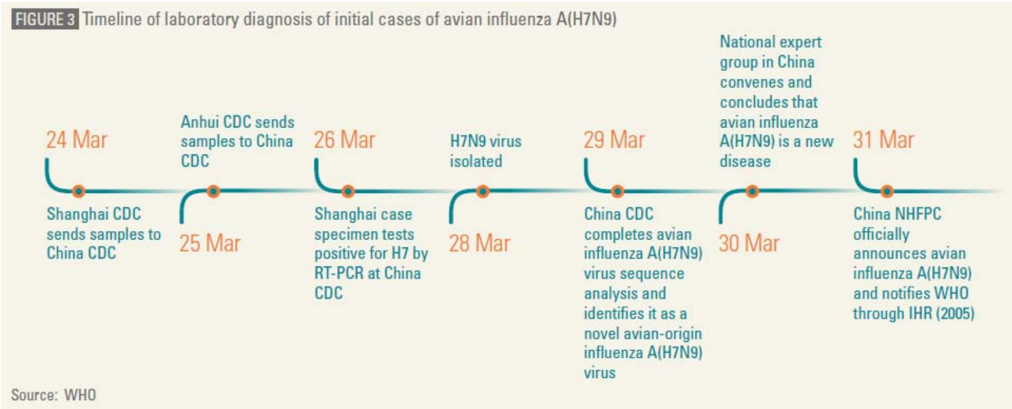
Lessons learned in existing early warning alert and outbreak response systems

- Influenza surveillance system fit for purpose – monitoring flu trends or detection of novel influenza (One size does not fit all)
  - Selection of sentinel sites / sentinel populations
  - Quality assurance (e.g. geographical representativeness)
- Seasonal influenza surveillance supports detection of novel strains
  - Establishes syndromic case definitions that capture human infections with novel influenza viruses
  - Develops laboratory capacity for detection of non-seasonal influenza A subtypes
- Sustainability of influenza surveillance systems
  - Reliance on donor funding, including reagents and equipment
  - High staff turnover, especially in rural sites
- Challenges in inter-sectoral collaboration e.g. animal and human health

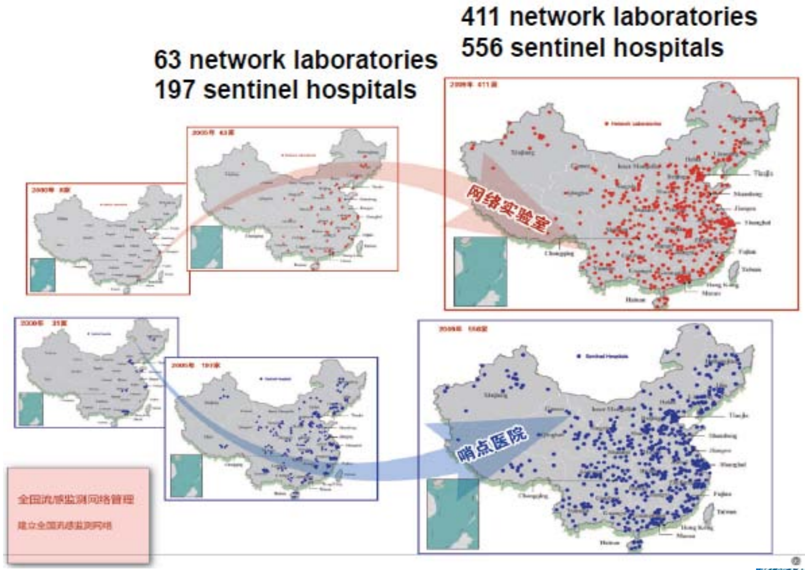
Case Study: A/H7N9



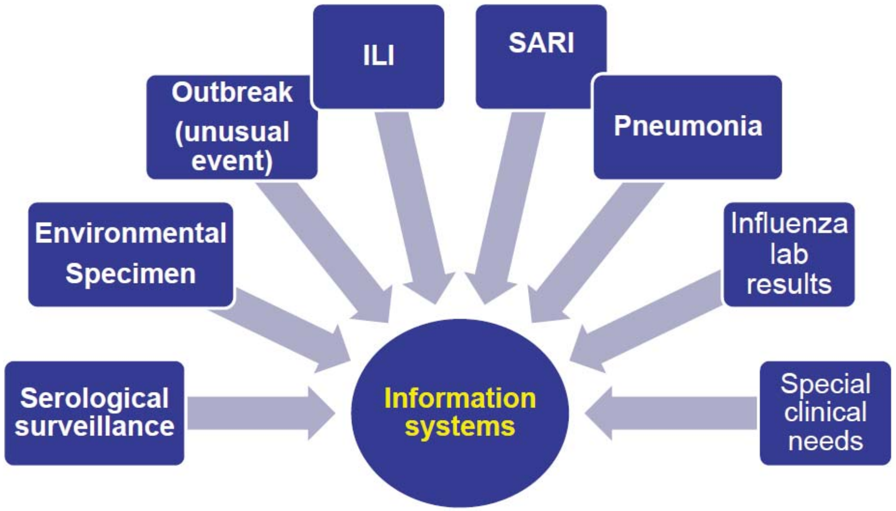
China: Timeline of detection of H7N9



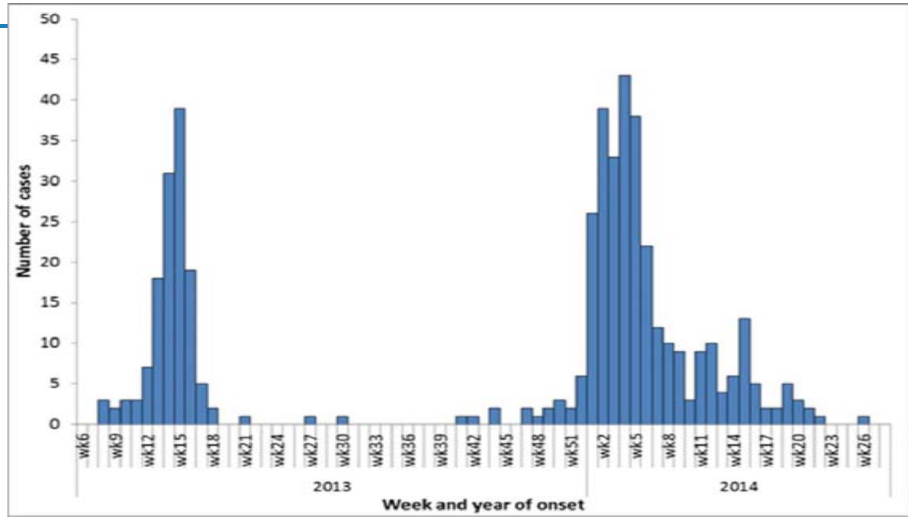
China: Expansion of Sentinel Facilities and Laboratory Networks



China: Combining Surveillance Methods

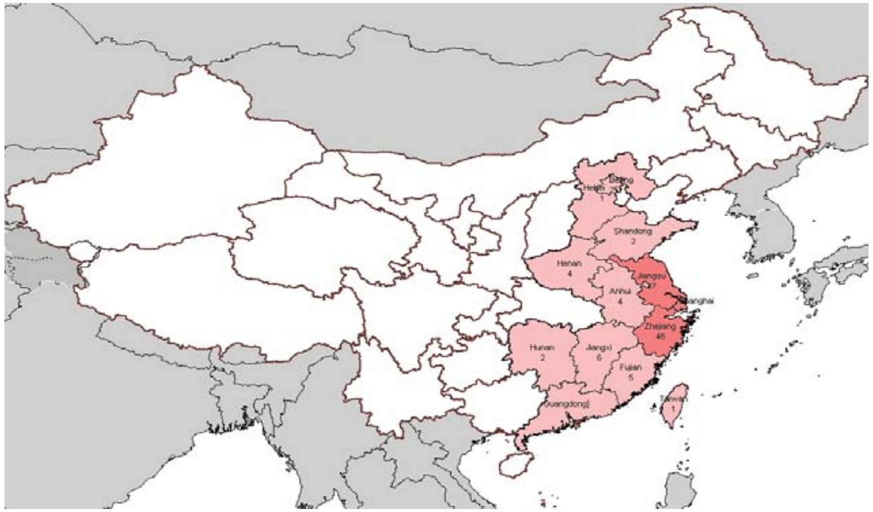


Epidemic curve of avian influenza A(H7N9) in humans, Mar 2013 – 30 Jul 2014

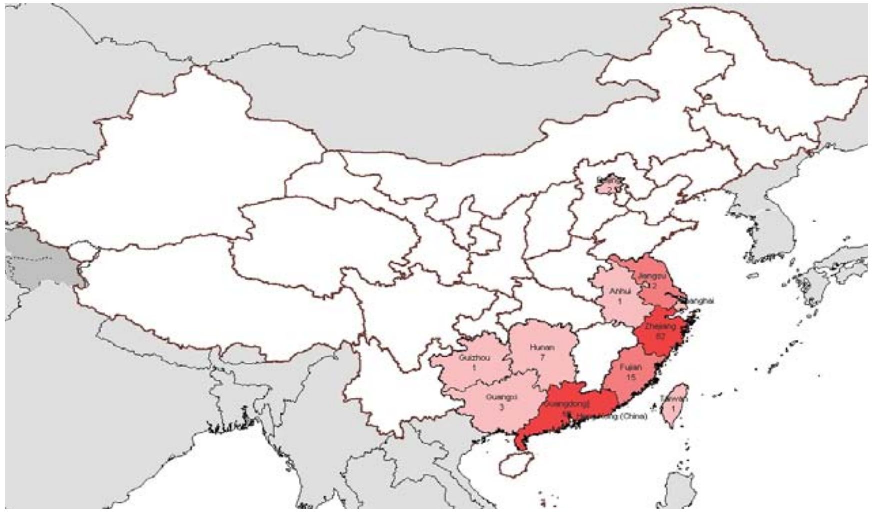


As of 30 July 2014, n = 451 cases including 171 deaths (CFR 38%)

Provinces reported H7N9: 1st wave

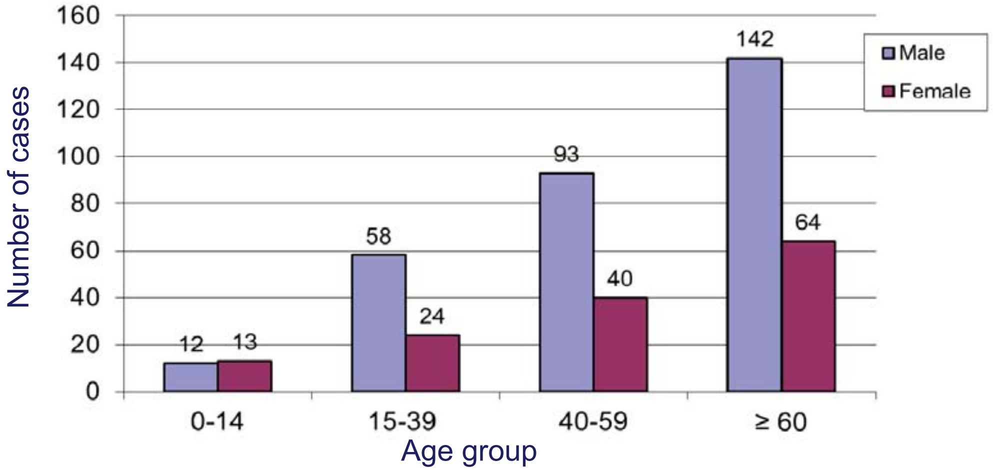


Provinces reported H7N9: 2nd wave



Age and gender of H7N9 cases

(as of 21 Aug 2014)



Note: n = 451, age and sex details not available for 5 cases

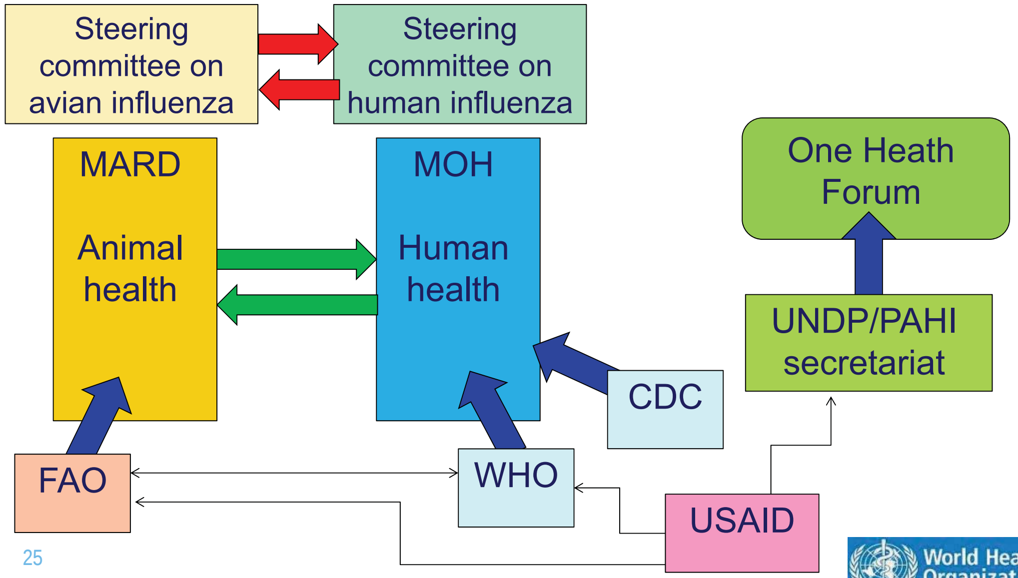
Viet Nam: Response to A/H7N9

- Elevated risk (towards Vietnamese New Year)
- Government prompt and high level response
  - Prime minister's telegraph
  - High level steering committees; Close coordination between animal and human health sector
  - Surveillance systems enhanced; EBS, ILI, SARI
  - National plans and guidelines
  - Lab: H7N9 test kits and reagents supplied

- MARD-MOH-WHO-FAO joint action
  - Joint risk assessment
  - Joint press release

Viet Nam: Response to A/H7N9

Coordination between human and animal health sectors



WHO response

- Information sharing:
  - Event Information Site (EIS)
  - Disease Outbreak News (DON)
- Technical expertise:
  - Framework for action, tools, materials for diagnosis and treatment in cooperation with partners
- Joint risk assessment
- Logistics
  - e.g. Facilitate antiviral stockpile

Summary

- WHO works with countries and partners to promote public health security through ***preparedness planning, prevention, early detection and rapid response*** to emerging diseases and other public health emergencies
- Influenza surveillance:
  - Provides information to detect, assess and respond
  - Combination of surveillance approaches, e.g. Event-based and Indicator-based (e.g. ILI, SARI, laboratory)
  - Global standards for the collection, reporting, and analysis of epidemiological surveillance data
  - Information sharing and joint response between animal and human health sectors

