

The 5th OIE Regional Expert Group Meeting for Implementation of the Programme on Surveillance of Wild and Domestic Birds along Migratory Flyways under the OIE/Japan Trust Fund (JTF) Project for Strengthening HPAI Control in Asia

COUNTRY PRESENTATION

MONGOLIA

**Recent HPAI outbreaks and H5N1 HPAI virus
characterization studies in domestic birds
and wild birds**

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Tokyo, Japan,

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Investigation programme of wild birds

Recent HPAI outbreaks and H5N1 HPAI virus characterization in wild birds



Recent HPAI outbreaks and H5N1 HPAI virus characterization in wild birds



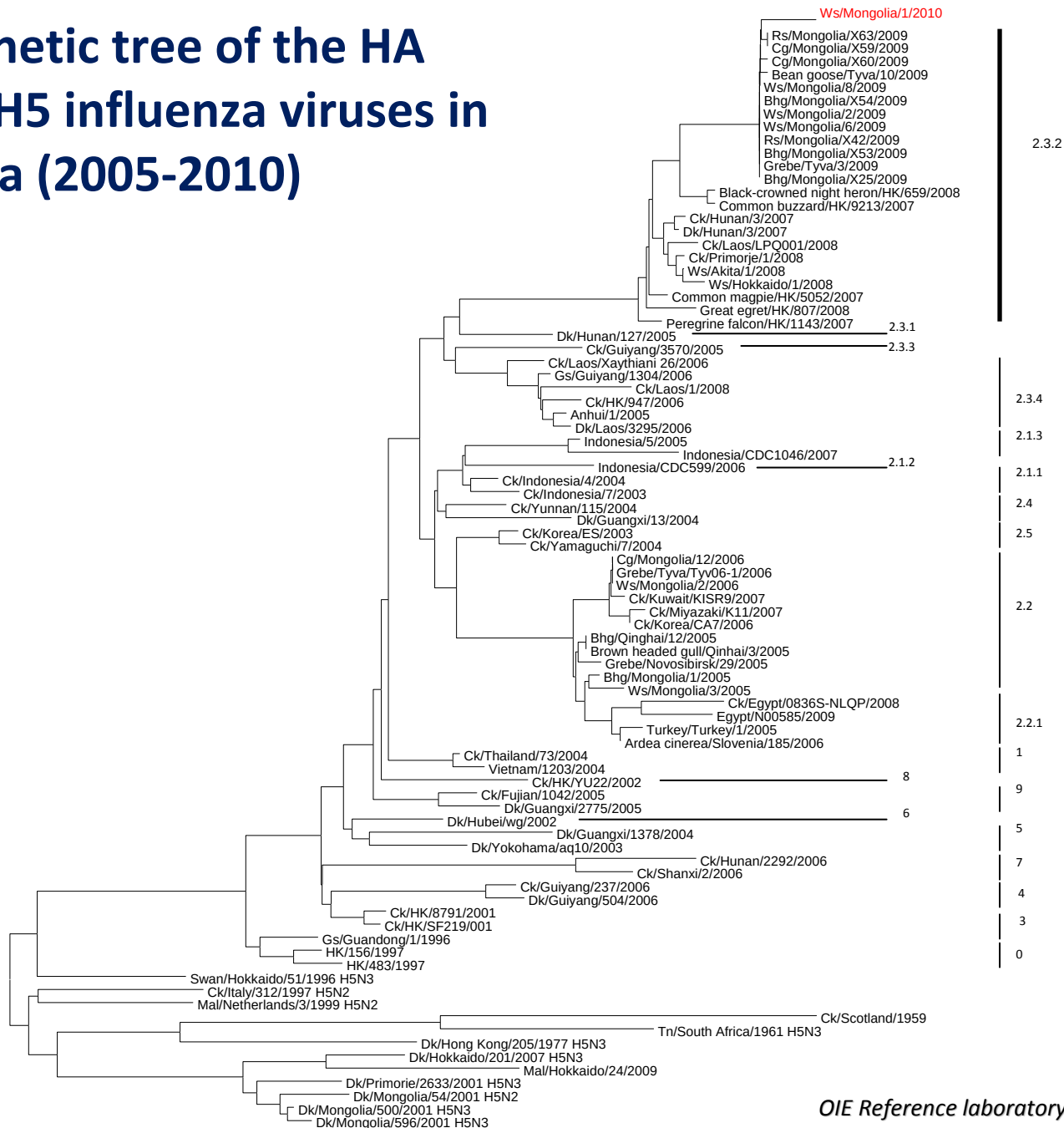
Recent HPAI outbreaks and H5N1 HPAI virus characterization in domestic and wild birds



Recent HPAI outbreaks and H5N1 HPAI virus characterization in wild birds

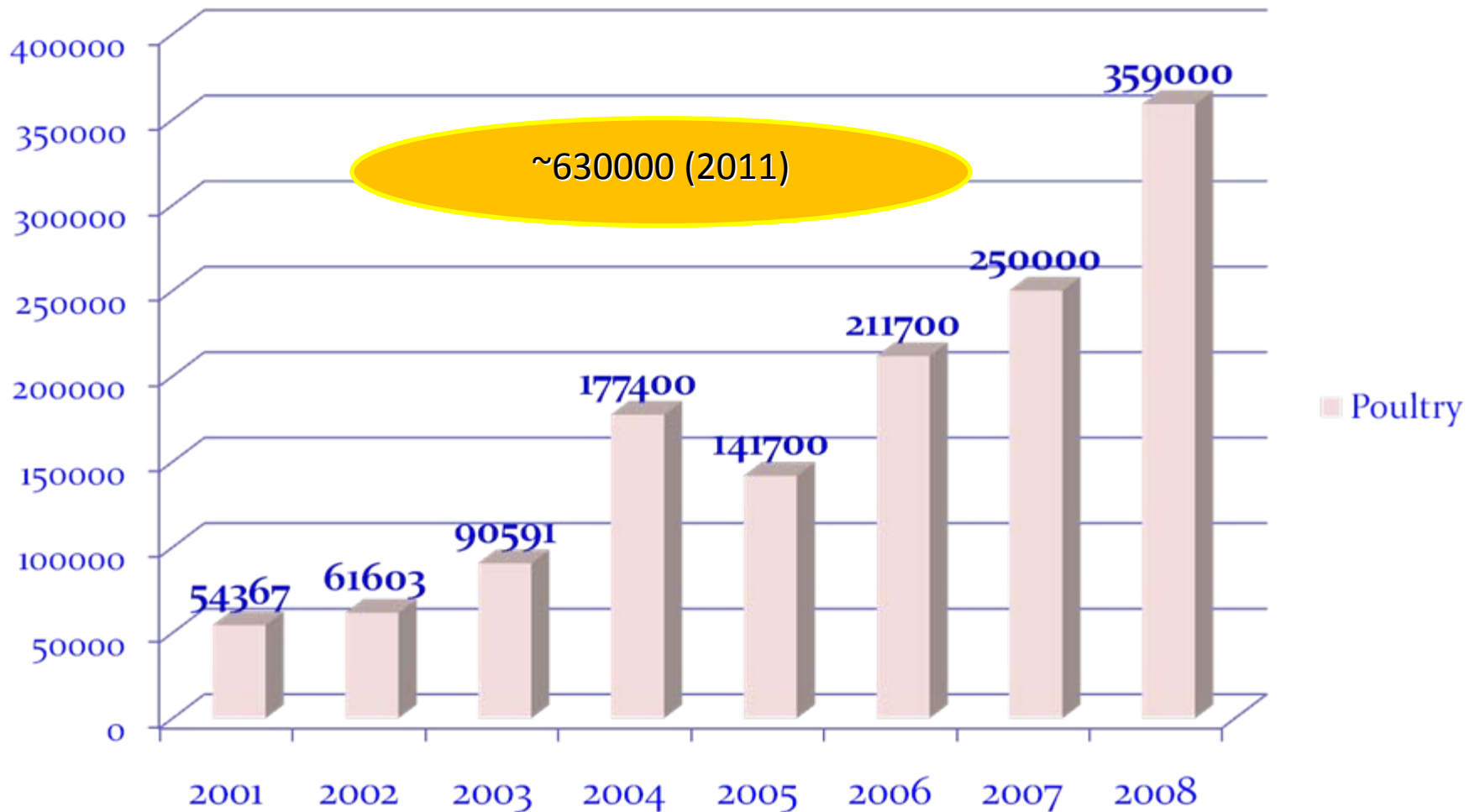


Phylogenetic tree of the HA gene of H5 influenza viruses in Mongolia (2005-2010)



OIE Reference laboratory, Hokkaido

Active AI surveillance/monitoring programme of domestic birds

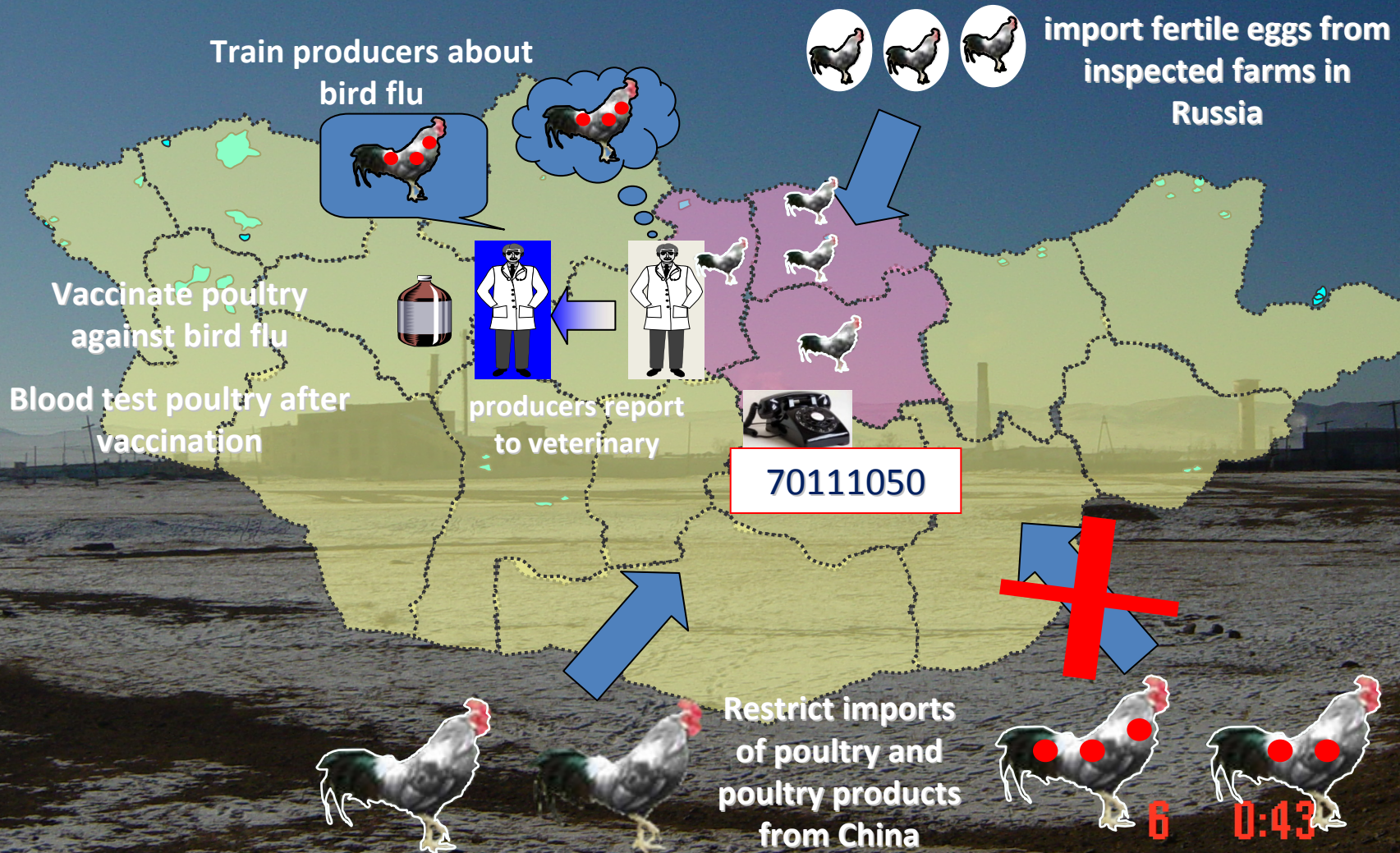


No HPAI disease is registered in domestic bird.

