Surveillance of Avian Influenza in Southeast Asia

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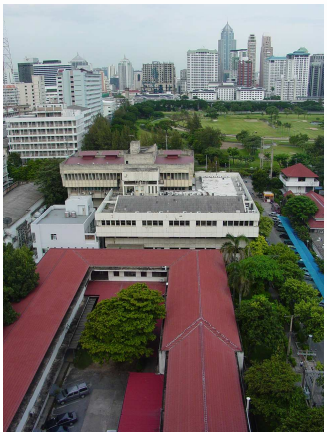


Veterinary Sciences

Surveillance of Avian Influenza in Southeast Asia

- Avian influenza & Updated Situation
- Influenza Surveillance & Control
  - Thailand experience
  - Our activities
    - Backyard, Live bird market,
    - Free grazing, Wildbird
- Q & A

CUEIDAs

Center of Excellence
Emerging and Re-Emerging
Infectious Diseases
in Animals (CUEIDAs)
Faculty of Veterinary Science
Chulalongkorn University
Alongkorn Amonsin (Director)

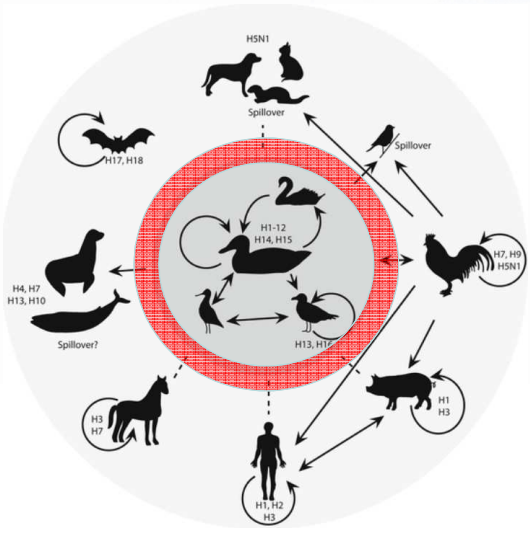
Awards (Influenza activities):

- **The National Research Council of Thailand:**
  - **National Excellence Research Award, 2012**
- **The Thailand Research Fund:**
  - **TRF Senior Scholar, 2014**
- **The National Research Council of Thailand:**
  - **National Excellence Researcher Award, 2015**
- **The Thailand Research Fund:**
  - **TRF Senior Scholar, 2017**

Influenza

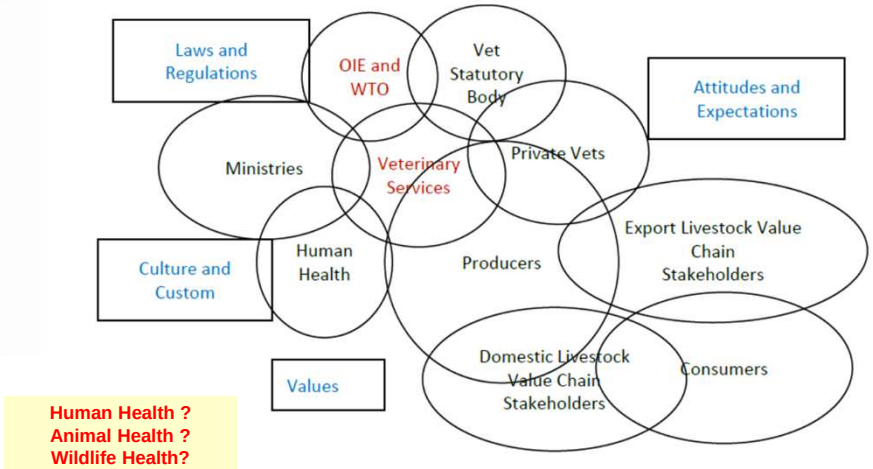
Wild Birds
Aquatic birds
(Reservoir)
H1-H16