Acknowledgement

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Do Thi Hong Hien

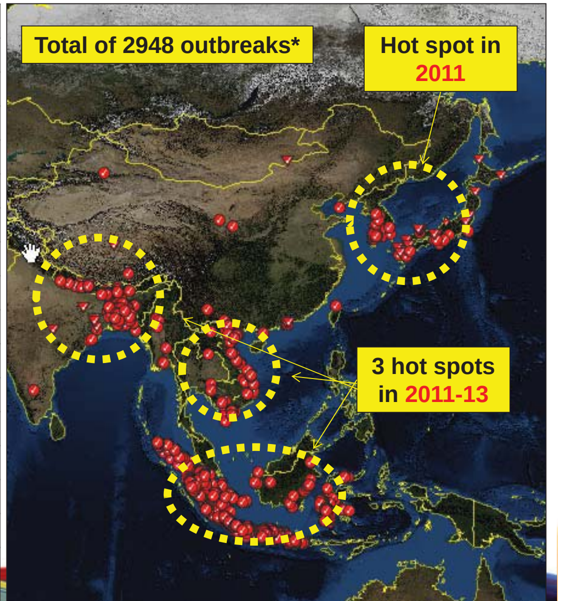
HPAI Situation in ASEAN

Contributors

- ASEAN RSU
- FAO ECTAD RAP
- ASEAN Member States
- ASEAN Secretariat

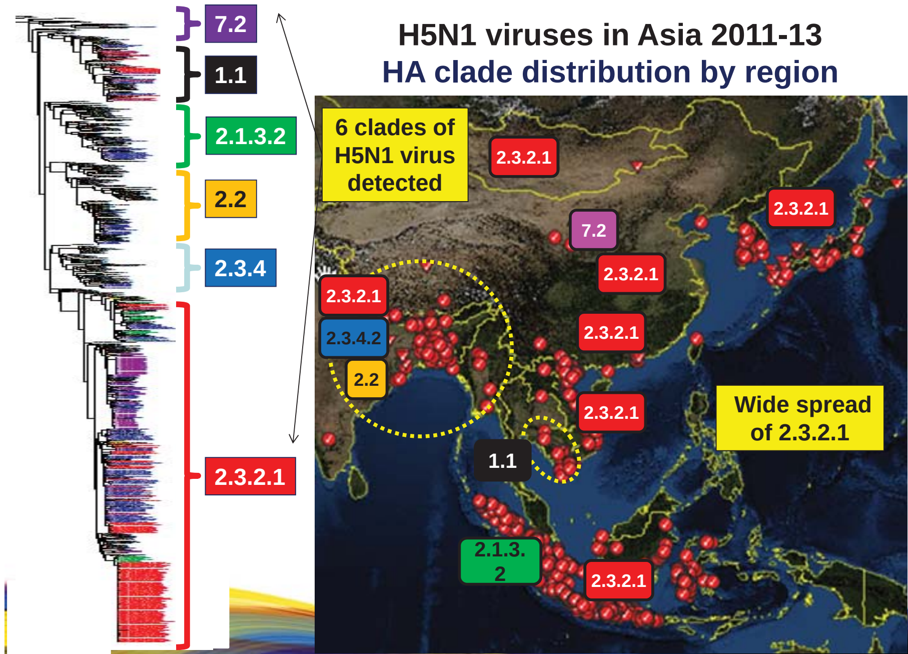
ASEAN Economic Community

Country	No. of outbreaks*		
	2011	2012	2013
Japan	65	0	0
Korea, R	58	0	0
Korea, DPR	0	0	1
China	1	6	1
China HK	9	23	0
Mongolia	0	0	0
Vietnam	45	55	29
Laos	0	0	1
Cambodia	13	4	7
Myanmar	1	2	0
Indonesia	1164	588	447
Bangladesh	147	25	2
India	3	12	7
Nepal	1	14	204
Bhutan	0	11	2
Total	1507	740	701

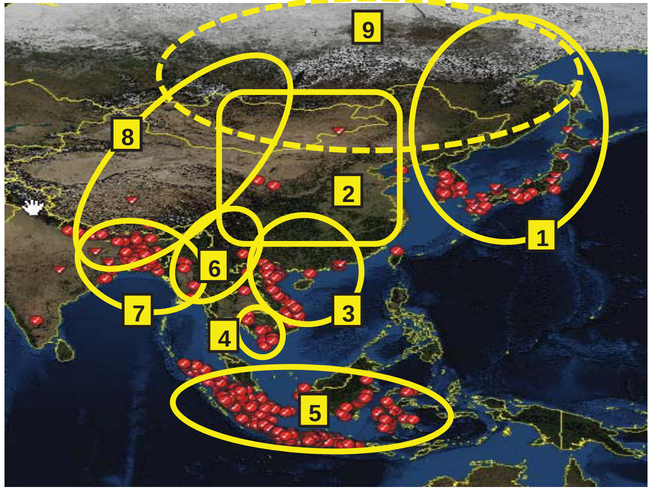


*Officially reported cases except West Asia (Source: Empres-i Asia)

H5N1 viruses in Asia 2011-13
HA clade distribution by region



H5N1 Epi-zones* in Asia



*Epi-zone: Geographical area where closely related viruses were shared, and frequent virus incursion/exchange is expected. Epi-zones are dynamic and changing.

Reports of HPAI in human: 2003 - 2014

Country	2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Cambodia	0	0	0	0	4	4	2	2	1	1	1	0	1	0	1	1	8	8	1	1	26	14	9	4	**56**	**37**
Indonesia	0	0	0	0	20	13	55	45	42	37	24	20	21	19	9	7	12	10	9	9	3	3	2	2	**197**	**165**
Lao	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**	**2**
Myanmar	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0**
Thailand	0	0	17	12	5	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**25**	**17**
Vietnam	3	3	29	20	61	19	0	0	8	5	6	5	5	5	7	2	0	0	4	2	2	1	2	2	**126**	**63**
Total	**3**	**3**	**46**	**32**	**90**	**38**	**60**	**50**	**54**	**45**	**31**	**25**	**27**	**24**	**17**	**10**	**20**	**18**	**14**	**12**	**31**	**18**	**13**	**8**	**464**	**316**

Update - 2014

Since January 2014, there were a total of 13 human cases with 9 deaths reported from:

- Cambodia 9 cases with 5 fatalities (Kampong Cham 2, Kampong Chhnang 1, Kampong Thom 1, Kandal 2 and Kracheh 2)
- Indonesia 2 case, 2 fatalities (Central Java and Jakarta)
- Viet Nam, 2 cases, 2 fatalities (Binh Phuoc and Dong Thap)

ASEAN: HPAI in animals, 2004 - 2013

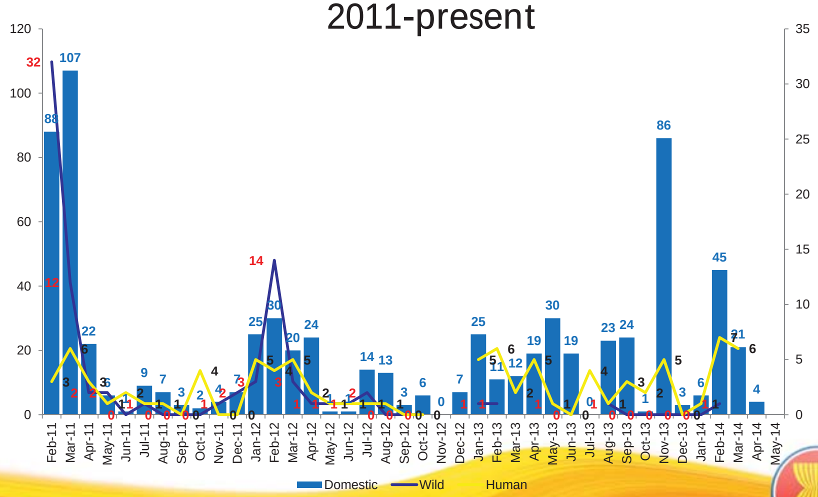
Country	Year										Total
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Cambodia	15	2	6	1	1	1	2	8	1	7	**44**
Indonesia	1	2	223	2,751	1,162	1,048	1,216	1,155	588	540	**8,686**
Lao PDR	19	0	1	0	4	1	1	0	0	0	**26**
Malaysia	0	0	5	1	0	0	0	0	0	0	**6**
Myanmar	0	0	78	15	0	0	3	10	2	0	**108**
Thailand	1,753	194	5	4	4	0	0	0	0	0	**1,960**
Viet Nam	2,406	1,068	36	73	71	46	44	38	48	25	**3,855**
Total	**4,194**	**1,266**	**354**	**2,845**	**1,242**	**1,096**	**1,266**	**1,211**	**639**	**572**	**14,685**

H5N1 in 2014- ASEAN

Domestic poultry: Since the beginning of 2014, there were 324 outbreaks of HPAI H5N1 reported from 7 countries in Asia, including 3 from ASEAN (297):

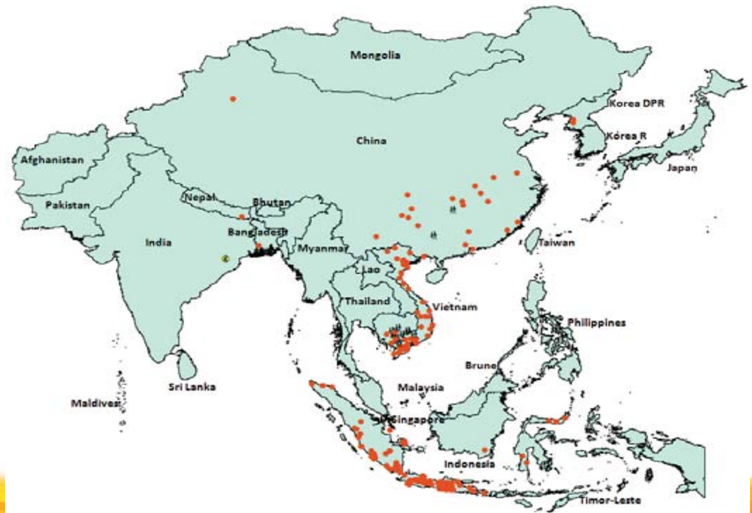
- Cambodia, 5 outbreaks were reported from (5 areas)
- Indonesia, 248 H5N1 events were reported (22 areas)
- Vietnam, 44 outbreaks were reported (33 Provinces)

Temporal distribution of HPAI in Asia, 2011-present



Total number of outbreaks per month

Spatial distribution of H5N1 in Asia in 2014



H5N1...and the future...

1. Continue to sustain efforts to build capacity to assess risks and needs, to improve understanding (dynamic factors...)
2. Capacity to prevent and respond must be continuously strengthened
   - Planning for effective actions relies on science/evidence base information on the ground
   - Effective monitoring of program implementation to measure progress

3. Ability to predict (allows preparation) must be considered
   - Search for **pandemic progenitor viruses**
   - Identify/ understand drivers

4. Understand not only HPAI but overall→ animal influenza

5. Strengthen collaboration with partners

ASEAN Economic Community

ASEAN Coordinating Centre for Animal Health and Zoonoses (ACCAHZ)

- SOM-AMAF/AMAF – Endorsed Proposal for Establishment and Creation of Preparatory Committee
- Ongoing development and finalisation of Establishment Agreement
- Target of signing: 2015
- Technical Units: Veterinary Epidemiology, Communication, Laboratory, and disease specific Program

ASEAN Economic Community

ASEAN Coordination Centre for Animal Health and Zoonoses (ACCAHZ)

GOVERNING BOARD

Office of the Executive Director

Operations Unit

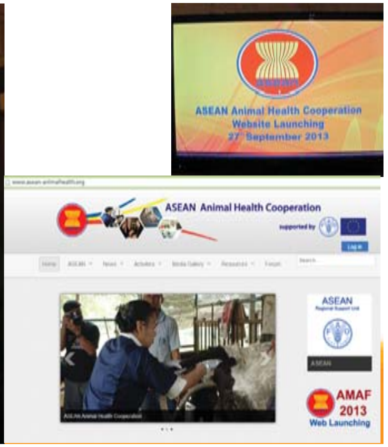
Epidemiology Network (EPINET) Coordination Unit

Laboratory Network (LABNET) Coordination Unit

Programme Coordination Unit/Communication

Launched the ASEAN Animal Health Cooperation Website

27 September 2013, Kuala Lumpur, Malaysia at the 35th AMAF Meeting



THANK YOU

ASEAN Economic Community

How to do Poultry Surveillance in the Presence or Absence of Vaccination

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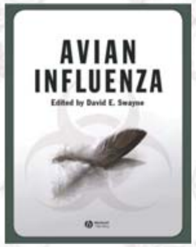


Introduction

What is the goal of avian influenza surveillance?

- Find AI virus (agent) or AI virus infections (antibodies)
- Within a defined population of animals
- At a minimum detection rate
- Confident that results are accurate
- BUT, vaccination creates challenges for serological surveillance as vaccinated birds have antibodies to hemagglutinin and possibly neuraminidase of interest

Introduction

Vaccination Issues:

– Monitoring of vaccination effectiveness (seromonitoring)

– Surveillance for AIV (virus) or AIV infection (antibodies)

- Syndromic – a clinical case initiates diagnostic investigation (also termed passive surveillance)
- Active – predesigned program to look for AIV or AIV infections on non-syndromic sampling

Key Areas

- ‘Is the disease (or infection) there? Optimize diagnostic process to detect the agent
- Basics of sample collection, packaging, transport, laboratory testing and use of laboratory data in a practical surveillance system
- Collecting the right biological sample, handling it correctly (preserving the disease agent / antibodies etc.), not cross-contaminating it
- Reliable and accurate laboratory diagnostic tests – sensitive and specific; standardized and validated
- Careful lab technique, especially rRT-PCR; separate steps in different rooms, and proficiency testing of individual laboratorians

Key Areas

- Subset of samples for virus isolation attempts for biological characterization
- Correct interpretation of results (including understanding sensitivity and specificity of tests)
- Good data management, integrate with field metadata
- Molecular epidemiology – clues to source, clade monitoring, reassortments, future to determine farm-to-farm spread, etc.
- Available capacity of laboratory for maximum sample test numbers and financial support for such tests; including emergency surge capacity/finances and sustainable capacity/finances

Tests for AIV or AIV Infection

- Current AIV tests
  - rRT-PCR
  - Virus isolation: will not be replaced: isolates needed for confirmation and characterization
  - Antigen detection immunoassays ("pen side" test)
- Adequately sensitive and specific for <u>defined use</u>
- Current AIV serology tests
  - Type A influenza virus tests (screening): agar gel immunodiffusion (AGID) and ELISA
  - Subtype tests: HA (HI or ELISA) & NA (NI, IFA or ELISA)

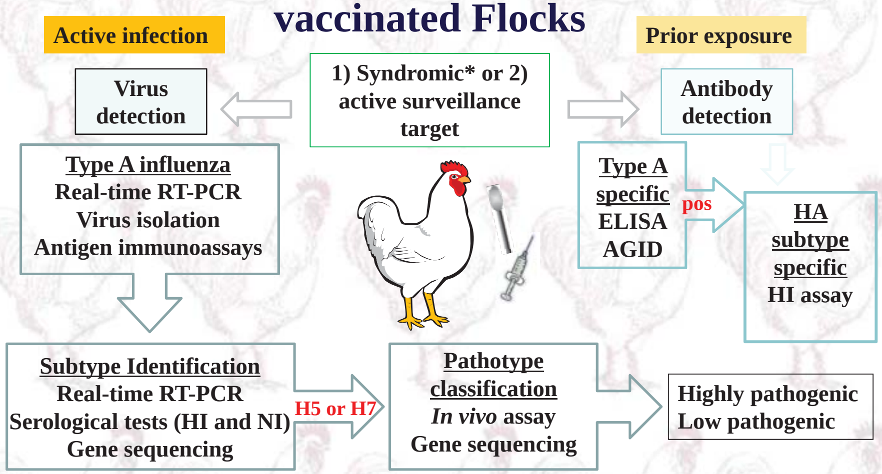
Big issues:
- Surveillance for early detection (syndromic and active)
- Transparency in reporting ("who you tell")

