FAO's initiative on HPAI control in Bangladesh

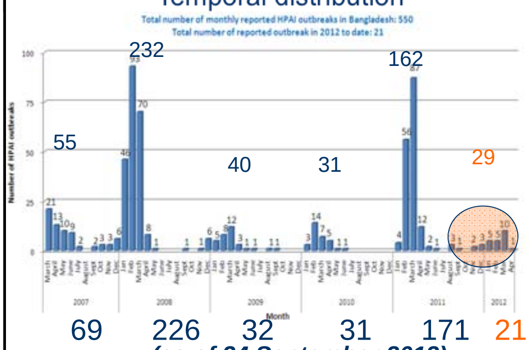
The 5th OIE Regional Meeting on Strengthening Animal Health Information Networking for HPAI Control and Prevention in Asia
Hanoi, Vietnam, 2-3October 2012

Prepared by Bangladesh ECTAD Country Team

Food and Agriculture Organization of the United Nations

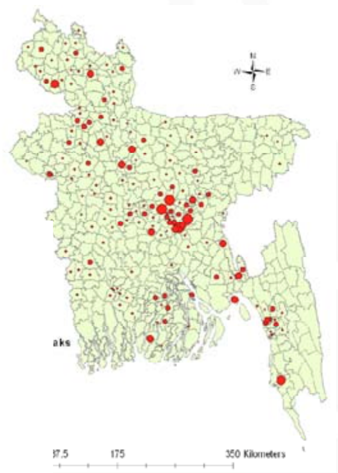
Current situation on H5N1 HPAI in Bangladesh

Temporal distribution

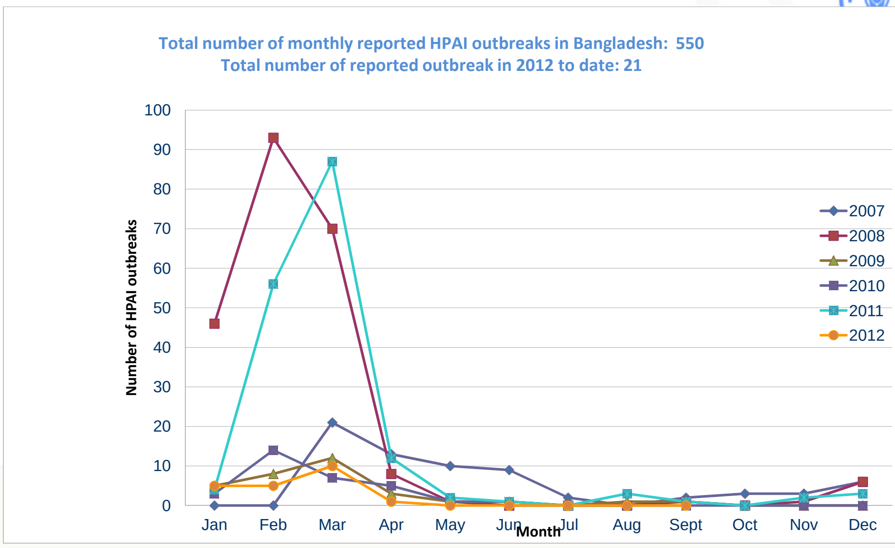


(as of 24 September 2012)

Geo-spatial distribution



- First case was reported in March 2007
- Five waves of outbreaks during the last 5 years show conspicuous "seasonality"
- 6th wave began earlier than usual.



H5N1 HPAI infection in humans in Bangladesh

In Bangladesh, **no human fatal cases with HPAI H5N1** have so far been reported.

2008

In the first human **non-fatal** case reported in May 2008, a 15-month-old boy, got the virus when his mother slaughtered a chicken at home and later cuddled him with unwashed hands. This was due to a strain (clade 2.2) of H5N1.

2011

• Two cases in 2011 were reported, also **non-fatal infection** in a particular area in the city of Dhaka, Kamalapur in March.

- 13-month baby girl
- 31 month old male child

(*One case of another subtype H9N2, though low pathogenic avian influenza, was also detected in Kamalapur, Dhaka in March 2011.*)

2012

•Three human cases were reported from Kaptan Bazar, Dhaka in February and March, 2012. All were **non-fatal infection** .

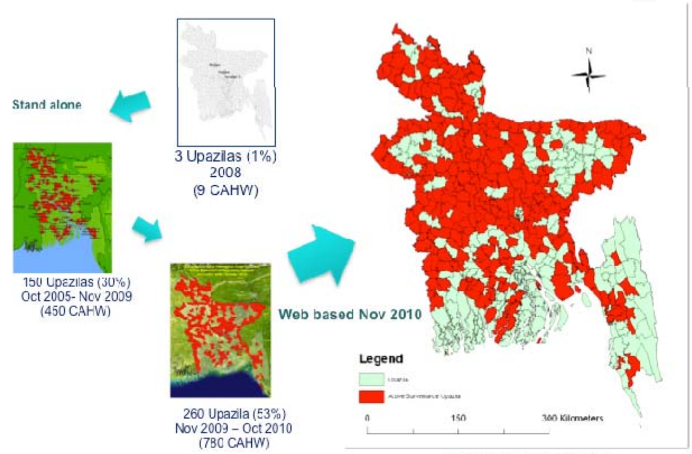
-40 year old male live bird market worker

-26 year old male live bird market worker

-18 year old male live bird market worker

Food and Agriculture Organization of the United

Establishing active surveillance using Web-based SMS Gateway



306 Upazilas (62%)
Oct 2010 – Feb 2012(1,006 AIW)

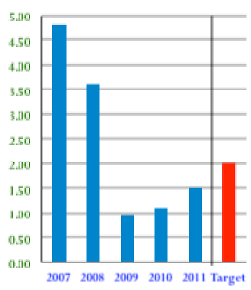
The active surveillance system initiated by FAO ECTAD Bangladesh has been successfully transferred to a government project "AIPRP" and further expanded.

The coverage of Upazilas by Active Surveillance using SMS Gateway system has evolved over the last 4 years from 1% to 62 %

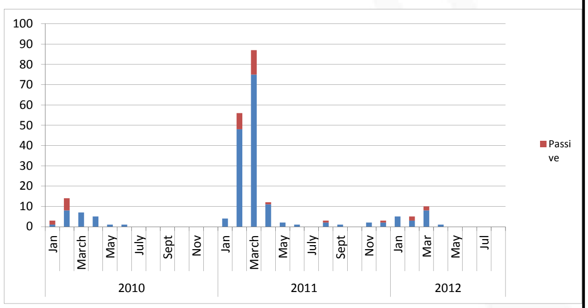
Food and Agriculture Organization of the United

Outcome/Impact from Active Surveillance on H5N1 HPAI using web-based SMS Gateway

Response Time reduced



Early Reporting

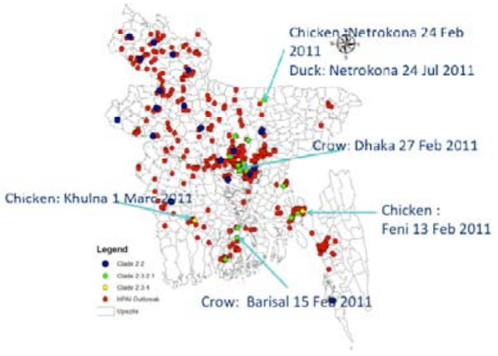


Outbreak response capacity continued to improve: from 4.8 days in 2007 to 1.43 days in 2011 (from report to culling)

More than 86% (2011) of outbreaks were reported by Active surveillance using SMS Gateway ahead of passive surveillance system

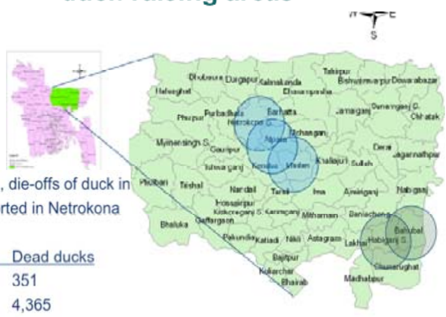
Sampling from dead crows during die-offs

During early 2011 there were three major mortality events in crows. H5N1 of clade 2.3.2.1 was identified.



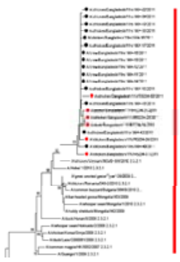
Sample collection in search of hidden reservoirs in free-ranging ducks after die-offs

Intensive Surveillance on Free-ranging ducks/nomadic ducks in duck-raising areas



- In July 2011, die-offs of duck in backyards reported in Netrokona district.

Upazilas	Dead ducks
Atpara	351
Modon	4,365
Sadar	1,500

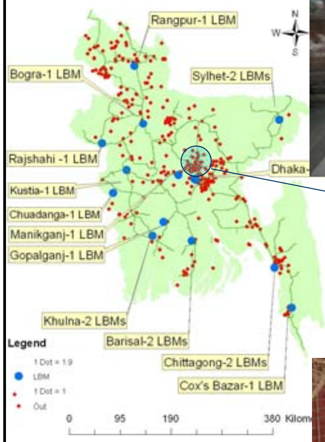


Black dots are isolates from crows and chicken in February 2011

Red dots are isolates from ducks in July 2011

➢In 6 districts including Netrokona, 35 veterinarians hired and trained for duck surveillance.

24 Live Bird Markets Renovated



24 LBMs

8 LBMs in Dhaka

LBM closure: After 3 new cases of human infection with H5N1, LBMs in Dhaka started implementing weekly restday for thorough cleaning and disinfection

A weekly rest day for thorough cleaning and disinfection commenced on 16 April 2012 in Kaptan Bazar, Dhaka.

- **All major LBMs in Dhaka City (69) complied with the weekly rest day order.**
- **Samples from poultry case, floor, environment and crow fecal sample from the ground have been collected from the premises of LBMs to monitor the effects of cleaning and disinfection: As of 25 September 2012, 1020 dead birds, 253 crow fecal samples, 4,124 swab samples were collected. Out of 1,020 samples, 1 dead duck and 17 dead chicken were tested positive for Influenza A by Rapid test.**
- **To break the transmission cycle of HPAI virus in LBMs, , traders should suspend the sale of live poultry and vacate their stalls for thorough cleansing and disinfection on the rest days.**

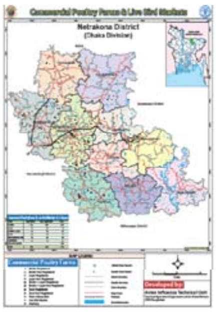
Streamline disease reporting from the field to the central database: Web-based Livestock Disease Information System (LDIS)

- Eliminates cumbersome paper works at Upazila level
- Eliminates voluminous paper works at DLS
- Reduces time of data transmission
- Reduces time to response
- Allows responses on a real-time basis

Pile of documents sent from 492 Upazila to DLS every month to be analyzed.

584 DLS staff in 394 Upazilas out of 492 were trained in operating database

GIS mapping of commercial farms and major live bird markets



Geographic Information System (GIS) mapping was don for more than 60,000 commercial farms and major live bird markets within the country to identify commercial farms at risk of outbreaks and for facilitating outbreak responses

Challenges in HPAI control in Bangladesh

- Free-ranging poultry at large: Family poultry represents more than 80 percent of the total poultry production, and 90 percent of the 18 million rural households keep poultry in Bangladesh.
- Poorly managed live bird markets and traders' yards playing a major role in the persistence and transmission of H5N1 virus

FAO's future plan/activities on HPAI control/prevention in Bangladesh

Plans for 2012-13

- New project entitled "Strengthening National Capacity to Respond to HPAI and Emerging and Re-Emerging Diseases in Bangladesh", was formulated and approved, also funded by USAID.
- The project will contribute to the improvement of livelihoods of vulnerable population in Bangladesh by safeguarding human and animal health, and improving food security and safety.
- The outcome is a decreased spread of H5N1 HPAI and other emerging and re-emerging diseases of significant public health and economic impact in the country, which will be achieved through enhanced coordination, multi-sectoral approach and outbreak management.
- The project will build on past work implemented by FAO through its ECTAD team in Bangladesh.
- Direct beneficiaries will be livestock and poultry producers and traders, Technical institutions will also benefit from enhanced and improved services Utimate beneficiaries will be the general population of Bangladesh.

Plans for 2012-13 (cont.)

- Four components were included: coordination support, technical support to DLS to control HPAI and EPTs, LBM development & PPP enhancement, and introducing health certification system using SMS Gateway for tracking poultry movement.
- Emphasis will be placed on enhancing biosecurity and biosafety in LBMs, commercial farms, backyard poultry and free-ranging duck to break transmission cycle in LBMs.
- National, regional and international collaboration will be enhanced (EPT, EPT+ and HPED).
- A vital role will be played in coordinating strategies and interventions to contain the disease and to ensure effective collaboration among key players to avoid overlapping of activities.
- The focus will be on early detection, diagnosis and prevention and to intervene at the human-animal interface and wild bird-domestic bird interface, adopting the One Health concept.
- Flocks of ducks silently infected with H5N1 will be narrowed down and eliminated
- Support will be provided to DLS to perform pre- and post-vaccination monitoring and surveillance.

Thank you for your attention

Generous supports of United States Agency for International Development (USAID) and World Bank (WB) are greatly acknowledged

In addition to dedicated staff in the Avian Influenza Technical Unit / ECTAD Country Team, the contribution of the following collaborators also greatly acknowledged:

Department of Livestock Services
Bangladesh Livestock Research Institute
Central Disease Investigation Laboratory
Bangladesh Agricultural University
Chittagong Veterinary and Animal Sciences University
ICDDR,B
IEDCR

OIE Sub-Regional Representation for South-East Asia – Activities

Dr Karanvir Kukreja
OIE SRR STANDZ Project Officer
The 5th OIE Regional Meeting on Strengthening Animal Health Information Networking – HPAI Control and Prevention in Asia
Hanoi, Vietnam 2-3/10/2012

Outline

- OIE SRR and Staff
- OIE 5th Strategic plan and OIE SRR Work towards these objectives
- OIE SRR Programmes
- Future Plans

Location – Department of Livestock Development

OIE SRR SEA - Location

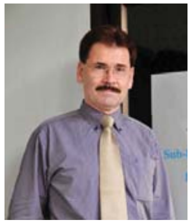
- Department of Livestock Development

Sub Regional Representative

Dr Ronello Abila

Project Coordinators

Dr Dirk Van Aken



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Ms Melada Ruengjumroonnath

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OIE 5th Strategic Plan (2011-2015)

The OIE 5th Strategic Plan includes Six Strategic Objectives (SO) and three Cross-cutting Areas (CCA)

- **SO-1** : International Communication of Animal Disease and Zoonosis Information
- **SO-2** : Development and Implementation of Scientifically Based Standards and Guidelines
- **SO-3** : Prevention, Control And Eradication of Animal Diseases, including Zoonoses
- **SO-4** : Ensuring the Scientific Excellence of Information and Advice
- **SO-5** : Capacity Building for National Veterinary Services
- **SO-6** : Strengthening the Organisation's Influence on Policy Design, Applied Research and Governance
- **CCA-1** : "One Health" Framework
- **CCA-2** : Cooperative Agreements
- **CCA-2** : Communication and Public Information

SO-1 : International Communication of Animal Disease and Zoonosis Information

SO-1.1 ANIMAL HEALTH INFORMATION

Timely and accurate information available to Members and other interested parties through the WAHIS and dissemination via WAHID.

SO-1.2 DISEASE INTELLIGENCE AND SURVEILLANCE

International capacity in disease intelligence, including analysis of disease emergence, horizon scanning, modelling and forecasting; stronger GLEWS initiative taking into account existing national, regional and international models.

SO1 – SRR Activities

- SRR Assists countries in reporting on priority diseases using ARAHIS, the WAHIS Regional Core for ASEAN
- SRR's focus is on FMD reporting, but encouraging reporting on FMD helps country in reporting other diseases such as HPAI

SO-2 : Development and Implementation of Scientifically Based Standards and Guidelines

SO-2.1 List of status diseases
- Scientifically valid list of diseases for which "status" is recognised by the OIE.

SO-2.2 Standards development
- Up-to-date and relevant standards in the Terrestrial Animal Health Code and Aquatic Animal Health Code. Guidelines for determining the impact of climate- and environmentally induced changes on the provisions of the Codes. Guidelines for reducing the risks of infectious diseases at the animal-human-ecosystem interface in accordance with the "One Health" framework.