Bat
(Reservoir)
H17-H18



Michelle Wille et al.,

One Health Approach
Institutional Map

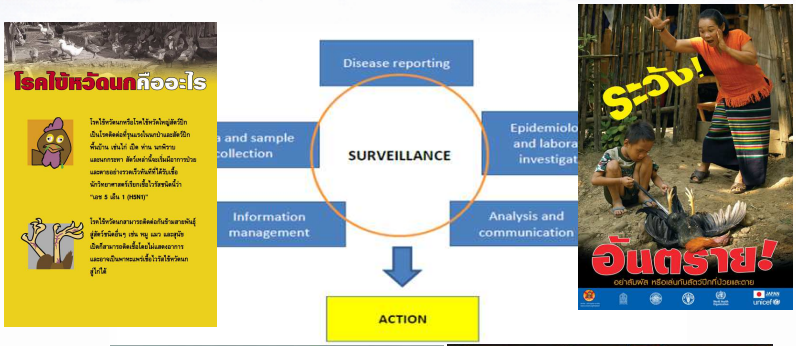


Human Health ?
Animal Health ?
Wildlife Health?

Human-Animal-Ecosystems interfaces (HAEI)

OIE guideline, 2014

Good model:
One Health Approach



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Update situation HPAI-H5N1 outbreaks

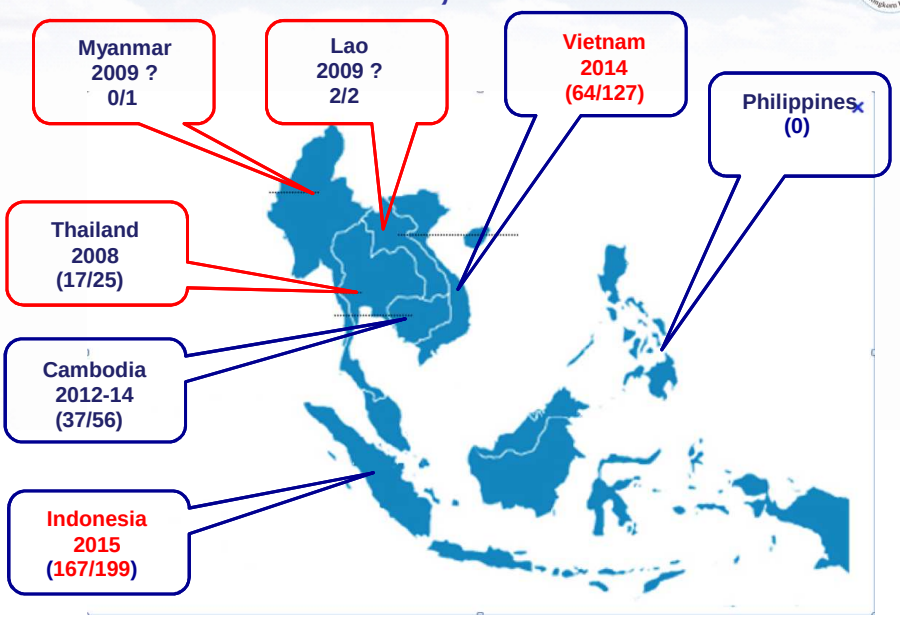
Cumulative number of confirmed human cases for avian influenza A(H5N1) reported to WHO, 2003-2019

Country	2003-2009*		2010-2014**		2015		2016		2017		2018		2019		Total	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
Azerbaijan	8	5	0	0	0	0	0	0	0	0	0	0	0	0	8	5
Bangladesh	1	0	6	1	1	0	0	0	0	0	0	0	0	0	8	1
Cambodia	9	7	47	30	0	0	0	0	0	0	0	0	0	0	56	37
Canada	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
China	38	25	9	5	6	1	0	0	0	0	0	0	0	0	53	31
Djibouti	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Egypt	90	27	120	50	136	39	10	3	3	1	0	0	0	0	359	120
Indonesia	162	134	35	31	2	2	0	0	1	1	0	0	0	0	200	168
Iraq	3	2	0	0	0	0	0	0	0	0	0	0	0	0	3	2
Lao People's Democratic Republic	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Myanmar	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Nepal	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Nigeria	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Pakistan	3	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1
Thailand	25	17	0	0	0	0	0	0	0	0	0	0	0	0	25	17
Turkey	12	4	0	0	0	0	0	0	0	0	0	0	0	0	12	4
Viet Nam	112	57	15	7	0	0	0	0	0	0	0	0	0	0	127	64
Total	468	282	233	125	145	42	10	3	4	2	0	0	1	1	861	455