1. Monitoring of Vaccination Effectiveness

- Hemagglutinin subtype specific antibodies; hemagglutination inhibition assay (HI) – e.g. H5 and H7
  - Titers of 1:32 or greater are protective from death
  - Titers of 1:128 and greater give best protection from virus replication and shedding
  - Need ≥ 80% with protective antibody titers
- Vaccinated flocks should be boosted if < 80% have titers ≥ minimum established titer by control authority

Solution: Monitor all vaccinated flocks, and boost as needed to determine herd immunity in *at risk* population

2a. AI Diagnostic/Surveillance Overview: Non-vaccinated Flocks



- *Syndromic surveillance – presented with sick or dead birds for diagnostics
- With eradication goals – speed and accuracy are essential

2b. AI Diagnostic/Surveillance Overview: Vaccinated Flocks (HA-positive)

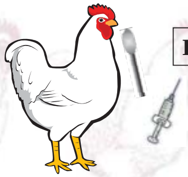
Active infection

Prior exposure

1) Syndromic* or 2) active surveillance target

Virus detection

Antibody detection: vaccine dependent



Type A influenza
Real-time RT-PCR
Virus isolation
Antigen immunoassays

HA recombinant

Heterologous NA

Type A specific ELISA AGID

NA subtype specific assay

Subtype Identification
Real-time RT-PCR
Serological tests (HI and NI)
Gene sequencing

H5 or H7

Pathotype classification
In vivo assay
Gene sequencing

Highly pathogenic
Low pathogenic

With surveillance goals – vaccination complicates HA serology

2b. Surveillance for AIV

Syndromic Surveillance ('Biosensor')

- Identifiable, susceptible population
  - Non-vaccinated sentinel birds that die (defined, tagged population; ex. Hong Kong vaccination program)
  - Daily mortality or sick vaccinated birds (undefined)
    - Antibody negative birds – missed during vaccination
    - Poorly immunized birds – poor immune response to vaccine or low quality vaccine
- Rapid sensitive detection methods
  - Pooled oral swabs, maximum of 11/tube
  - Screen with flockside antigen-capture tests: '+/-' should be confirmed in sensitive/specific lab test
  - Confirmatory testing:
    - RRT-PCR: 3 hour laboratory test
    - Virus isolation – HPAI virus in 48 hours

2b. Surveillance for AIV infection

Active Serological Surveillance for AIV Infection; i.e. where is the field virus circulating?

- Heterologous neuraminidase vaccine - specific anti-neuraminidase antibodies (NI, IFA or ELISA) in vaccinated poultry
- Example:
  - H7N3 HPAI outbreak
  - H7N2 vaccine
  - Antibodies to N3 indicates H7N3 infection in vaccinated poultry
- Cannot do active serological surveillance in non-vaccinated sentinel chicken for HPAIV; i.e. dead, but can for LPAIV

2b. Surveillance for AIV infection

Active Serological Surveillance for AIV Infection; i.e. where is the field virus circulating?

- <u>Recombinant vaccine with HA only</u> - Specific anti-NP/M antibodies (AGID or ELISA) in vaccinated poultry
- Example:
  - H7N3 HPAI outbreak
  - rHVT-H7 vaccine
  - Antibodies to NP/M indicates active virus infection – need to identify the virus subtype (HA and NA using Hi and NI, respectively)
- Issues with sensitivity of tests to identify infection within vaccinated population and sampling strategies to identify such infected birds

OTHER ISSUES: SAMPLE TYPES AND PROCESSING METHODS

Species/ Sample Type	Recommended Specimen	Suggested Processing Method	Notes
Gallinaceous Poultry (chickens, turkeys, quail)	Tracheal or oropharyngeal swab	RNeasy or Ambion Magnetic bead RNA extraction, then RRT-PCR	Virus primarily replicates in the respiratory tract (LPAI)
Waterfowl-ducks	Wild birds - Cl Swabs; Domestic waterfowl – oral & Cl swabs	Ambion Magnetic Bead RNA extraction then RRT-PCR	Virus primarily replicates in the intestinal tract. RNA extraction method must be modified for cloacal samples
Any species	Tissue samples	Macerate with glass beads in Trizol and then Magnetic beads	For HPAI viruses high levels of virus may be in tissues.
Environmental samples	(Swab)	Virus isolation to detect live virus	RRT-PCR can detect inactivated virus, so may be inappropriate

OTHER ISSUES: SAMPLE TYPES

- Oropharyngeal and trachea swabs optimal for poultry
- Cloacal swabs (poultry or wild-bird) must be processed differently and should be run with an internal positive control
- Tissue: Lung best for LPAIV and HPAIV
- Samples from "epidemiological unit", not individual animal

TESTS ARE FOR DETECTING: USE UNDER CORRECT PROGRAM

- Active infection
  - 1° - Virus genetic material (RNA)
    - rRT-PCR: Matrix and subtype tests (H5, H7, others)
  - 2° - Virus isolation and characterization
    - Chicken embryo inoculation
    - HA activity, AGID, rRT-PCR
    - HI and NI subtyping
  - 3° - Immunoassays /Antigen detection tests
- Prior exposure
  - Antibody – influenza A group
    - AGID
    - ELISA
  - Positives – followed with HI and NI tests for subtype determination
  - Outbreak scenarios or endemic situations – may do subtype-specific HI as surveillance test
  - May be difficult to collect sera at LPM, better on farm

Virology Laboratory Tests

- Appropriate test by design: Screening (pen-side & syndromic surveillance), detection AIV (rRT-PCR) or isolation AIV (VI eggs)
- Virus Isolation verses rRT-PCR (latter better in low virus titer samples and more rapid)
- Virus Isolation: 9-11-day-embryonating chickens eggs >>> cell culture
- Fresh specimen for virus isolation w/cold chain vs preserve nucleic acids (watch organic material to media ratio – don't overwhelm protectant or preservative)
- Problems of bacterial and other viral contaminants in VI samples
- Lab cross contamination during amplification steps

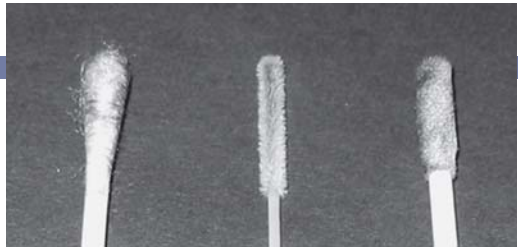
Lateral flow devices – screening tool

- Pros
  - Rapid and on site- 15 minutes
  - Highly specific- positives are reliable
  - Inexpensive (US kits -$8-10 per test)
  - Can use same sample types as other tests
  - Not species specific
  - Type A specific
    - Some subtype specific tests are available regionally-subtype specific tests less reliable
  - Can be used with HP or LP AIV but best when presented with dead birds and in syndromic surveillance programs

Lateral flow devices

- Cons
  - Low sensitivity- 10^4 to 10^5 EID_{50}/ml needed in sample
    - False negatives possible
    - Best during peak of shed (2-4 days post infection for an individual bird)
  - Weak positives may be difficult to see for untrained personnel, especially seen with autolytic specimens

Swab Type

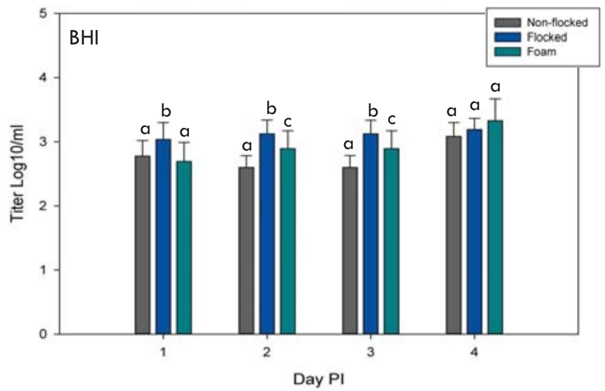


- Public health research has shown differences in respiratory virus detection among swab types
  - Capture and release
- Current swab most commonly used in the US
  - Non-flocked/wound (dacron/nylon tipped), plastic shaft
- Newer types
  - Flocked (nylon)
  - Foam (urethane)
- All cost the same (~$0.10 USD)
- All have the same head size

Swab type: rRT-PCR OP Swab Titers

1, 2, 3, 4 DPI- 100% positive

10 and 14 DPI- All negative



Flocked swabs superior to non-flocked swabs

Swab Pooling

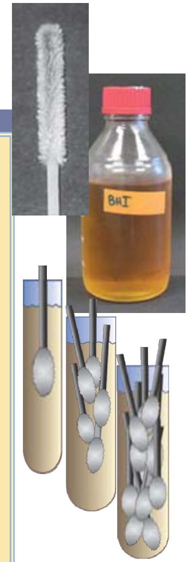
- **AIV**
  - No difference in the number positive by virus isolation or rRT-PCR OP swabs
  - Too few CL swabs were positive to draw conclusions

- **NDV**
  - No difference in the number positive by virus isolation or rRT-PCR for OP swab

  - Pooling up to 11 OP swabs did not affect rRT-PCR or virus isolation

Recommendations for all tests

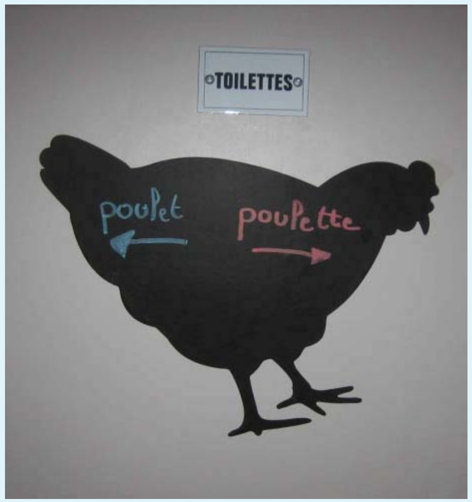
1. Flocked swabs
   - No wooden shafts, No Calcium Alginate swabs, avoid cotton
   - No dry swabs
2. BHI (or similar protein containing buffered media)
   - Antibiotics preferred (unless bacteriological examination will be conducted with the same specimen)
3. Up to 11 swabs per vial (5.5ml media and larger tube)
   - Puts all you swabs in one tube; no back-up if loss or breakage occurs
4. Transport vial with swab in or out; Impacts work flow/logistics at the lab, particularly if the swabs are left in
5. Keep samples cool (e.g. on ice). Do NOT freeze samples (-20C kills virus)
6. Transport to the lab within 24 hrs



Conclusions

- Surveillance for AIV (virus) or AIV infection (antibodies) uses a combination of syndromic (clinical case diagnostics) and active (non-clinical case) surveillance
- Surveillance in vaccinated populations is more complex than in non-vaccinated populations
  - Antibodies to HA, NP/M and other proteins in the vaccine interferes with routine tests used in serosurvellance
  - Examination for virus must be focused on susceptible population; i.e. clinically-ill/dead non-vaccinated sentinels or vaccinated chickens
  - Serosurveillance is dependent on type of vaccine used
    - Heterologous neuraminidase – test for NA antibodies
    - HA recombinant vaccine – NP/M antibody tests (AGID/ELISA)
    - Inactivated whole virus vaccine – only can use non-vaccinated sentinels

Thank You!



Animal Influenza Meetings: 12-17 April 2015

9th International Symposium on Avian Influenza

- 12-15 April, 2015
- University of Georgia, Athens, Georgia, USA
- Co-chairs: David Swayne, Ian Brown, David Stallknecht
- Questions: David.Swayne@ars.usda.gov

- OFFLU Meeting, 15 (afternoon) April 2015, secretariat@offlu.net

- 3rd International Neglected Influenza Viruses meeting, 15 (beginning in evening)-17 April 2015
  - Co-Chairs: Tom Chambers; tmcham1@uky.edu
    Stacey Schultz-Cherry; stacey.schultz-cherry@stjude.org

OIE Regional Workshop on Enhancing Influenza A Viruses National Surveillance, Tokyo, Japan, August 26-28, 2014

H5N1 avian influenza vaccination in China

Hualan Chen

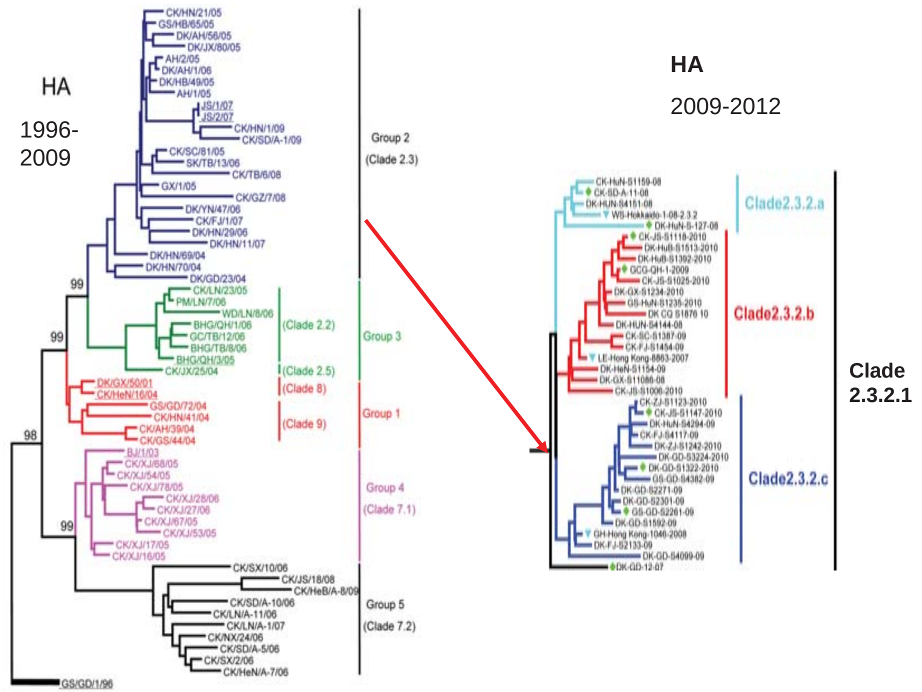
Harbin Veterinary Research Institute, CAAS

The most important poultry disease

- Resulting in the death or culling of over 250 million poultry and wild birds
- Involved multiple countries; infected wild birds
- Endemic in several developing countries—impossible to control the disease by "stamping out"

Vaccination is an alternative

- **Oil adjuvant inactivated vaccines:** the naturally isolated low pathogenic virus or attenuated high-growth virus generated by reverse genetics as seed strains
- **Live virus-vectored vaccines:** Recombinant fowlpox virus, recombinant Newcastle disease virus



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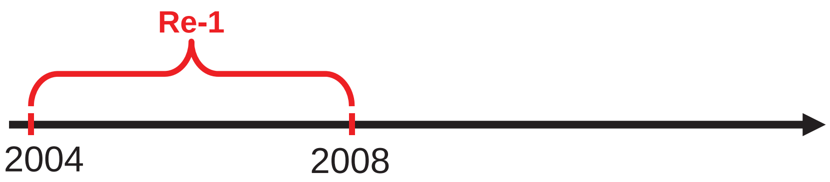

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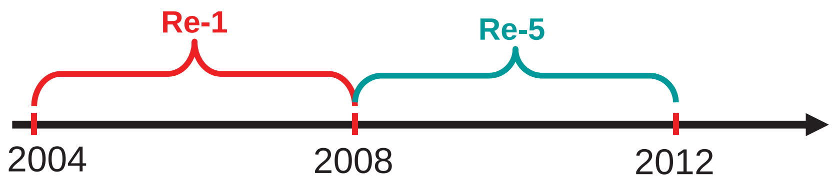