SO-2.3 Veterinary legislation
- Veterinary Legislation adequate for the improvement of governance and the ability to meet the standards and guidelines contained in the relevant OIE Codes and Manuals.

SO-2.4 Diagnostic tests and pharmaceuticals
- Provide standards for diagnostic tests and veterinary pharmaceutical products (in particular, vaccines) and certification of diagnostic assays.

SO-3 : Prevention, Control And Eradication of Animal Diseases, including Zoonoses

SO-3.1 Eradication of critical diseases
- *Global eradication or containment of diseases adversely affecting animal and veterinary public health, food security or trade, or with negative impacts on poverty.*

SO-3.2 Control strategies and contingencies
- *Develop strategies for the control of transboundary diseases and their implications to trade and protocols for establishing health and trade contingency plans to face health events.*

SO-4 : Ensuring the Scientific Excellence of Information and Advice

SO-4.1 Reference Centres
- A strong network of Reference Centres (RL and CCs) to provide the highest quality of scientific services and advice to the OIE and its Members.

SO-4.2 Expert advice
- Ensure the highest quality of expert advice available to OIE, its Specialist Commissions and Working Groups, and to OIE Members.

SO-4.3 Scientific research and development
- Encourage scientific research and development of new technologies in animal and veterinary public health and animal welfare

SO-4.4 Environment and climate change
- Decision-making frameworks on the evolving relationship between the ecosystem, invasive species and emerging and re-emerging animal diseases.

SO-5 : Capacity Building for National Veterinary Services

SO-5.1 Strengthening veterinary services
- *Members are able to strengthen the quality of their national VS, benefit from their membership in the OIE, take part effectively in the standards-setting activities of the OIE, and fulfil their obligations of membership by applying OIE standards.*

SO-5.2 "One Health" planning
- *Development of well-structured and detailed national cooperation plans for reducing the risks from infectious diseases at the animal-human-ecosystems interface by providing a longer (three-year) financing framework and accommodating a flexible approach to the use of the funds beyond emergency response.*

SO-5 : Capacity Building for National Veterinary Services

SO-5.3 Training and professional development

Delegates organise, manage and implement appropriate legislation for including veterinary products with registration, quality control and final use of veterinary products. There is continuing education of veterinarians and veterinary para-professionals in their respective countries in accordance with OIE PVS criteria. Veterinarians and veterinary para-professionals fulfil at least the basic missions of the OIE to improve animal and veterinary public health and animal welfare worldwide and to meet societal expectations at global, regional and national levels.

SO-5.4 Focal points

Strengthened networks and improved professional competence of OIE Focal points in their respective areas; provide for professional development.

SO-6 : Strengthening the Organisation's Influence on Policy Design, Applied Research and Governance

SO-6.1 Professional development and leadership

Enhanced authority and status of official VS and AqAH services at the national level. Development of education programmes at the university and post-graduate level in the area of veterinary PH to ensure the long-term availability of qualified professionals in national VS. Recognition of the importance of veterinary activities for society as a whole at the global level Guidelines for veterinary education.

SO-6.2 Policy research

Develop tools for the use of its Members in policy research in relation to design options for the control and management of animal diseases, and in particular those at the human-animal-ecosystem interface. Such policy research, linked with epidemiological studies and socio-economic research, is necessary to improve and rationalize delivery of technical options for the management of diseases.

SO-6 : Strengthening the Organisation's Influence on Policy Design, Applied Research and Governance

SO-6.3 Mediation of disputes

Provider of expert advice to Members as envisaged in Article 5.3.8 of the Terrestrial Code, in the "the OIE informal procedure for dispute" on sanitary issues affecting trade

SO-6-4 Public information and communications policy

The role and status of the official OIE Delegates are effective communicators of OIE policies and standards; Delegates are able to engage in dialogue at the national level with the authorities that represent Members at FAO, WHO, CBD and other relevant bodies such as the Codex Alimentarius Commission or the IPPC

Cross-cutting areas

CCA-1 "One Health" framework

Cooperation with agency partners to establish an international institutional framework that addresses emerging infectious diseases at the animal-human-ecosystems interface and would strengthen capacities in key areas.

CCA-2 Cooperative agreements

Agreements leading to mutual support and cooperation at the policy and funding levels, ensure that the relative responsibilities of the respective organisations are defined, and strengthen the technical aspects of the OIE's work programme

CCA-3 Communication and public information

Development and implementation of a new communication strategy. Stronger communication with Delegates, as well as with professionals, policy makers and the public.

Relationship between the OIE 5th Strategic Plan and OIE SRR-SEA activities

OIE 5th Strat.Plan	SO-1		SO-3		SO-5				SO-6				CC
	1.1	1.2	3.1	3.2	5.1	5.2	5.3	5.4	6.1	6.2	6.3	6.4	1
STANDZ													
-SEACFMD	X	X	X	X	X		X	X	X	X	X	X	X
-STRIVE			X	X	X		X	X	X	X		X	X
-RABIES		X	X	X	X	X	X	X	X	X		X	X
IDENTIFY													
-Comp 1	X	X	X		X		X	X	X	X		X	X
-Comp 2		X			X	X	X	X	X			X	X
-Comp 3			X		X	X	X	X	X	X		X	X
HPED													
-Comp 1	X		X	X	X		X	X	X	X		X	X
-Comp 2		X			X		X	X		X		X	X
-Comp 3		X	X	X	X	X	X	X	X	X		X	X

The Components of the SRR-SEA Programme of Work

Component 1: Coordination and Policy Engagement

Expected Output: *Regional Organisations and Member Countries Coordinate and Align Animal Health Sectors with OIE Evidence-Based Policy and International Standards.*

Component 2: Veterinary Systems Strengthening

Expected Output: *Veterinary Services Progressively Improve Performance consistent with OIE Policies and Standards.*

Component 3: Technical Support to Disease Management

Expected Output: *Member Countries Effectively Manage FMD and Rabies.*

Component 4: Strengthening the Capacity of the SRR-SEA

Expected Output: *Strengthened capacity of the SRR-SEA in priority organizational development areas of gender/social mainstreaming, monitoring and evaluation, operations research and communications.*

SRR SEA Donor assisted programmes

- **STANDZ** – AusAID
  - **S**top **T**rans-boundary **AN**imal **D**iseases and **Z**oonoses
- **HPED** – EU
  - Highly Pathogenic Emerging and re-emerging Diseases
- **IDENTIFY** – USAID EPT
  - Emerging Pandemic Threats Program

Stop Trans-boundary Animal Diseases and Zoonoses (STANDZ)

STANDZ

- **Umbrella programme to cover AusAID Funded projects**
  - SEACFMD
  - STRIVES (Strengthening VS)
  - One Health (Rabies)
- **June 2011 – June 2016**
- **Comprehensive multi-component programme**
  -design framework accommodates all present (and future) initiatives at SRR-SEA

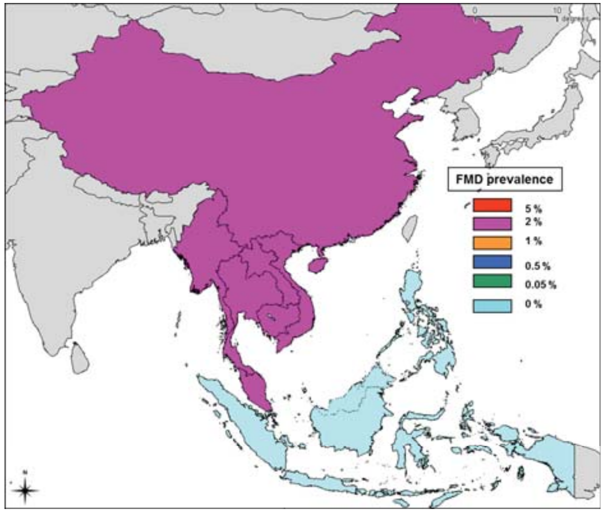
SEACFMD

South **E**ast **A**sia and **C**hina **F**oot and **M**outh **D**isease Campaign

Australian Government
Aid Program

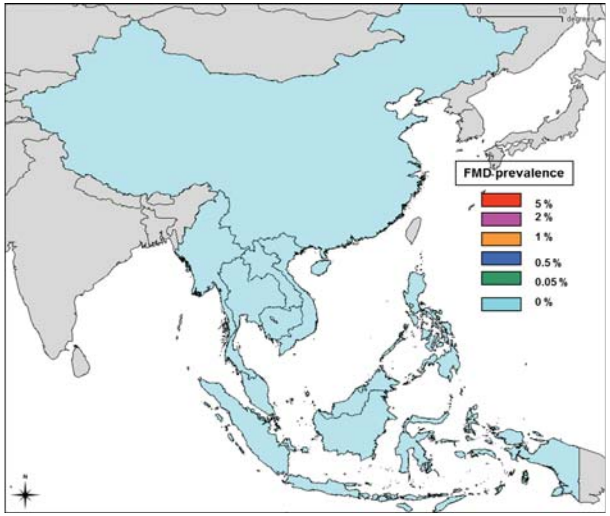
SEACFMD 2012

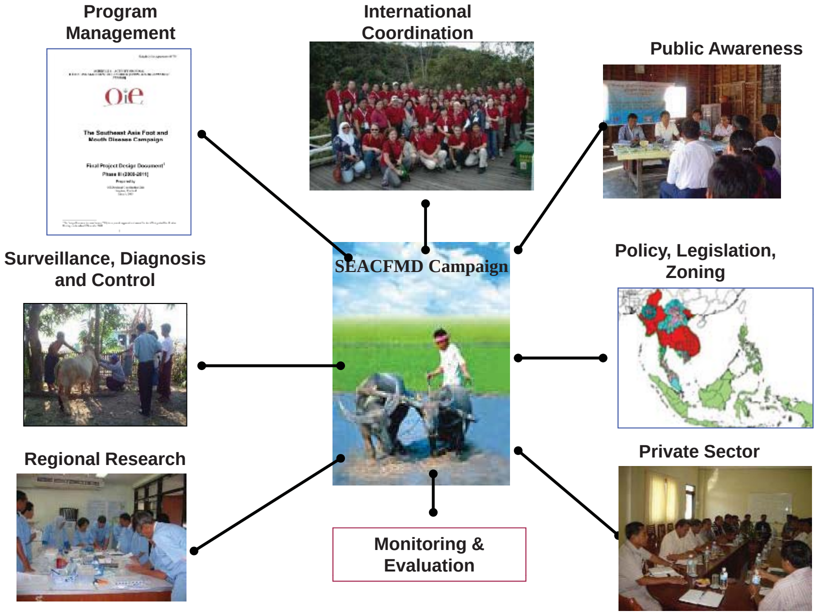
Australian Government
Aid Program



SEACFMD 2020

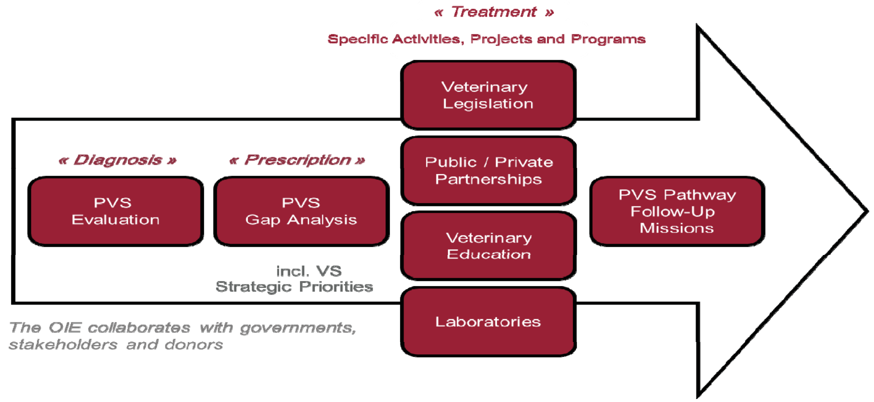
Australian Government
Aid Program





STANDZ – STRIVES

- Initiative to strengthen Veterinary Services in countries using the OIE (PVS) Performance of Veterinary Services Pathway as a model



One Health

Key focus on Rabies

Australian Government
Aid Program

RABIES

- 20th ASEAN Sectoral WG Livestock asked OIE and Vietnam to draft the Sub-Regional Rabies Strategy
- HPED supports a Rabies Vaccine Bank


Strengthening Cooperation and Information Sharing on Rabies among ASEAN Plus Three Countries

23-25 April 2008, Ha Long, VIET NAM

CALL FOR ACTION

Towards the Elimination of Rabies in the ASEAN Member States and the Plus Three Countries

WE, THE PARTICIPANTS of the Workshop on Strengthening Cooperation and Information Sharing on Rabies among ASEAN Plus Three Countries, organised by the National Institute of Hygiene and Epidemiology, Ministry of Health of Viet Nam, under the ASEAN Plus Three Emerging Infectious Diseases Programme, held in Ha Long, Viet Nam on 23-25 April 2008.

UNITED by the common desire and collective will to eliminate rabies, a neglected and under-reported disease, that kills at least 30,000 people in Asia annually and that at least 40% of these deaths are among children less than 15 years of age.

COMMITTED to working together in the spirit of solidarity and unity to meeting the goal toward eliminating rabies in Asia by 2020.

DETERMINED to contributing to realising an ASEAN Socio- Cultural Community that is socially responsible and having a common identity of a caring and sharing society which is inclusive and where the well-being and welfare of the peoples are enhanced.

AFFIRMED by the Resolution to Eliminate Rabies adopted during the Conference Towards the Elimination of Rabies in Eurasia organised by the World Organisation for Animal Health (OIE), the World Health Organization (WHO) and the European Union held in Paris, France on 27-30 May 2007.

AGREEING that in the Regional Meeting on Zoonotic Diseases, WHO Regional Office for South East Asia (SEARO) in Jakarta in November 2007, some of the basic principles of [illegible]

ADHERING [illegible]

Developing a Rabies Strategy for SE Asia

Australian Government
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- To bring together various initiatives
  - Both at the national and international level
- Harmonization of strategies based on science and experiences of various programs

Strengthening Cooperation and Information Sharing on Rabies among ASEAN Plus Three Countries

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AGREEING that in the Regional Meeting on Zoonotic Diseases, WHO Regional Office for South East Asia (SEARO) in Jakarta in November 2007, some of the basic principles of zoonoses prevention and control mentioned are applicable to rabies, and likewise, documents, proceedings, developed during the Fourth International Symposium on Rabies Control in Asia in March 2001, Hanoi Vietnam, jointly organized by Fondation Merieux and WHO; and The Strategies for the Control and Elimination of Rabies in Asia, Report of WHO Inter-regional Consultation, held in Geneva, Switzerland in July 2001 contained recommendations and resolutions that focus on rabies in Asia, with the documents having been endorsed by many experts/representatives from ASEAN Member States;

ADHERING to the goal of the ASEAN Plus Three Emerging Infectious Diseases Programme and the strategic vision of the OIE and WHO to reduce the economic, social and disease burden that results from emerging infections that threaten the region by enhancing regional preparedness and capacity through integrated approaches to prevention, surveillance and timely response, and endorsed by the ASEAN Plus Three Health Ministers in Yangon, Myanmar in 2006;

ASEAN/FAO/OIE/WHO Rabies Workshop

Some key recommendations of Rabies Workshop 19-20 January 2012 Chiang Mai, Thailand

Australian Government
Aid Program

ASEAN Member States, with the support of development partners, to

- Apply dog population and movement management in compliance with OIE Standards and to promote responsible ownership.
- Develop national step-wise action plans leading to the progressive control of animal rabies with special focus on dogs.