Limited import to product of birds (limited area in Russia, China)

Active AI surveillance/monitoring programme of domestic birds

Prevention and Surveillance

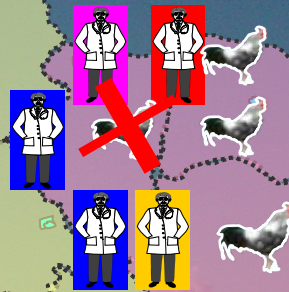


Active AI surveillance/monitoring programme of domestic birds

Response to Outbreak

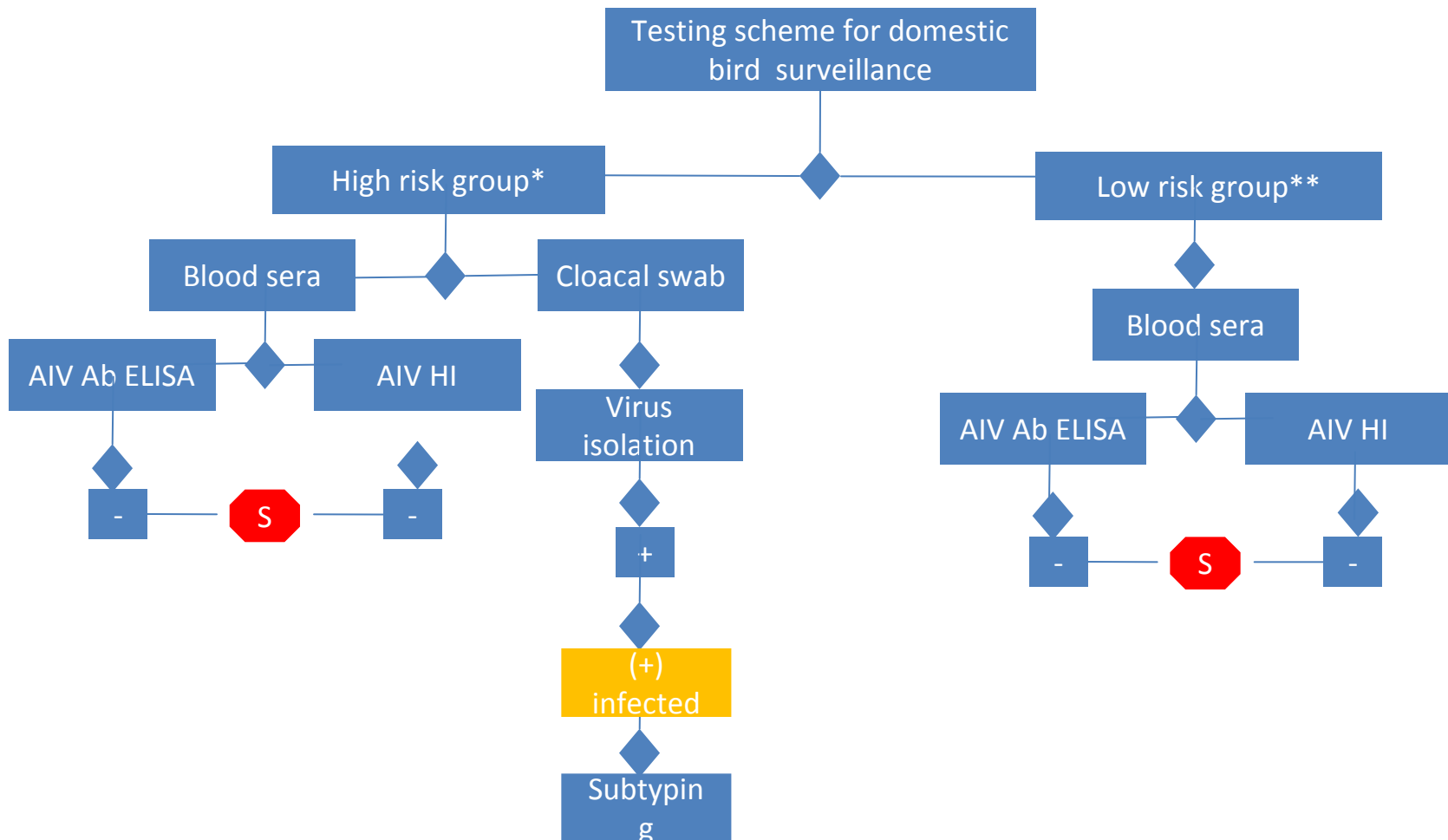
Business as usual in non-affected areas but markets may be affected

Poultry slaughter and quarantine in affected areas



Active AI surveillance/monitoring programme of domestic birds

The objective of this surveillance is to detect influenza infection in backyard and commercial poultry, the existence of low pathogenic Influenza virus circulation, and predict whether there is a risk of infection transmission from wild birds.



*small poultry farmers, backyard chickens without fencing, free range in raising area

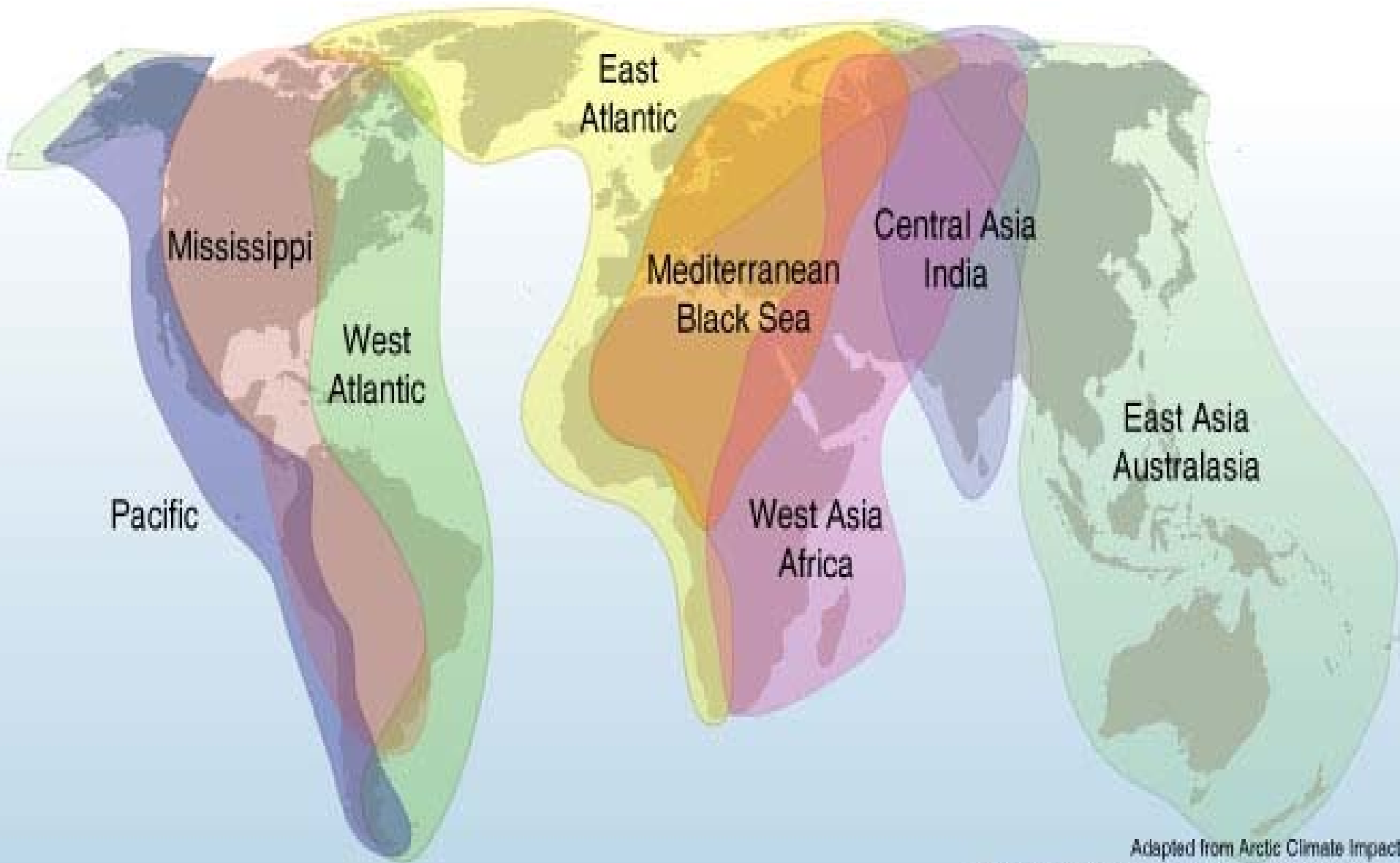
**indoor chickens with fence, shelter and low probability contact with wild birds

Active/passive AI surveillance/monitoring/ Investigation programme of wild birds

Why is Mongolia important?

- Mongolia supports large concentrations of waterfowl.
- Important breeding, moulting and pre-migratory staging areas.
- Support birds from multiple flyways (wintering in China, SE Asia, Indian SC., Australasia, Africa)

Migration routes waterfowl



Adapted from Arctic Climate Impact Assessment (ACIA), 2004. Impacts of a Warming Arctic.

The 3th monitoring level of bird influenza survey of ecological observations, their migration, population estimate and species registration was studied during the field trips in 2009 and 2010 respectively 79 lakes and 86 lakes which included total 12 provinces (aimags) of the western, center and southern part of Mongolia.

Active/passive AI surveillance/monitoring/ Investigation programme of wild birds

2009

No	Place	Species of bird	Specimen ID	Species of specimen	Viruses
1	Gun galuur lake, Bayandelger, Tuv	Hearing gull / <i>Larus argentatus</i> /	1	Feces	H 4N6
2	Jargal lake, Umnudelger, Khentii	Ruddy Shelduck / <i>Tadorna ferruginea</i> /	7	Feces	H 10N6
3	Turgen tsagaan, Dashbalbar, Dornod	Gadwall / <i>Anas strepera</i> /	26	Feces	H 10N6
4	Turgen tsagaan, Dashbalbar, Dornod	Ruddy Shelduck / <i>Tadorna ferruginea</i> /	27	Feces	H 10N6
5	Chukh lake, Dashbalbar, Dornod	Mallard / <i>Anas platyrhynchos</i> /	28	Feces	H 3N8
6	Khorin tsagaan, Dashbalbar, Dornod	Ruddy Shelduck / <i>Tadorna ferruginea</i> /	31	Feces	H 3N8
7	Ugii lake, Arkhangai	Whooper swan / <i>Cygnus cygnus</i> /	58	Feces	H 3N8

2010

No	Place	Species of bird	Specimen ID	Species of specimen	Viruses
1	Angirt lake, Chuluunkhoroot, Dornod	Whooper swan / <i>Cygnus cygnus</i> /	63	Brain	H5N1
2	Angirt lake, Chuluunkhoroot, Dornod	Whooper swan / <i>Cygnus cygnus</i> /	64	Pancreas	H5N1
3	Angirt lake, Chuluunkhoroot, Dornod	Whooper swan / <i>Cygnus cygnus</i> /	65	Lung	H5N1
4	Angirt lake, Chuluunkhoroot, Dornod	Whooper swan / <i>Cygnus cygnus</i> /	66	Trachea	H5N1
5	Khar-Us lake, Chandmani, Khovd	Hearing gull / <i>Larus argentatus</i> /	42	Feces	H3N8
6	Buuntsagaan lake, Bayarnkhongor	Bar-Headed Goose / <i>Anser indicus</i> /	9	Feces	H4N6
7	Khargal lake, Teshig, Bulgan	Bar-Headed Goose / <i>Anser indicus</i> /	32	Feces	H4N6

In the totally 14 viruses detect was collected samples during in the field trips in 2009 -2010 respectively 86 lakes which included 12 provinces.

Collaborating agencies

USAID-Mongolia

Wildlife Conservation Society,
Mongolian Academy of Sciences, Institute of
Biology