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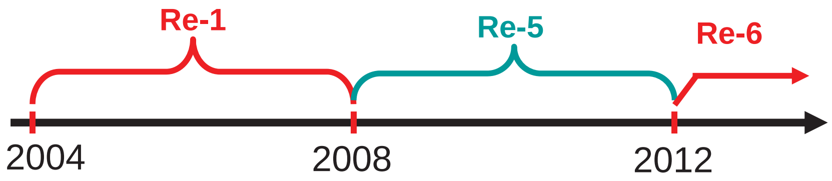

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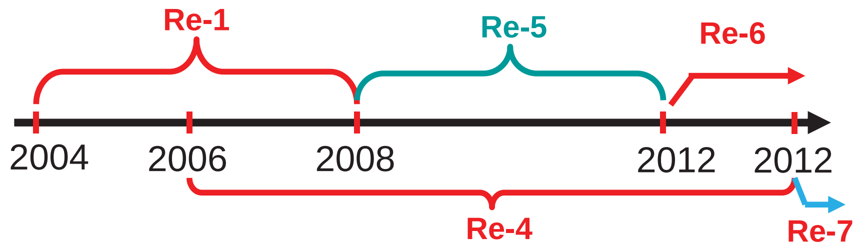

Seed virus generated		Doses used in each year (billions)[a]									Total
Seed name	*HA* and/or *NA* gene donor virus (HA clade)	2004	2005	2006	2007	2008	2009	2010	2011	2012	
A/Turkey/England/N-28/73 (H5N2) (N-28)	Not applicable	2.5	4.08	3.6	/	/	/	/	/	/	10.18
H5N1/PR8 (Re-1)	A/goose/Guangdong/1/1996 (0)	0.57	3.3	4.57	9.6	4.6	/	/	/	/	22.64
H5N1/PR8 (Re-4)	A/chicken/Shanxi/2/2006 (7.2)	/	/	0.84	0.42	0.59	0.54	0.95	0.24	0.025	3.605
H5N1/PR8 (Re-5)	A/duck/Anhui/1/2006 (2.3.4)	/	/	/	/	4.4	7.20	6.80	6.77	3.71	28.88
Re-1/Re-4	–	/	/	/	2.2	1.5	/	/	/	/	3.7
Re-4/Re-5	–	/	/	/	/	1.5	9.08	7.51	7.67	4.03	29.79
H5N1/PR8 (Re-6)	A/duck/Guangdong/ S1322/2006 (2.3.2)	/	/	/	/	/	/	/	/	3.66	3.66
Re-4/Re-6	–	/	/	/	/	/	/	/	/	4.23	4.23
H5N1/PR8 (Egypt-1)	A/chicken/Egypt/18-H/09 (2.2.1.1)	/	/	/	/	/	/	/	0.25	0.2	0.45
rFPV-HA-NA	A/goose/Guangdong/1/1996 (0)	/	0.615	/	/	/	/	/	/	/	0.615
rLH5-1	A/goose/Guangdong/1/1996 (0)	/	/	2.6	1.3	0.5	/	/	/	/	4.4
rLH5-5	A/duck/Anhui/1/2006 (2.3.4)	/	/	/	/	0.7	1.47	1.74	1.71	1.03	6.65
rLH5-6	A/duck/Guangdong/S1322/2006 (2.3.2)	/	/	/	/	/	/	/	/	0.72	0.72

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Over 100 billions doses have been used in China, Vietnam, Indonesia, Egypt, and several other countries

Challenge 2

- **Vaccination coverage rate** is difficult to reach to the level (>70%) that is required for the national population immunity

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Species	Breeder chickens and layers		
Rough amount	4-5 billions		
Vaccination coverage rate	**>80%**		

Challenge 2

- **Vaccination coverage rate** is difficult to reach to the level (>70%) that is required for the national population immunity

Species	Breeder chickens and layers	Waterfowls (ducks)	
Rough amount	4-5 billions	4 billions	
Vaccination coverage rate	**>80%**	<30%	

Challenge **2**

- **Vaccination coverage rate** is difficult to reach to the level (>70%) that is required for the national population immunity

Species	Breeder chickens and layers	Waterfowls (ducks)	Broilers
Rough amount	4-5 billions	4 billions	8 billions
Vaccination coverage rate	**>80%**	<30%	<20%

Ducks

- Though H5N1 strains are lethal for chickens, most of them replicate in ducks asymptomatically.

Duck enteritis virus (DEV)

- Duck viral enteritis is acute contagious disease in susceptible flocks of domestic waterfowl caused by DEV, a herpesvirus.

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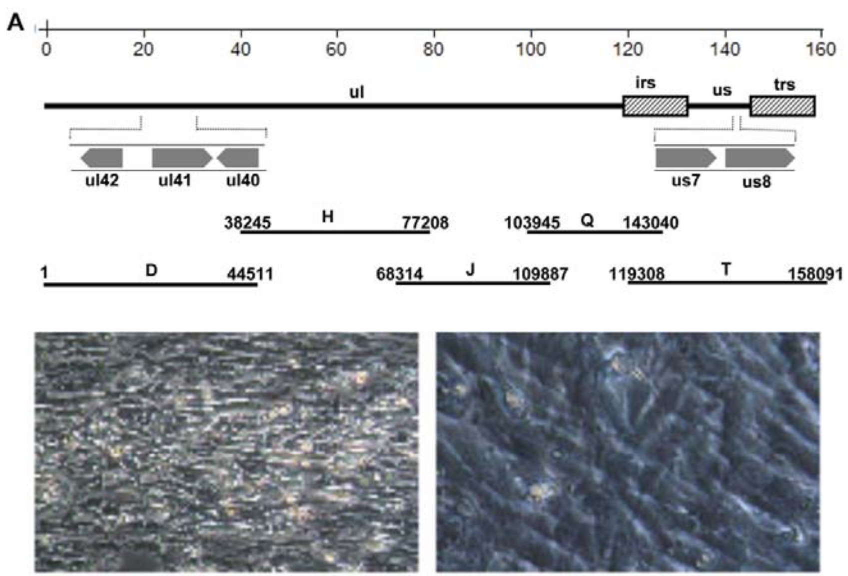
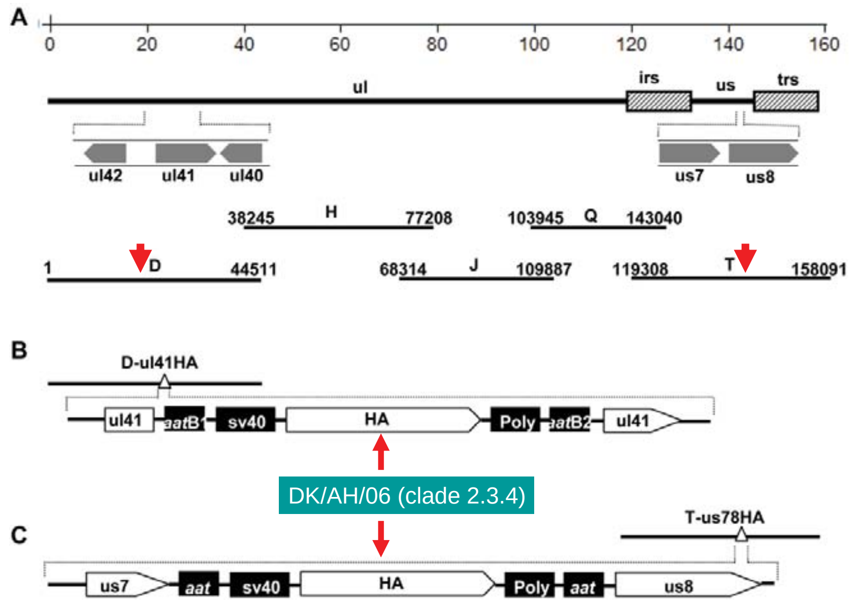
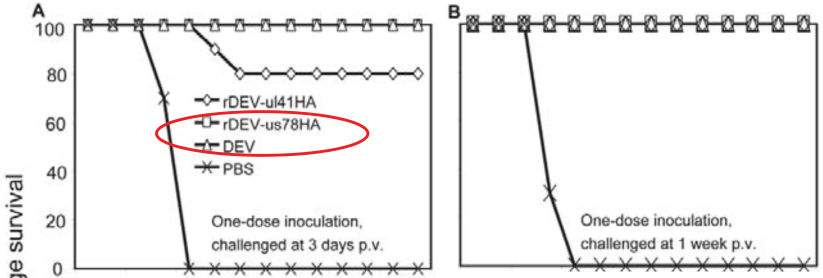
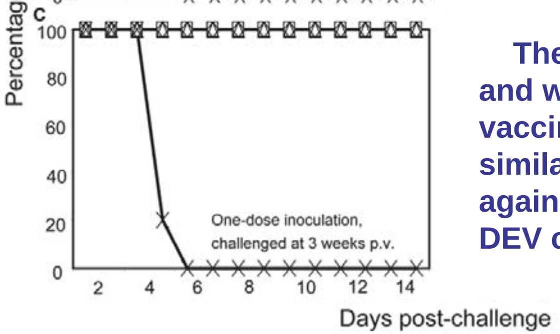
- Live attenuated DEV vaccine has been widely used to control the disease in duck producing area. In China, more than 70% ducks received at least two doses of this vaccine.
- Can a recombinant DEV-HA virus work as a bivalent vaccine in ducks against both DEV and H5N1 virus?





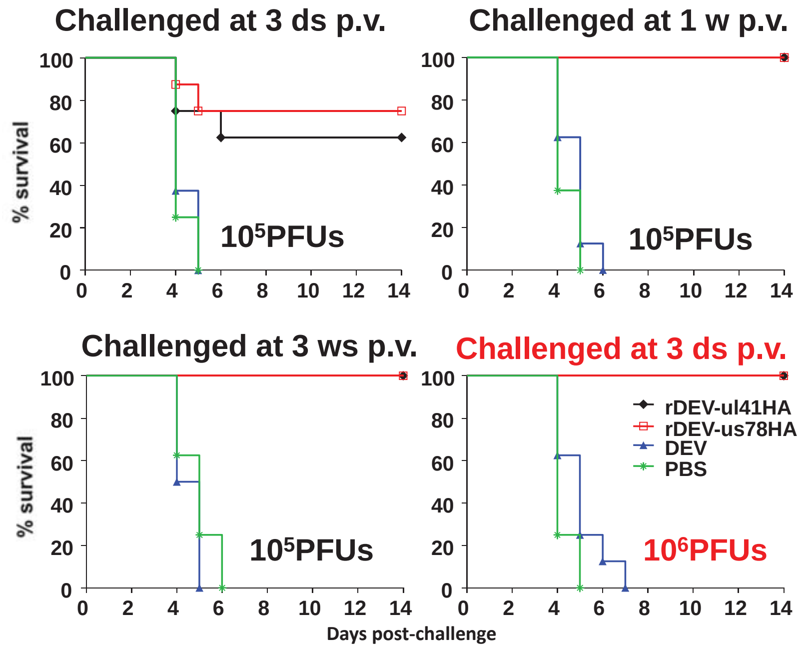
Protection against to the lethal DEV Challenge





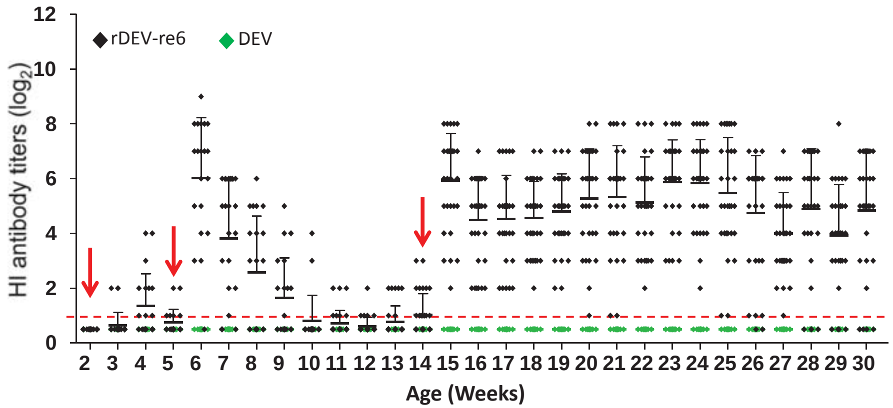
The rDEV-us78HA and wild type DEV vaccine virus provide similar protection against the lethal DEV challenge.

Protection against to the lethal H5N1 Challenge



Field test in ducks

500 2-week-old layer ducks were used



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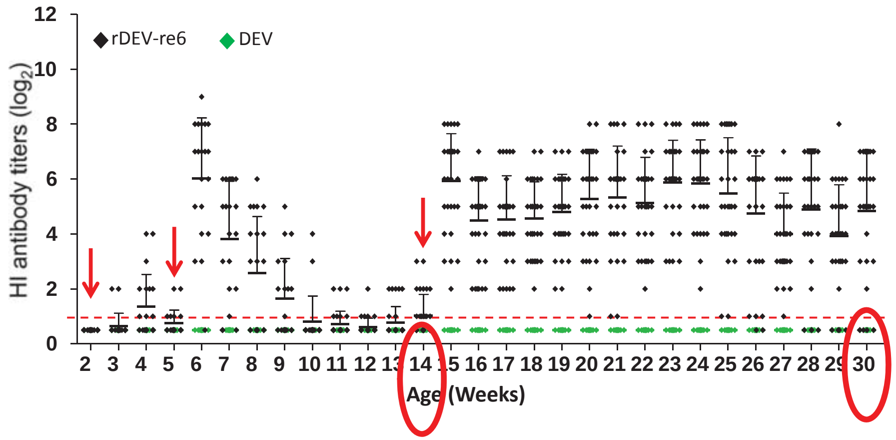

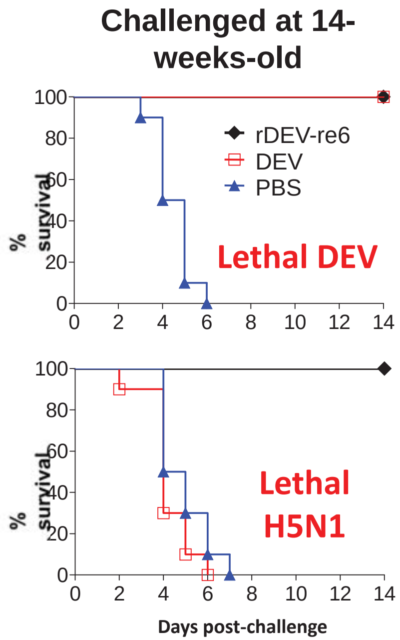

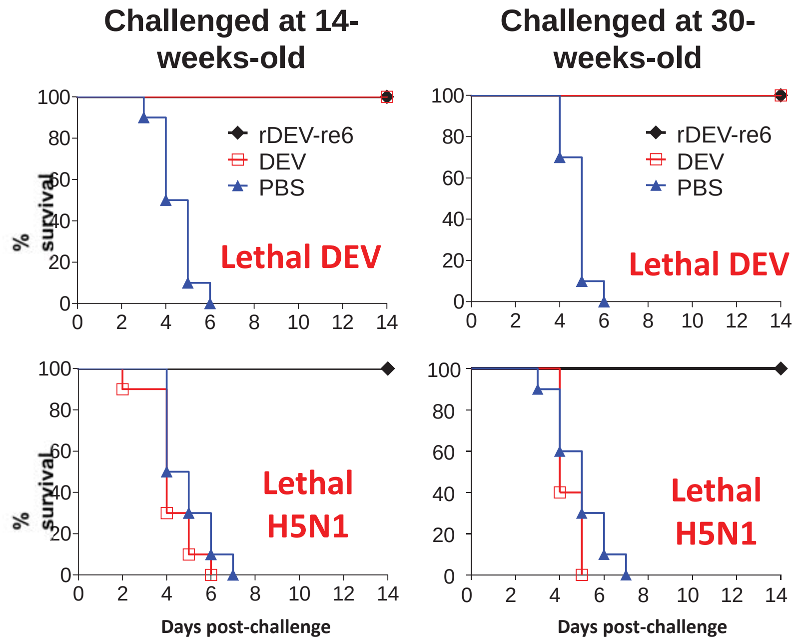

These results demonstrated that the recombinant DEV expressing the H5N1 virus HA gene could work as an ideal live virus bivalent vaccine against both the DEV and H5N1 virus in ducks!