ASEAN Sectoral Bodies to work with FAO, OIE, WHO in order to support development regional and national step-wise action plans leading to the progressive control of animal rabies with special focus on dogs

One Health Planning

- FAO/OIE/WHO Tripartite collaboration
- Second Regional Zoonoses Workshop
  - Chiang Mai, January 2012
- Third Regional Zoonoses Workshop
  - Bali, November 2012
- 1st Joint Animal and Human Health Lab Meeting
  - Kuala Lumpur, Oct 2011
- Participate in APSED Meeting
- Participate in country joint Animal-Human health meetings

STANDZ – Small Grants Facility

- **Objective of the SGF**
  - To allow **selected member countries and OIE** to - **identify priority areas** that are relevant to the outcomes of the STANDZ
  - **Apply for funding to implement actions** that will contribute to achieving STANDZ outcomes
    - Vaccination Campaigns in Laos, Myanmar, and Cambodia (Planned)
    - Epidemiological study of FMD in Vietnam
    - Rabies vaccination campaign in Lao PDR

HPED – OIE Component

Strengthening Veterinary Services in Asia, Regional Vaccine Bank and capacity building
for surveillance, early detection and
eradication of highly pathogenic emerging
and re-emerging animal diseases

- **OIE Focal Points Trainings**
- **Vaccine Bank**
- **Funded PVS Missions in HPED eligible countries**
- **Tripartite activities (eg GFTADs)**

Vaccine Bank

Regional Vaccine Banks:

The OIE has set up a global Vaccine Bank for **Avian Influenza** vaccines

This Vaccine Bank has been expanded to other highly pathogenic emerging and re-emerging animal diseases, including **FMD** and **Rabies**

- Myanmar – FMD 200000 doses (2012)
- Laos – FMD 200000 doses (2011-2012)
- Cambodia – in planning
- Laos – Rabies 50000 doses

Vaccine Bank

Rabies when justified at the regional level to save public health funds and reduce the socio-economic cost of post exposure treatments of humans

Possible expansion to other **highly pathogenic emerging and re-emerging transboundary animal diseases in the Region**

Capacity Building: Good Governance

Maintain continuing education of **OIE Country Delegates** and National OIE **focal points** in the country specialised in the following different fields:

(i) **sanitary information systems (WAHIS)**;
(ii) **animal production food safety**;
(iii) **veterinary products**
(iv) **aquatic animal diseases**;
(v) **animal welfare**;
(vi) **Wildlife**
(vii) Veterinary Services **Communication.**
(viii) Laboratory

IDENTIFY

No this is not an acronym!

Emerging Pandemic Threat Program (EPT)

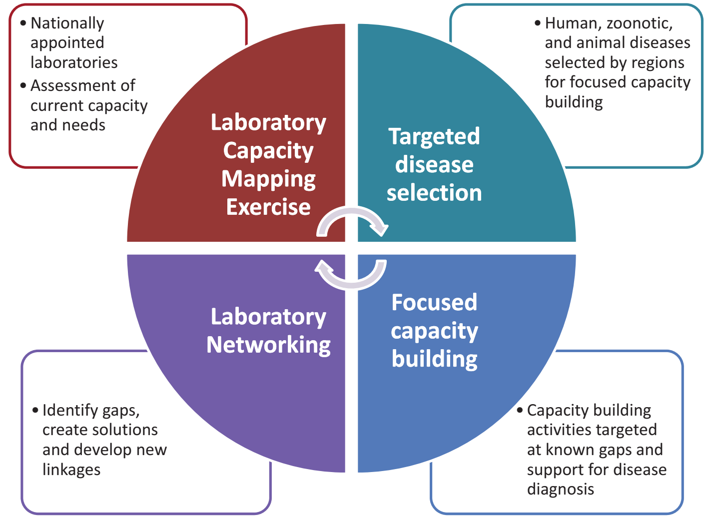
Early identification of and response to dangerous pathogens in animals before they can become significant threats to human health

PREDICT	RESPOND	IDENTIFY	PREVENT
To implement an early warning system that addresses the role of wildlife in facilitating the emergence and spread of new diseases	To strengthen countries' capacity to identify and respond to new disease outbreaks in a quick and sustainable manner	**To support the development of laboratory networks and strengthen diagnostic capacities in those areas thought most likely to be the source of emerging diseases**	To build a behavior-change response to infectious diseases and support efforts to characterize high-risk practices that increase the potential for spreading such diseases

To accomplish this outcome, the IDENTIFY project aims to provide sustainable inputs into:

1. The development of guidance and policy for national laboratories
2. Promoting laboratory quality (e.g. biosafety/biosecurity, quality assurance, accurate diagnosis, and specimen collection and handling and shipping)
3. Strengthening laboratory capacity in support of surveillance and response
4. Enhanced laboratory networking.

IDENTIFY Laboratory Networking Strategy



Key Activities so far in 2012

- Joint FAO-OIE-WHO Zoonoses Meeting (January)
- Rabies Workshop
- Organizing Regional FMD working group meetings (MTM, SEACFMD Labnet)
- Organizing Partner for FAO/OIE Global FMD Conference in Bangkok
- SGF-Funded Vaccination campaigns in Laos and Myanmar
- SGF and EU-funded rabies vaccinations in Laos for World Rabies Day
- Participation in PVS Gap Analyses
- FMD National Plan Formulation – Country workshops to be organized over coming months

Key Activities in next 12 Months

- IDENTIFY:
  - Laboratory Strategic Plan development
    - Cambodia September 2012
    - Thailand/Vietnam November 2012
    - Phillippines/Lao PDR December 2012
  - Laboratory Directors' Meeting – Vietnam, October 2012
  - OIE PVS Laboratory Tool Pilot – Lao PDR, Nov 2012
- STANDZ/SEACFMD:
  - Tripartite One Health Meeting (in conjunction with FAO/WHO) – November 2012
  - SEACFMD LabNet Meeting (Lanzhou, China)
  - SEACFMD EpiNet Meeting (2013)
  - FMD Regional Subcommission Meeting (Singapore, 2013)
  - Continued Small Grants Activities
- EU/HPED
  - Meeting of Focal Points for Aquatic Animal Health (Oct 2012)
  - Focal Points Refresher training for various focal points
  - Continued Vaccine Bank facilitation

Key activities contributing towards AI Control

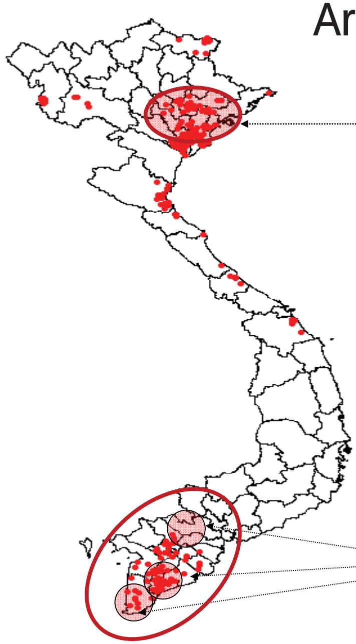
- Laboratory Capacity Building and Networking
  - Sponsorship of Lab Directors to Strategic Planning Workshop at Melbourne Business School
  - Country Laboratory Strategic Planning Workshops
  - PVS Pathway Pilot Lab Mission and Tools for Lao PDR
  - Quality Management Pilot Missions (Cambodia, Thailand)
  - Laboratory Exchanges of Staff to Regional Reference Laboratories and Collaborating Centres
- Information communication
  - Assists countries in reporting on priority diseases using ARAHIS (WAHIS Regional core) – facilitates country reporting on HPAI
- Cross Cutting Veterinary Services Capacity building
  - STRIVES
  - PVS E Missions
  - PVS GA Missions
  - PVS GA Prescription missions

Influenza A virus Prevalence Studies in Poultry in Vietnam

Under the OIE/Japan Trust Fund Project (JTF) for Strengthening HPAI Control in Asia, 2008 -2012

Kenji Sakurai, OIE Asia-Pacific
Hanoi, 2-3 October 2012

Areas studied in Vietnam



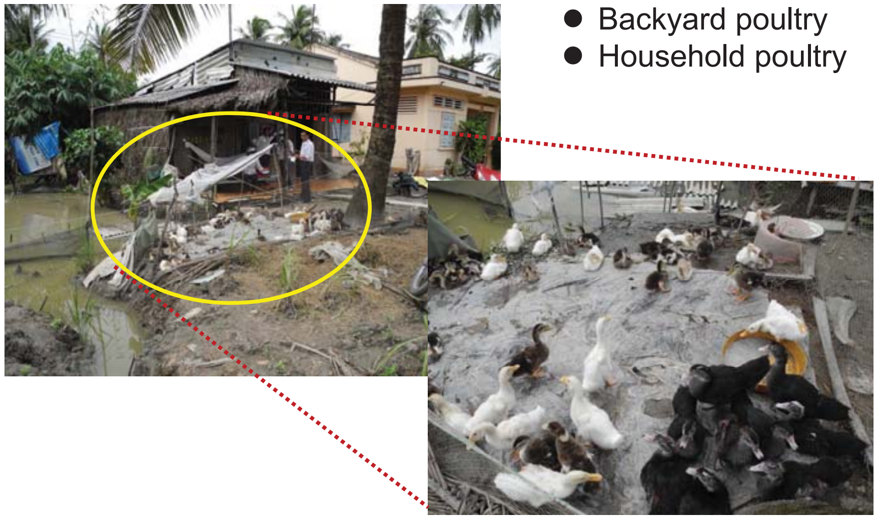
- North: 4 times
- South: 6 times

➢ Target species:
Domestic ducks

➢ Target premises:
(1) Small scale farms (backyard)
(2) Live bird (poultry) markets

➢ Condition:
Poultry without vaccination against H5N1

Small scale farms-1



- Backyard poultry
- Household poultry

Small scale farms-2

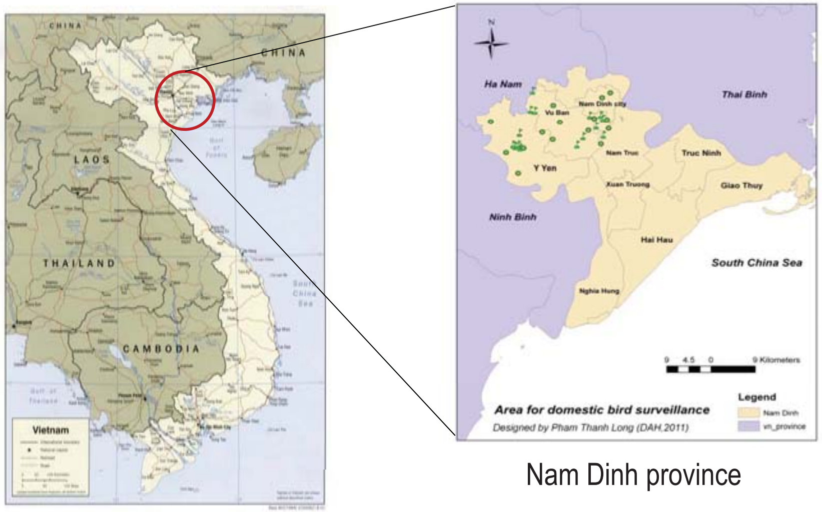
- Backyard poultry
- Household poultry

- One species

Live bird markets (LBMs)

- Wet markets
- Retail Markets
- Different species are mixed up.
- Slaughtering & processing

North Vietnam



Nam Dinh province

Sample collections in North Vietnam

Category	1st R Mar. '09	2nd R Jan. '10	3rd R Sep. '11	4th R Apr. '12	Total
Domestic bird	350	375	600	600	1,925
Wild bird	77	111	0	0	188
Environment	46	11	0	0	57

- The environmental samples constituted pond water and/or dead wild bird.
- All samples were taken from healthy birds.

Sample collections in North Vietnam

"Sample collections were focused on domestic ducks."

- In Sep 2011 (3rd round)

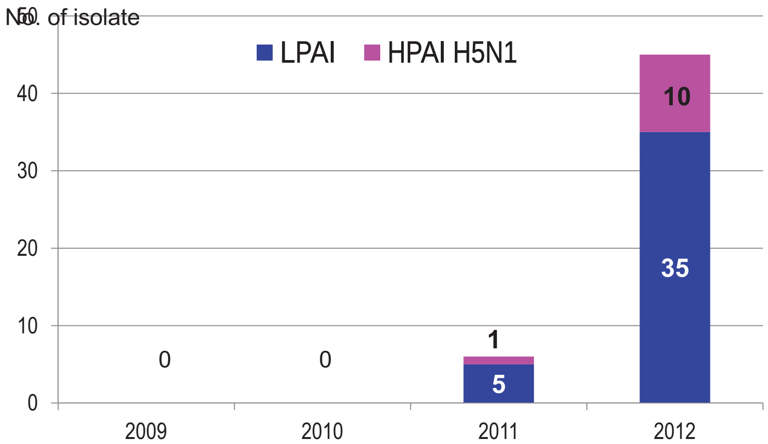
Table-1	No. of premise	No. of bird per premise	Duck	Muscovy	Chicken	Total
Backyard	15	20	280	20	0	300
Live bird market	15	20	280	20	0	300
Total	30	-	560 (93.3%)	40 (6.7%)	0	600

- In April 2012 (4th round)

Table-2	No. of premise	No. of bird per premise	Duck	Muscovy	Chicken	Total
Backyard	15	20	254	36	10	300
Live bird market	17	10-20	245	11	44	300
Total	32	-	499 (83.2%)	47 (7.8%)	54 (9.0%)	600

AI virus isolation in North Vietnam

!HPAI/LPAI viruses were isolated from healthy poultry."



AI virus isolation in North Vietnam – Subtype

"4 subtypes in Sep. 2011" "8 subtypes in Apr. 2012"

	March '09	Jan. '10	Sep. '11	Apr. '12
No. of isolate	0	0	6	45
HPAI	Nil	Nil	H5N1 (1)	H5N1 (10)
LPAI	Nil	Nil	H3N8 (1) H4N2 (1) H6N6 (3)	H3N2 (10) H3N6 (8) H3N8 (2) H4N6 (4) H6N6 (6) H9N2 (4) H11N9 (1)

Note: Figure in parenthesis shows the number of isolate.

AI virus isolation in North Vietnam

"All the HPAI H5N1 viruses were isolated from LBM."

- Backyard

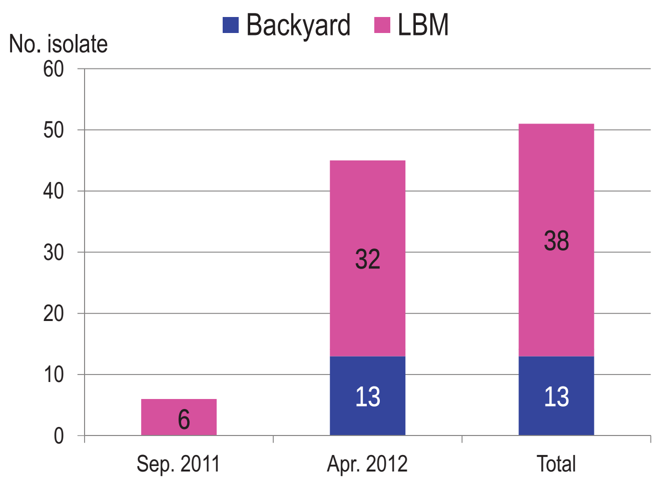
No. of isolate	Sep 2011	April 2012	Total
HPAI (H5N1)	0	0	0
LPAI	0	13 (4.3%)	13
Total No. of bird surveyed	300	300	600

- Live bird market (LBM)

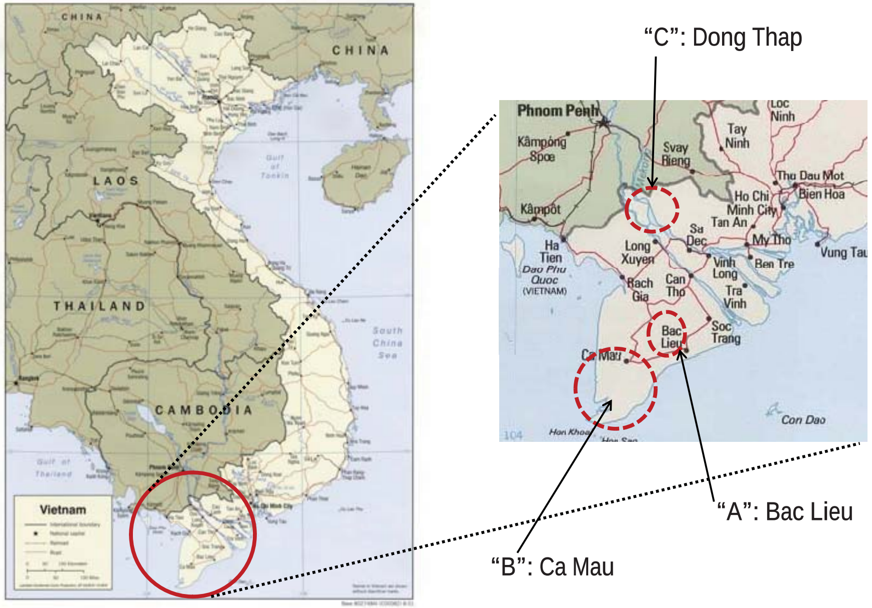
No. of isolate	Sep 2011	April 2012	Total
HPAI (H5N1)	1 (0.3%)	10 (3.3%)	11
LPAI	5 (1.7%)	22 (7.3%)	27
Total No. of bird surveyed	300	300	600

AI virus isolation in North Vietnam

"75% of HPAI & LPAI isolates were from LBM."