Recent H5N1 case (April 2019, Nepal)
As of 2019: H5N1
(861 human cases, 455 death, 17 countries)

World Health Organization

HPAI H5N1, South-East Asia



Update situation
HPAI-H5N2, H5N6, H5N8 outbreaks

2015: H5N2 outbreaks in commercial poultry in US
2017: H5N6 in China, Vietnam, Myanmar
2016-2017: H5N8 in wild birds: Europe & US

REUTERS EDITION: U.S. SIGN IN | REGISTER Search Reuters

US | Mon Apr 13, 2015 6:57pm EDT Related: U.S., HEALTH

TICS TECH OPINION BREAKINGVIEWS MONEY

U.S. finds first case of lethal bird flu in commercial chicken flock

CHICAGO | BY TOM POLANSEK

H5N2, H5N8 avian flu viruses surface in US

Filed Under: Avian influenza (Bird Flu)

Robert Roos | News Editor | CIDRAP News | Dec 16, 2014 Share Tweet LinkedIn Email Print & PDF

US authorities today reported finding wild birds in Washington state infected with two different highly pathogenic avian influenza (HPAI) viruses, H_5N_2 and H_5N_8, raising questions about possible connections with recent H_5N_2 outbreaks across the border in Canada and with an Asian H_5N_8 strain that is now hitting European poultry farms.

In reports to the World Organization for Animal Health (OIE), the US Department of Agriculture (USDA) said H_5N_2 was found in a wild pintail duck, while H_5N_8 was found in a captive wild gyrfalcon that was fed on hunter-killed birds. Both birds were in Whatcom County, Washington, which borders the

Frank Leung / iStock

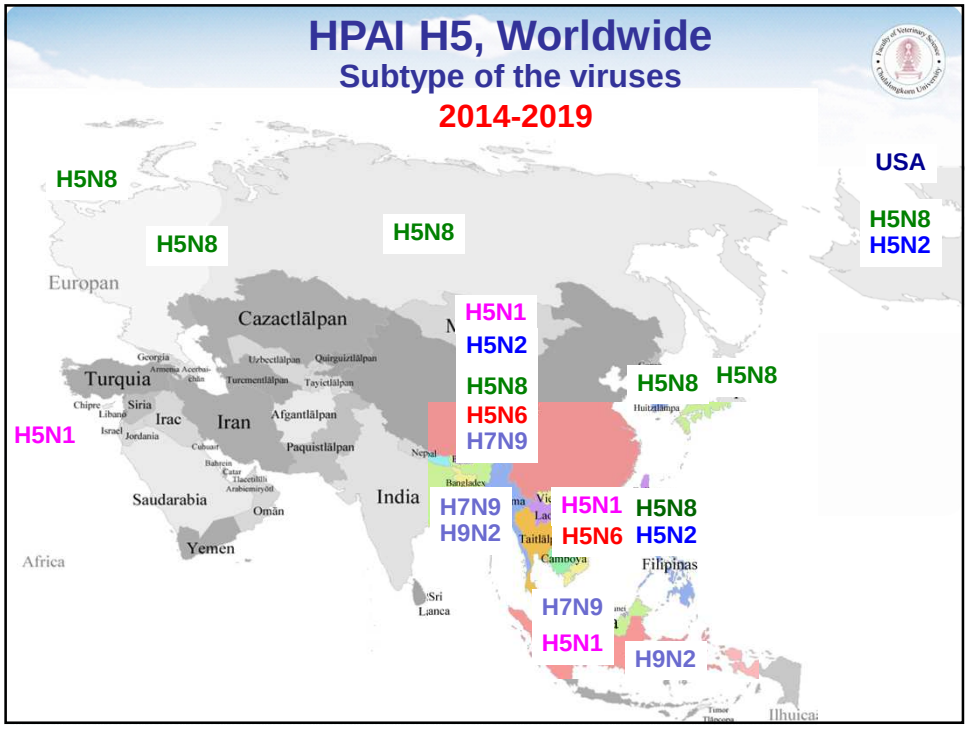
A wild pintail duck, one of the species in which H5N2 avian flu has been found in Washington state.