Challenge 2

- **Vaccination coverage rate** is difficult to reach to the level (>70%) that is required for the national population immunity

Species	Breeder chickens and layers	Waterfowls (ducks)	Broilers
Rough amount	4-5 billions	4 billions	8 billions
Vaccination coverage rate	>80%	<30%	<20%

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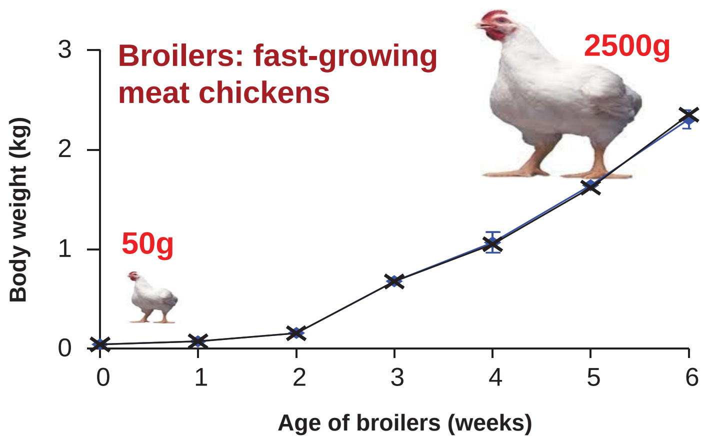
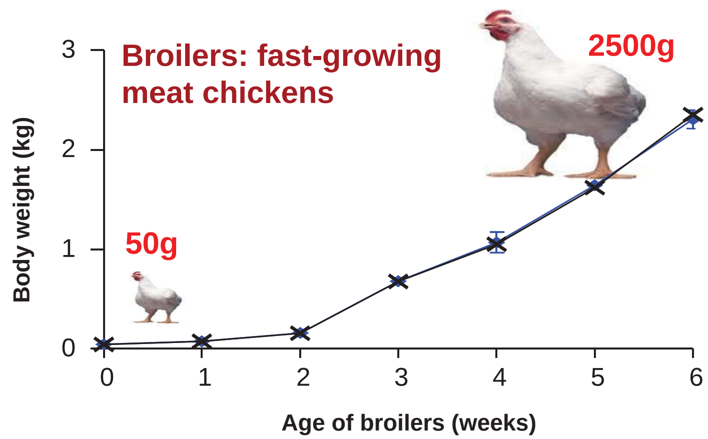


Problems of currently vaccines in broilers:

1. **Live virus vaccines were affected by maternal antibodies against to the vector viruses, two doses are needed**
2. **Killed vaccine needs 2-3 weeks to induce enough protection**



Test in broilers

Birds: 100 birds in each group

Inoculations: rDEV-re6, DEV, inactivated vaccines, PBS

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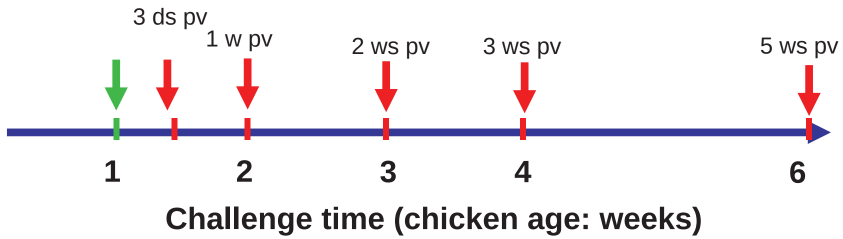
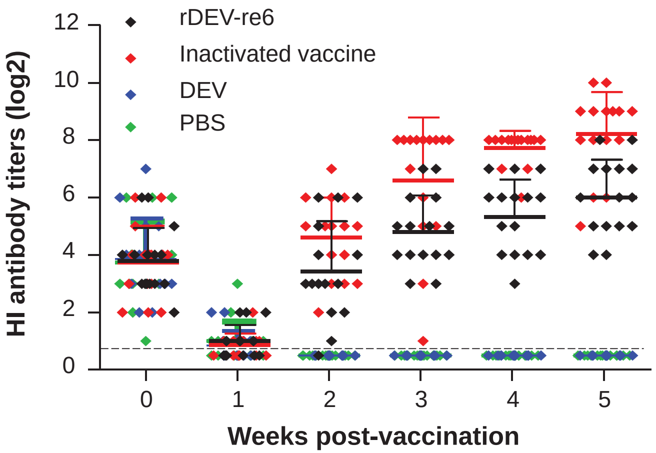
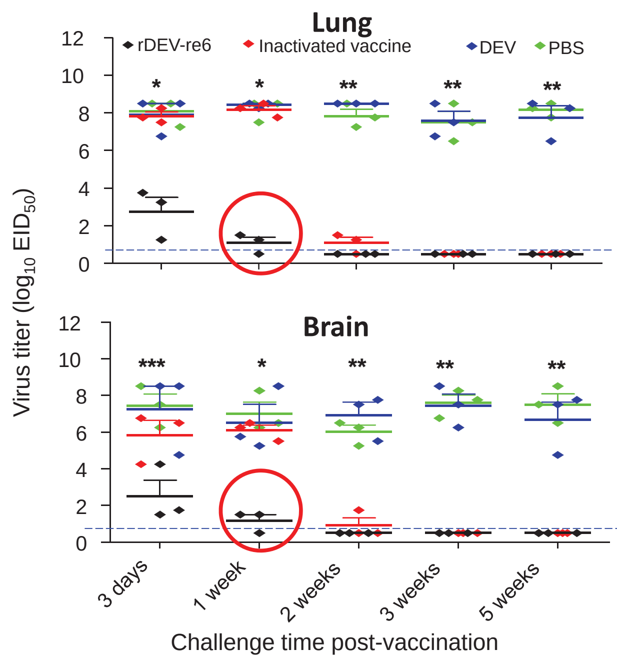
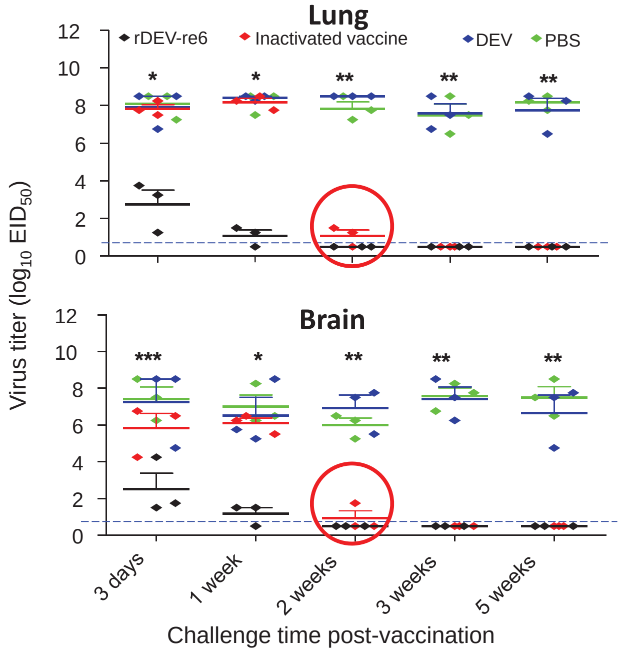
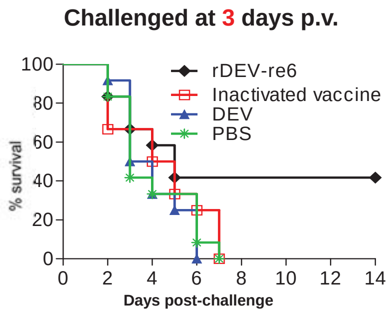


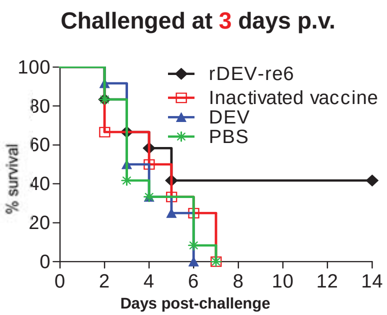
HI antibody titers in broilers






Lung
rDEV-re6
Inactivated vaccine
DEV
PBS
Brain
Virus titer (log10 EID50)
3 days
1 week
2 weeks
3 weeks
5 weeks
Challenge time post-vaccination


Challenged at 3 days p.v.
rDEV-re6
Inactivated vaccine
DEV
PBS
% survival
Days post-challenge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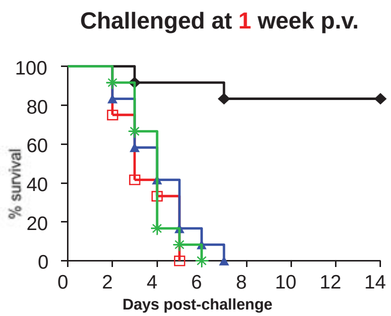
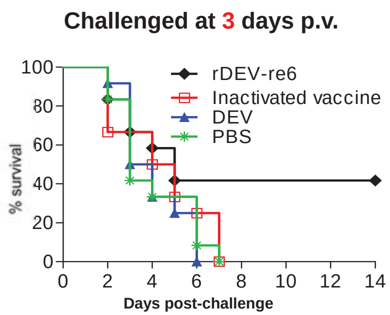
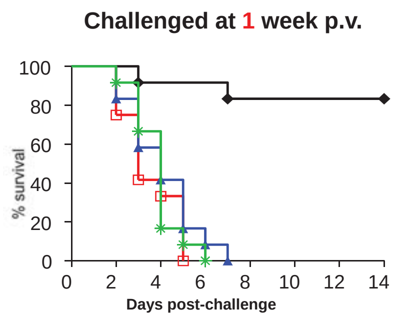
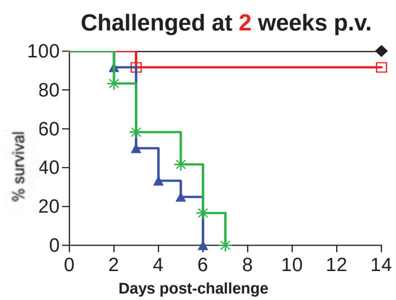
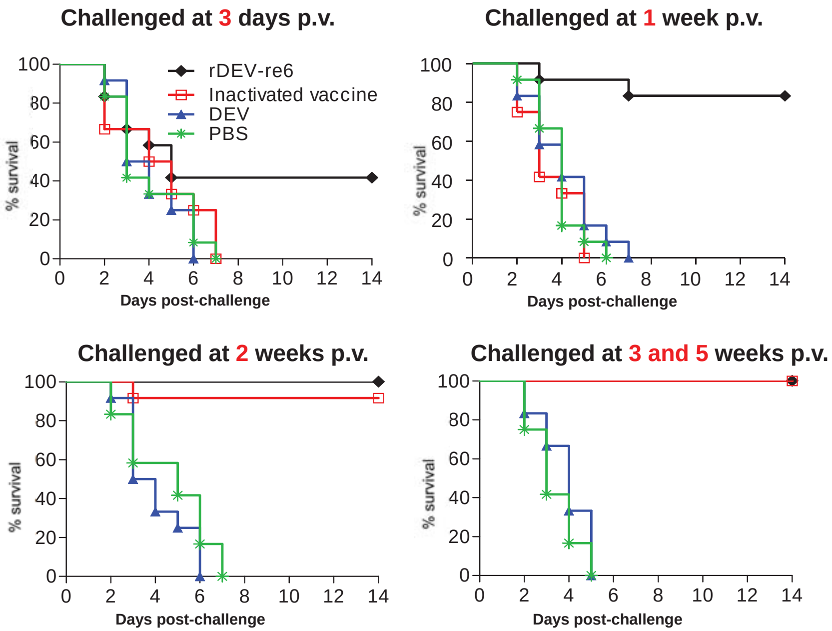

Challenged at 1 week p.v.
% survival
Days post-challenge


Challenged at 3 days p.v.
rDEV-re6
Inactivated vaccine
DEV
PBS
% survival
Days post-challenge


Challenged at 1 week p.v.
% survival
Days post-challenge


Challenged at 2 weeks p.v.
% survival
Days post-challenge



These results demonstrated that the recombinant DEV expressing the H5N1 virus HA gene could work as an ideal single dose live virus vaccine against lethal H5N1 virus infection in broilers!

Summary

- The low vaccination coverage rate in ducks and broilers is the major challenge for the complete control or eradicate the disease in China

Summary

- The low vaccination coverage rate in ducks and broilers is the major challenge for the complete control or eradicate the disease in China

- We, for the first time, developed a platform to generate recombinant DEV and demonstrated that the rDEV expressing H5N1 HA gene could work as a bivalent live vaccine for DEV and H5N1 in ducks and as a single dose vaccine for H5N1 virus in broilers.

Does vaccination drive the variation of influenza viruses?

- **No, I do not think so!** Because in China, the use of vaccine have made several clades of H5N1 viruses disappeared.
- H6 subtype virus as an example.