South Vietnam



Sample collections in South Vietnam

- AI virus studies have been conducted 6 times focused on domestic duck including Muscovy.
- Samples were taken from healthy birds.

Category	1st R Apr. '09 (A)	2nd R Mar. '10 (A)	3rd R Oct. '10 (A)	4th R Feb. '11 (B)	5th R Oct. '11 (B)	6th R Feb. '12 (C)	Total
Domestic bird	300	300	300	400	600	600	2,500
Wild bird	105	107	0	111	0	96	419
Environment	84	20	0	32	0	10	146

Note: "A": Bac Lieu province, "B": Ca Mau province, "C": Dong Thap province

AI virus isolation in South Vietnam

"Domestic ducks were commonly infected with LPAI viruses."

	1st R Apr.' 09 (A)	2nd R Mar. '10 (A)	3rd R Oct. '10 (A)	4th R Feb. '11 (B)	5th R Oct. '11 (B)	6th R Feb. '12 (C)	Total
LPAI	39 (13.0%)	1 (0.3%)	25 (8.3%)	12 (3.0%)	53 (8.8%)	22 (3.7%)	152 (6.1%)
HPAI H5N1	0	0	0	1 (0.3%)	15 (2.5%)	4 (0.7%)	20 (0.8%)
No. of bird	300	300	300	400	600	600	2,500

Note 1: "A": Bac Lieu province, "B": Ca Mau province, "C": Dong Thap province

Note 2: Figure in parenthesis shows the prevalence of AI virus infection.

AI virus isolation in South Vietnam – Subtype of isolates –

"Different subtypes of LPAI viruses were isolated from ducks ."

	1st	2nd	3rd	4th	5th	6th
No. of isolate	39	1	25	13	68	26
HPAI	Nil	Nil	Nil	H5N1 (1)	H5N1 (15)	H5N1 (4)
LPAI	H3N2 (1) H3N8 (1) H4N6 (7) H9N2 (26) H11N3 (3) H11N9 (1)	H9N6 (1)	H6N2 (24) H6N6 (1)	H6N2 (7) H11N5 (1) H11N9 (2) H12N5 (2)	H3N6 (1) H3N8 (7) H4N6 (4) H6N2 (39) H6N9 (2)	H4N6 (1) H6N2 (1) H7N1 (2) H9N2 (12) H9N8 (2) H10N7 (1) H10N8 (1) H11N3 (2)

Note: Figure in parenthesis shows the number of isolate.

AI virus isolation in South Vietnam

"HPAI H5N1 viruses were isolated exclusively from healthy ducks at LBM."

Table-1	No. of bird	No. of isolate	
		LPAI	H5N1
Backyard	1,440	33 (2.3%)	0 (0%)
Live bird market (LBM) #	1,060	119 (11.2%)	*20 (1.9%)*

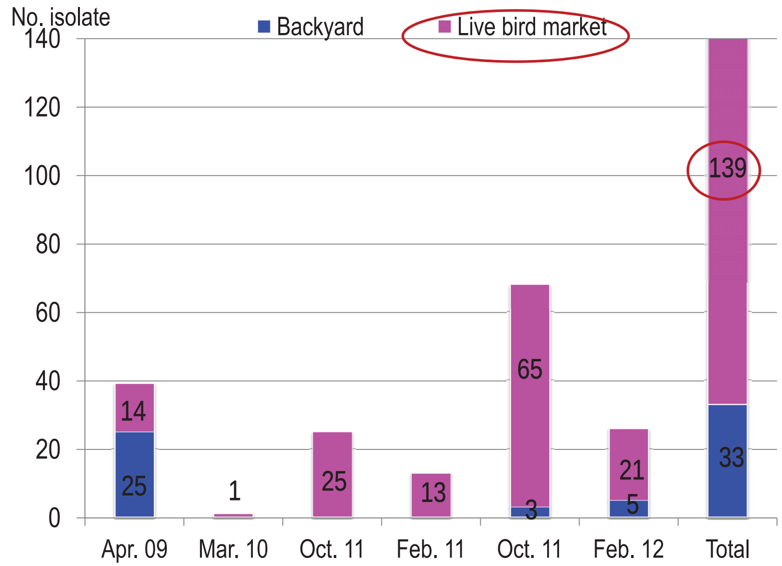
#: One slaughter point is included.

- Number of AI isolate

Table-2	1st	2nd	3rd	4th	5th	6th	Total
Backyard	25	0	0	0	3	5	33
LBM	14	1	25	13 (1)	65 (15)	21 (4)	139 (20)

AI virus isolation in South Vietnam

" 80% of AI isolates were from LBM."



AI virus isolation in South Vietnam – by type of premise –

"Poultry in LBMs are likely to be infected with influenza A viruses at higher rate than ones in backyard farms."

- Number of premise tested positive for AI virus

Table		4th R (Feb 2011)	5th R (Oct 2011)	6th R (Feb 2012)	Total
Farm	• No. of farm	0	1	1	2
	• Positive rate	0	6.7%	6.2%	4.4%
Market	• No. of market	5 (1)	11 (4)	7 (2)	23 (7)
	• Positive rate	33.1% (6.7%)	73.3% (26.7%)	46.7% (13.3%)	51.1% (15.6%)

Note1: Number of premise surveyed in each round was each 15 premises for both Backyard farms and LBMs.

Note2: Figure in parenthesis shows the number of HPAI H5N1 positive case.

Some key findings and observations

1. All the H5N1 HPAI viruses have been isolated exclusively from healthy ducks at live bird markets (LBMs).
2. However no H5N1 HPAI virus has been isolated from ducks at a farm's level.
3. This fact suggests that ducks and LBMs play an important role in the circulation of HPAI H5N1 virus in the environment.
4. Different subtypes of LPAI viruses have also been isolated from ducks at LBM more frequently than ones at small scale farms.
5. This fact suggests that ducks at LBMs are likely to be infected with LPAI viruses higher than ones at farms.
6. Infection with LPAI viruses may give ducks partial immunity to H5N1 virus, which may protect ducks from contracting the disease and succumbing to HPAI H5N1 virus.

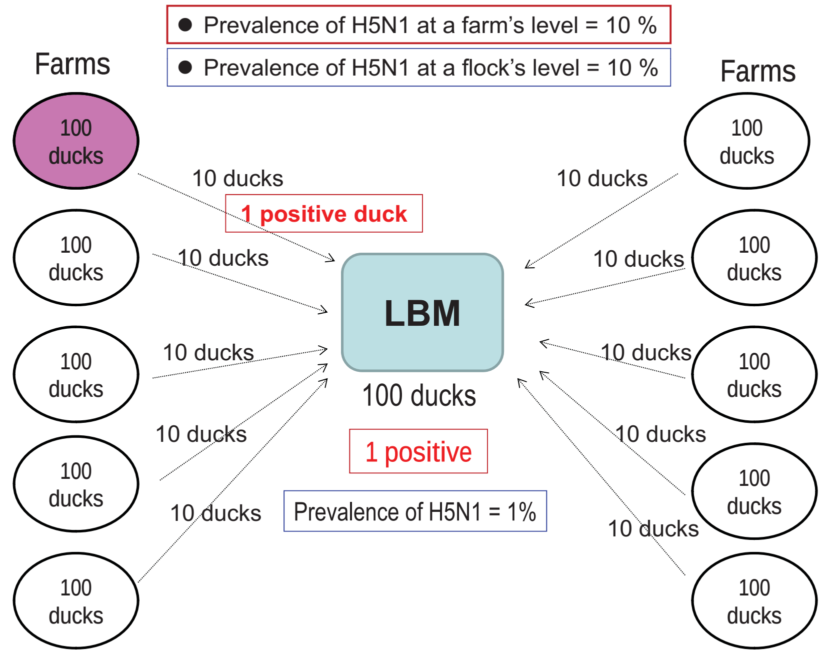
Facts and Assumption

(Facts)

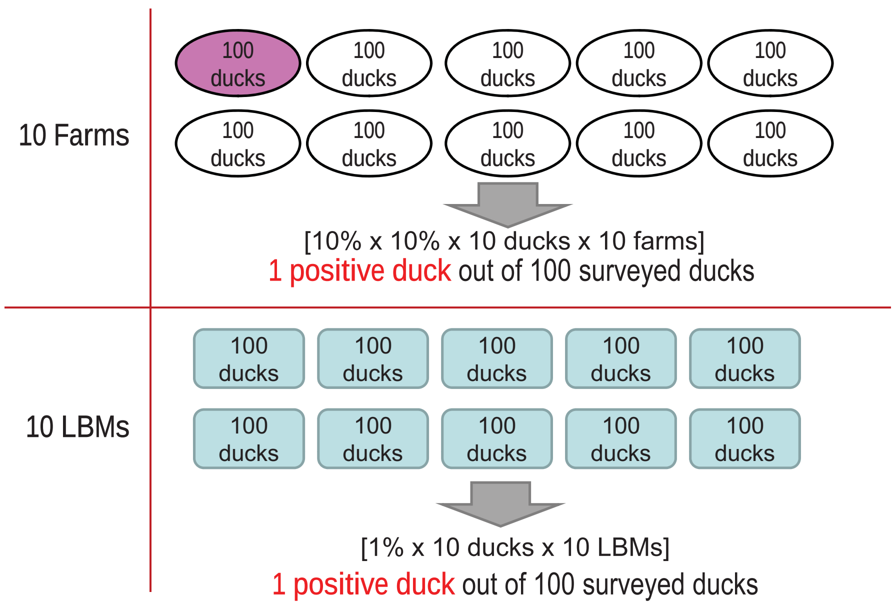
- Most of the poultry at LBMs come from small scale farms.
- Farms and LBMs were selected at random for sample collections.

(Assumption)

- HPAI virus would be isolated from both markets and farms.
- The prevalence of LPAI infection in farms would be similar to that in markets.



Sample collections: 10 ducks/premise



Findings and Questions

(Findings)

However,

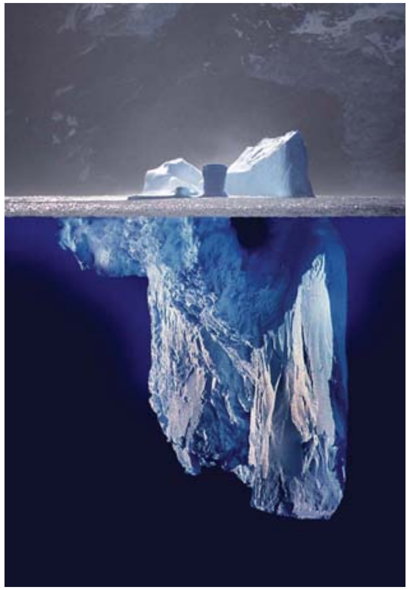
- H5N1 virus was isolated exclusively from LBMs, but no H5N1 virus from small scale farms.
- LPAI viruses were also frequently isolated from at LBM.

(Questions)

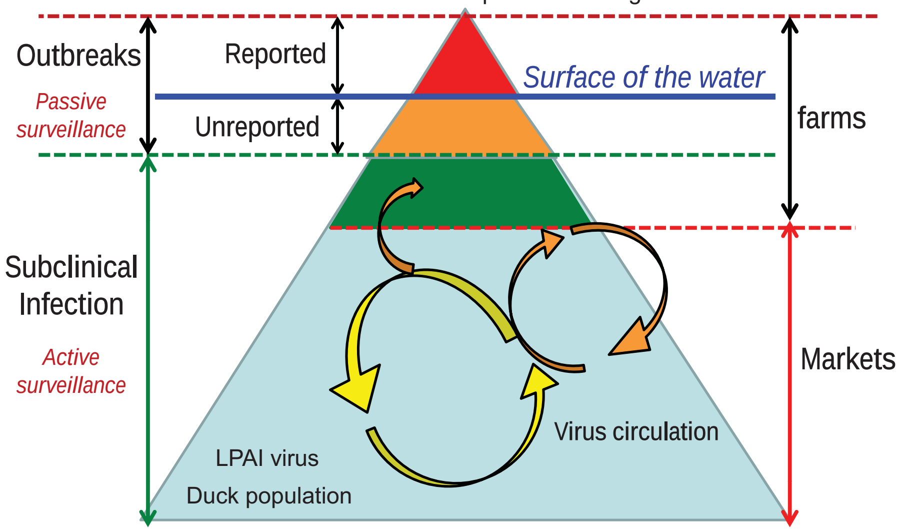
(Q1) Why the prevalence of LPAI virus infection in LBM seems to be much higher than that in small scale farm?

(Q2) Why the prevalence of H5N1 virus infection in LBM seems to be much higher than that in small scale farm?

Just the tip of the iceberg!



HPAI H5N1 situation ≒ "Iceberg"



(Q1) How we could break the virus circulation gradually and steadily to reduce the risk of H5N1 in Asia at a regional level?

(Q2) What actions should be undertaken in the next 5 years in Asia at a regional level?

Acknowledgements

- Department of Animal Health of Vietnam (DAH)
- National Centre for Veterinary Diagnostics of Vietnam (NCVD)
- Regional Animal Health Office No. 7 of Vietnam (RAHO-7)
- Sub-Department of Animal Health in Nam Dinh, Bac Lieu, Ca Mau, and Dong Thap provinces
- FAO-Vietnam
- Hokkaido University (OIE Reference Lab for HPAI in Japan)
- National Diagnostic Centre of Animal Quarantine Service of Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF)
- MAFF-Japan (Donor of the Project)

Thank you for your attention.

The 5th Regional Meeting on Strengthening Animal Health Information Networking for HPAI Control and prevention in Asia
Hanoi, Vietnam, 2-3 October 2012

How to control HPAI and prepare for pandemic influenza

Hiroshi Kida
Graduate School of Veterinary Medicine
Research Center for Zoonosis Control
OIE Reference Laboratory for Animal Influenza
WHO Collaborating Centre for Zoonoses Control
Hokkaido University, Sapporo, Japan

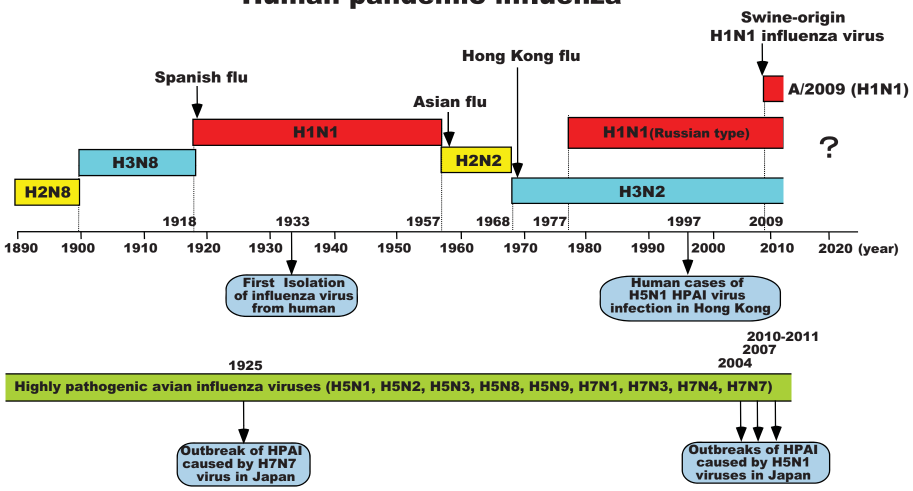
How should we control highly pathogenic avian influenza and prepare for pandemic influenza ?

* Why have the H5N1 HPAIVs persisted in poultry for 16 years ?
* Why are antigenic variants selected in poultry birds ?
* Will the HPAIVs returned to migratory birds persist in nature ?
* How should HPAI be controlled just in poultry ?
* Does AI vaccine confer complete protective immunity ?
* Will H5N1 HPAIV cause pandemic influenza?
* Are the measures for the control of seasonal flu satisfactory ?