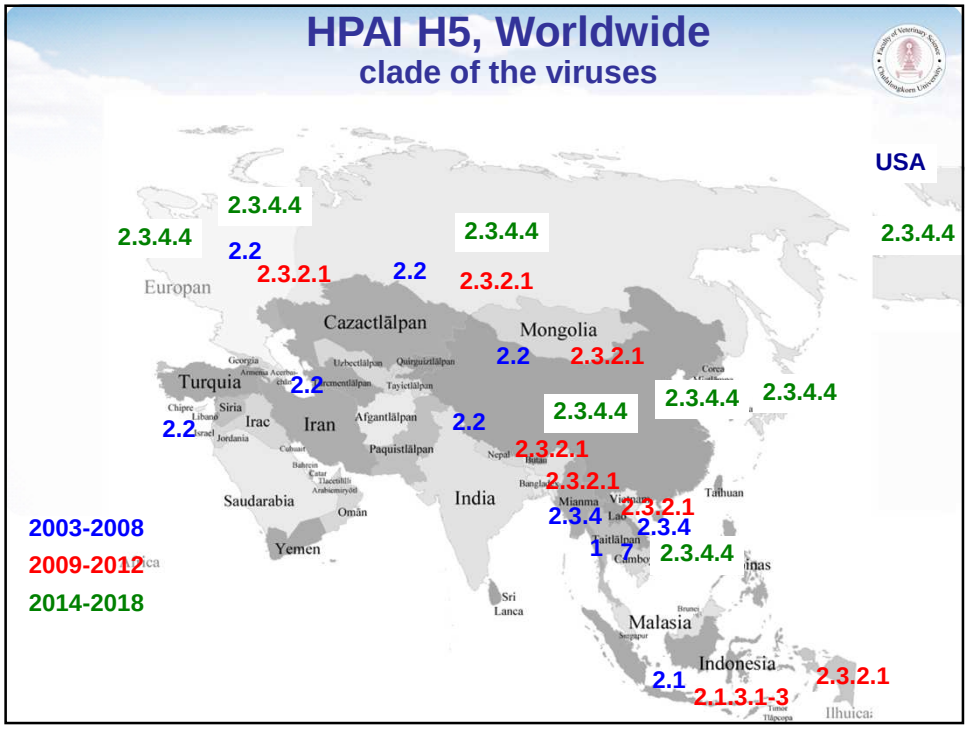
Influenza subtypes	Animal infection	Human infection	NOTE
H5N8 (HPAI)	China (2010, 2014) Japan (2014) Korea (2014-15) Taiwan (2015) US (2014) (wild-birds, backyard) US (2015) (turkey farm) Europe (2014-2018) Europe (Bulgaria Jan 2019)	No human cases	Reassortant GS/GD/96 Clade 2.3.4.4 Novel H5N8 reassortant (H5N6) in the Netherland Pacific flyway in the US (Wild-birds-carriers)
H5N2 (HPAI)	Taiwan (2014-15) US, Canada (2014) West) US (2015; 25 US states) Egypt (March 2019) Taiwan (Feb 2019)	Human cases (Japan) No human cases (US) Low risk	Clade 2.3.4.4 Pacific northwest Mississippi fly way (Wild-birds-carriers)