The H6 viruses detected in China from 2008-2011 show clear antigenic difference

TABLE 4 Antigenic analysis of H6 avian influenza viruses isolated in China

Virus (HA group)	HI antibody titer of antiserum against virus (HA group)[a]: CK/GD/S1312/10 (H6N2) (1)	DK/HuB/S1114/09 (H6N2) (2)	DK/ZJ/S4204/10 (H6N6) (3)	DK/GD/S4192/08 (H6N2) (4)	DK/GD/S1419/11 (H6N6) (5)
CK/GD/S1312/10 (H6N2) (1)	<u>640</u>	80	40	<10	<10
DK/GD/S1328/10 (H6N2) (1)	640	80	80	<10	<10
GS/GD/S1384/10 (H6N2) (1)	640	80	80	<10	<10
DK/GD/S1289/10 (H6N2) (1)	320	40	80	<10	<10
DK/HuN/S3047/09 (H6N2) (1)	320	40	80	<10	<10
CK/GD/S1453/10 (H6N2) (1)	640	80	80	<10	<10
DK/HuB/S4135/10 (H6N2) (1)	320	40	80	<10	<10
CK/GD/S1414/10 (H6N6) (1)	640	80	80	<10	<10
DK/ZJ/S1023/10 (H6N6) (1)	320	80	160	<10	<10
DK/GD/S3180/10 (H6N6) (1)	640	80	80	<10	<10
DK/HuN/S4273/10 (H6N6) (1)	320	80	80	<10	<10
CK/GD/S1311/10 (H6N6) (1)	640	80	40	<10	<10
CK/HuN/S4495/10 (H6N6) (1)	320	40	80	<10	<10
CK/HuN/S3003/09 (H6N6) (1)	320	40	80	<10	<10
DK/HuB/S1114/09 (H6N2) (2)	320	<u>160</u>	40	<10	<10
DK/HuB/S4170/08 (H6N2) (2)	160	160	40	<10	<10
DK/HuN/S1284/09 (H6N2) (2)	320	160	160	<10	<10
DK/GD/S4018/10 (H6N6) (2)	160	80	160	<10	<10
DK/GD/S1663/09 (H6N6) (2)	80	80	160	<10	<10
CK/GX/S4029/10 (H6N6) (2)	160	80	80	<10	<10
DK/ZJ/S4204/10 (H6N6) (3)	80	<10	<u>320</u>	<10	<10
CK/HuN/S4191/09 (H6N2) (3)	80	<10	320	<10	<10
DK/HuN/S4386/09 (H6N2) (3)	80	<10	320	<10	<10
DK/HuB/S1366/09 (H6N2) (3)	80	<10	320	<10	<10
CK/GX/S4381/10 (H6N6) (3)	40	<10	320	<10	<10
DK/GX/S4111/10 (H6N6) (3)	80	<10	320	<10	<10
DK/GD/S4192/08 (H6N2) (4)	80	<10	160	<u>160</u>	<10
DK/GD/S1566/09 (H6N2) (4)	40	<10	160	80	<10
DK/GD/S1419/11 (H6N6) (5)	40	20	20	<10	<u>1280</u>
CK/GD/S2346/09 (H6N2) (5)	40	40	80	<10	160
DK/FJ/S4081/08 (H6N2) (5)	40	40	40	<10	160
DK/GD/S4251/10 (H6N6) (5)	20	20	20	<10	640
GS/GD/1/96 (H5N1)[b]	<10	<10	<10	<10	<10
Newcastle disease virus (LaSota strain)[b]	<10	<10	<10	<10	<10

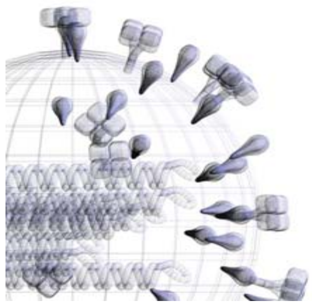
TABLE 3 Genotype and manifestation in mice of H6 influenza viruses

Virus	Group of each gene segment in the phylogenetic tree: HA	NA	PB2	PB1	PA	NP	M	NS	Genotype
DK/GD/S1328/10 (H6N2)	1	1	1	1	1	1	1	1	A1
GS/GD/S1384/10 (H6N2)	1	1	1	1	1	1	1	1	A1
DK/GD/S1289/10 (H6N2)	1	1	1	1	1	1	1	2	A2
DK/HuN/S3047/09 (H6N2)	1	1	1	1	2	1	1	1	A3
CK/GD/S1453/10 (H6N2)	1	1	2	2	1	1	1	2	A4
CK/GD/S1312/10 (H6N2)	1	5	1	5	1	1	5	5	A5
DK/HuB/S4135/10 (H6N2)	1	5	6	5	4	5	5	5	A6
DK/HuB/S4170/08 (H6N2)	2	2	5	4	5	2	4	4	A7
DK/HuB/S1114/09 (H6N2)	2	3	1	1	1	1	1	1	A8
DK/HuN/S1284/09 (H6N2)	2	4	1	2	2	1	1	3	A9
CK/HuN/S4191/09 (H6N2)	3	1	1	1	1	1	1	1	A10
DK/HuN/S4386/09 (H6N2)	3	1	4	1	1	1	1	2	A11
DK/HuB/S1366/09 (H6N2)	3	2	1	1	1	1	1	2	A12
DK/GD/S4192/08 (H6N2)	4	1	1	1	3	1	1	2	A13
DK/GD/S1566/09 (H6N2)	4	2	1	1	3	1	1	2	A14
CK/GD/S2346/09 (H6N2)	5	2	5	4	5	2	4	4	A15
DK/FJ/S4081/08 (H6N2)	5	2	5	4	5	2	4	4	A15
CK/GD/S1414/10 (H6N6)	1	1	1	1	1	1	1	1	B1
DK/ZJ/S1023/10 (H6N6)	1	1	1	1	1	1	1	1	B1
DK/GD/S3073/10 (H6N6)	1	1	1	1	1	1	1	1	B1
GS/GD/S4362/09 (H6N6)	1	1	1	1	1	1	1	1	B1
DK/GD/S1155/11 (H6N6)	1	1	1	1	2	2	1	2	B2
DK/GD/S3180/10 (H6N6)	1	1	1	1	3	1	1	1	B3
DK/HuN/S4273/10 (H6N6)	1	1	1	3	2	1	1	2	B4
CK/GD/S1311/10 (H6N6)	1	1	1	5	1	1	5	5	B5
DK/ZJ/S1134/11 (H6N6)	1	1	2	1	1	1	1	1	B6
DK/GD/S3225/10 (H6N6)	1	1	2	1	1	1	1	1	B6
DK/GD/S3468/10 (H6N6)	1	1	2	2	1	1	1	1	B7
CK/HuN/S4495/10 (H6N6)	1	1	5	3	2	3	1	4	B8
CK/HuN/S3003/09 (H6N6)	1	3	1	1	2	1	3	1	B9
DK/GD/S4018/10 (H6N6)	2	1	2	1	1	1	1	2	B10
DK/GD/S1663/09 (H6N6)	2	3	1	1	1	1	1	1	B11
CK/GX/S4029/10 (H6N6)	2	3	2	2	1	1	1	1	B12
CK/GX/S4381/10 (H6N6)	3	1	1	1	1	1	1	1	B13
DK/GX/S4111/10 (H6N6)	3	1	1	1	1	1	1	1	B13
DK/ZJ/S4204/10 (H6N6)	3	1	1	2	2	1	1	1	B14
DK/GD/S4251/10 (H6N6)	5	2	3	2	1	4	2	3	B15
DK/GD/S1419/11 (H6N6)	5	2	3	2	1	4	2	3	B15

Thirty-eight H6 subtype viruses formed **30** different genotypes.

Wang et al., JVI, 2014

Thanks!



Vaccine efficacy against H5N1 virus

SPF ducks: 12 groups of 11 ducks

Inoculation: rDEV-ul41HA, rDEV-us78HA, DEV, PBS

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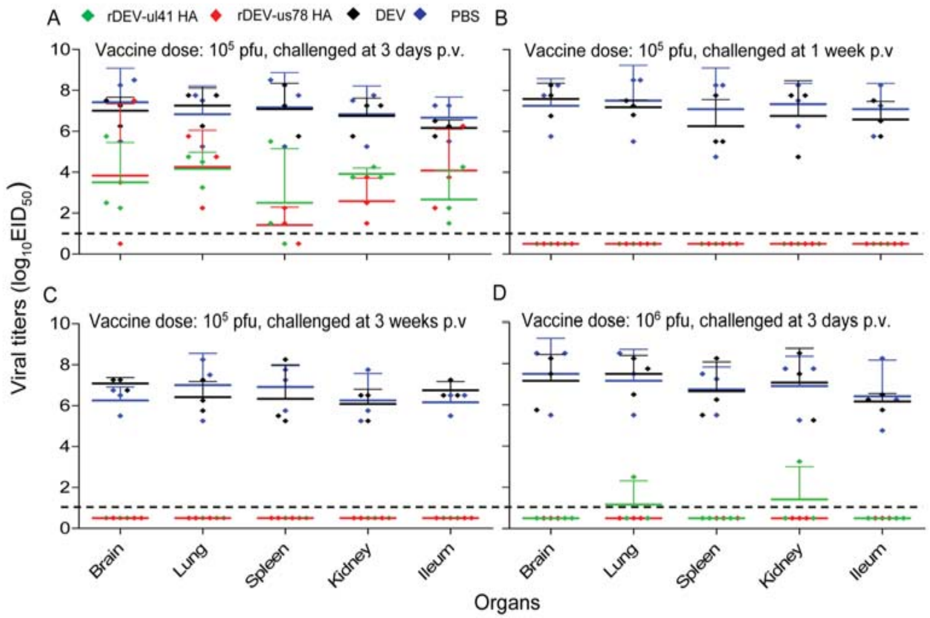
Inoculation: rDEV-ul41HA, rDEV-us78HA, DEV, PBS

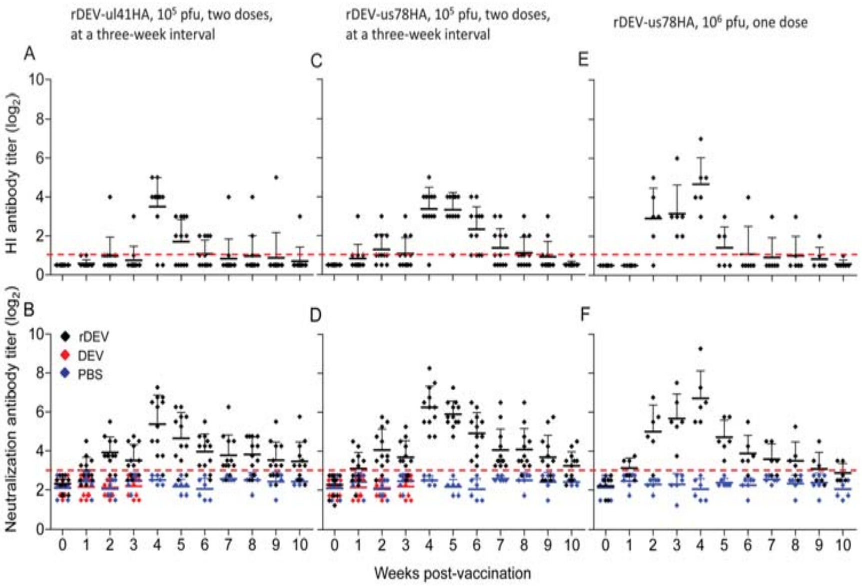
Challenge: 100-fold DLD50 of H5N1 virus at 3, 7, and 21 days post vaccination, respectively

Challenged virus replication in organs of ducks



Challenge virus shedding in the broilers received different vaccines

Challenge time (post-vaccination)	Vaccine	No. of swabs shedding virus/total no. on day p.c.[b]					
		3		5		7	
		Oropharyngeal	Cloacal	Oropharyngeal	Cloacal	Oropharyngeal	Cloacal
3 days	rDEV-re6	3/8	5/8	1/5	0/5	0/5	0/5
	Inactivated vaccine	6/8	7/8	3/5	0/5	NA[c]	NA
	DEV	5/6	6/6	3/3	3/3	NA	NA
	PBS	4/5	5/5	4/4	4/4	NA	NA
1 week	rDEV-re6	1/11	2/11	1/11	0/11	0/10	0/10
	Inactivated vaccine	5/5	4/5	NA	NA	NA	NA
	DEV	4/7	5/7	2/2	2/2	NA	NA
	PBS	7/8	6/8	1/1	1/1	NA	NA
2 weeks	rDEV-re6	0/12	0/12	0/12	0/12	0/12	0/12
	Inactivated vaccine	2/11	2/11	2/11	3/11	1/11	0/11
	DEV	3/6	4/6	3/3	3/3	NA	NA
	PBS	7/7	6/7	4/5	4/5	NA	NA
3 weeks	rDEV-re6	0/12	0/12	0/12	0/12	0/12	0/12
	Inactivated vaccine	0/12	0/12	0/12	0/12	0/12	0/12
	DEV	6/8	7/8	NA	NA	NA	NA
	PBS	3/5	5/5	NA	NA	NA	NA
5 weeks	rDEV-re6	0/12	0/12	0/12	0/12	0/12	0/12
	Inactivated vaccines	0/12	0/12	0/12	0/12	0/12	0/12
	DEV	8/9	9/9	3/3	3/3	NA	NA
	PBS	6/7	6/7	NA	NA	NA	NA



rDEV-ul41HA, 10^5 pfu, two doses, at a three-week interval
rDEV-us78HA, 10^5 pfu, two doses, at a three-week interval
rDEV-us78HA, 10^6 pfu, one dose
A
B
C
D
E
F
HI antibody titer (log2)
Neutralization antibody titer (log2)
rDEV
DEV
PBS
Weeks post-vaccination

National Strategies for Controlling Avian Influenza Viruses Bangladesh

Background information

- Animal population

Birds	Million	Animal	Million
Chicken	249	Cattle	23.34
Duck	47.2	Buffalo	1.45
		Goat	25.27
		Sheep	3.14

- Major animal diseases of concerns

Birds		Animal	
NCD	IBD	FMD	PPR
HPAI	Salmonellosis	Anthrax	H.S
Mycoplasma	Duck Plague		

Influenza (H5N1)outbreaks history

Year	Commercial	Backyard	Total
2007	44	25	69
2008	208	18	226
2009	23	09	32
2010	29	02	31
2011	168	03	171
2012	23	0	23
2013	3	0	3
2014	2	0	2
Grand Total	500	57	557

- Clade/sub clade: 2.2.2 (2.2), 2.3.4, 2.3.2.1
  - Up tp 2010: only one sub-clade (2.2.2) exist
  - From 2011 (Jan): two more sub clades evolved
- Temporal distribution:
  - Less humid and dry part of the year
- Spatial distribution
  - 52 districts affected
  - Not reported from hilly districts
  - H7N9 is not yet detected in Bangladesh

National control strategy

- Intensive surveillance
- Strengthening diagnostic capability
- Early detection and stamping out and compensation
- Decontamination, movement restriction
- Enhanced biosecurity in poultry farms
- Hygienic improvement of live bird markets
- Public Awareness
- Strengthening coordination with Public health and environment sector

National surveillance programme

- Avian Influenza Surveillance Types

Actives Surveillance	Passive Surveillance
➢Actives Diseases search-Field man and Animal Workers collcet the seram,clocak and oropha sample from Ducks ,chicken,pig for antibodies and virues identification.	Farmers reports even to Veterinary Authorities
➢Live Birds Market - Animal Health Wokers collect the sample from the LBM	Fields Veterinarians Reports to Epidemiology Unit ,DLS
➢Farms- Labs, person collect the sample from the farms	Volunteers to Reports Local Upazlla Office
➢Backyeards - Animal Health Worker regularly serum and swab sample collect from Backyeard chicken .	Laboratories Reports to Epidemiology Unit
➢Environments-Field workers collect the sample from LBMs.	
➢Wetlands-Faces sample collected from Wetland and test are done BLRI	

Laboratories Diagnosis

Diagnosis Center	Number	Facilities Available
District Veterinary Hospital	35	Necropsy, Rapid AI Antigen Detection (RAD) .
Central Veterinary hospital	01	Clinical and pathological diagnosis.
Field disease investigation laboratory	09	Necropsy, RAD, serology and bacteriological analysis
Central disease investigation laboratory	01	Necropsy, Bacteriology Serology, Molecular test, Histo-pathology,
Bangladesh Livestock Research Institute	01	National Reference Laboratory for Avian Influenza
Regional Reference Laboratory for PPR	01	Serology, Molecular test PPR

Vaccination programme

- **Titles**: Avian Influenza Vaccination Trial in Bangladesh
- Duration- 2012-2013
- **Object** :To reduce avian influenza outbreaks to a level that can be responded effectively through conventional stamping out procedure
- Location- Two Districts

Type of Vaccine:

- *Inactivated Vaccine :*
- Inactivated AIV H5N1 Re-6 vaccine (Merial)
- Nobilis Influenza H5, Inactivated H5N2 (Intervet)
- *Vector-vaccine :*

Vectormune HVT-AIV vaccine (CEVA-Biomune)

Strategy of vaccination

The vaccination trial was implemented through public-private partnership under the control of DLS

- Vaccination targets
  - all existing breeder stocks
  - all DOCs produced by the breeder farms
  - all existing commercial layers
- Vaccines: Inactivated vaccines for breeders and layers and live vector vaccine for DOCs
- Post-vaccination serological monitoring using Clade 2.2 and clade 2.3.2.1 antigens
- Intense clinical and virological surveillance

Serological monitoring

- Blood samples ware tested at CDIL, BLRI and BAU
- Samples was tested for HI antibody titre using antigen prepared from Clade 2.2 and Clade 2.3.2.1 viruses
- **Result**- Antibody titer of the vaccination birds ware satisfactory.
- 2nd Avian Influenza Vaccination Trial is going on for detection of antibodies and identification of shading viruses after vaccination in nine districts.