To answer to these questions, it is prerequisite to understand ecology of influenza viruses in nature, birds and mammals;

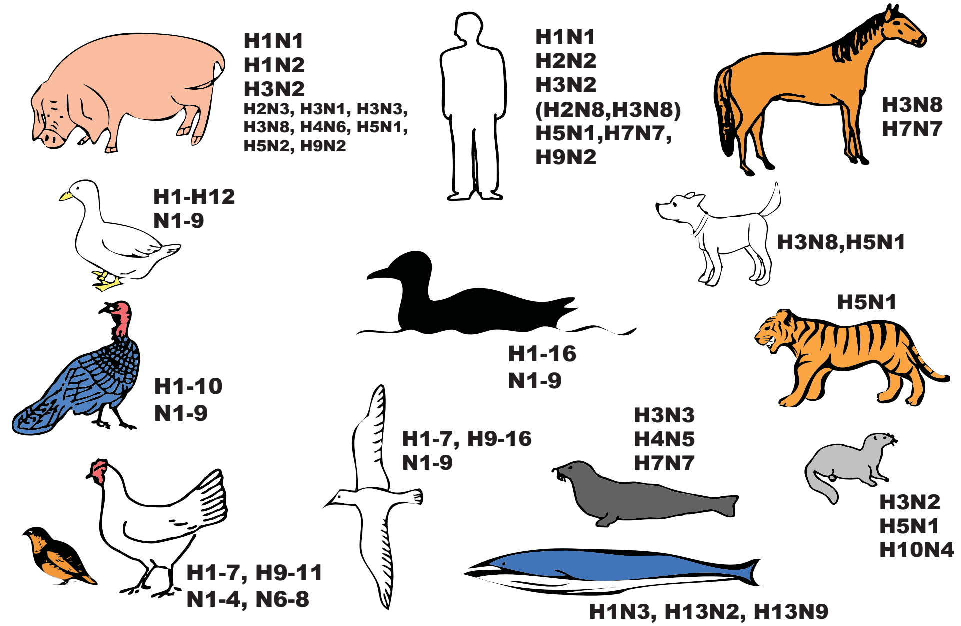
origin, perpetuation in nature, and evolution of influenza viruses, and mechanisms of the emergence of HPAIV and pandemic strains.

Human pandemic influenza



Highly pathogenic avian influenza

Host range, and HA and NA subtypes of influenza A virus

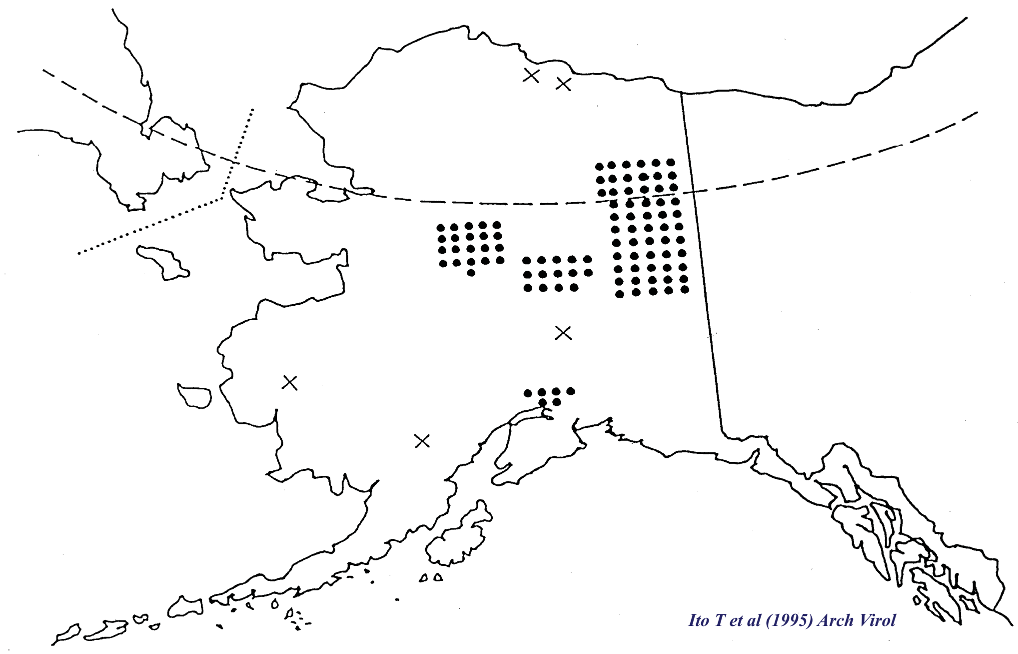


Duck influenza

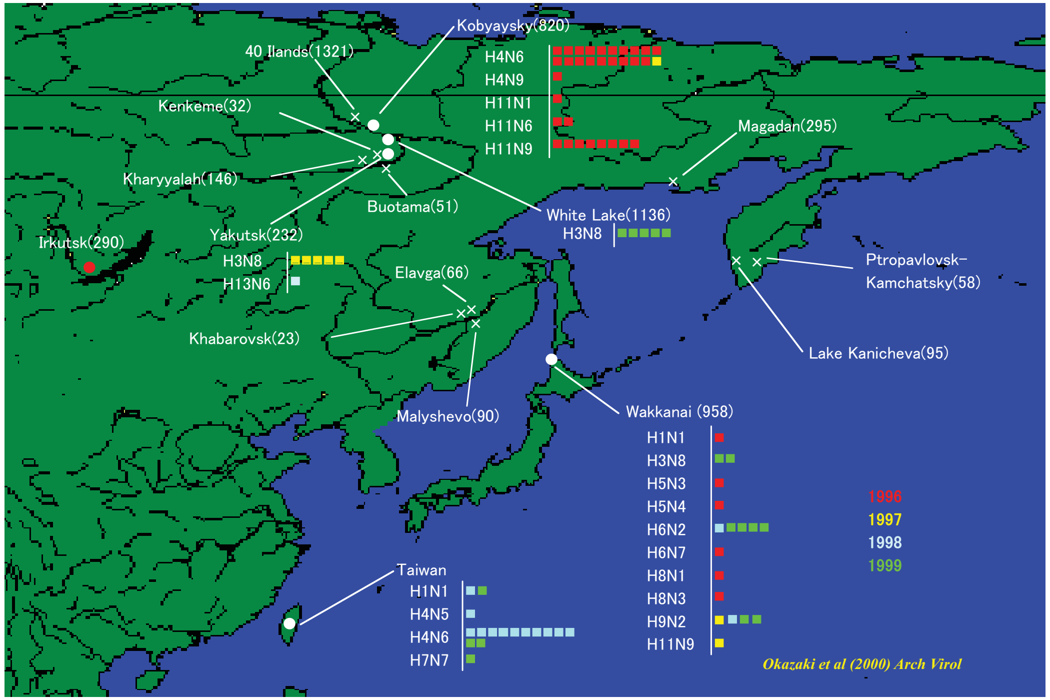
- Each of the known subtypes (H1-16, N1-9) of influenza A virus has been isolated from ducks.
- In ducks, viruses replicate in the colon, being shed with feces in a week, and non-pathogenic.
- Water-borne fecal-oral transmission
- Ducks carry and provide viruses during migration and over-wintering.
- Influenza viruses circulating in ducks are highly stasis antigenically and genetically.

→ Migratory duck is the natural host of influenza A viruses.

Kida et al (1980) Infect Immun; (1987) Virology

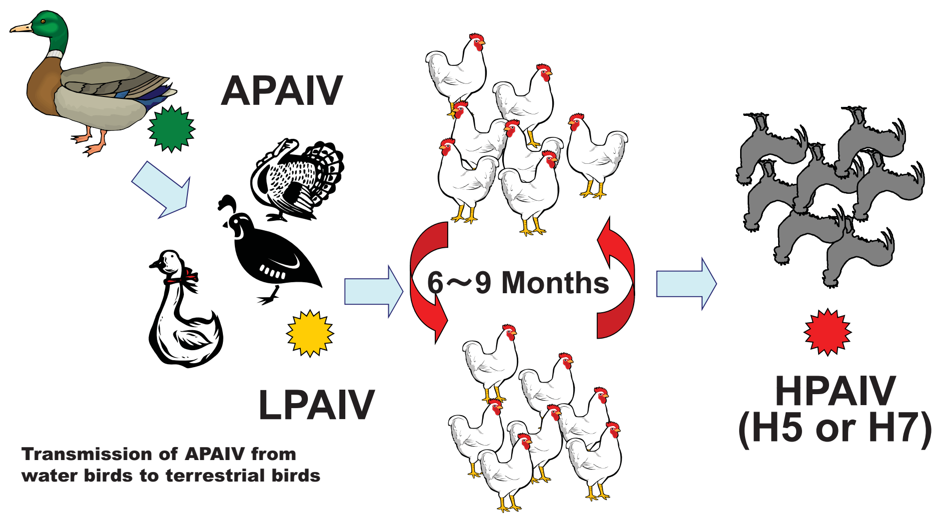


Ito T et al (1995) Arch Virol



Okazaki et al (2000) Arch Virol

Acquisition of pathogenicity of avian influenza viruses in chickens

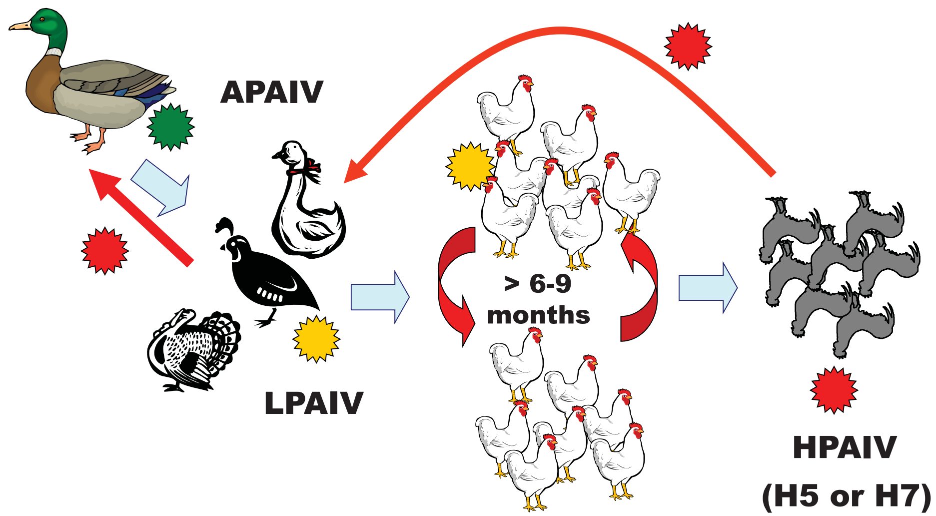


Amino acid sequences at the cleavage site of the HA of influenza A virus

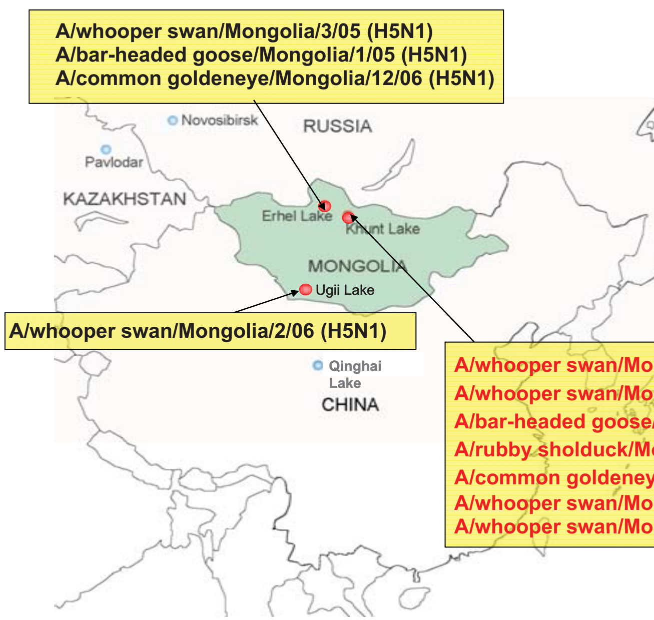
Subtype	Strains	A A sequence
H1	Dk/Alberta/35/76(H1N1)[b]	IQSR GLF
H2	Mal/MT/Y61(H2N2)[b]	IESR GLF
H3	Dk/Menphis/928/74(H3N8)[b]	KQTR GLF
H4	Dk/Czechoslovakia/56(H4N6)[b]	KASR GLF
H5	Ck/Scotland/59(H5N1)[b]	RKKR GLF
H5	Ty/MN/3/92(H5N2)[a]	RETR GLF
H6	Shw/Australia/1/72(H6N5)[b]	IETR GLF
H7	FPV/Rostock/34(H7N1)[b]	KKRKKR GLF
H7	Mal/Alberta/195/89(H7N3)[a]	KKTR GLF
H8	Ty/Ontario/6118/68(H8N4)[b]	VEPR GLF
H9	Ty/Wisconsin/66(H9N2)[b]	RSSR GLF
H10	Ck/Germany/N/49(H10N7)[b]	VQGR GLF
H11	Dk/England/56(H11N6)[b]	IASR GLF
H12	Dk/Alberta/60/76(H12N5)[b]	VQDR GLF
H13	Gl/Maryland/704/77(H13N6)[b]	ISNR GLF
H14	Mal/Gurjev/263/82(H14N5)[b]	KQAK GLF
H15	Shw/Australia/2576/79(H15N9)[b]	IRTR GLF

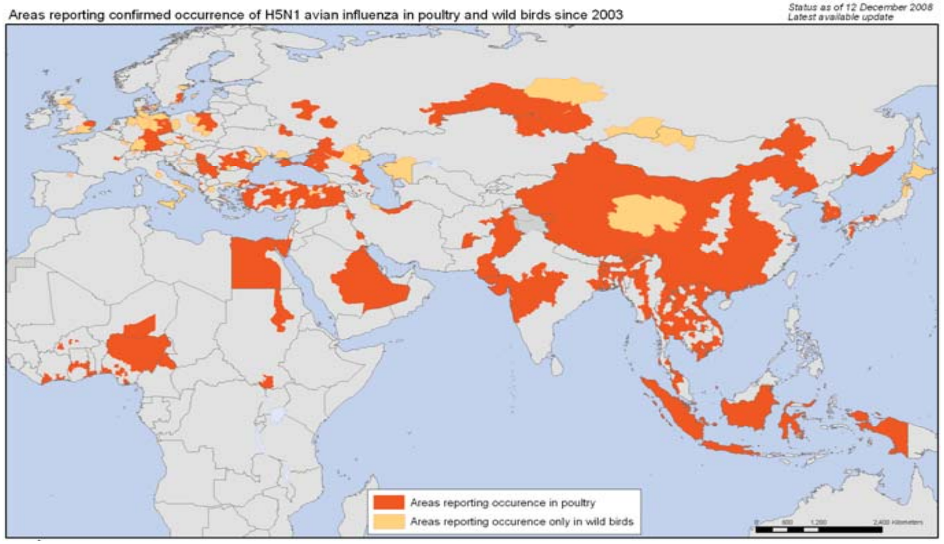
[a] Senne et al, 1996, [b] Kovacova et al, 2002

Return of the HPAIV from domestic poultry to migratory water birds



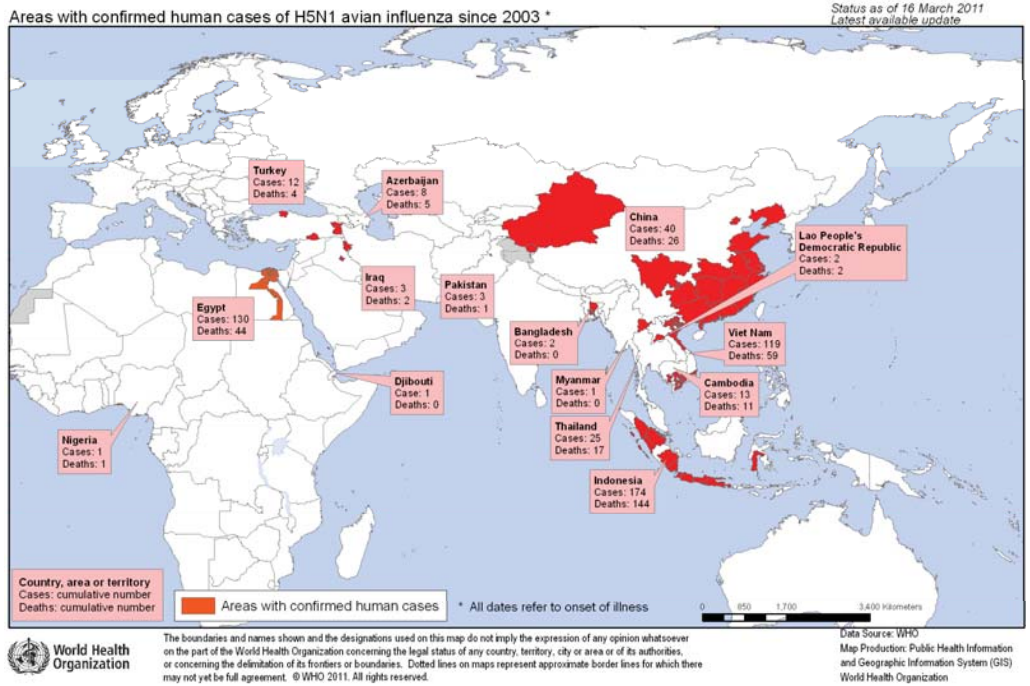
HPAI viruses isolated from wild birds in Mongolia in May