Hokkaido University

United Nations FAO

World bank

OIE



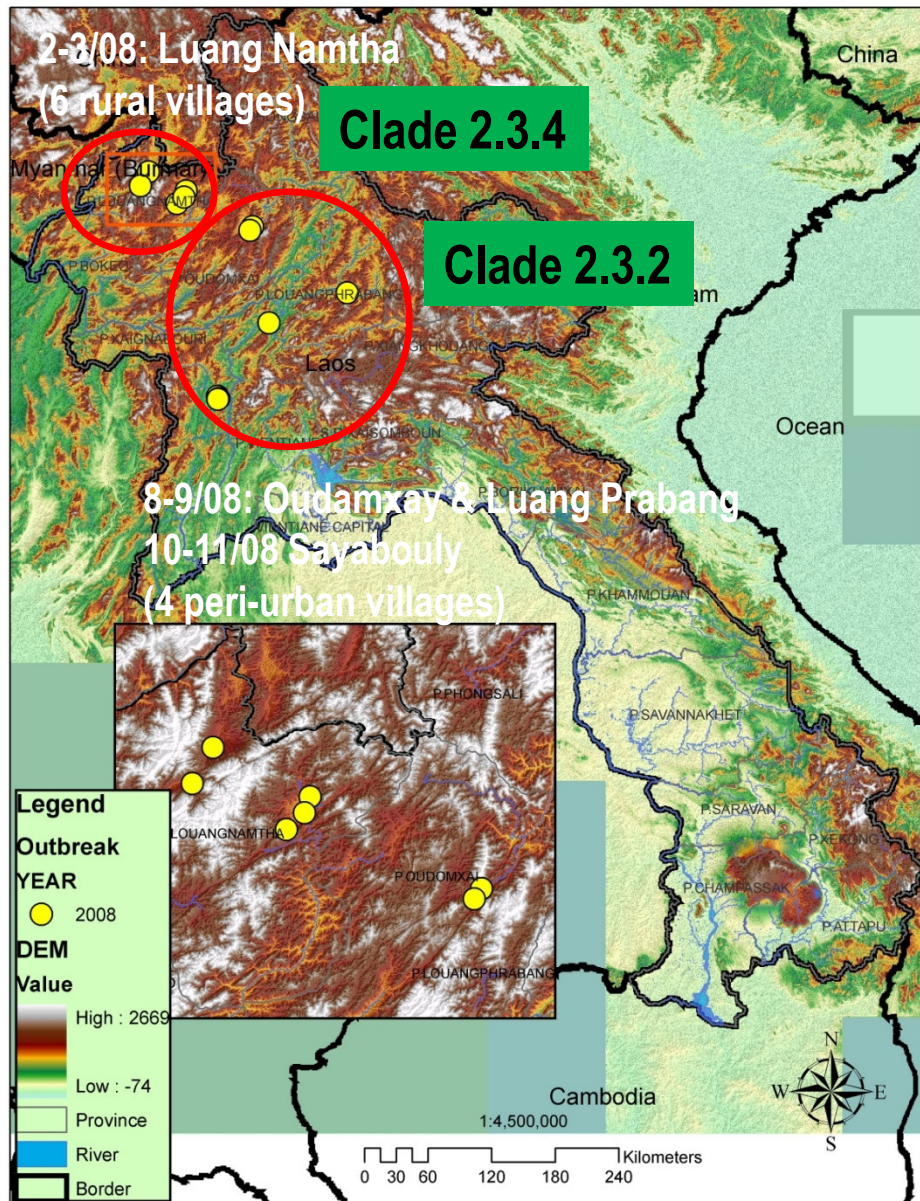
THANK YOU FOR YOUR ATTENTION

OVERVIEW OF H5N1 OUTBREAK IN LAO PDR

**Phouvong Phommachanh
Wattana Theppangna**

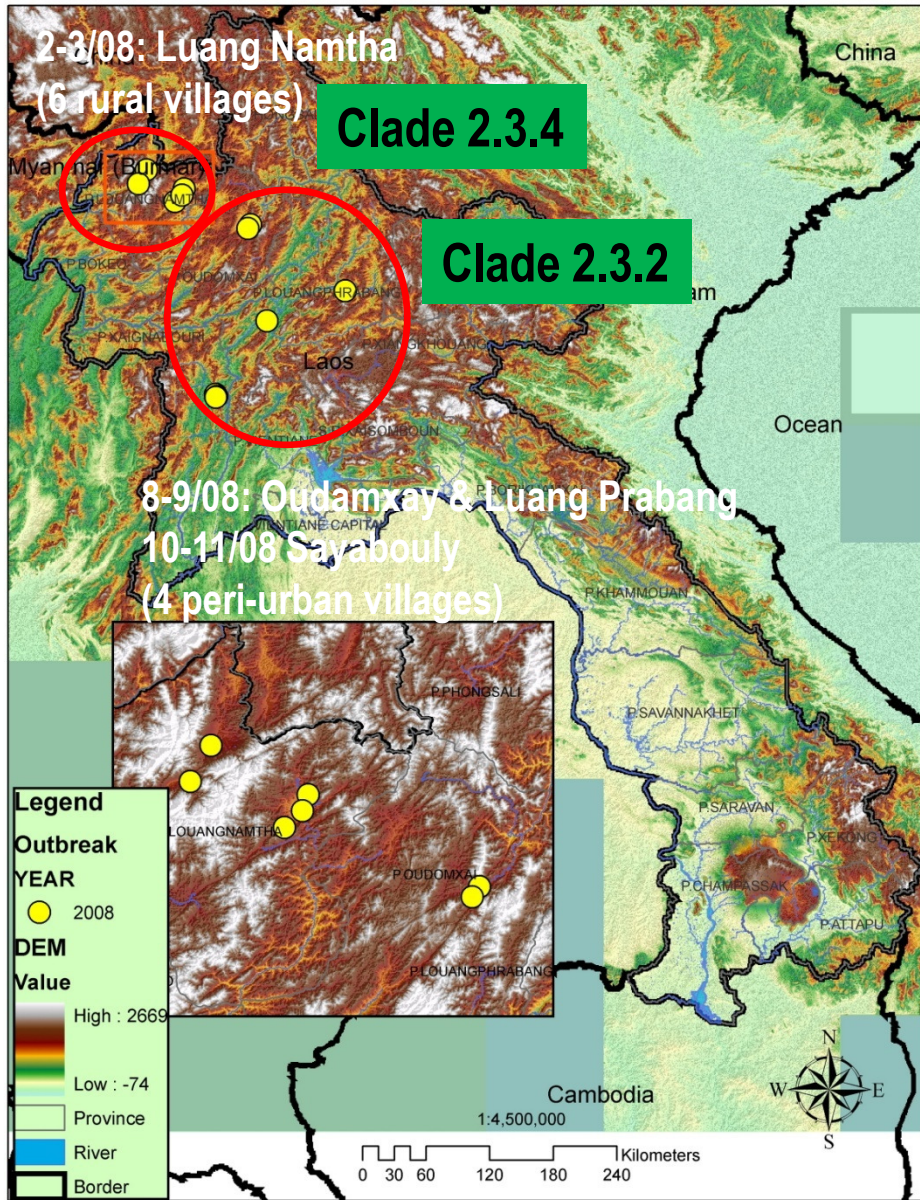
National Animal Health Center

Summary Lao outbreaks 2008



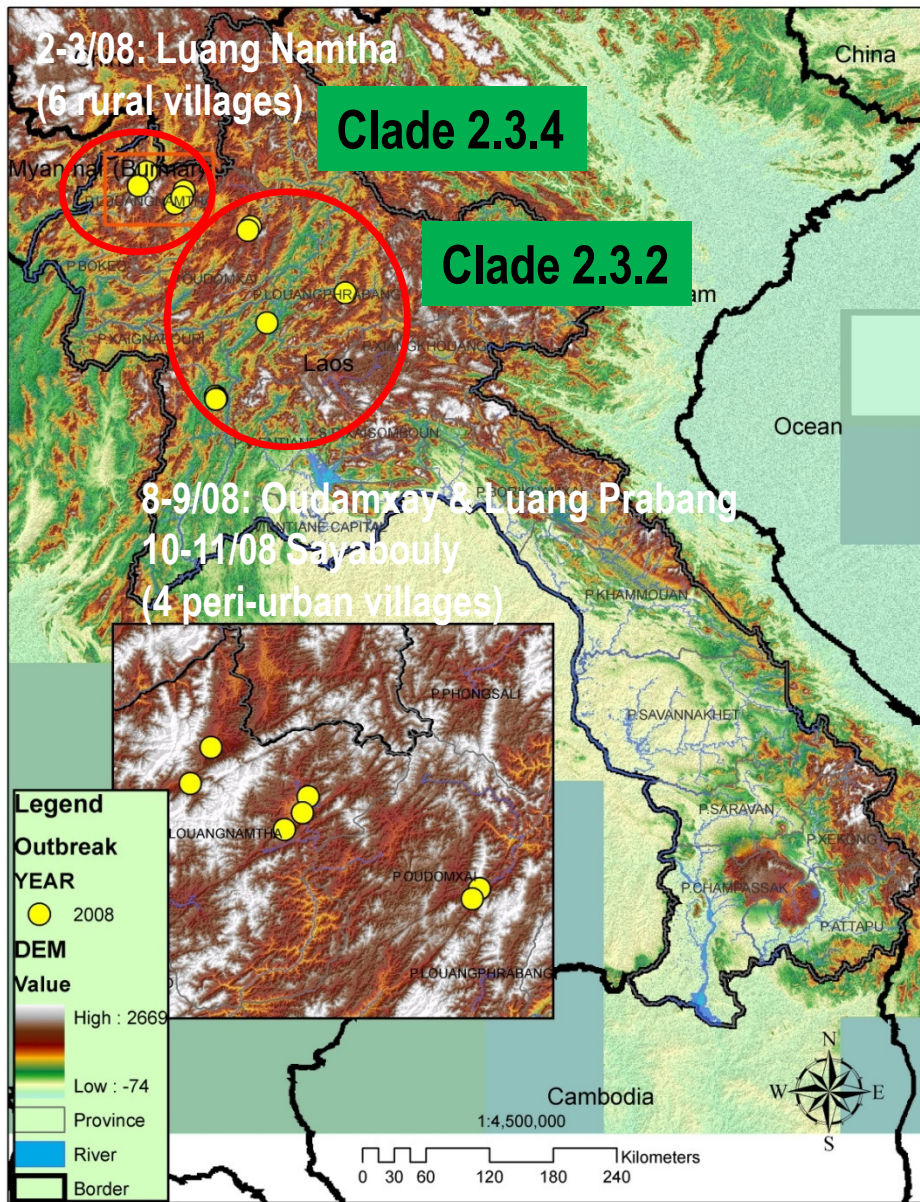
- Date: Feb - Mar 08
- Location: Luang Namtha (6 rural villages)
- District: Muang Long, 1 village
Muang Sing, 1 village
Luang Namtha, 3 villages
Vieng Phouka, 1 village
- Species: Backyard chickens, ducks, geese & turkeys
- Subtype: Clade 2.3.4
- Different strain to Feb 07 (Boltz et al., 2010).

Summary Lao outbreaks 2008



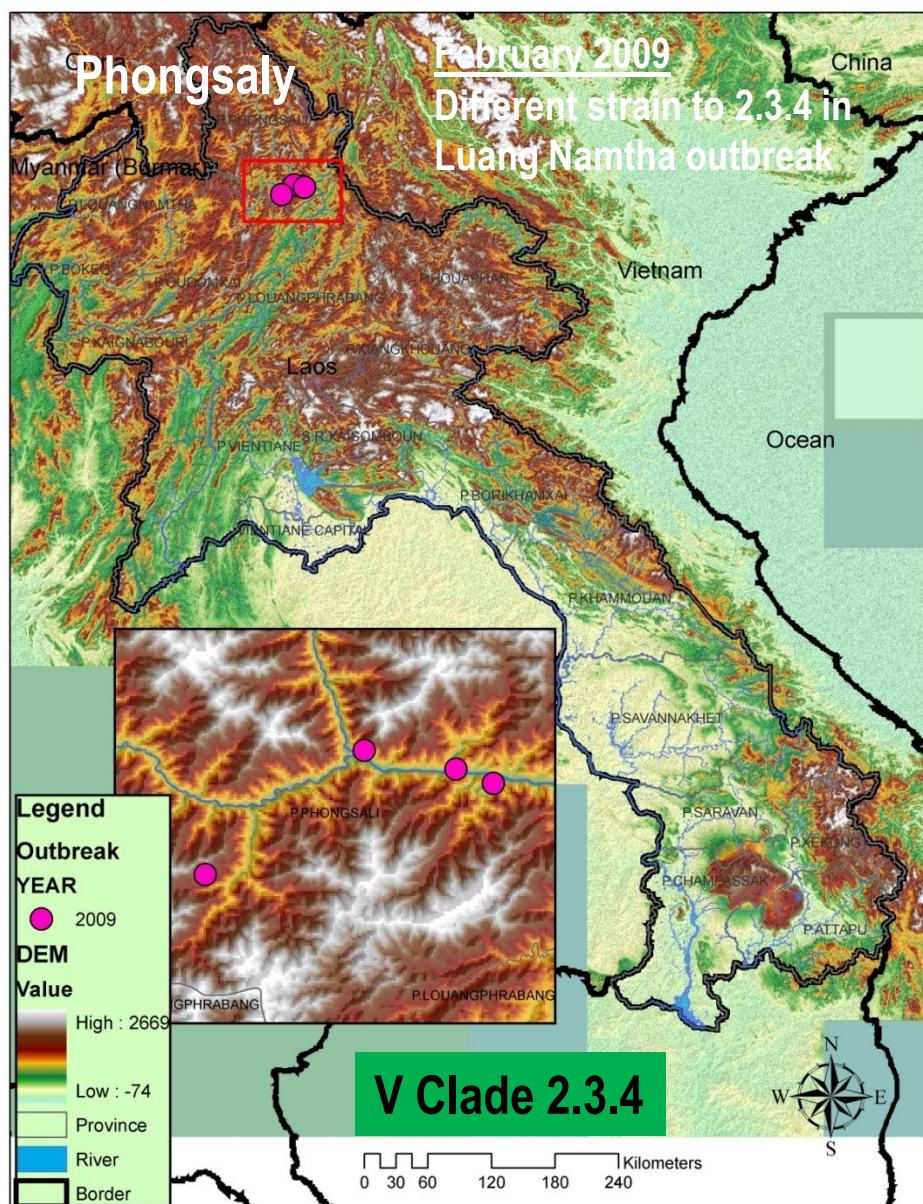
- Date: Aug - Sep 08
- Location: Oudamxay & Luang Prabang
- District: Nambak, 1 village
Xay, 2 villages
- Species: Backyard ducks
- Subtype: Clade 2.3.2
- Some evidence that virus introduced via ducklings imported from China (Eagles et al., 2009)

Summary Lao outbreaks 2008



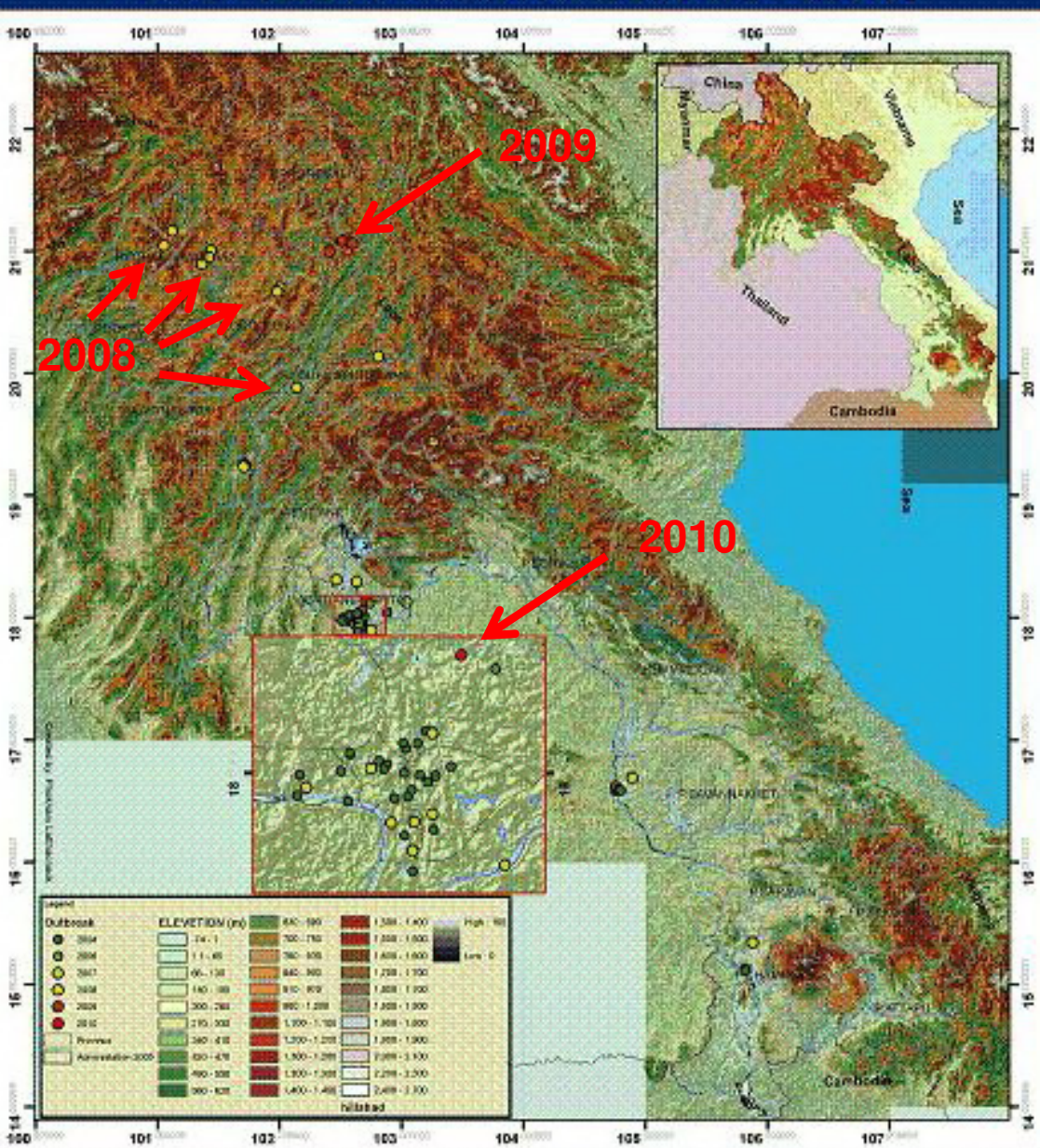
- Date: Oct - Nov 08
- Location: Sayaboury
- District: Sayaboury, 4 peri-urban villages
- Species: Backyard chickens & ducks
- Subtype: Clade 2.3.2
- No information on relationship of this virus to the 2.3.2 clade in the Aug – Sep 08 outbreak