Lessons learnt

- Containing the disease is more challenging than presumed
- Early reporting, rapid diagnosis and quick response is very important
- Bio-security of farms and markets should be given highest priority.
- LBMs are one of the main source of spreading AI virtues.
- Quarantine, movement control, monitoring of trades are very important
- Prudent communications may reduce the risk of market collapse and prevent more cases in both humans and animals
- Effective vaccination need high farm Bio-security, proper surveillance and monitoring, Good performance of veterinary Service. early
- Strengthen Public and Privet partnership is very import for AI control.

Future plan

- Risk-based surveillance to complement existing passive and active surveillance systems
- Integration of human and animal surveillance systems using One Health Approach
- Integration of Community Animal Health Worker-based participatory approaches to increase sensitivity of the surveillance system
- Restructuring of live bird markets (LBMs) and poultry production and marketing practices towards more bio-securety approach that will ensure food safety and public health
- Encouragement of community bio-security practices for better compliance
- Extended vaccination program, monitoring and evaluation of vaccine and exist from vaccination.

National Strategies for Controlling Avian Influenza Viruses

Indonesia

Muhammad Azhar
Hendra Wibawa

Outline

- Background information
- Influenza outbreak history
- National control strategy
- National surveillance programme
- Development influenza virus monitoring
- Vaccination programme
- Lessons learn
- Future plan

Animal Population

No	Types of Animals	2011	2012	2013
A.	Ruminant (Cattle, Buffalo Buffalo Goat, Sheep)	45,463,000	49,357,000	47,821,000
B	Non Ruminant (Pig, Horse, Horse, Rabbit)	864,000	9,412,000	9,182,000
C	Poultry			
1	Broiler chicken	1,177,991,000	1,244,402,000	1,344,191,000
2	Layer chicken	124,636,000	138,718,000	146,622,000
3	Native chicken	264,340,000	274,564,000	276,777,000
4	Duck	43,488,000	49,296,000	51,355,000
5	Quail	7,357,000	12,234,000	12,553,000
6	Pigeon	1,209,000	1,806,000	2,139,000
	Total Poultry	1,619,021,000 00	1,721,020,000 00	1,833,637,000 00

25 Major Animal Diseases

Decree of Minister of Agriculture
No. 4026/Kpts/OT.140/04/2013 , Date 1 April 2013

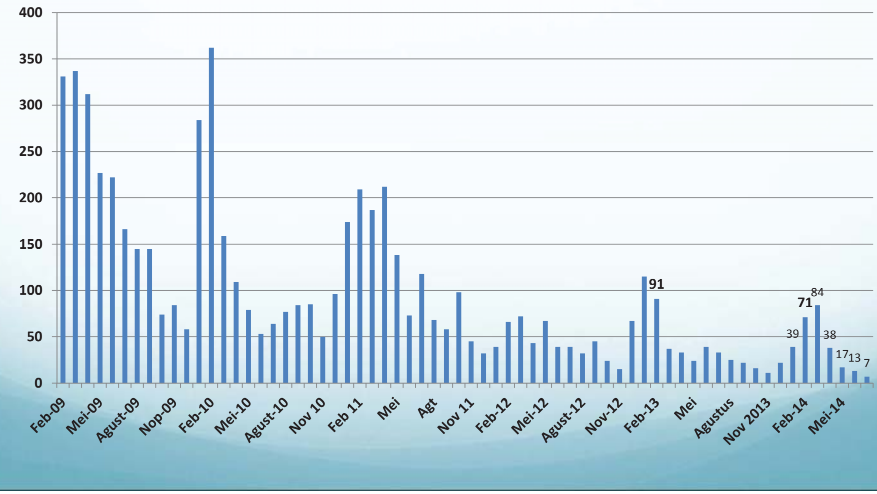
Anthrax	SE	Jembrana	Campylobact.
Rabies	Nipah	Surra	Cysticercosis
Salmonellosis	IBR	Para TB	Q Fever
Brucellosis (B. Abortus)	Bovine TB	Toxoplasmosis	FMD*
AI	Leptospirosis	**CSF/HC**	BSE*
PRRS	Brucellosis (B. Suis)	Swine Influenza	RVF*
Helminthiasis			

Blue: Priority Diseases

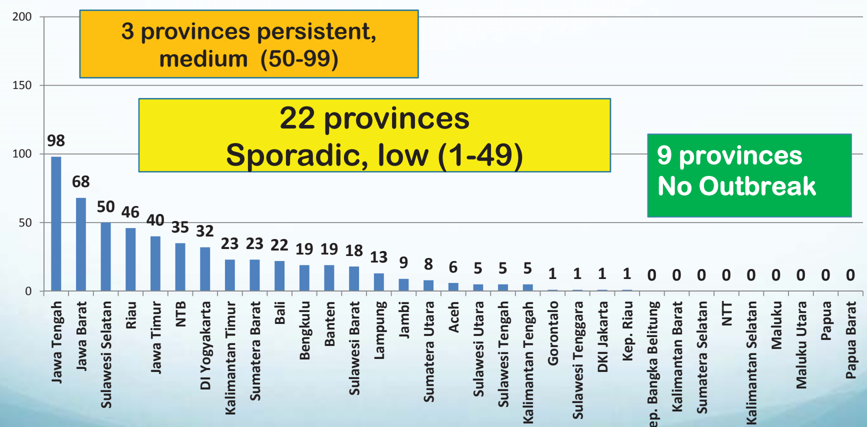
Red*) Exotic Diseases

HPAI Outbreak in Backyard Poultry Yearly, 2007 - July 2014

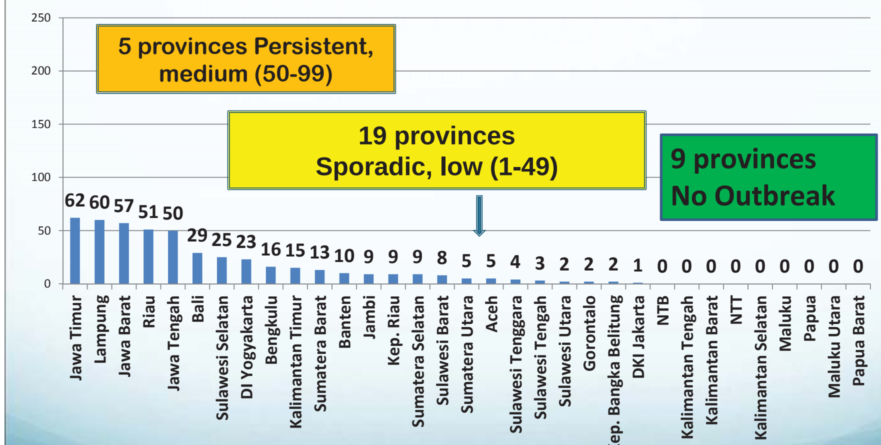
HPAI Outbreak in Backyard Poultry Monthly, 2009 - July 2014



HPAI Outbreak in Backyard Poultry in 2012, by Province



HPAI Outbreak in Backyard Poultry in 2013, by Province



HPAI Control and Eradication Strategies to Achieve Free Status 2020 (Roadmap)

1. Bio-security
2. Vaccination
3. Depopulation
4. Movement control
5. Surveillance
6. Compartmentalization and zoning
7. Poultry market chain improvement
8. Supporting by: IEC, PPP, Legislation, management

National Surveillance Programme

Emphasizing Avian Influenza Surveillance:

- Continue risk based surveillance of poultry
- Live Bird Market Survey
- H7N9 Emergency Surveillance
- Influenza Virus Monitoring (IVM)

On going process to develop integrated National Animal Health Information System (i-SIKHNAS)

iSIKHNAS How the "iSIKHNAS" system work?

iSIKHNAS Function in iSIKHNAS system

SPECIAL ACTIVITY FUNCTION

Code	
SK	Animal movement permit
VSK	Animal movement validation
POP	Population
VAK	Vaccination report
SUR	Active surveillance
RP	Slaughter house

ANIMAL HEALTH REPORTS AND INVESTIGATION FUNCTIONS

Code	
P	Priority Syndrome Report
U	General Sign Report
R	Response report
PNE	Negative report
PK	Follow up report
LAB	Specimen test report

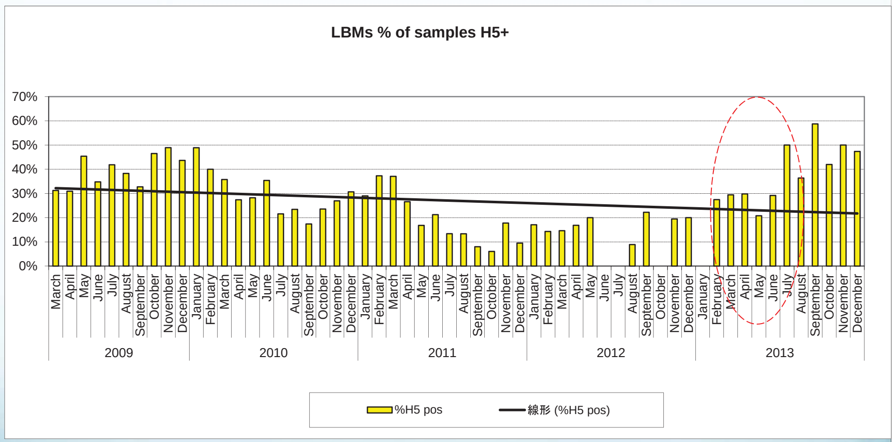
Surveillance Strategy

1. Enhancing the field animal health network's capability to conduct passive surveillance nationally in accordance with World Animal Health Organization (OIE) standards, and strengthen the national disease reporting system
2. Enhancing the epidemiological and scientific basis of active surveillance programme to ensure they are risk based
3. Increasing the scope of laboratory capacity and optimizing the investment in laboratories by developing a network.
4. Expanding **quality assurance and accreditation** within the public sector laboratories.
5. Improving field and laboratory linkage

Surveillance Influenza Virus by 8 DICs

- In 2009/2010 **Conducting Influenza Virus A/H1N1** Risk Based Surveillance by 8 DICs, collected 3.960 samples (2.804 samples for PCR and 1.156 serum) from pig population in Sumatera, Java, Bali, Kalimantan and Sulawesi. The results of laboratory testing that not found clinical signs and not found Influenza A/H1N1 novel virus.
- Surveillance Influenza Virus A/H5N1 collected samples (Swab, serum, organ, feather, egg etc) form poultry 21.141 samples (2010), 33.829 (2011), 33.162 (2012), 41.342 (2013).
- Surveillance Influenza Virus A/H7N9 in 2012/2013 collected environmental samples from 263 Live Bird Markets in Greater Jakarta, Surabaya, Medan: 864 samples. Result: 33,7 % Matrix (+) dan 0 % H7N9.

LBM Surveillance of H5N1 in Greater Jakarta, 2009-2013



•Decreasing prevalence of H5 subtype from 2009-2012
•In 2013, H5 prevalence increase in the same time of new clade outbreak (actually surprising peak from June/ July after the peak but coinciding with duck outbreaks during that time on Java , see map)

Overall Results LBMs Surveillance

Greater Jakarta, since 2009

7632 environmental swab samples collected
47% influenza A virus (+) and 27% H5 subtype (+)

Surabaya

Up to September 2013, 292 environmental swab samples collected with PCR result
40% influenza A virus (+) and 6% H5 subtype (+)

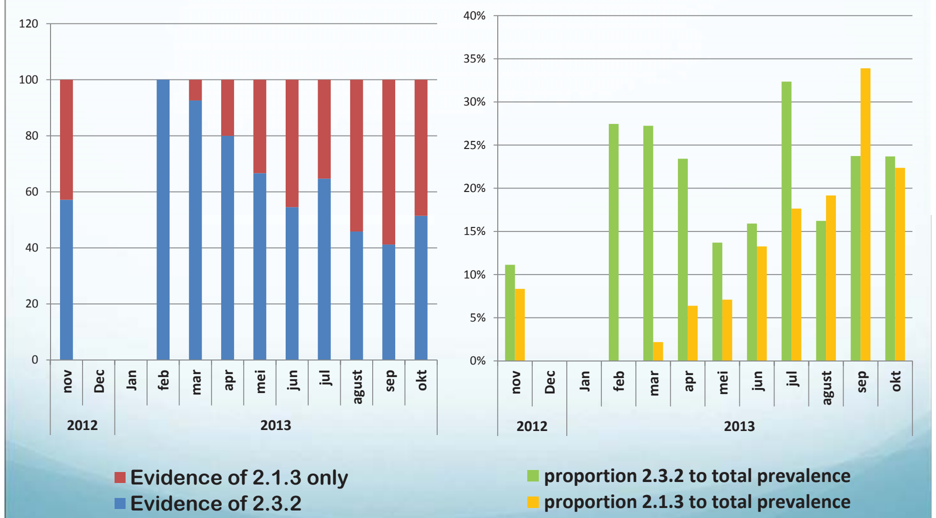
Medan

Up to October 2013, 295 environmental swab samples collected with PCR result
2% influenza A virus (+) and 2% H5 subtype (+)

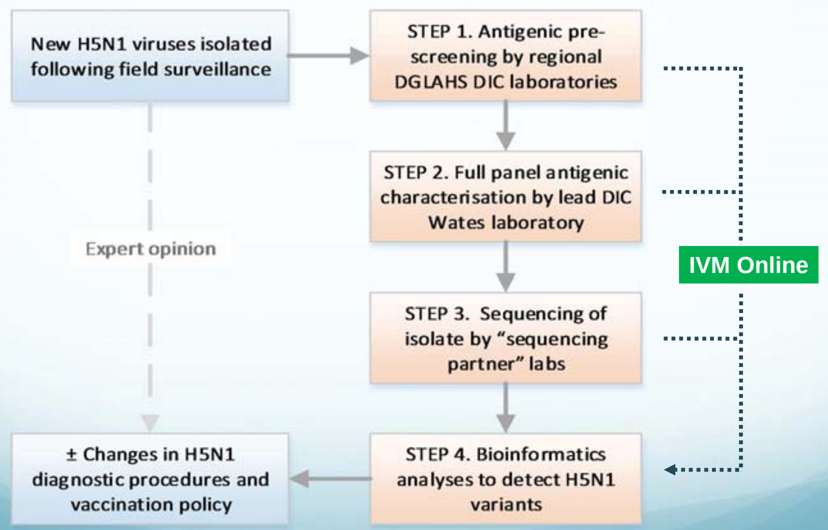
Result of H7 PCR Testing Environment Sample from LBMs