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

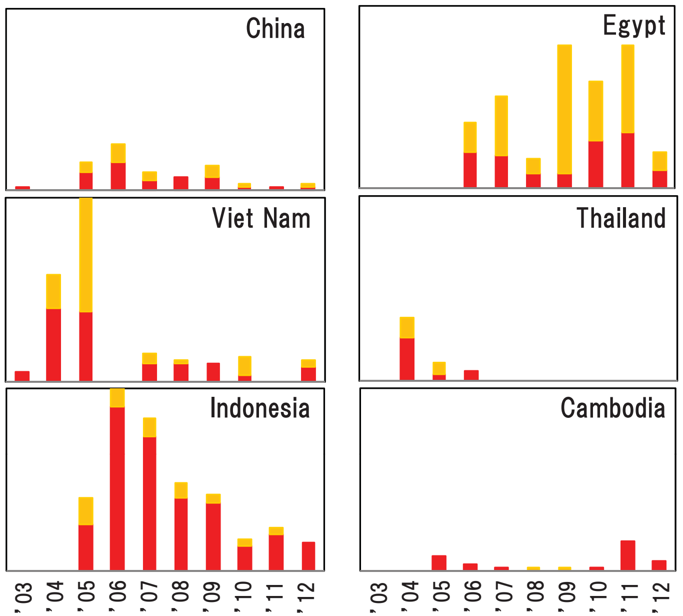


Confirmed human cases of H5N1 HPAIV infection

Country	Deaths/Cases
China	28 / 43
Viet Nam	61 / 123
Indonesia	159 / 191
Egypt	60 / 168
Cambodia	19 / 21
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	0 / 3
Total	359 / 608

As of 10 Augst 2012

WHO (2012), 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 a stockpile,

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 bird flu

- may prevent manifestation of disease signs and decrease the amount of virus shed, but does not confer protective immunity from infection.
- "Stamping-out policy" including early detection of infection, culling the infected flock, compensation, and monitoring has been recommended for the control of avian influenza.
- Vaccination was not primarily recommended but later approved as one of the options applied as a tool for the control of HPAI.
- Country where vaccine is used is not designated as HPAI-free.

→ leads silent spread of virus.

Vaccine 27 (2009) 5174–5177

Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/vaccine

Short communication

Long lasting immunity in chickens induced by a single shot of influenza vaccine prepared from inactivated non-pathogenic H5N1 virus particles against challenge with a highly pathogenic avian influenza virus

Takashi Sasaki[a,*], Norihide Kokumai[a], Toshiaki Ohgitani[a], Ryuichi Sakamoto[b], Noriyasu Takikawa[c], Zhifeng Lin[d], Masatoshi Okamatsu[e], Yoshihiro Sakoda[e], Hiroshi Kida[e,f]

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Table 1
HI antibody titres against Dk/Vac-1/04 in chickens during the 138 weeks following Dk/Vac-1/04 vaccination.

Group	Chicken No.	HI antibody titres and weeks after vaccination															
		1	2	3	4	5	16	28	40	52	64	76	88	100	112	124	138
Vaccinated	2	<4	128	2048	4096	2048	1024	512	512	512	256	256	256	256	256	256	256
	3	<4	256	1024	2048	2048	2048	1024	1024	1024	512	512	512	512	256	256	128
	6	<4	128	512	1024	1024	1024	256	256	256	128	128	128	128	64	64	64
	7	<4	128	512	2048	2048	256	128	128	128	128	128	128	128	64	64	64
	8	<4	512	1024	2048	2048	1024	512	512	512	512	512	512	256	128	128	128
GM[a]		<4	194	891	2048	1783	891	388	388	388	256	256	256	223	128	128	111
Non-vaccinated	9	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	10	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	11	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	12	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
GM[a]		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4

[a] GM: geometric mean.

Table 2
Clinical signs of influenza in vaccinated chickens after challenge with the HPAI virus Ck/Yamaguchi/04.

Group	Chicken No.	Serum HI antibody titre[a] and virus strain		Clinical signs on days following HPAI challenge													
		Dk/Vac-1/04	Ck/Yamaguchi/04	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Vaccinated	2	256	256	–[b]	–	–	–	–	–	–	–	–	–	–	–	–	–
	3	128	128	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	6	64	128	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	7	64	64	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	8	128	128	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Non-vaccinated	9	<4	<4	–	+[b]	D[b]											
	10	<4	<4	+	D												
	11	<4	<4	–	D												
	12	<4	<4	–	+	D											

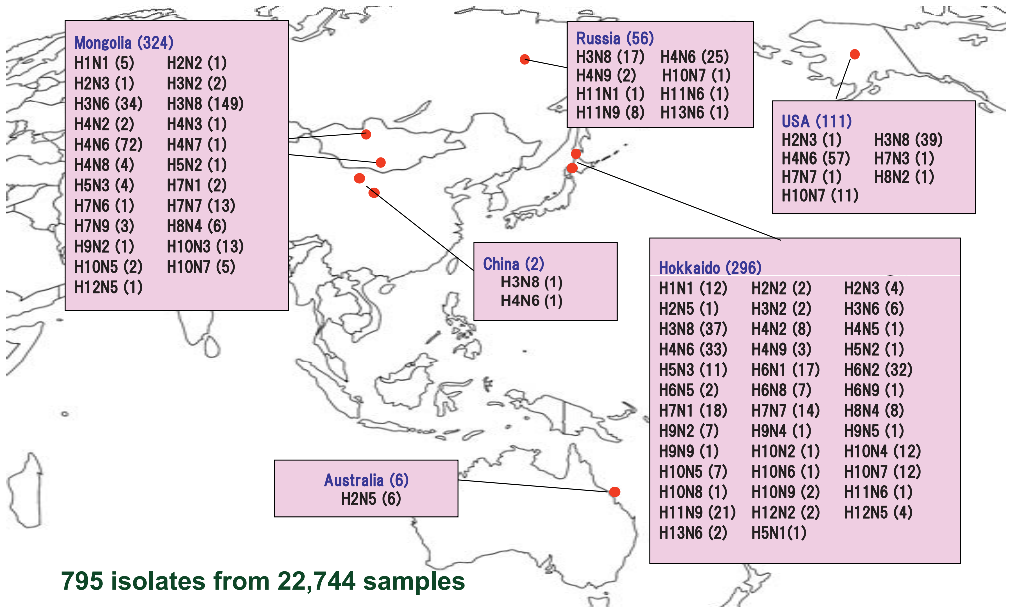
[a] HI antibody titre at the time of challenge.
[b] '–' no abnormal signs; '+': typical clinical signs (lethargy, loss of appetite and nervous symptoms); D: death.

Table 3
Antibody response and virus isolation from laryngopharyngeal and cloacal swabs of chickens after challenge with the Ck/Yamaguchi/04 virus.

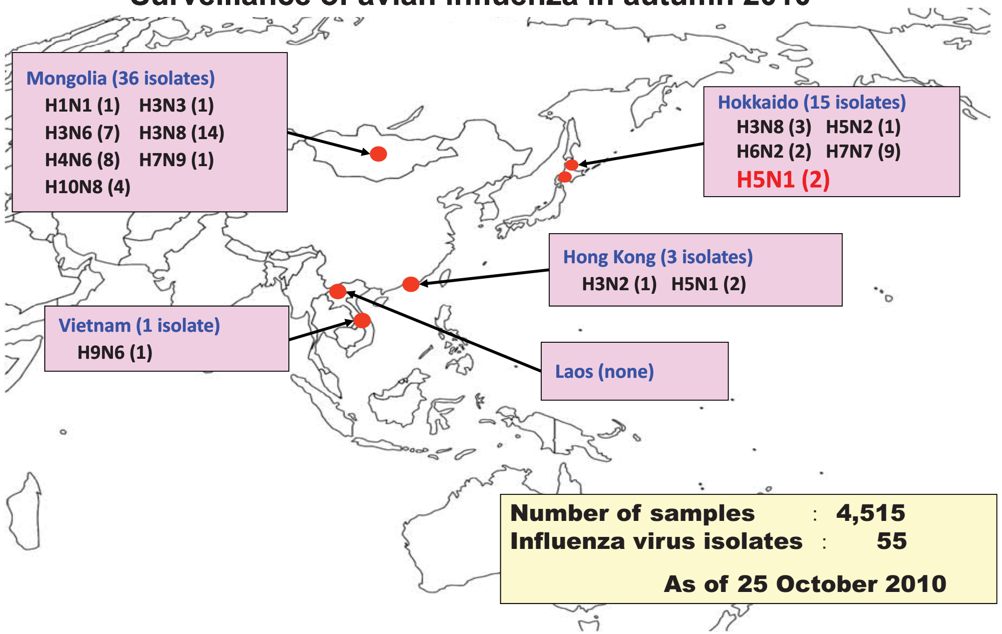
Group	Chicken no.	Serum HI antibody titre and virus strain				Virus titres[a] on the following days after challenge							
		Dk/Vac-1/04		Ck/Yamaguchi/04		2		3		4		14	
		Pre[b]	Post[b]	Pre	Post	L[c]	C[c]	L	C	L	C	L	C
Vaccinated	2	256	2048	256	2048	–[d]	–	NT[d]	NT	–	–	–	–
	3	128	8192	128	8192	1.7	–	NT	NT	–	–	–	–
	6	64	512	128	512	–	–	NT	NT	–	–	–	–
	7	64	2048	64	2048	1.5	–	NT	NT	–	–	–	–
	8	128	512	128	256	1.3	–	NT	NT	–	–	–	–
Non-vaccinated	9	<4	NT	<4	NT	6.8	5.5	6.0	4.5	NT	NT	NT	NT
	10	<4	NT	<4	NT	4.5	5.5	NT	NT	NT	NT	NT	NT
	11	<4	NT	<4	NT	6.5	4.8	NT	NT	NT	NT	NT	NT
	12	<4	NT	<4	NT	7.5	5.5	4.5	4.8	NT	NT	NT	NT

[a] Virus titre expressed as $\log_{10} EID_{50}$/mL.
[b] Pre: at the time of challenge; Post: 14 days post-challenge.
[c] L: laryngopharynx; C: cloacal.
[d] '–': Indicates a virus recovery titre lower than 0.5 $\log_{10} EID_{50}$/mL; NT: not tested.

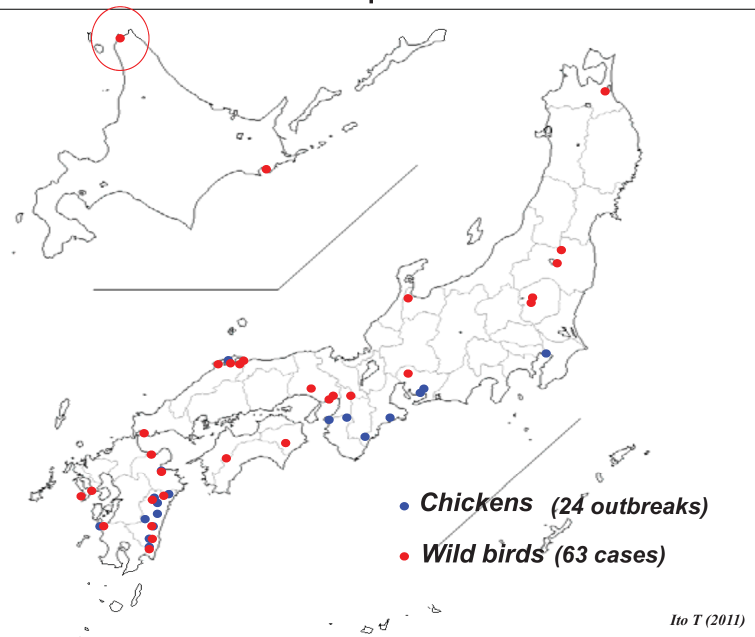
Surveillance of avian influenza in autumn (1991～2009)



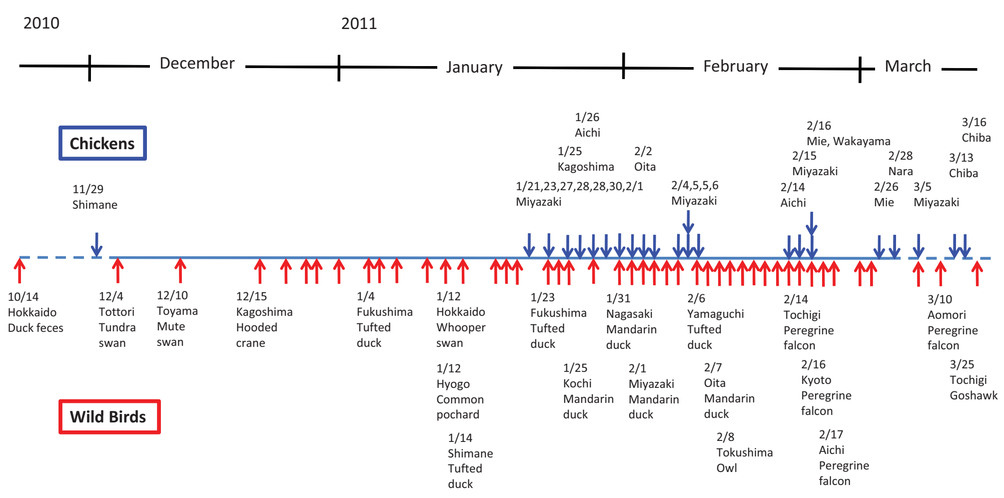
Surveillance of avian influenza in autumn 2010



Outbreaks of H5N1 HPAIV infection in Japan in 2010-2011 winter season

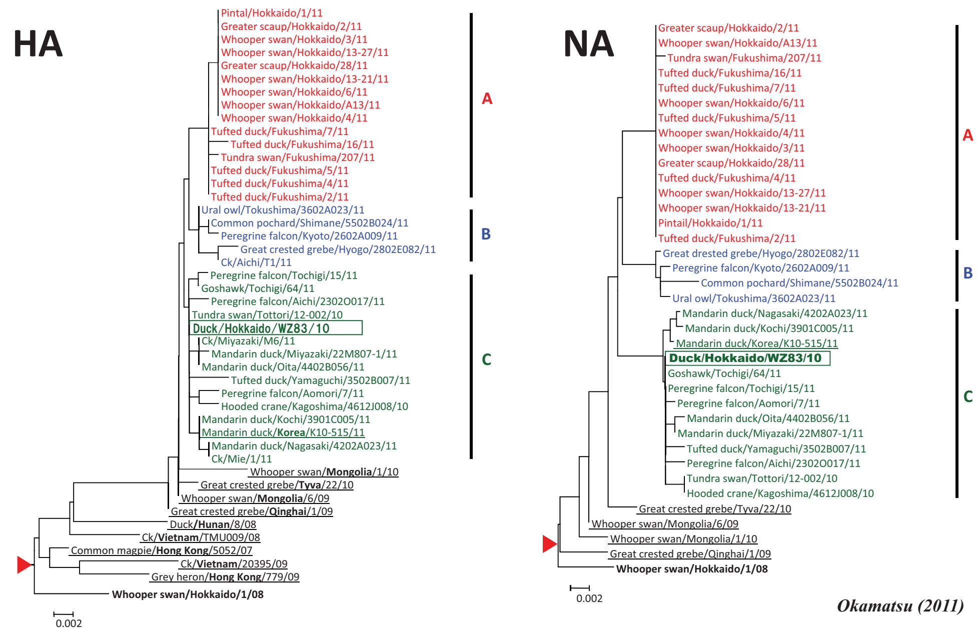


Time line of H5N1 HPAIV infection outbreaks in Japan 2010 - 2011



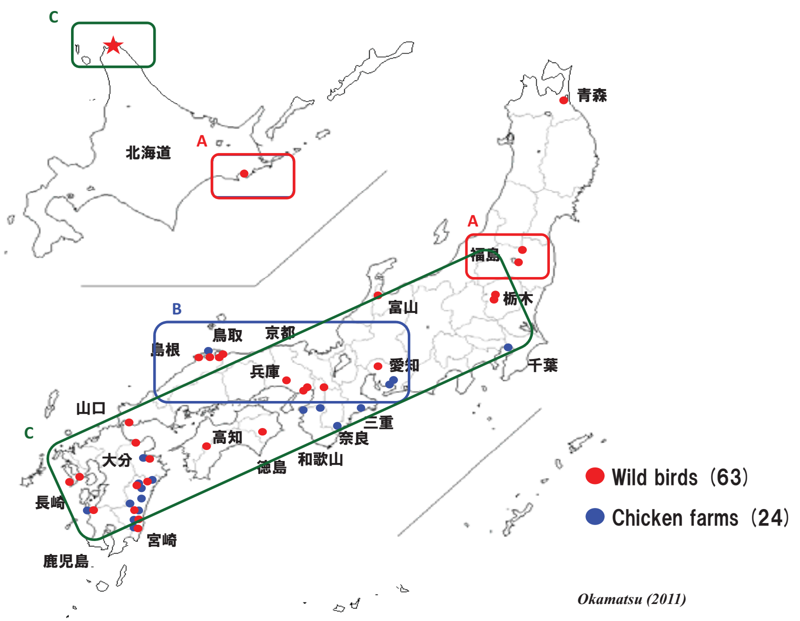
Ito T (2011)