Influenza subtypes	Animal infection	Human infection	NOTE
H5N6 (HPAI)	Lao Vietnam, Cambodia (recent Feb 2019) Myanmar Philippines China, HK Korea, Japan Chinese Taipei (Recent Mar 2019)	Severe ILI China Recent human case (Mar 19) 17 cases (11) since 2014	2014-2018 Clade 2.3.4.4

Significance

HPAI-H5N2: **Animal production & Low risk**
HPAI-H5N8: **Animal production**
HPAI-H5N6: **Animal production & Public health SEA**


HPAI H5, Worldwide
Subtype of the viruses
2014-2019
H5N8
H5N8
H5N8
USA
H5N8
H5N2
Europan
Cazactlālpan
H5N1
H5N2
H5N8
H5N6
H7N9
H5N8
H5N8
Turquia
Irac
Iran
Afgantlālpan
Paquistlālpan
H5N1
Saudarabia
Oman
Yemen
India
H7N9
H9N2
H5N1
H5N6
H5N8
H5N2
Filipinas
Africa
Sri Lanca
H7N9
H5N1
H9N2
Ilhuica:


HPAI H5, Worldwide
clade of the viruses
USA
2.3.4.4
2.3.4.4
2.3.4.4
2.3.4.4
2.2
2.2
2.3.2.1
2.2
2.3.2.1
Europan
Cazactlālpan
Mongolia
2.2
2.3.2.1
Turquia
2.2
2.3.4.4
2.3.4.4
2.2
Irac
Iran
Afgantlālpan
2.2
2.3.4.4
2.2
Paquistlālpan
2.3.2.1
2.3.2.1
Saudarabia
India
Tailuan
2.3.4
2.3.2.1
2.3.4
1
2.3.4.4
Oman
Yemen
Sri Lanca
Malasia
Indonesia
2.1
2.1.3.1-3
2.3.2.1
Ilhuica:
2003-2008
2009-2012
2014-2018

Update situation
LPAI outbreaks

Significance

Subtype ?: **Animal production**
Animal production & Public health

Update situation
H7N9

Influenza subtypes	Animal infection	Human infection	NOTE
H7N9	China Myanmar (No virulence in poultry) NOTE: Of 1558, 3 HPAI (H), 16 (C), 6 (E)	China Severe ILI (Recent case Feb 2019) Canada Malaysia	Cases with poultry exposure, environment HA: Duck Eastern China NA: Duck China Internal: H9N2 eastern Asia Since 2013-Mar 19 (1568 infect/615 fatal)

Update situation H9N2

Influenza subtypes	Animal infection	Human infection	NOTE
H9N2	Worldwide (enzootic in middle east, Africa, Asia (China) (virulence in ducks (IDN)	HK (1st case) (Since 1999) (recent Feb 2019: China, Mar 2019 Oman) Non fatal, mild ILI (30 Human cases)	Sporadic cases with poultry exposure, H9N2: able to reassort with other subtypes

Update situation (HPAI)

Summary & Lessen learn

HPAI H5:	**HPAI-H5 in the US, Europe, SEA**
	No human cases (H5N8)
	limit cases (H5N2, H5N6)
	Risk to SEA (H5N6)
LPAI	**Risk to SEA (H7N9, H9N2)**
Genetic monitoring	**Recent concern 2.3.4.4**
Prevention & control:	**HPAI monitoring (Wild bird)**
	LPAI monitoring (Backyard, LBM)
	Animal trades, Movement
	Migratory bird flyway

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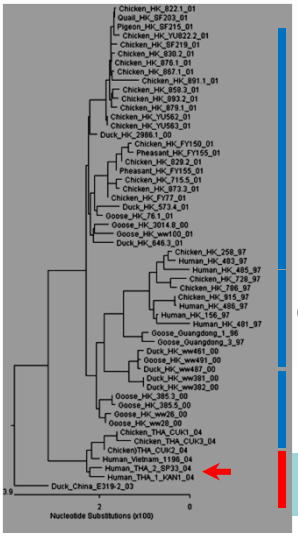
HPAI-H5N1, Thailand