Summary Lao outbreaks 2009



- Date: Feb 09
- Location: Phongsaly
- District: Khoua, 5 villages
- Species: Backyard chickens
- Subtype: Clade 2.3.4
- Different strain to 2.3.4 in Luang Namtha outbreak (FAO EMPRES, Mar 2009)

HPAI Outbreaks in Laos (2004-2010)

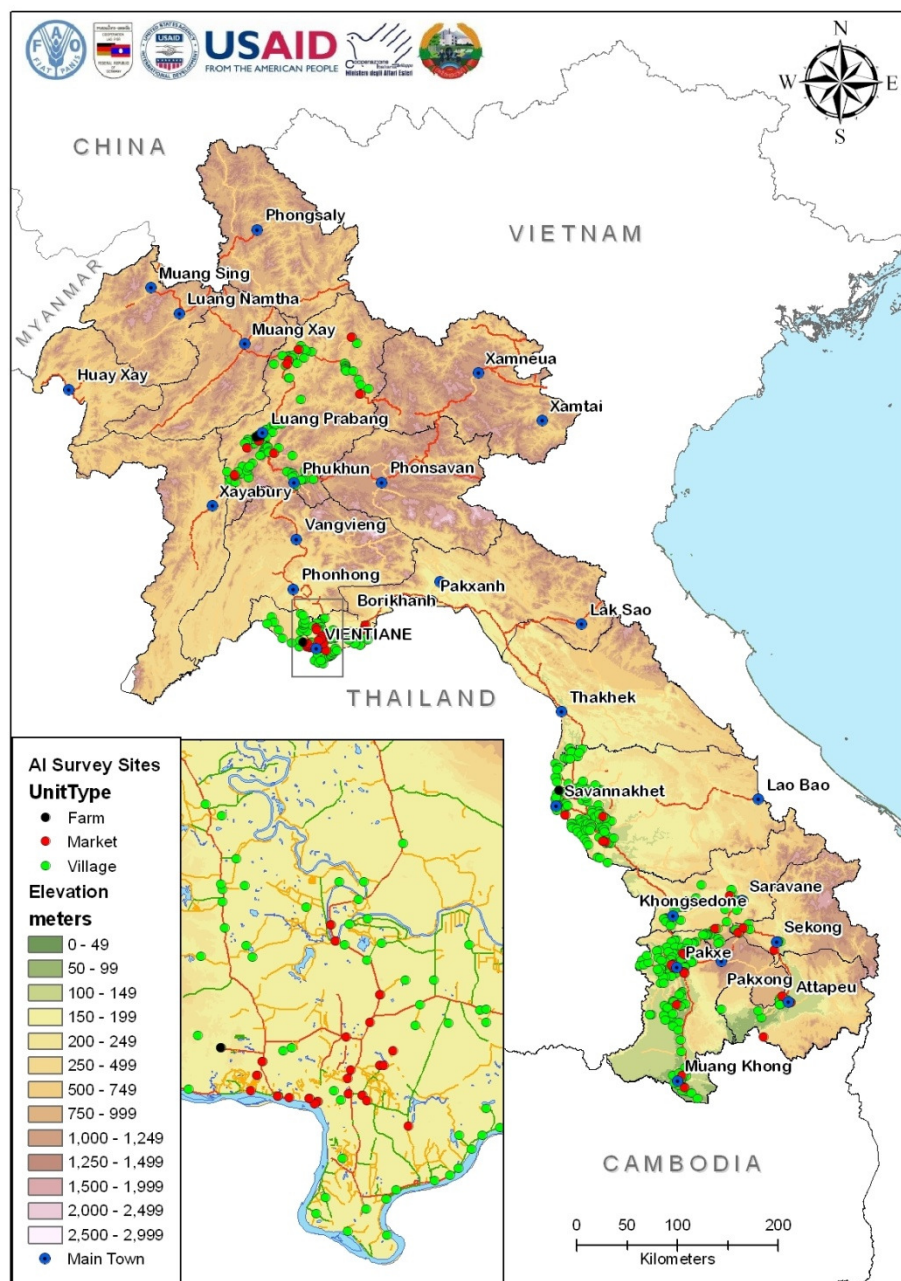


- Date: May 10
- Location: Vientiane capital
- District: Xaythany, 1 farm
- Species: Layer chicken
- Subtype: Clade 2.3.4
- Same strain with others circulating previously.

Summary of Lao H5N1 outbreaks

- Eight 'waves' of HPAI outbreaks have occurred in Lao PDR since Jan 04 to May 10.
- Two HPAI-associated human deaths occurring in Feb-Mar 07.
- Outbreaks from 2004-2007 occurred largely in 4 central and southern provinces: Vientiane capital, Savannakhet, Champasak, and Vientiane Province, with one outbreak in the north-eastern province of Xiengkhouang in Feb-Mar 07.
- After Mar 07 there was a shift in the geographic focus of HPAI outbreaks to the northern provinces of Laos where infection occurred predominantly in duck farms and backyard poultry populations: Luang Namtha (2008), Luang Prabang (2008), Oudamxay (2008), Sayaboury (2008) and Phongxaly (2009).

Previous active surveillance (2006 – 2009)



Map of active surveillance sites (2006-2009)

1. Apr-Oct 2006 (4 provinces)
2. Feb-Jul 2007 (4 provinces)
3. Jun-Nov 2007 (10 provinces)
4. Sep-Dec 2008 (7 provinces)
5. Feb-Mar 2009 (7 provinces)
6. Aug 2009 (3 provinces)

Diagnostic tests used in H5N1 surveillance in Lao PDR

	Apr-Oct 2006 (US)	Feb-Jul 2007 (US)	Jun-Aug 2007 (Ger)	2008 (US)	2009 (US)	2010 (US)
Serology - screening	HI (H5)	No information	IDEXX ELISA ¹	IDEXX ELISA ²	IDEXX ELISA	IDEXX ELISA
Serology- confirmation		No information	HI (H5) not used to test ELISA- positive samples	HI (H5)	HI (H5)	HI (H5)
Virology- screening	VI	VI	VI	PCR – M gene	PCR – M gene	PCR – M gene
Virology- confirmation	HA	HA	HA	RT-PCR (H5)	RT-PCR (H5)	RT-PCR (H5)

¹ The initial use of ELISA was validated for chicken sera but not for duck sera, and subsequent introduction of an ELISA that was validated for detecting AIV antibodies in multiple poultry species.

² IDEXX ELISA validated for duck and chicken sera used from 2008 onwards.

Active surveillance in Lao PDR

- Village, farm and market poultry populations in the four provinces (Luang Prabang, Vientiane Capital, Savannakhet and Champasak), have been sampled 6 times between 2006 and 2009, while poultry in the other 13 provinces in Laos have been sampled only once.
- Given the majority of samples were collected from ducks one would expect positive results to ELISA screening which detects any AIV.

Summary of the previous active surveillance

- 3% of samples collected in the German surveillance project between June and November 2007 were ELISA-positive (however, the test was not validated for duck sera).
- 0.2% of samples in the January-March 2009 surveillance were ELISA-positive.
- A relatively high prevalence (1.6%) of ELISA-positive birds in August 2009 surveillance.
- The active surveillance program in 2008 and 2009 did not include these northern provinces that share a border with China.
- IS THE ACTIVE SURVEILLANCE RESULTS PROVIDE A RELIABLE INDICATION THAT THE VIRUS WAS NOT CIRCULATING IN THE SAMPLED POPULATION?

Active surveillance (March-December 2010)

- The shift in geographic distribution of outbreaks to the northern provinces was a major factor leading to the change in the active surveillance strategy in 2010.
- A revised design capturing spatial and temporal distributions:
 - Expanded to 9 provinces (where there were HPAI outbreaks in the past years)
 - 4 samplings throughout the year (March, June, September, December)
 - Sampling more ducks but also chickens at the live bird market

No. of samples collected by type of surveillance site per province

Provinces	Live bird market	Duck farms	Villages duck	Total
Phongsaly	80	-	272	352
Luang Namtha	160	-	250	410
Oudomxay	288	50	300	638
Luang Prabang	214	-	249	463
Xiengkhouang	240	140	350	730
Vientiane	40	-	608	648
Vientiane Capital	362	257	498	1,117
Savannakhet	169	200	60	429
Champasack	550	-	350	900
Total	2,103	647	2,031	5,687
<i>Percentage</i>	<i>37%</i>	<i>11%</i>	<i>52%</i>	<i>100%</i>

Sampling, screening and analysis methods

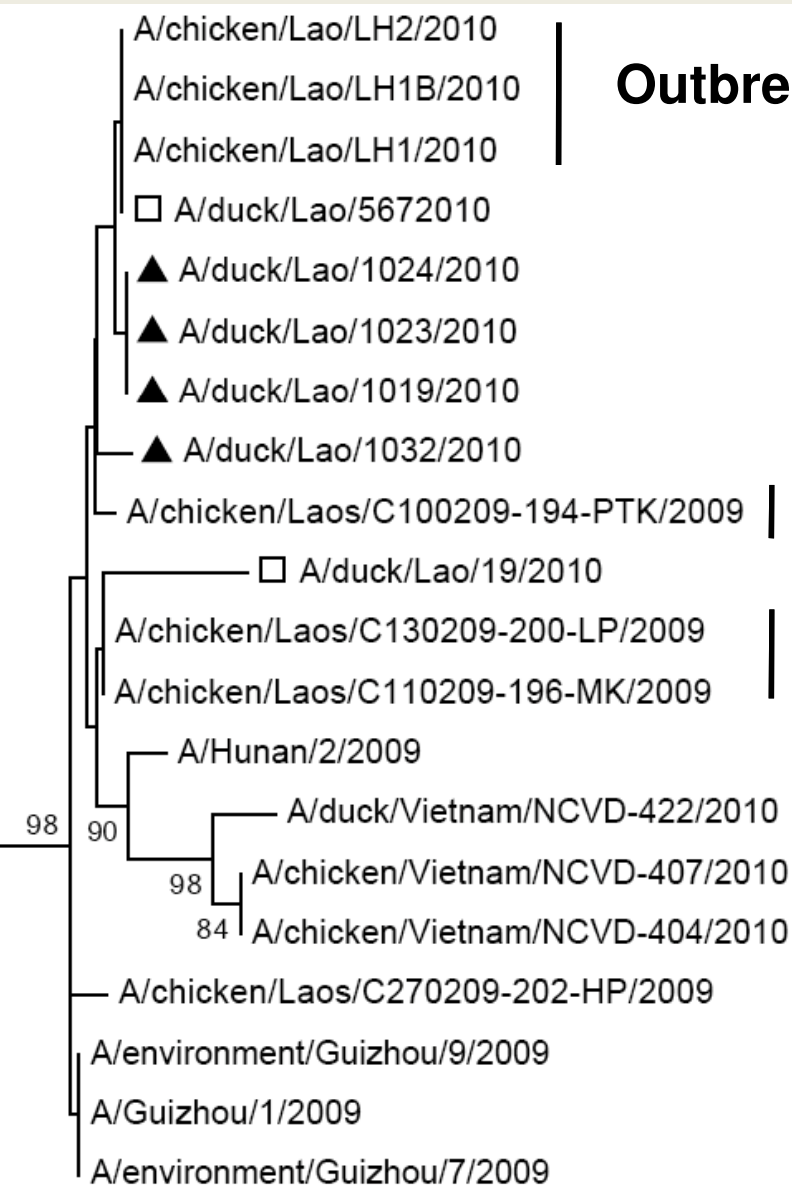
- tracheal, cloacal swabs
 - rRT-PCR screen for M-gene
 - rRT-PCR screen for H5
 - virus isolation, sequencing
- sera
 - ELISA-based screen for antibodies
 - Hemagglutinin Inhibition test

Result of active surveillance 2010

Multiple introductions of HPAI H5N1 into Lao PDR in 2009-2010

- 2 groups of clade 2.3.4 viruses
 - 8 isolates
- 1 group of clade 2.3.2 viruses
 - 2 isolates