Phylogenetic analysis of the H5N1 HPAIV isolates(clade 2.3.2)



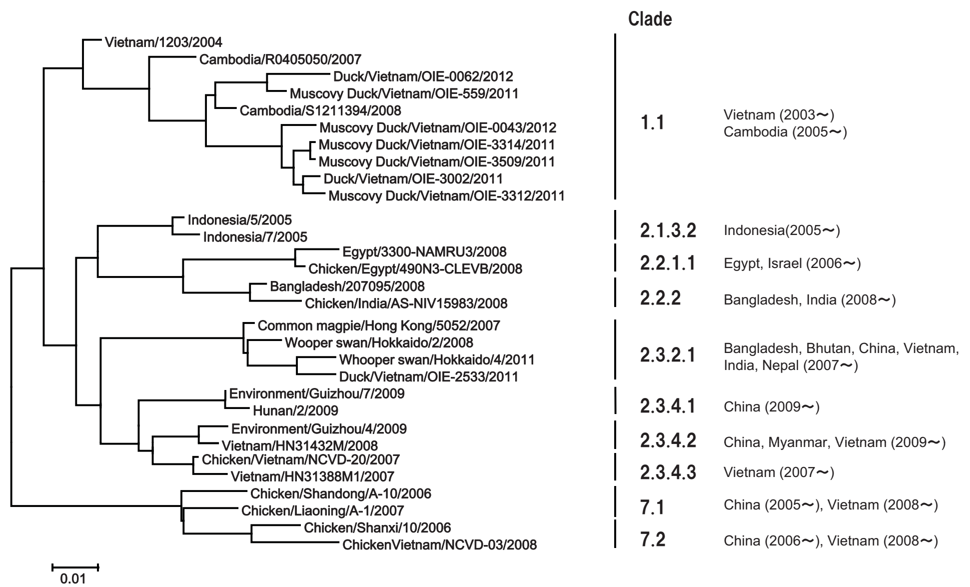
Okamatsu (2011)

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



Okamatsu (2011)

Phylogenetic tree of the HA genes of H5N1 HPAIVs



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

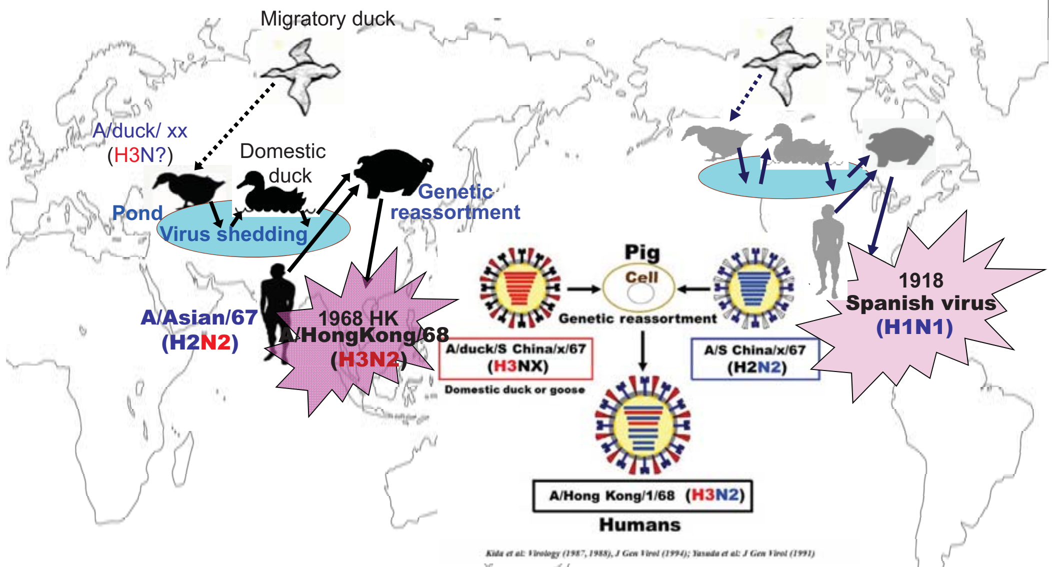
It is considered that;

- Highly pathogenic avian influenza H5N1 virus strains have persisted in domestic poultry for 14 years and antigenic variants have been selected mainly 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. Surveillance of swine flu is crucial in the countries where avian flu has not been controlled.

Rout of transmission of the genes of pandemic strains



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

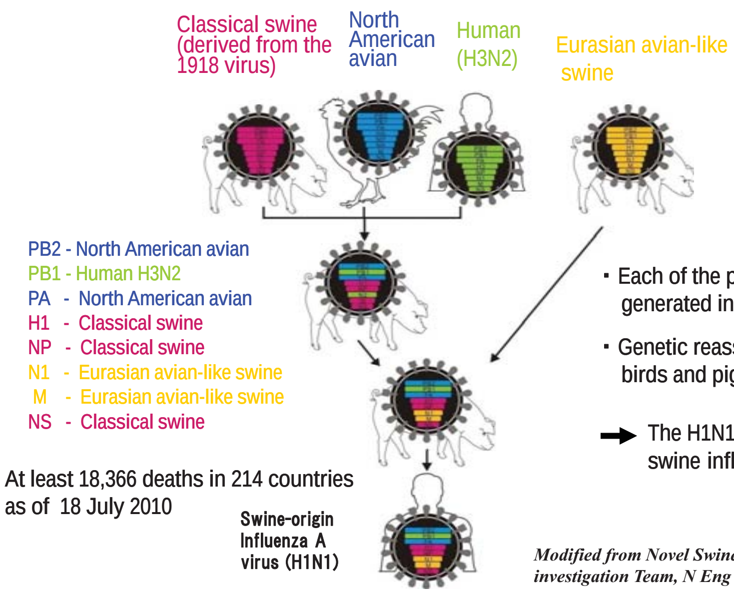
Candidates of future pandemic strains

- H1 to H16 and N1 to N9 subtypes of influenza A viruses perpetuate in the lakes where ducks nest in nature.
- 1957 H2N2, 1968 H3N2, 1918 H1N1 and 2009 H1N1 viruses are the reassortants between avian influenza viruses and the preceding human strains.
- Pigs are susceptible to each of avian and mammalian influenza viruses, generating reassortants.

→ Avian viruses of any subtype can contribute genes for reassortants : None of the 16 HA and 9 NA subtype can be ruled out as potential candidates for future pandemic strains.

→ Global surveillance of swine flu as well as avian flu is important.

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

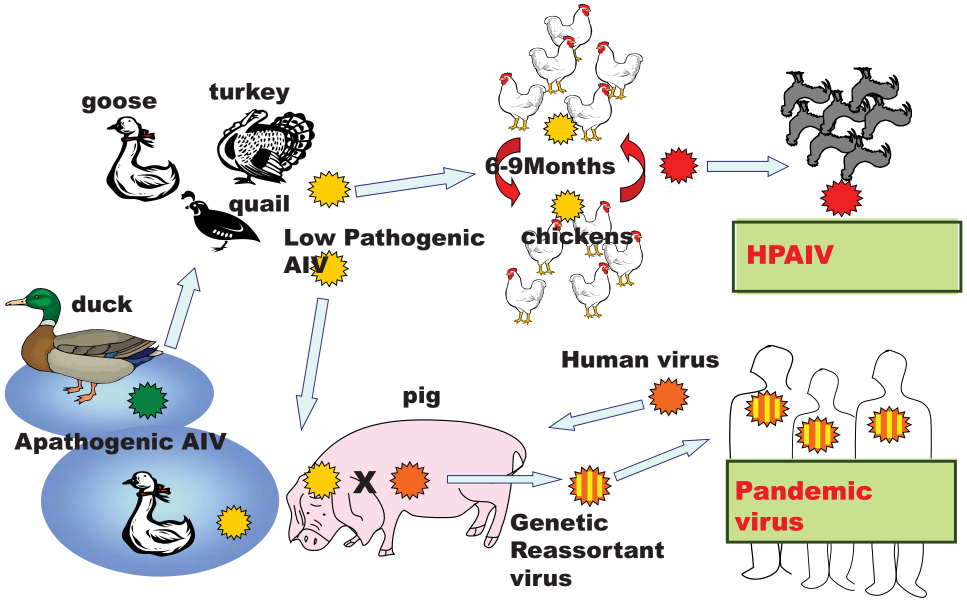


At least 18,366 deaths in 214 countries as of 18 July 2010

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

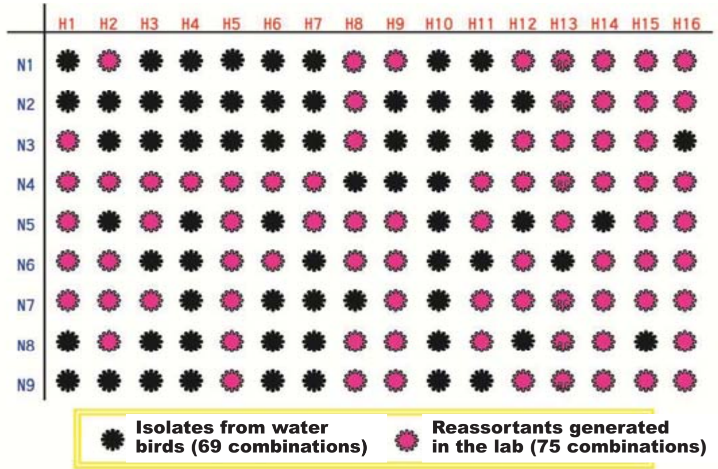
➡ The H1N1 strain is a genuine swine influenza virus.

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 69 combinations of the HA and NA subtypes have been isolated from fecal samples of ducks in Alaska, Siberia, Mongolia, Taiwan, China, and Japan (black).

75 other combinat-ions have been generated by genetic reassort-ment procedure in the lab (red).

Thus, 246 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, databased, and opened for Web site (http://virusdb.czc.hokudai.ac.jp/vdbportal/view/index.jsp).

How should we control HPAI and prepare for pandemic flu?

1. **Why have the H5N1 HPAIVs persisted in poultry for 16 years and antigenic variants been selected ?**
   Misuse of Vaccine.
2. **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 is urgently needed.
3. **How should avian influenza be controlled just in poultry ?**
   Enhanced surveillance, early detection, culling the flock, movement restriction, and strengthening hygienic measures without misuse of vaccine, monitoring, and contain just in domestic poultry.
4. **What are the advantage and disadvantage of the use of vaccines ?**
   Vaccine should be carefully used in addition to, not instead of stamping out.
5. **Will H5N1 HPAIV cause pandemic influenza?**
   It is unlikely to occur that direct transmission of AIV from birds to humans, but may occur via pigs. H5N1 alone is not a candidate of pandemic strain.
6. **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. Mix not transmissibility up with pathogenicity.

★ Global surveillance of avian, swine and human influenza, and seasonal flu control measure-based strategy by international collaboration under the concept of “One World, One Health”

Designing More Effective HPAI Control Strategies Based on Lessons Learned from the Past

D.E. Swayne

OIE Collaborating Centre for Research On Emerging Avian Diseases
FAO Reference Centre for Avian Influenza
Exotic & Emerging Avian Viral Diseases Research Unit
SEPRL, ARS, USDA, Athens, Georgia, USA

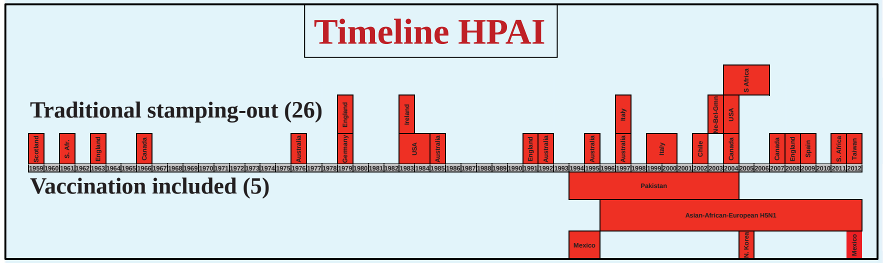
Control Strategies

Eradication is the only strategy for HPAI

Historical "Stamping-out" Components:

- Diagnostics and surveillance
- Biosecurity (including modifications to the way poultry are reared and sold, movement management, and cleaning and disinfection)
- Elimination of infected poultry
- Education (including behavioral change communications)
- Decreasing host susceptibility (vaccines/vaccination & host genetics)

Epizootic Metrics

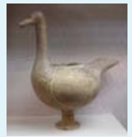


- 24 epizootics, < 1 year
- 26 epizootics used comprehensive control programs with stamping-out; mostly leading to eradication
- Vaccination added as a component with 5 epizootics

There is no "one control strategy"

- Vaccination used as a tool to reduce infection pressure, allow food security (poverty prevention), control of the disease, and development of infrastructure to eradicate

H5N1 HPAI



- H5N1 HPAI panzootic is unique:
  - 16 years of reported outbreaks
  - 9 years of multi-country control experience
  - Multiple introductions into some countries
  - Wild bird involvement
  - Affected poultry and wild birds in 63 countries, over 250 million poultry dead or culled: 1) 13 countries used vaccine, and 2) 50 did not use vaccine
- Successes:
  - Eradication in >50 countries. What did they do "right"?
  - Reduction in number of outbreaks in poultry
  - Reduced time to eradication
  - Reduction in projected rate of human cases

- Progressive re-definition of the role of vaccines and vaccination as tools in a comprehensive control program

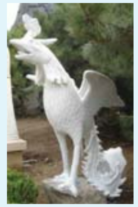
HPAI: National Control Programs

All countries had national HPAI/LPNAI control programs with common components including:

- Quarantine and additional movement restrictions or controls
- Tracing of poultry in outbreak area
- Enhanced biosecurity measures
- Farmer and public education and awareness about the disease
- Monitoring
- Rapid diagnostics
- Stamping-out of positive cases
- Disinfection of facilities and equipment
- Decontamination and disposal of infectious materials
- Compensation

HPAI: National Control Programs

Some countries had additional components including:



- Crisis management framework
- High-throughput rapid diagnostic testing
- Early processing of at-risk non-infected poultry
- Emergency vaccination
- Pen-side testing as a screening tool
- Zoning of movement restrictions & surveillance

Practice of culling varied with country:

- Infected premise
- Dangerous contacts/contiguous premises
    - Zonal approach – 0.5, 1 or 3 km

Quantitative implementation of each component varied with country

Vaccination

What can Vaccines/Vaccination do?

Increase resistance to AIV infection (contact transmission)

Reduce replication of AIV in respiratory & GI tract

Prevent illness and death in poultry

↓

Reduced environmental contamination

Reduced transmission to birds

Reduced human exposure and infections

Maintained livelihood and food security of rural poor

What can Vaccines/Vaccination not do?