Region	year	month	Total Sample	Matrix Pos	Matrix Neg	H7 Pos	H7 Neg	%M+	%H7
JABODETABEK	2012	November	77	32	45	0	32	**41,6**	0
JABODETABEK	2013	February	71	29	42	0	29	**40,8**	0
JABODETABEK	2013	March	76	39	37	0	39	**51,3**	0
JABODETABEK	2013	April	102	46	56	0	46	**45,1**	0
JABODETABEK	2013	May	208	86	122	0	86	**41,3**	0
JABODETABEK Total	**2013**		**534**	**232**	**302**	**0**	**232**	43,4	0
MEDAN	2013	March	74	1	73	0	1	**1,4**	0
MEDAN	2013	May	74	1	73	0	1	**1,4**	0
MEDAN Total			**148**	**2**	**146**	**0**	**2**	**1,4**	0
RAWAKEPITING	**2013**	**May**	**36**	**16**	**20**	**0**	**16**	**44,4**	0
SURABAYA	2013	March	73	25	48	0	25	**34,2**	0
SURABAYA	2013	April	73	16	57	0	16	**21,9**	0
SURABAYA Total	**2013**		**146**	**41**	**105**	**0**	**41**	**28,1**	**0**
Grand Total			**864**	**291**	**573**	**0**	**291**	**33,7**	0

Proportion prevalence of Clade 2.1.3 and Clade 2.3.2.1 in LBM Greater Jakarta Nov 2012 – Oct 2013

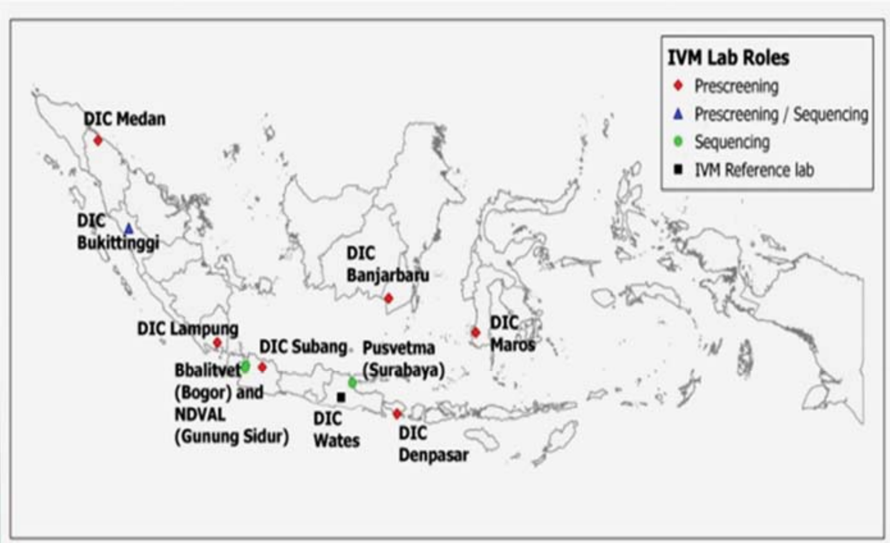


Development of Influenza Virus Monitoring (IVM) Network for Animal Health



IVM Online: An integrated antigenic and genetic data analysis for influenza virus monitoring in animals (start with H5N1)

Membership of the current IVM laboratory network with a description of their main role with respect to this monitoring network



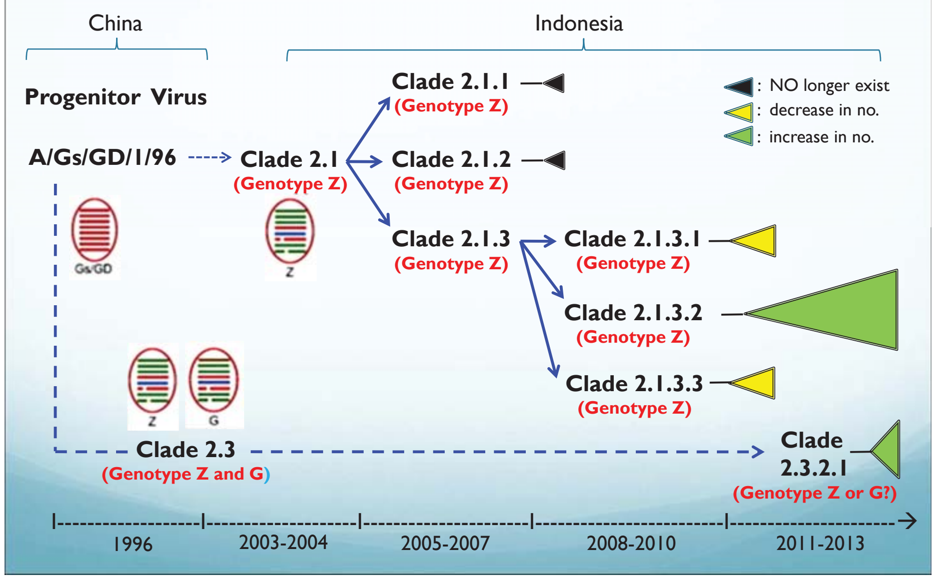
Outcomes of IVM Network:

- The most innovative aspect of the IVM network: **the formalization of an objective system to assist decision makers** following the detection of a variant or newly introduced H5N1 virus, clade 2.3.2.1;
- These lead to **the successful and timely development of an AI vaccine** (***Afluvet***) based on the characterization of a local H5N1 clade 2.3.2.1 isolate;
- **Development of pre-screening and full screening protocols for antigenic characterization** using standardised panels of reagents;
- **Development of the web-based database and bioinformatics tools (IVM Online)** for antigenic and genetic characterisation and visualisation;
- **Updated molecular diagnostics techniques** (PCR for Type A, H5N1 and H5N1 clade 2.3.2.1);
- **Increased capacity of Indonesian animal health laboratories** to do own antigenic and genetic characterization (standarized HI and sequencing methods for AI);
- **Improved knowledge of circulating H5N1 viruses**; which **helped HPAI control policies, including vaccination** by ensuring H5N1 vaccines remain effective in the face of field virus antigenic drift and multiple clades circulation. This may include **recommendations for updated challenge and vaccine**

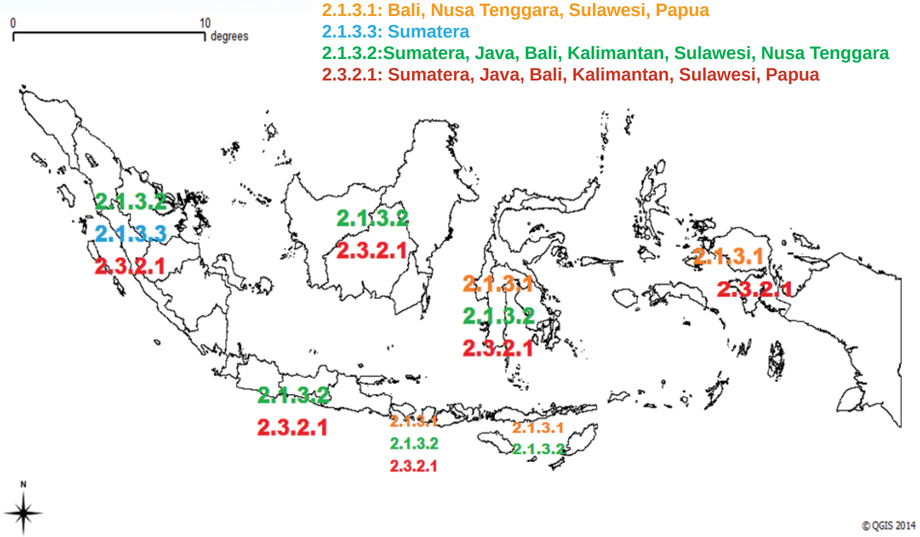
IVM Network:

- The IVM network shows the successful implementation of coordinated and integrated monitoring system for H5N1 HPAI virus in Indonesia and help decision makers in respond with the detection of a variant or newly introduced virus into Indonesia.
- The IVM network has relevance for other countries seeking to establish national laboratory networks for the surveillance of avian influenza and other pathogens.

Evolution of H5(N1) Subtype Virus in Indonesia

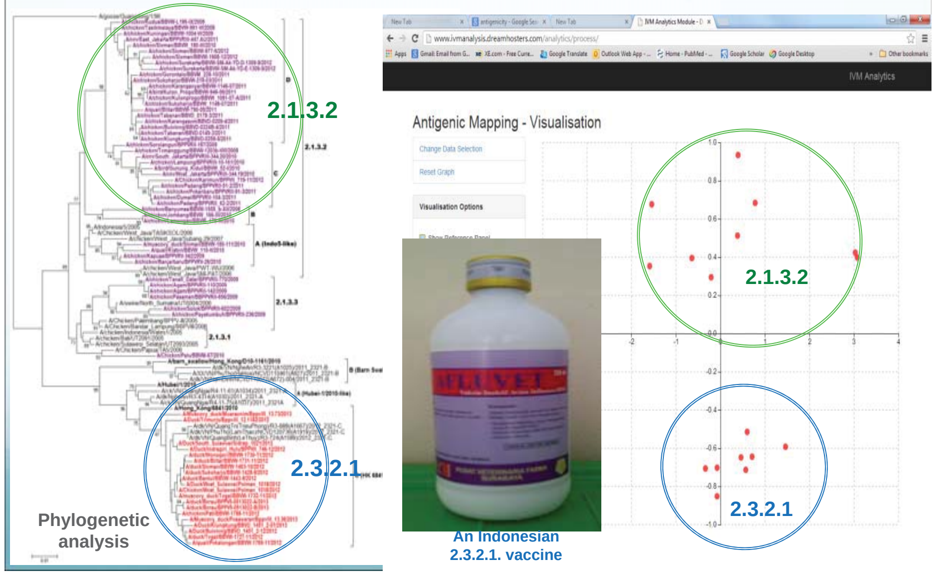


Genetic Mapping of H5N1 virus in Indonesia between 2008 and 2013



The benefits of the IVM network approach to HPAI surveillance

- e.g. the detection of the introduction of a new clade (2.3.2.1) H5N1 virus into Indonesia

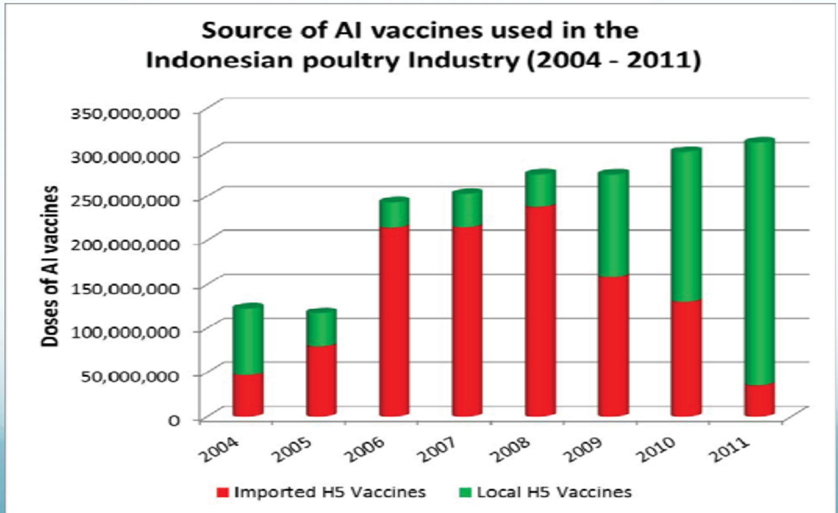


An Indonesian 2.3.2.1. vaccine

Vaccination Programme

1. Since 2011: stop imported vaccines, then using national vaccine products with local H5N1 (clade 2.1.3) strain master seed. 5 National AI Vaccine Producers (1 Gov & 4 Private)
2. Outbreak of new clade 2.3.2 in December 2012, then June 2013: produce local Vaccine H5N1 (clade 2.3.2.1). All vaccines should be tested by National Veterinary Drug Assay Laboratory before registered at Ministry of Agriculture.
3. 2014: plan to produce new bivalent vaccine (clade 2.1.3. and 2.3.2) for chicken and duck. Strain isolates of master seed and challenge test recommended by results of IVM online
4. Since 2009: changed from mass vaccination to targeted vaccination strategy. 3 keys proper vaccination : (1) registered vaccine (2) programme/booster (3+2) and (3) vaccination technique

Comparison of Imported and Local H5N1 Vaccines Used



Lessons learnt (Constrains)

- In the specific case of the IVM network, such a change in process (*e.g sequencing followed by antigenic cartography*) would need to be considered carefully, as the benefits of introducing new technology must be weighed up against the potential loss of data consistency and the cost.
- Lack of local government support on budget allocation, veterinary services institution, number of veterinarian.
- Lack of small scale commercial poultry farmer's awareness in implementing minimal standard procedures of Bio-security (→ 3 zones Bio-security), Vaccination (→3 proper Vaccination) , Reporting outbreak, Depopulation (→PVUK/CPVS).
- No law enforcement on movement control of poultry from infected farm into poultry market chains

Future Plan

- Indonesia Roadmap to achieve HPAI Free Status 2020
- 3 Key principles to implement the strategies:

1. Comprehensive → all poultry sectors and market chains
2. Sustainability
3. Involvement of all stakeholders

Thank you

Terima kasih

National Strategies for Controlling Avian Influenza Viruses

Australia

Background information

- 1600 commercial poultry farms
  - 560 million broilers per year
  - 22.5 million layers – 4.8 billion eggs
- 1.5 million chickens in backyard flocks
- Major animal diseases
  - Avian influenza in wild birds only
  - Country freedom for HPAI
  - No H5N1 or H7N9

Influenza outbreaks history

- Avian influenza
  - HPAI – 1976, 1985, 1992, 1994, 1997, 2012, 2013
    - All ≤ 3 farms
    - All eradicated by stamping out
  - LPAI (H5, H7) – 1976, 1992, 2006, 2012, 2013
    - All ≤ 2 farms
    - All but 2006 eradicated by stamping out

National control strategy

Avian influenza – eradicate the disease from domestic and zoo birds and re-establish Australia's HPAI-free status in the shortest possible time.

- Quarantine and stamping out
- Decontamination
- Tracing and surveillance
- Enhanced biosecurity
- Cost-sharing arrangements (HPAI – 80:20; LPAI – 50:50)

National surveillance programme

- Outbreak investigations to rule out influenza in disease events
  - 1200 poultry samples annually
- Wild bird surveillance
  - 9000 samples annually
  - 2% prevalence of AI infection in duck species
  - Lower prevalence in other species
  - All H types and all N types present
  - All low pathogenicity strains

Laboratory diagnosis

- Seven state/territory laboratories
  - All with capacity to test for influenza viruses
  - Confirmatory testing must be done at AAHL
- Australian Animal Health Laboratory
  - OIE reference laboratory for AI
  - Full range of techniques for diagnosing influenza viruses
    - Hemagglutination, HI, immunodiffusion, ELISA, PCR
    - Identification of all H and all N types

Vaccination programme

- No vaccination used for avian influenza to date
- Prepared to use vaccine if standard procedures do not control an outbreak

Lessons learnt

- Recent movements to very large, free range flocks may increase the risk of AI outbreaks in commercial poultry farms.
- Growing size of poultry farms requires consideration of different approaches to culling infected birds compared with historical approaches

Future plan

- Maintenance of national freedom from highly pathogenic avian influenza by strict border controls and stamping out of outbreaks.
- Survey of poultry farms to identify factors associated with AI infection
- National surveillance strategy