Clade 2.3.4 group 1 persists since February 2009

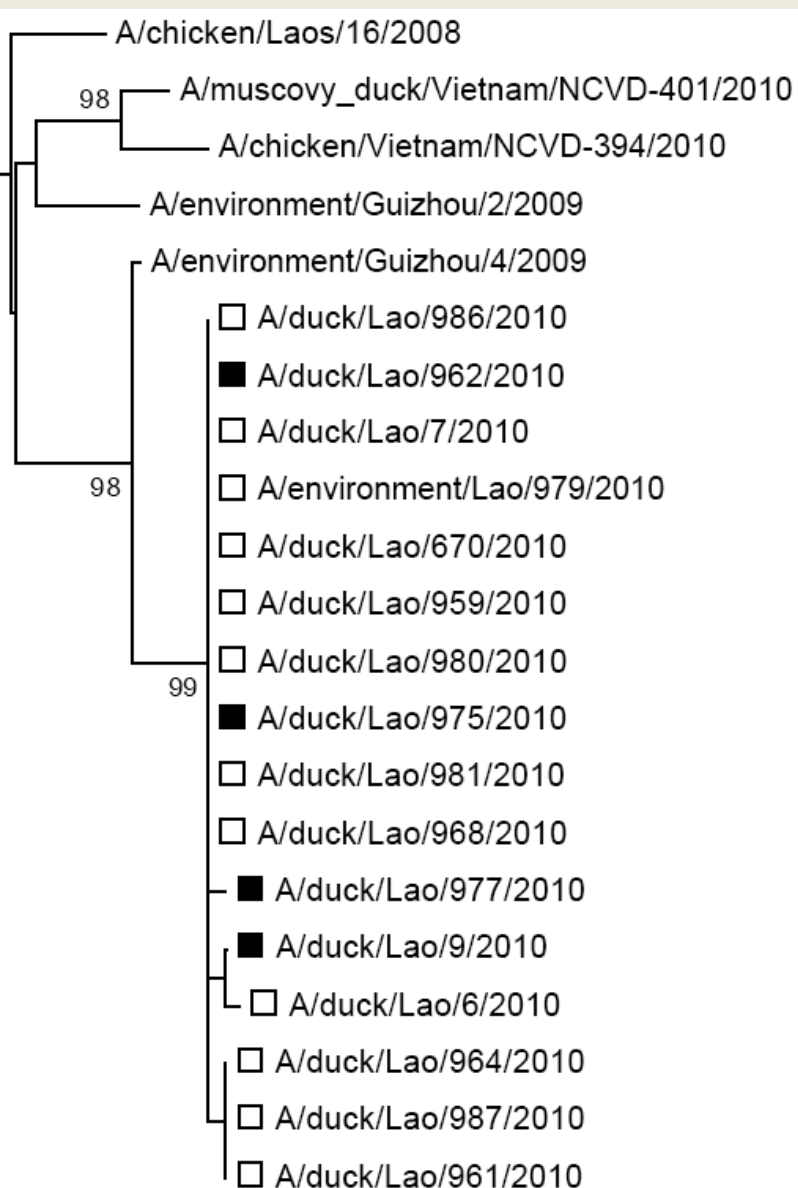


Outbreak Vientiane Capital May 2010

- clade 2.3.4 group 1

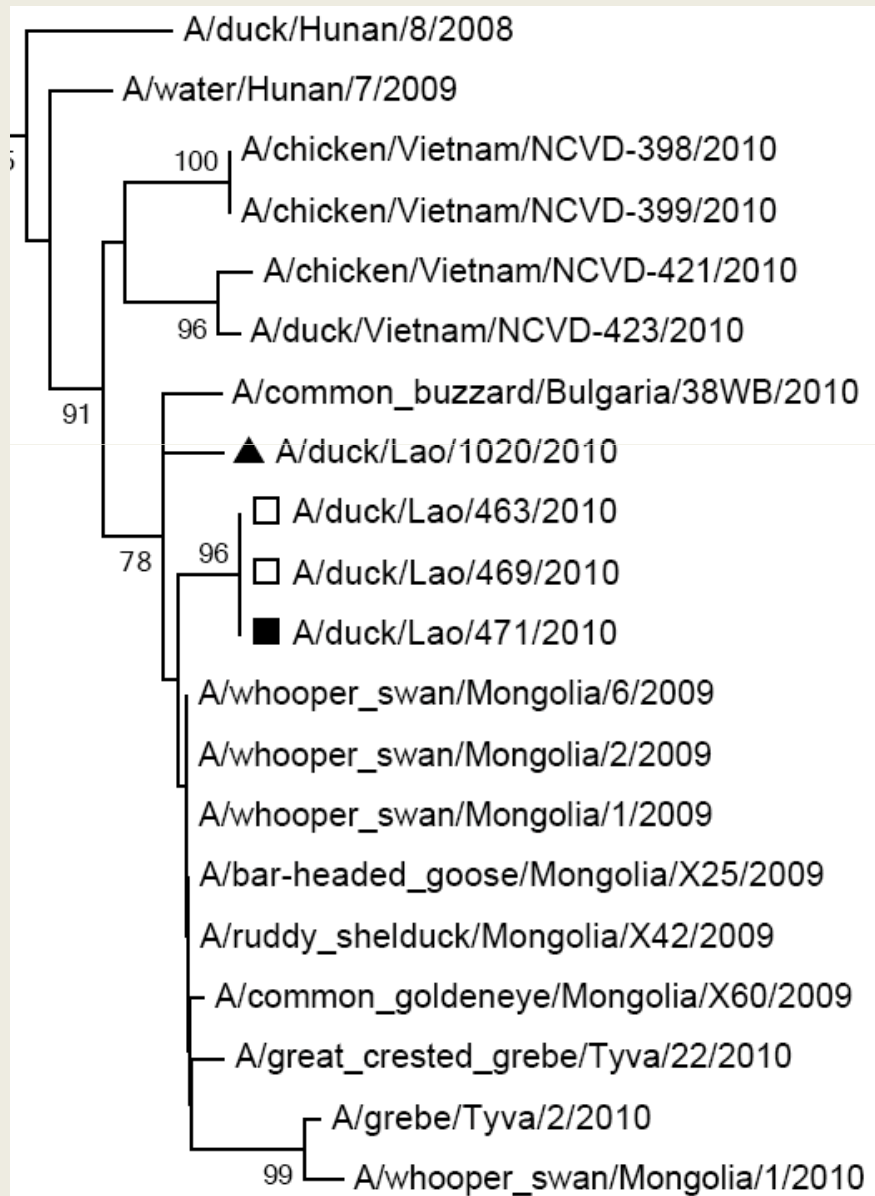
Outbreak Phongsaly February 2009

Clade 2.3.4 group 2 only detected in March 2010



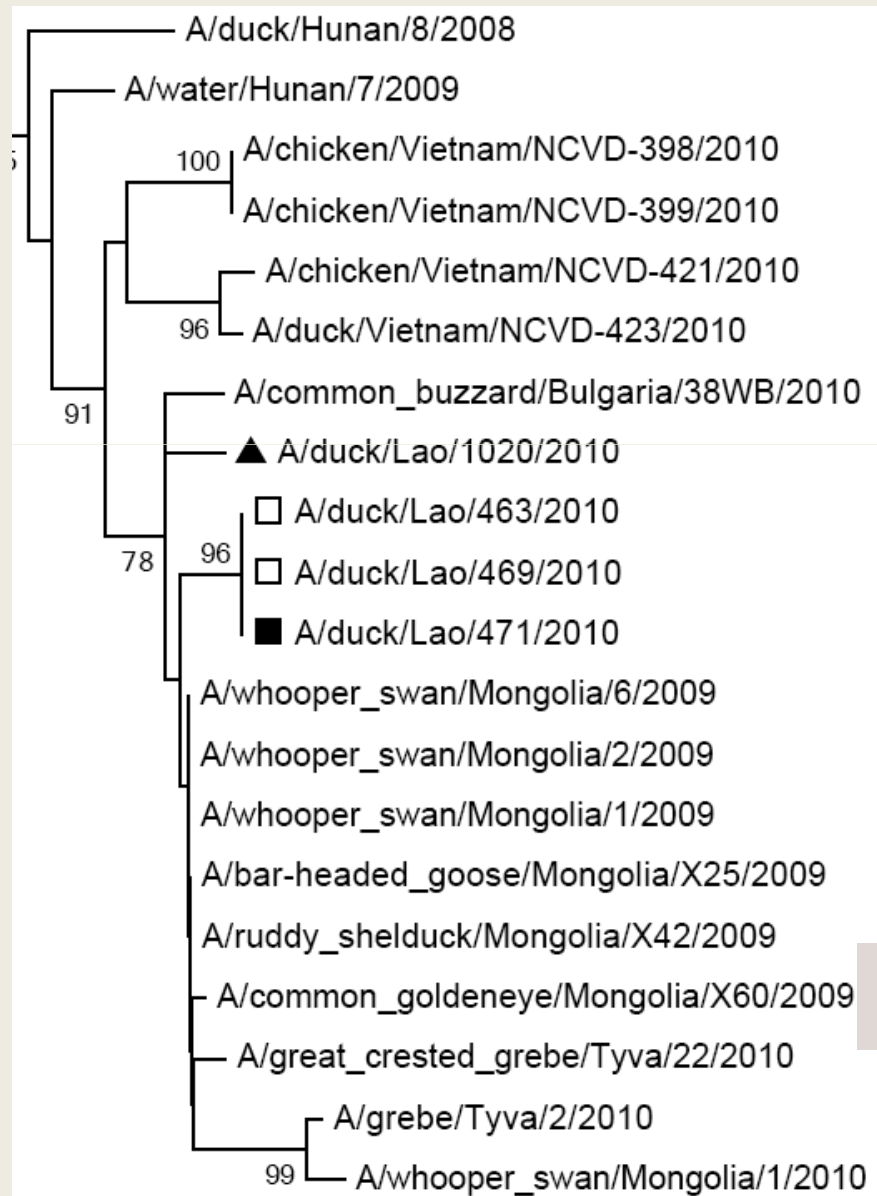
- clade 2.3.4 group 2

Clade 2.3.2.1 persists since March 2010



- clade 2.3.2.1

Three clade 2.3.2.1 viruses from March 2010 were reassortants:



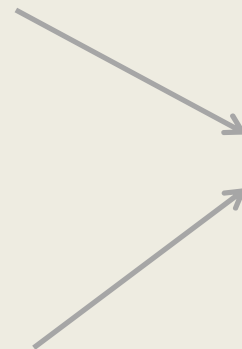
- clade 2.3.2.1

Sample*	PB2	PB1	PA	H5§	NP	N1	M	NS
A/ck/LH1				2.3.4				
463		NA	NA	2.3.2				NA
469		NA		2.3.2				
471				2.3.2				

Serology reveals H5N1 exposure in domestic ducks

- Clade 2.3.4
 - 5 provinces

- Clade 2.3.2
 - 5 provinces



2 provinces:
contained antibodies to
both

- **All 9 provinces contained either H5-positive sera or H5-positive swabs**
- **5 provinces contained evidence of 2.3.2 and 2.3.4 exposure**

Country Poster Presentation

Republic of Korea

DVM. Chang, Hyun Chul



**Animal, Plant and Fisheries
Quarantine and Inspection Agency**

CONTENTS

- ✕ Recent HPAI outbreaks
- ✕ Active AI surveillance programme of domestic birds
- ✕ Active AI surveillance programme of wild birds

POULTRY IN THE REPUBLIC OF KOREA

- Number of poultry by species in the last 3 years

Category	2009	2010	2011
Chicken	138,768,000	149,200,000	149,511,000
Duck	12,733,275	14,397,301	15,053,352
Others	12,305,798	13,888,085	13,816,042
Total	163,807,073	177,485,386	178,380,394



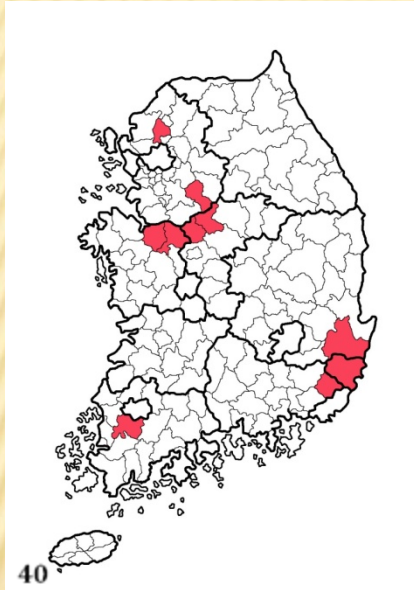
HPAI(H5N1) OUTBREAKS

Classification	2003 / 2004	2006 / 2007	2008	2010/2011
Duration	2003.12.10 ~ 2004. 3.20 (102days)	2006.11.22 ~ 2007. 3. 6 (104 days)	2008. 4. 1 ~ 2008. 5.12 (42 days)	2010.12.29 ~2011.5.16 (139 days)
Administrative areas	7 Provinces (10 Si/Gun)	3 Provinces (5 Si/Gun)	11 Metro cities/ Provinces (19 Si/Gun/Gu)	6 Provinces (25 Si/Gun)
Outbreaks	19	7	33	53
Affected poultry farms	Chicken 10, Duck 9	Chicken 4, Duck 2, Quail 1	Chicken 24, Duck 8, Others 1	Chicken 18, Duck 33, Quail 1, Pheasant 1
No. of poultry culled	392 farms 5,285 thousands	460 farms 2,800 thousands	670 farms 10,204 thousands	283 farms 6,427 thousands
Antigenic clade	HA 2.5	HA 2.2	HA 2.3.2	HA 2.3.2
Genetic analysis	Similar to isolates from migratory birds	Similar to isolates from migratory birds	Similar to isolates from migratory birds	Similar to isolates from migratory birds (99.4%)
Indemnity	\$ 153 million	\$ 58 million	\$ 307 million	\$ 82.2 million
Declaration of HPAI Free	2004.9.21	2007.6.18	2008.8.15	2011.9.5