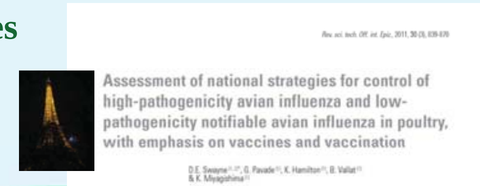
Eradicate

Vaccines/Vaccination in National Control

Why some countries have not used H5/H7 vaccines – top five responses*:

- Absence of AI in the country
- No immediate risk for outbreaks
- Stamping-out proved successful
- Lack of adequate resources for vaccination
- High cost of vaccines

*From 2002-2010 survey to OIE Delegate for countries with HPAI outbreaks (69 of 80; 86%) as part of 16 month sabbatical to OIE



Assessment of national strategies for control of high-pathogenicity avian influenza and low-pathogenicity notifiable avian influenza in poultry, with emphasis on vaccines and vaccination

Vaccines/Vaccination in National Control

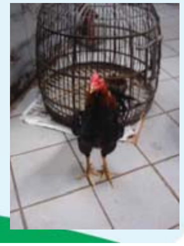
Why are some countries using, have used or may use H5/H7 vaccines – top five responses:

- Stamping-out measures were not enough in large outbreaks
- Control of localized infection “persistent” in some population of poultry species (i.e. domestic ducks)
- To protect expensive breeds and birds
- Enzootic disease was present
- Resources for vaccination were adequate

*From 2002-2010 survey to OIE Delegate for countries with HPAI outbreaks (69 of 80; 86%) as part of 16 month sabbatical to OIE

How Has Vaccination Been Used

- H5/H7 Vaccination used in different ways:
  - Zoo birds and captive held non-poultry (i.e. 14 EU and 2 other countries)
  - Single poultry farm (ex. Israel ostriches)
  - Ring vaccination zone after outbreak (Pakistan, Mexico)
  - Targeted for high risk poultry – ex. outdoor ducks (France), free-range layers (the Netherlands)
  - Focused sector-specific vaccination – (ex. Italy in turkeys and capons 2003-2005 in Northern Italy H5/H7 LPNAI)
  - Routine vaccination of poultry:
    ex. China (including Hong Kong), Egypt, Vietnam, Indonesia



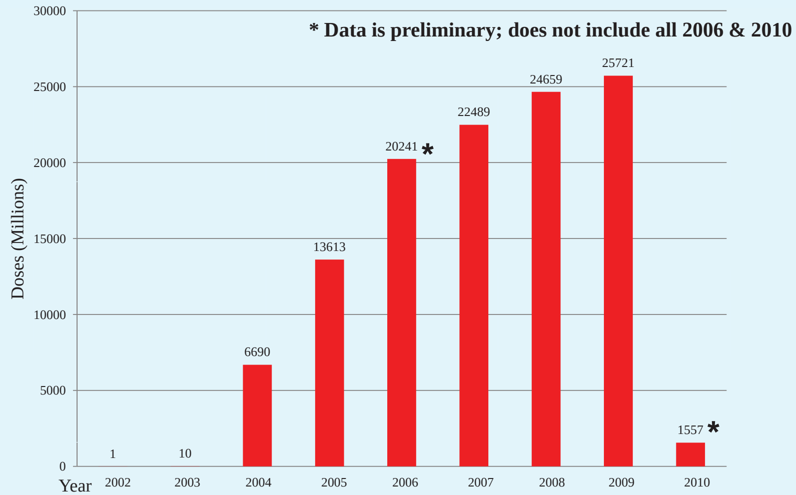
*From 2002-2010 survey to OIE Delegate for countries with HPAI outbreaks (69 of 80; 86%) as part of 16 month sabbatical to OIE

Did vaccination create HPAI enzootic infection?

- Bangladesh and eastern India enzootic without vaccination
- Egypt – 383 outbreaks before vaccination began and 573 outbreaks with 1% poultry vaccinated
- China – first case 1996 & in first 2 months of 2004, 48 outbreaks in 16 provinces. Vaccination began mid-2004
- Indonesia – first cases July 2003 with 312 outbreaks and 10.9 million deaths by June 2004
- Vietnam – by end of 2004, 24% of communes & 60% of towns had cases & 17% of the poultry population affected. Started vaccination Oct 2005

Data suggests H5N1 HPAI was enzootic before vaccination

Doses of H5 AI Vaccine Used 2002-2010*



>113b doses for *at risk* national poultry population of 131b (41.9% coverage); global production of 520b (10.9%)

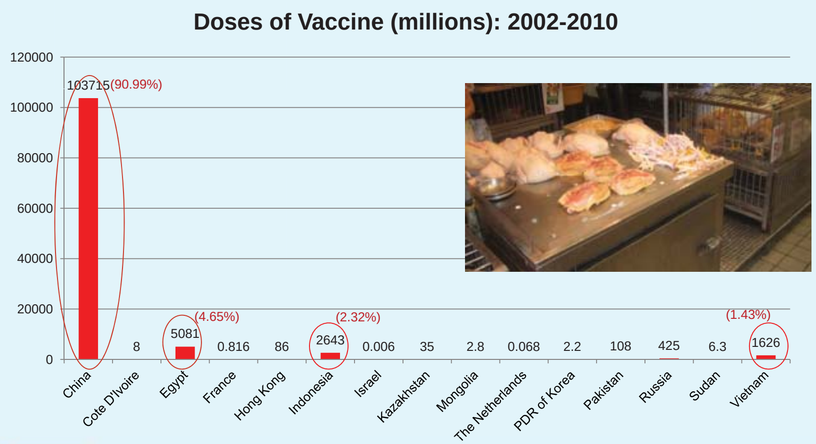
スライド 12

DS1 Update with new numbers from China
David Swayne, 2011/08/29

Vaccination

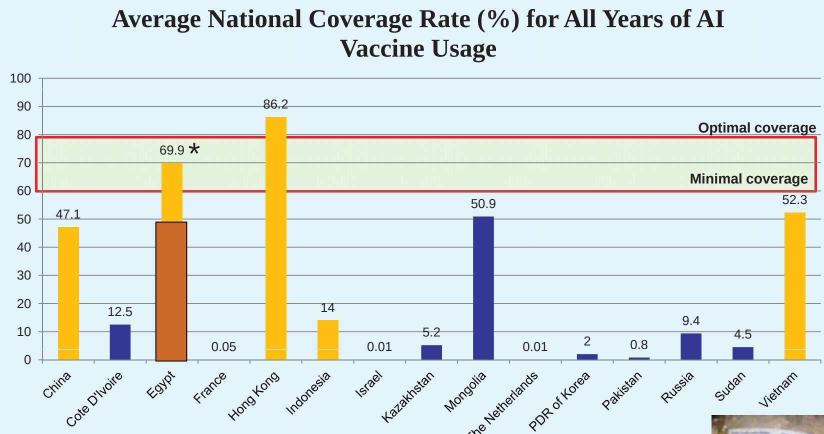
- 95.5% inactivated whole virus vaccine while 4.5% recombinant virus (rNDV and rFPV)
- 14 countries vaccinated poultry against HPAI (2002-2010)
  - Preventive (<0.2%): Mongolia, Kazakhstan, France and The Netherlands
  - Emergency (<0.8%): Cote d’Ivoire, Sudan, PDR Korea, Israel, Russia, Pakistan
  - Routine (99%): China (including Hong Kong), Egypt, Indonesia and Vietnam
  - 2012 – Mexico, H7N3 vaccination of layers in Jalisco & Bangladesh, pending H5N1 in comm. poultry

Vaccine Used



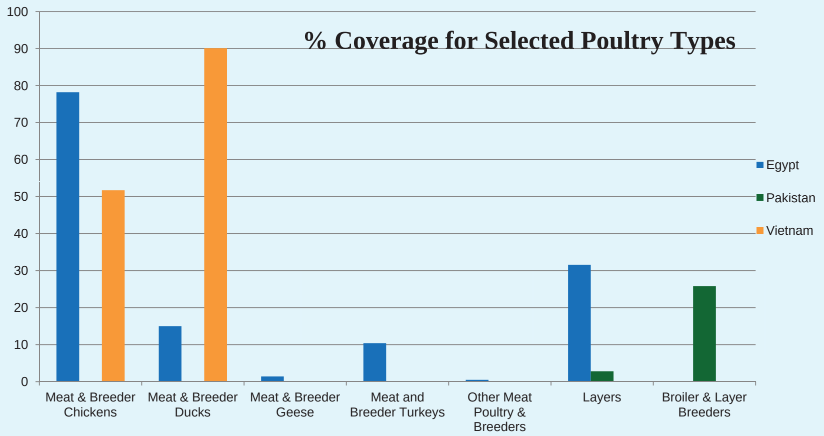
Enzootic countries: >99% of vaccine

National Verses Targeted Vaccination



*Using higher village poultry estimates of Egyptian Government, suggests 27.8-48.6% national coverage

Vaccination Coverage

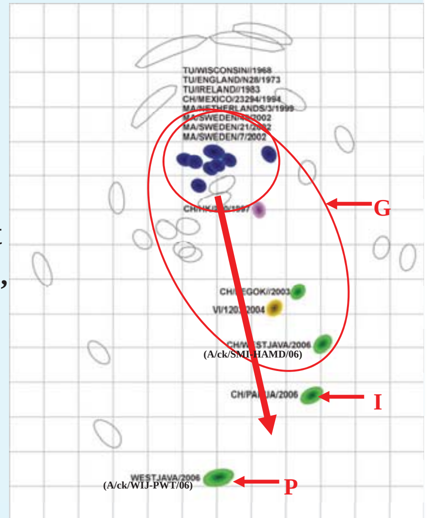


Each country had a different usage pattern

Antigenic Drift

Vaccine Seed Strains: Indonesia

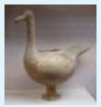
- Historical H5 Vaccines – Similar antigenicity
- Drifting of HA away from root
  - Good protection: Ck/HK/220/97, Ck/Legok/03, VN/1203/04, Ck/WJ/HAMD/06
  - Intermediate protection: Ck/Papua/06
  - Poor protection: PWT/06



Swayne, Smith and Fouchier, 2008

Antigenic Drift

- Egypt (2006-): Some field strains from commercial farms are resistant to immunity from Mexico/94 and Re-1 vaccines
- China (2004-):
  - Tk/England/1973 [H5N2]: (2004-6)
  - Re-1 (rg A/gs/Guangdong/1/1996 [H5N1] (0): 2004-8
  - Re-4 (rgA/ck/Shanxi/2006 [H5N1](7): 2006-7
  - Re-5 (rgA/dk/Anhui/1/2006 [H5N1](2.3.4): 2008-12
  - Re-6 (rgA/dk/Guangdong/S1322/2010 [H5N1] (2.3.2): 2012-
- Vietnam: 2011 2.3.2.1B resistant to immunity from Re-1 & Re-5 (future will use Re-6)
- Hong Kong (2008): clade 2.3.4



- Antigenic drift is being continually addressed

Major Issues

- Control of people movement will be required to eradicate HPAI because must control secondary spread:
  - Moving infected poultry is the major risk
  - Free movement of poultry products, contaminated clothing, shoes, equipment, etc are significant risks
  - Movement of wild birds are of lowest risk

- Large production in sectors 3 & 4 is difficult for disease control; many owners who make individual decisions for their own economic good, but can be bad for disease control
- Identification of infection and reservoirs (species, location)
- Myth: Vaccines/vaccination are the ultimate weapon
  - Resist infection and reduce replication; no sterilizing immunity
  - Difficult logistics of application (especially sectors 3 & 4)
  - National campaigns cannot achieve population immunity in large poultry populations, positive effects are quick overcome by short

Example: Hong Kong Program

- 11.6 to 4 million poultry per year (2002-2010)
- Initiated vaccination 2002 (11%), full implementation 2004-2010 (102.3%)
- Farms registered (30) and monitored:
  - Biosecurity measures
  - Farm inspection
  - Sentinel birds
  - Lab testing: poultry monitoring

- Serological monitoring of vaccination: booster if too low (90% >16 mean HI is acceptable)
  - Vaccination required of imported poultry

Prototype: Hong Kong Program

- DIVA surveillance: sentinels for virus and antibodies
- Control of wholesale (1) & retail (133) markets
- Elimination of backyard poultry in 2006
- Shift to commercial poultry products away from live poultry markets
- Movement control*

Optimal Program Components

- First, utilize the four major components: Diagnostics & Surveillance, Biosecurity, Education and Culling
- Virological surveillance to determine the circulating field strains and their antigenic character in order to select an antigenically relevant vaccine seed strain
- Determine the geographic location, production sectors and species which are affected; i.e. target the vaccination

Optimal Program Components

- Apply the vaccine to 60-80% of the *at risk* poultry by using an continuously applied, age-based vaccination program; boost before movement
  - Sectors 1 & 2 in high density areas of sectors 3 & 4
  - Asymptomatic reservoirs (e.g. domestic ducks)
- Utilize virological and/or serological strategies to identify infections among vaccinated birds
- Reassess and refocus vaccination program annual based on surveillance and field epidemiological information
  - Movement controls (e.g. market chain analysis)

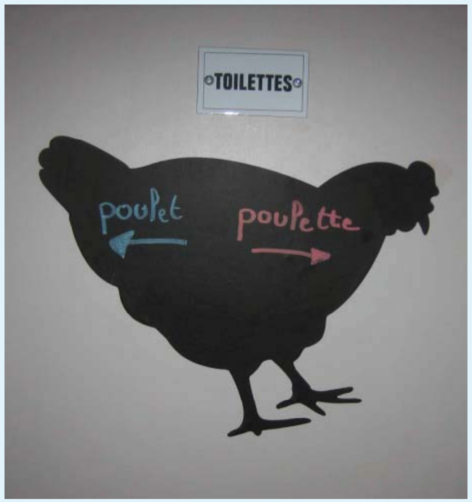
Concluding Thoughts

- Stamping-out will continue to be the preferred HPAI control strategy and is associated with shorter eradication times
- Vaccination has provided immediate positive impact on HPAI prevention and control
- Vaccination's role in eradication is long-term, buying time to improve surveillance, biosecurity and production practices while providing national food security and maintaining rural livelihoods
- Vaccination did not create enzootic H5N1 HPAI, but routine national vaccination has contributed to virus "persistence" in the field by complicating surveillance and contributing to complacency

Concluding Thoughts

- Effective vaccination must have population immunity in *at risk* poultry; >60% (minimum), 80% (optimal)
  - Easier to achieve in commercial production, but difficult in semi-commercial and village production systems
  - There must be economic incentives for farmers to vaccinate; e.g. difficult to achieve if vaccinating for the good of public health or to prevent a 'pandemic' as in domestic ducks (H5N1)
  - Vaccination must be linked to food security & rural livelihoods especially in semi-commercial and village production
- Vaccination protocols must fit the species & type of bird, production sector & immune status of the population
  - Targeted approach to *at risk* poultry (not national program)
  - Age/production cycle based in sector 1 & 2, but may boost in campaign-system (use in sector 3 & 4)

Merci Beaucoup!



31 HPAI Disease Events

1. 1959: Scotland, H5N1
2. 1961: S. Africa, H5N3
3. 1963: England, H7N3
4. 1966: Canada, H5N9
5.1975: Australia, H7N7
6. 1979: Germany, H7N7
7. 1979: England, H7N7
8. 1983-84: USA, H5N2
9. 1983: Ireland, H5N8
10. 1985: Australia, H7N7
11. 1991: England, H5N1
12. 1992: Australia, H7N3
13. 1994: Australia, H7N3
§ 14. 1994-95: Mexico, H5N2
§ 15. 1995 & 2004: Pakistan, H7N3
16. 1997: Australia, H7N4
17. 1997: Italy, H5N2
* § 18. 1996-2012: Eurasia/Africa, H5N1
19. 1999-2000: Italy, H7N1
20. 2002: Chile, H7N3
21. 2003: Netherlands, H7N7
22. 2004: USA, H5N2
23. 2004: Canada, H7N3
24. 2004, 2006: S. Africa, H5N2 (ostriches)
§ 25. 2005: N. Korea, H7N7
26. 2007: Canada, H7N3
27. 2008: England, H7N7
28. 2009: Spain, H7N7
29. 2011: S. Africa, H5N2 (Ostriches)
30. 2012: Chinese Taipei, H5N2
§ 31. 2012: Mexico, H7N3

*Largest epizootic in 50 yrs
§ Vaccine used in the control strategy