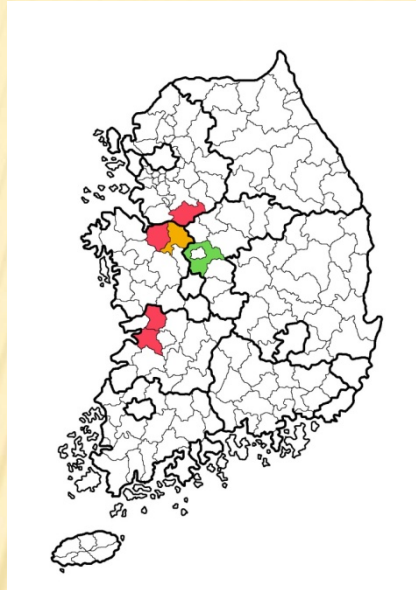


H5N1 HPAI Epidemics in the Republic of Korea

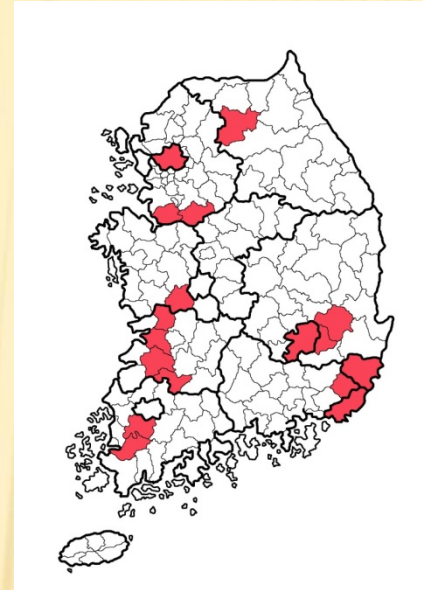
03/04 Epidemic



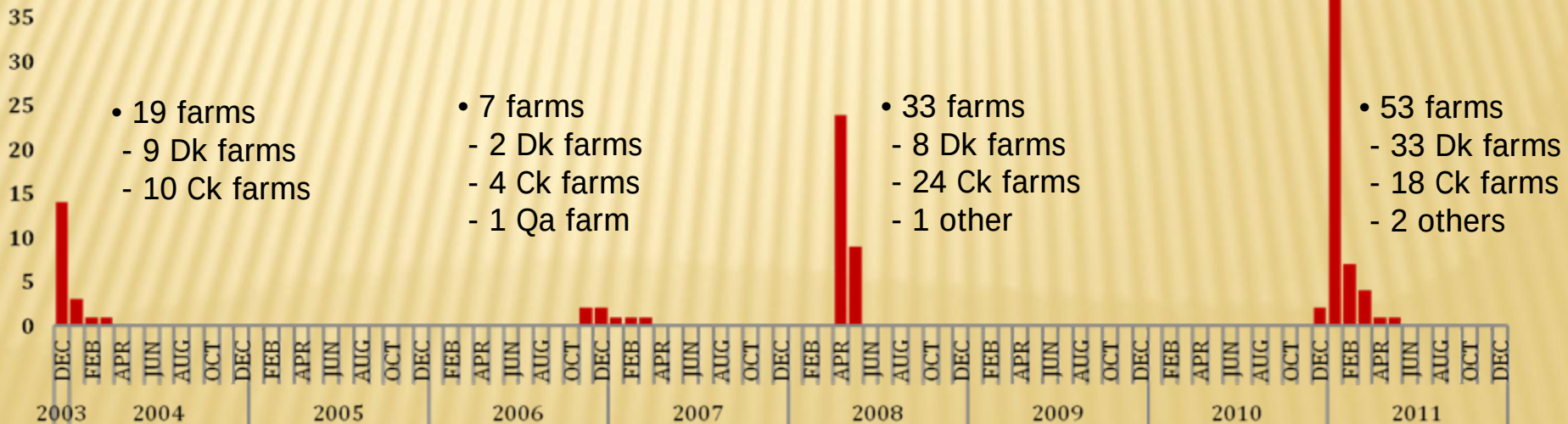
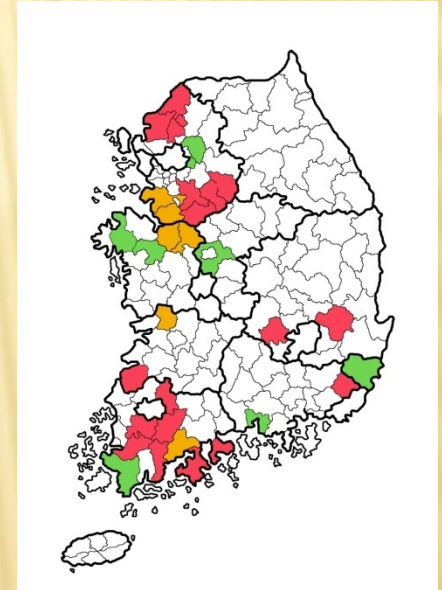
06/07 Epidemic



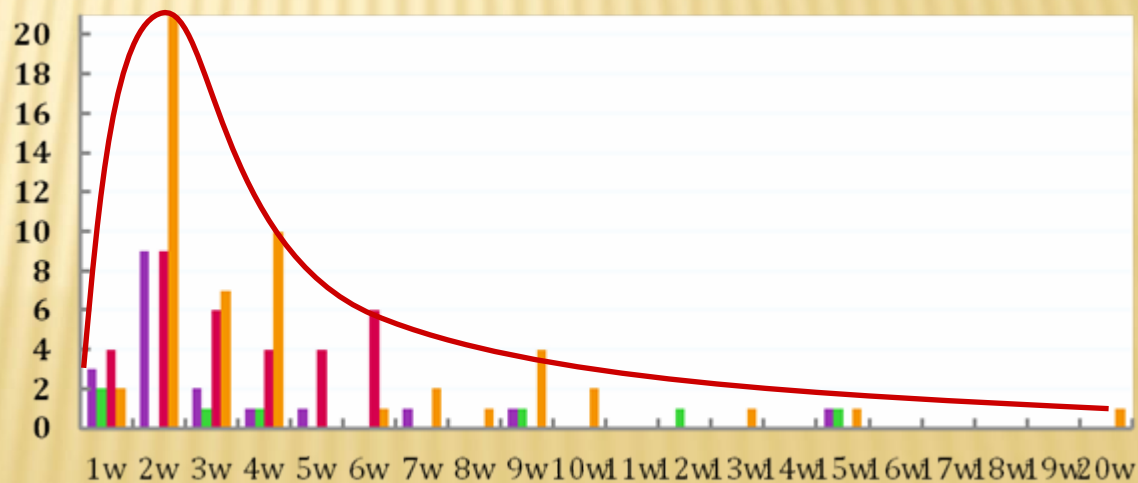
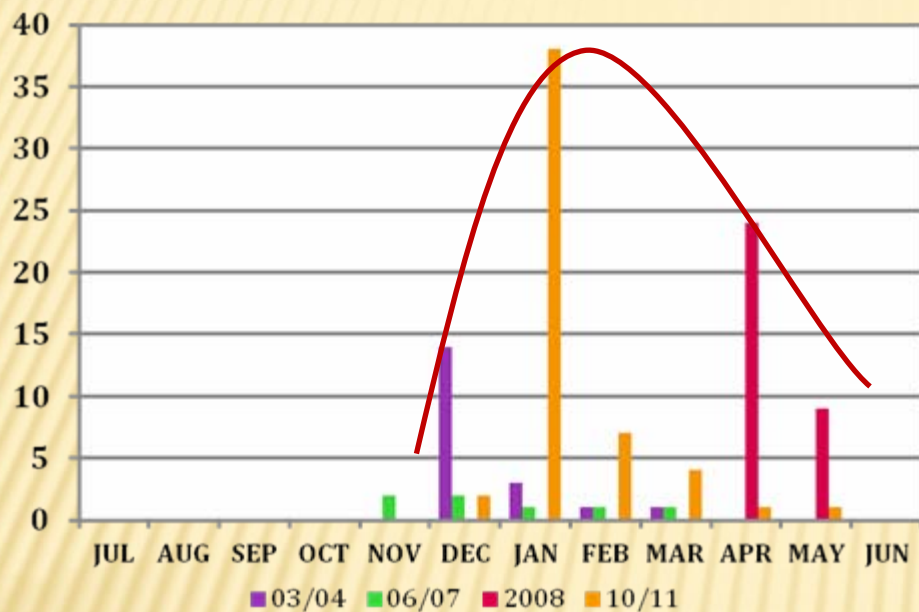
2008 Epidemic



10/11 Epidemic

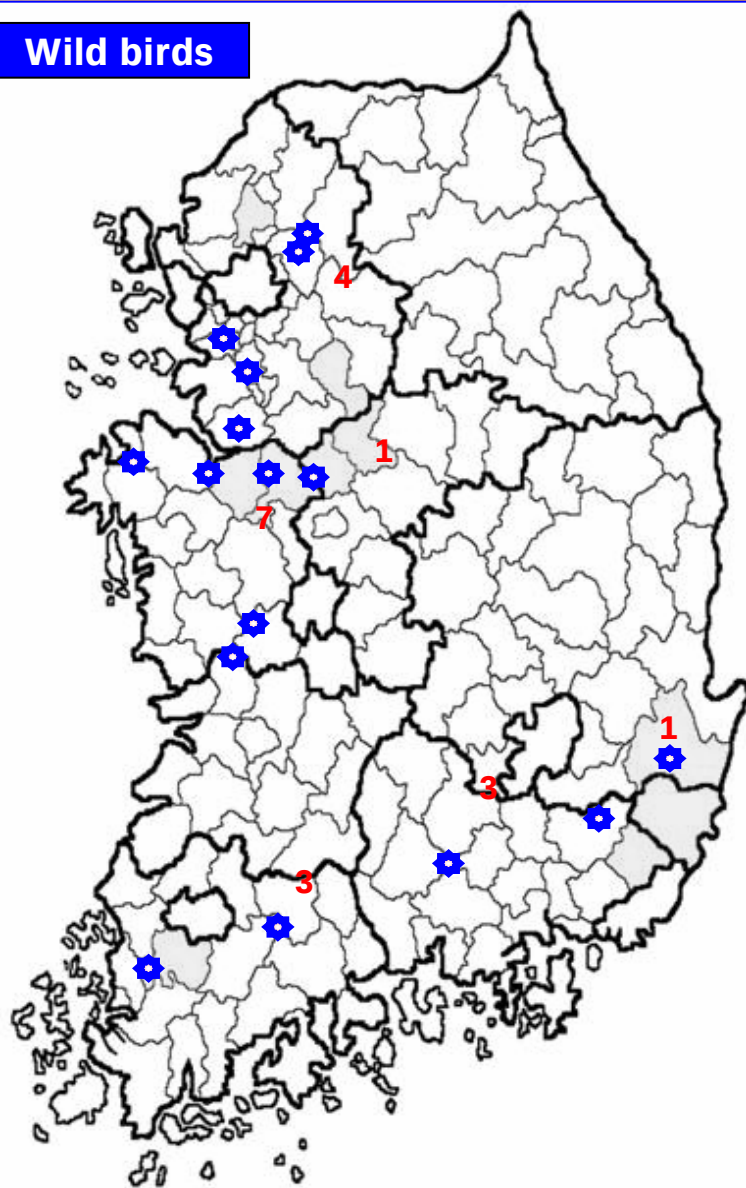


H5N1 HPAI Outbreak Pattern in the Republic of Korea

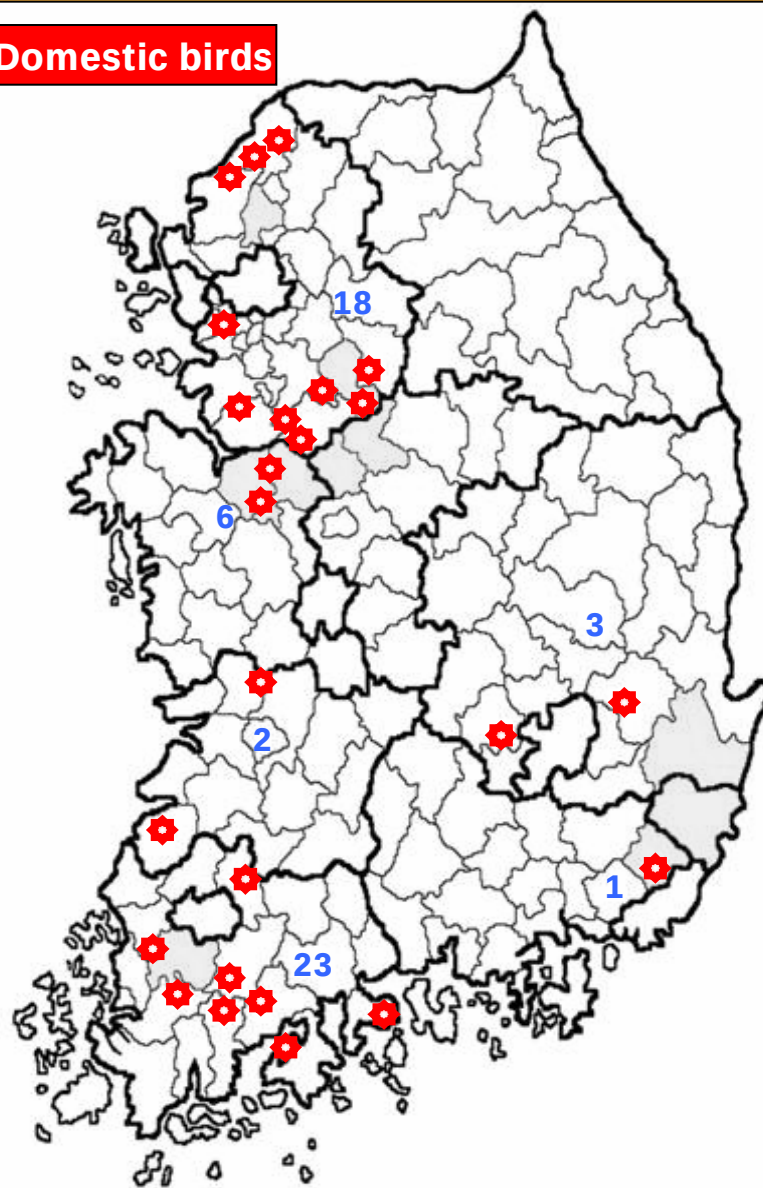


2010/2011 H5N1 HPAI outbreaks

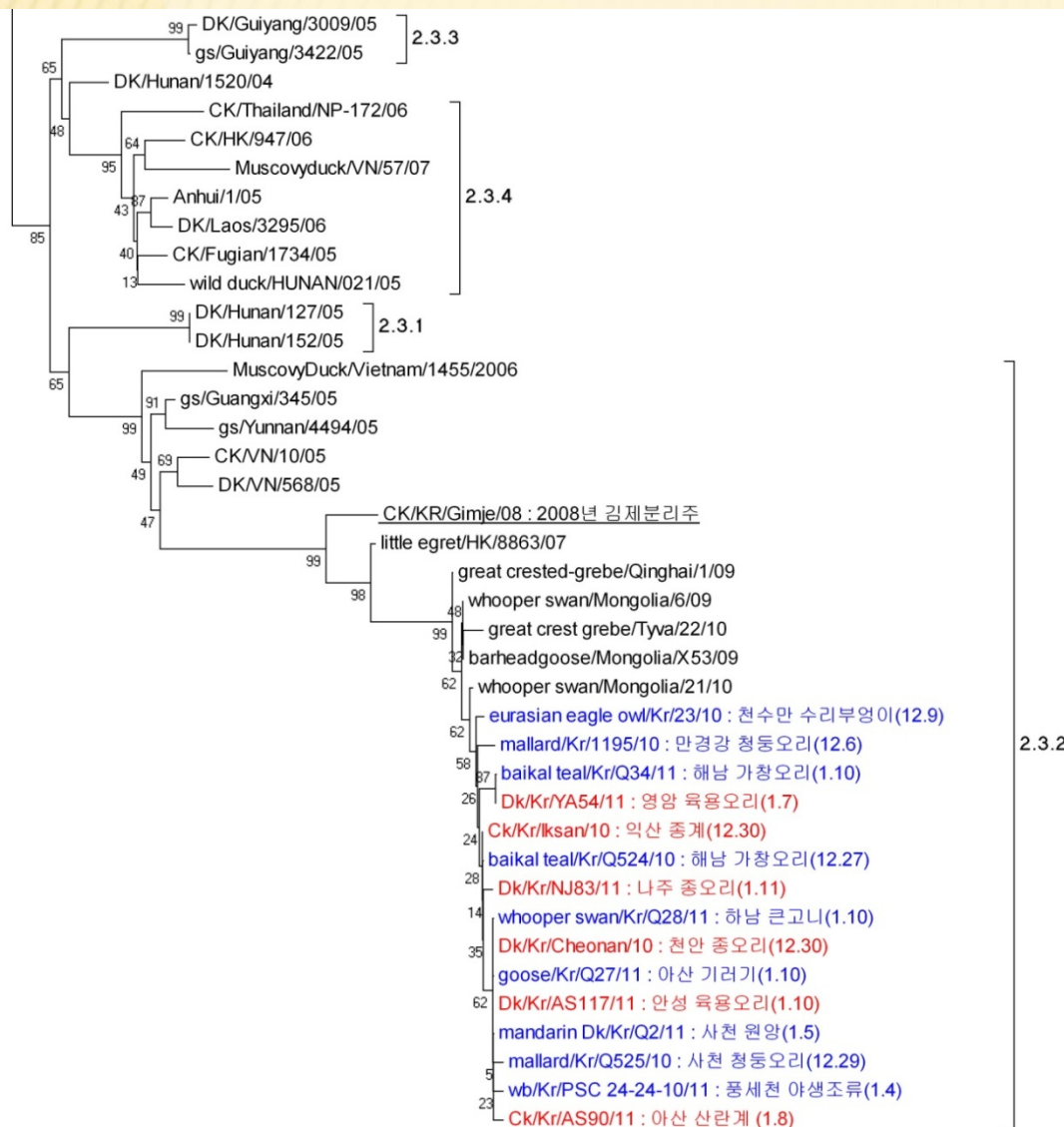
Wild birds



Domestic birds



2010/2011 H5N1 HPAI in Korea



HPAIV isolated from Domestic Poultry

Homogeneity 99.4%

HPAIV isolated from Wild birds

Genetic relatedness between HPAIV isolated from poultry in **Korea and HPAIV from wild birds in **Northeast Asia** (Mongol, China, Japan)**

Epidemiological investigation (2010/2011)

Migratory birds are suspected to be introducing factor

- **H5N1** was isolated from wild birds (including feces)
- **HPAIVs** isolated from wild birds and domestic **HPAI** outbreak farms were identified to belong in **the** same genetic group (HA 2.3.2.)
- **HPAIVs** isolated from domestic wild birds are similar to the virus from great-crested grebe in Chinghai, 2009 and whooper swan in Mongolia, 2009 & 2010.

Transmitting factors

- **Visit by people or cars** contaminated with feces of infected wild birds inhabiting the area nearby farm (Highest possibility)
- **Supplying residual feed** contaminated with feces of infected wild birds
- **Direct contact** with infected wild birds (in case of pasturage)
- **Farmer's visit** to contaminated farm (or meeting)



HPAI Prevention Program in Korea

- Routine surveillance is performed year-round
 - Passive surveillance : prompt reporting to government when found HPAI-suspected animals
 - Active surveillance : early detection of introduction & precaution of risk
 - Lab. Tests (Ag&Ab) on 11 types of targets (wild bird, duck, chicken, quail, imported feed, pigs, etc)
- Immediate control measures are taken action such as quarantine and disinfection on the suspected farms
- Control of easily mutable H5/H7 subtype LPAI
- Improvement of diagnosis ability of local diagnostic labs
- Continuous instruction, education and promotion

Emergency response against HPAI outbreak

Outbreak area

- Management of the AI Central-Preventive Headquarters
- Setting-up & maintenance of the Control Area (10km radius)
- Serological test of duck farms (Control Area)
- Disinfection & Emergency observation
- Installation of the mesh of domestic farms
- Movement control for 14 days

Free area

- Restrictions on visitor access (Vehicles, people, etc)
- Strengthening of the observation of fowl farms
- Promotion of AI preventive methods (sending SMS text messages)



HPAI Control Strategy

● Framework of HPAI control (Domestic bird)

- **Step 1**

- Establishment of movement restriction around the place of origin

- **Step 2**

- Stamping-out & disinfection for removing the source of infection

- **Step 3**

- Performing surveillance on domestic fowls in the region of movement restriction

- **Step 4**

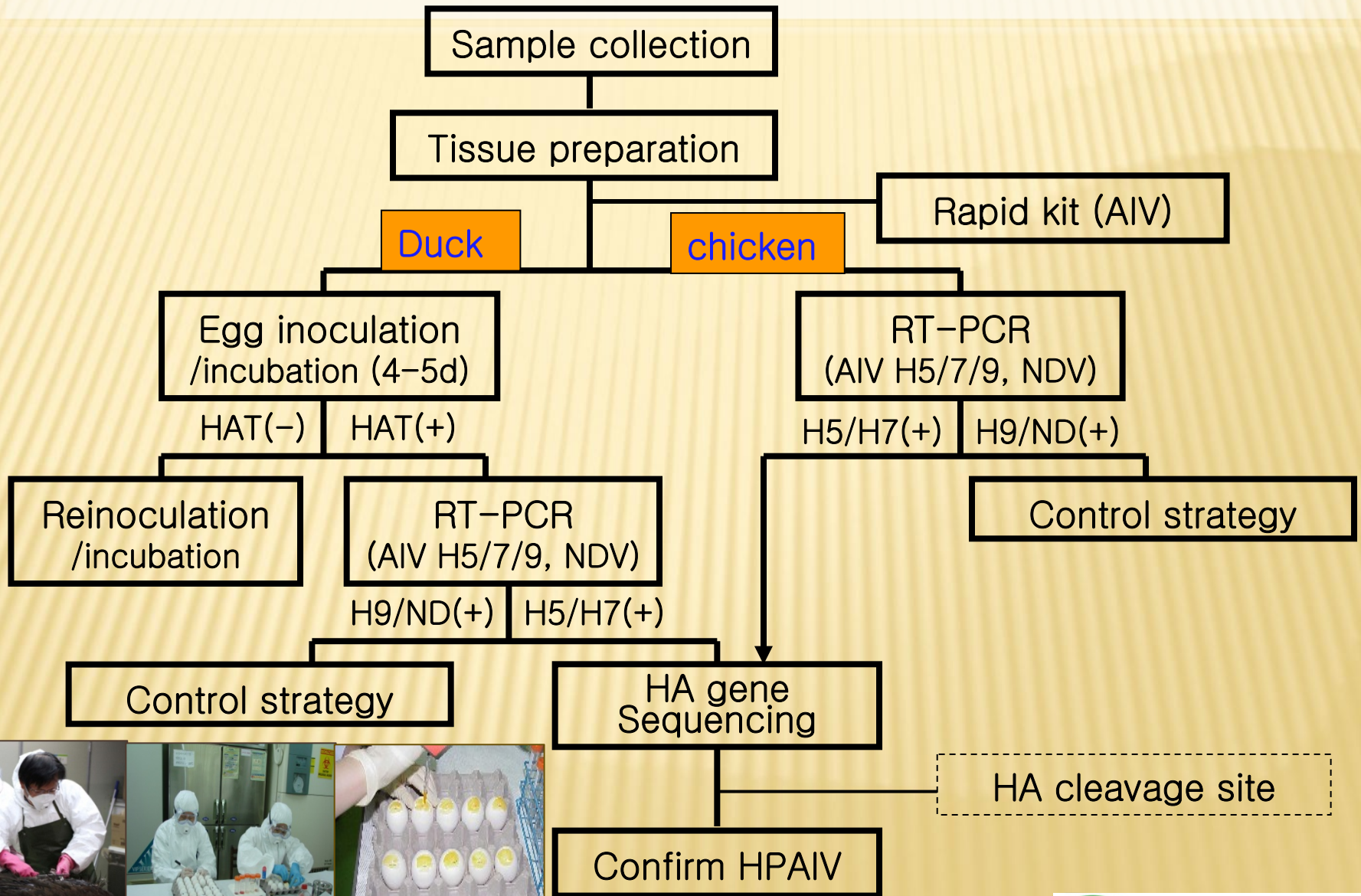
- Removal of movement restriction & Re-stocking



2012 AI surveillance programme in Korea

Classification		Testing period	Frequency	Test	Charged institute
Breeding duck		Mar~Apr, Jun~Jul, Sep~Oct, Dec	4 times	Ag, Ab	(Primary test) Regional(Si · Do) Lab. (Confirmative test) QIA
Broiler duck				Ag	
Other poultry such as quails, turkeys, etc		Jan~May, Sep~Dec	2 times	Ag	
Ducks for ecological farming		May~Jul	1 time	Ag, Ab	(Primary test) Vet. Univ., etc (Confirmative test) QIA
Captured wild birds		Ordinary times	-	Ag, Ab	
Wild bird feces		Jan~May, Sep~Dec	9 months	Ag	
Pet(ornamental) birds		Jan~Feb, Sep~Oct	2 times	Ag	
Poultry in the regional market(live bird market)		Feb~Apr, Sep~Dec	2 times	Ag	QIA
Pigs raised in the hazardous area of AI		Jan~May, Sep~Dec	1 time	Ag	
Imported feed materials for livestock		Jan~Dec	1 time	Ag	
LPAI (H5/H7) Ab test	GPS	120 days ~ Before laying	2 times	Ab	
	PS	Jan~May, Sep~Dec	2 times		
	Layer				
	KNC				

AI virological diagnosis

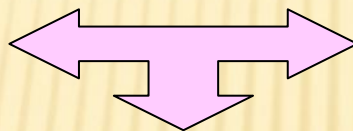


National plan for AI monitoring system

Sample collection

by live stock health control association, Regional vet lab., QIA

- Duck farm (breeder duck, meat duck & ecological farming duck)
- Chicken farm (GPS, PS, Layer, Native)
- Wild bird (feces, capture)
- Live bird market, other poultry such as quail & peasant
- Feed, pet bird, swine etc.



Diagnosis(lab tests)

QIA

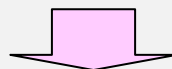
- Captured Wild bird
- Feed (imported ingredient)
- Swine
- Chicken (GPS)
- Live bird market

Regional Vet lab.

- Breeder duck
- Broiler duck
- Chicken (PS, Layer, Native)
- Other poultry

Univesity

- Wild bird feces
- Pet bird
- Ecological farming duck
- Captured Wild bird



Final diagnosis by QIA



AI surveillance results in 2011

Classification			Tests		Positive	Serotypes
			Farms (spots)	Tests		
Duck	Breeder	Ag	526	6, 079	14 farms	H3(4), H4(5), H3·H4(2), H3·H12(1), H3·H4·H12(1), H6·H11(1)
		Ab	483	52, 638	1 farms	H5(1)
	Broiler	Ag	3, 544	21, 028	11 farms	H1(1), H3(6), H6(2), H11(2)
	Eco-farming	Ag	25	50	—	—
		Ab	25	250	—	—
Wild bird	Feces	Ag	1, 276	5, 148	34 cases	H1(3), H3(3), H4(3), H6(7), H7(12), H9(2), H10(2), H12(2)
	Captured	Ag	67	2, 008	2 birds	H1(1), H7(1)
		Ab	67	1, 956	70 birds	H5(69), H7(1)
Chicken		Ab	1, 675	76, 913	—	—
Live bird market		Ag	228	2, 675	8 cases	H6(3), H9(5)
Other poultry (quail, turkey, peasant, etc)		Ag	322	3, 800	2 farms*	H7(1)*, H9(1)
		Ab	290	4, 959	1 farms	H7(1)
Pet (ornamental) bird		Ag	235	470	—	—
Pig in AI hazardous area		Ag	1, 135	20, 363	—	—
Imported feed material		Ag	12	318	—	—
Total			9, 910	198, 655	※ All Ag serotypes were LPAI	

* 1 H7 Ag positive farm in other poultry tests is the same farm as 1 H7 Ab positive farm



METHODS OF SURVEILLANCE IN WILD BIRDS

- ✕ Identification
 - + Higher risk species
- ✕ Sampling
 - + Capture birds
 - + Feces
- ✕ Analysis
 - + Avian influenza virus
- ✕ Tracking
 - + Migratory wild birds

Criteria used to select Higher Risk Species

Migration

Migratory

non-Migratory

Preferred Habitat

Littoral

Freshwater marsh

Freshwater

Agricultural

Other habitat

Gregariousness

Group size,
density

Distance with
other birds

Mixing with other
birds species

Specific Risk factors

Colonial breeding

Roosting
concentration

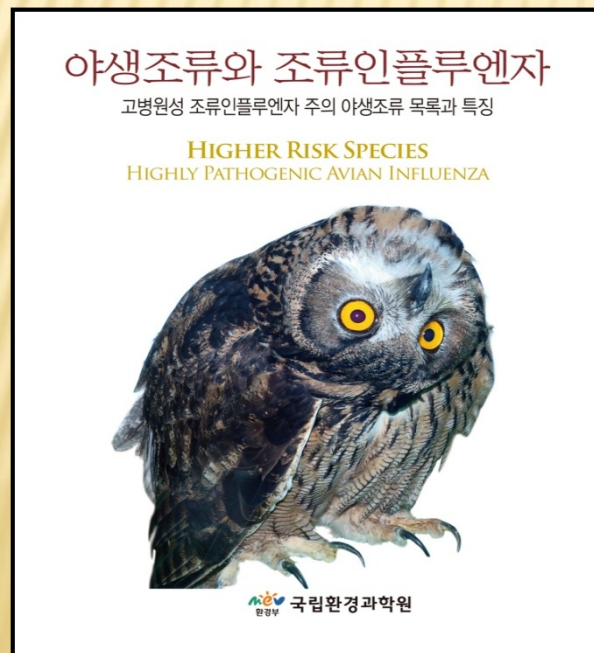
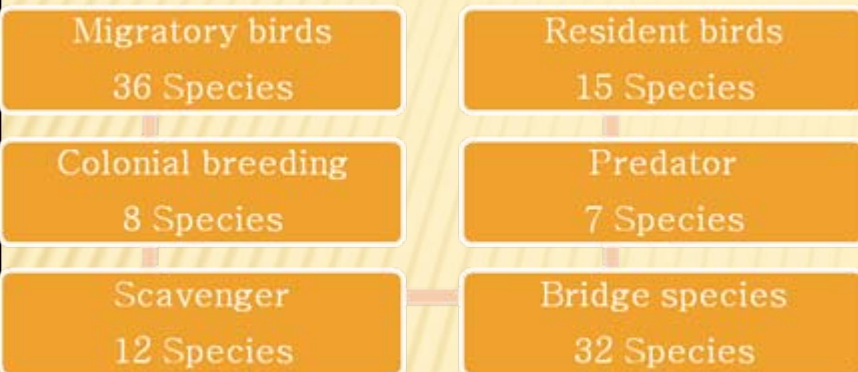
Predation

Scavenging

H5N1 confirmed

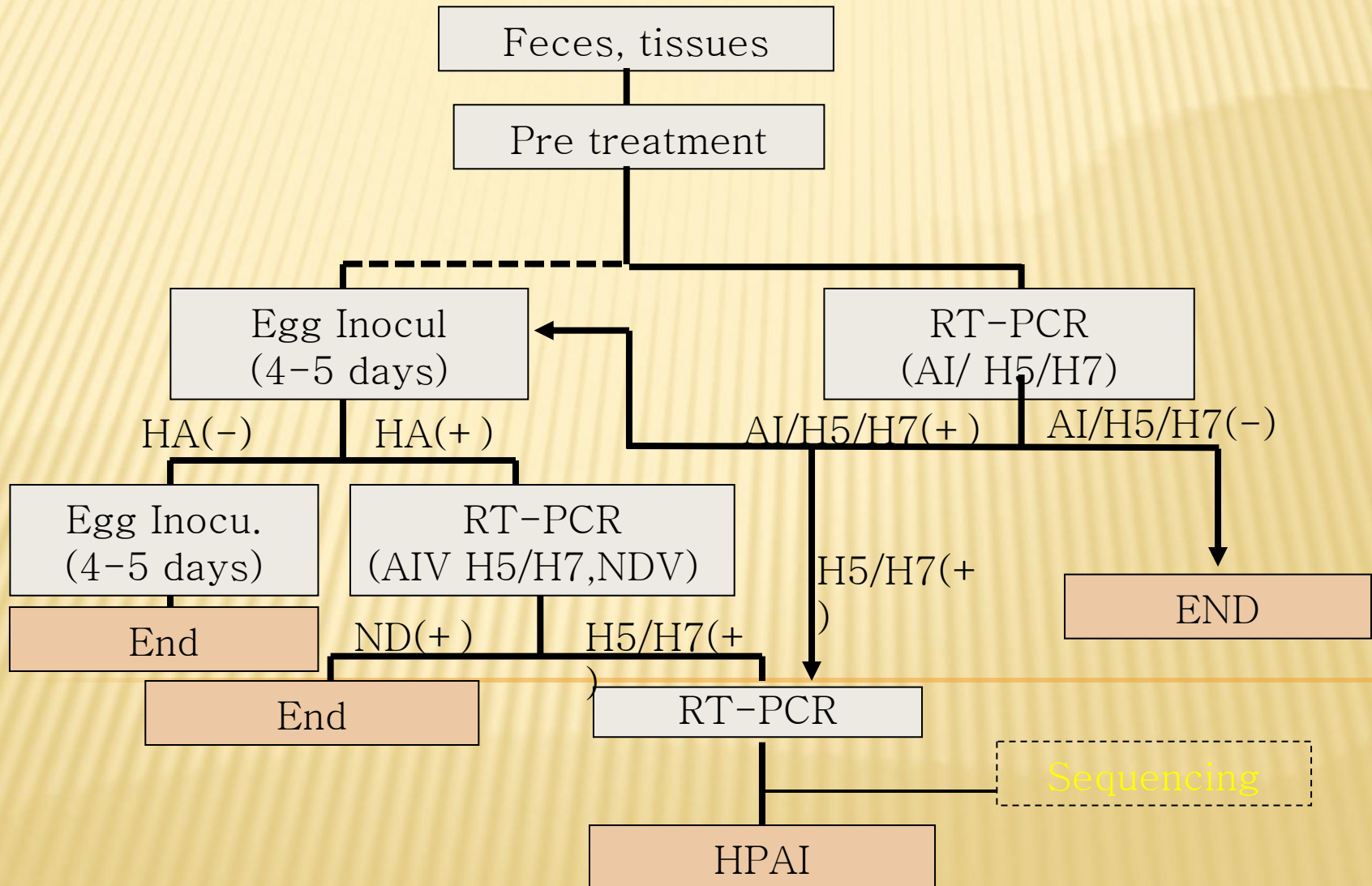
Contact human and
poultry

SELECTION OF 63 HIGHER RISK SPECIES



Bridge species 32 Species	
Black-crowned Night Heron	Oriental Turtle Dove
Cattle Egret	Eurasian Skylark
Great Egret	Barn Swallow
Intermediate Egret	Red-rumped Swallow
Little Egret	White Wagtail
Grey Heron	Meadow Bunting
Greater White-fronted Goose	Yellow-throated Bunting
Bean Goose	Grey-capped Greenfinch
Ruddy Shelduck	Eurasian Tree Sparrow
Mandarin Duck	White-cheeked Starling
Mallard	Eurasian Jay
Spot-billed Duck	Azure-winged Magpie
Eurasian Teal	Black-billed Magpie
Baikal Teal	Daurian Jackdaw
Black-headed Gull	Rook
Mew Gull	Common Crow

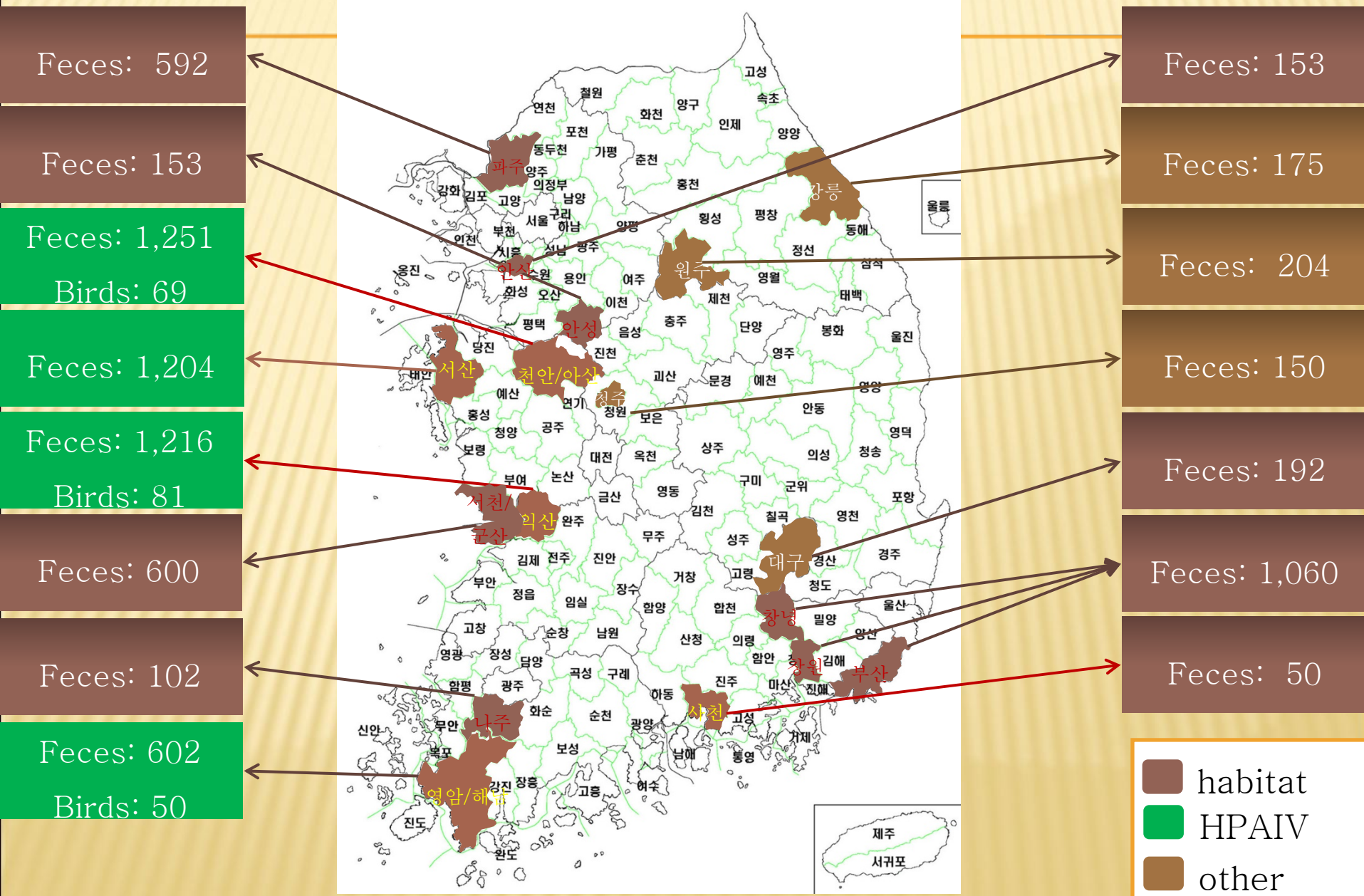
Flow chart of isolation of Avian influenza virus



SAMPLING

- ✗ Capture of wild birds
 - + Using nets
 - + Banded with metal rings
 - + Physical examination
 - + Blood, cloacal & oropharyngeal swab
- ✗ Feces
 - + One sample/one tube
 - + Transported within 24 hours
 - + Not freeze

Summary of samples collected in wild birds (2011)



2011 surveillance

	Feces	Winter birds	Summer birds	Transit birds	Dead	Total
Samples	7,704	200	52	65	300	8,321
Results	145 LPAI viruses	LPAI: 1 case AI antibody: 46 cases (H5: 15 cases)	0	0	0	

HPAI viruses isolated from wild birds (2010–2011)



HPAI Control Strategy

● **Framework of HPAI control (Wild bird)**

☐ **Outbreak Area**

- **Manage the AI Central-Preventive Headquarters**
- **Set up & maintain the Control Area (10km)**
- **Serological test of duck farms (Control Area)**
- **Disinfection & Emergent observation**
- **Equip wild bird preventing mesh in domestic farms**
- **Movement control for 14days (duck) or 7days (chicken)**

☐ **Free Area**

- **Restrict visitor access (Vehicles, Person, etc)**
- **Strengthen observation of fowl farms**
- **Promote AI preventive methods (sending SMS text messages)**

SUMMARY OF 2011 AI SURVEILLANCE IN WILD BIRD

- ✖ No HPAI virus detected but 146 LPAI viruses were found.
- ✖ LPAI viruses isolated
 - + H2N3, N3N8, H4N6, H5N2, H5N3, H6N1, H6N2, H7N4, H7N7, H7N9, H10N1, H10N2, H11N2
- ✖ All detected AI viruses were found in winter migratory birds.
 - + No virus was detected in summer migratory birds or transit birds



Thank you for your attention !