1St report of HPAI-H5N1 outbreak, 2004

A/chicken/Nakorn-Pathom/THA/CU-K2/04



Virology. 2004, 328:169-176

HPAI-H5N1 outbreak in tigers

Avian Influenza H5N1 in Tigers and Leopards

Juthatip Keawcharoen,* Kanisak Oraveerakul,* Thijs Kuiken,† Ron A.M. Fouchier,† Alongkorn Amonsin,* Sunchai Payungporn,* Suwanna Noppornpanth,† Su... Theamb... Ratta... Parntep R...

Probable Tiger-to-Tiger Transmission of Avian Influenza H5N1

EID. 2006, 12 (4): 638

H5N1 infection in dog & cat, Thailand

Avian Influenza H5N1 in Naturally Infected Domestic Cat

Thaweesak Songserm,* Alongkorn Amonsin,† Rungroj Jam-on,* Namdee Sae-Heng,* Noppadol Meemak,‡ Nuananong Pariyothorn,† Sunchai Payungporn,† Apiradee Theamboonlers,† and Yong Poovorawan†

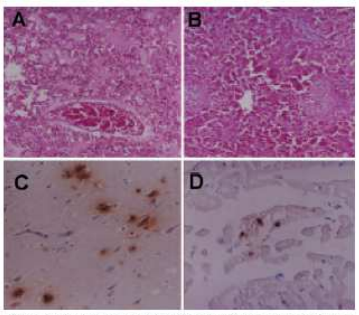


Figure 1. Microscopic lesions of the infected cat, lung edema with

Fatal Avian Influenza A H5N1 in a Dog

Thaweesak Songserm,* Alongkorn Amonsin,† Rungroj Jam-on,* Namdee Sae-Heng,* Nuananong Pariyothorn,† Sunchai Payungporn,† Apiradee Theamboonlers,† Salin Chutinimitkul,† Roongroje Thanawongnuwech,† and Yong Poovorawan†

Avian influenza H5N1 virus is known to cross the species barrier and infect humans and felines. We report a

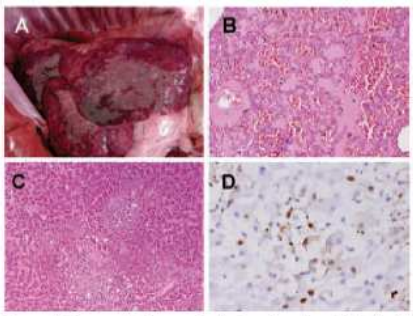


Figure 1. Gross and microscopic lesions from dog infected with

I: 638

Multi-years avian influenza surveillance in THAILAND

- ✓ Free-grazing duck system
- ✓ Livebird market system
- ✓ Wildbird

AVIAN DISEASES 55:593–602, 2011

Influenza A Virus Surveillance in Live-Bird Markets: First Report of Influenza A Virus Subtype H4N6, H4N9, and H10N3 in Thailand

chai,[B] Supanat Boonyapisitsopa,[A] Napawan Bunpapong,[A] Waleemas Jairak,[A] iroj Sasipreeyajun,[D] and Alongkorn Amonsin[ABE]

Animals, Research Unit, Faculty of Veterinary Science, Chulalongkorn University, ıant Road, Patumwan, Bangkok, Thailand
culty of Veterinary Science, Chulalongkorn University, Henri-Dunant Road, Patumwan, Bangkok, Thailand
ınce, Chulalongkorn University, Henri-Dunant Road, Patumwan, Bangkok, Thailand
ınce, Chulalongkorn University, Henri-Dunant Road, Patumwan, Bangkok, Thailand

11; Accepted and published ahead of print 28 June 2011

Arch Virol (2012) 157:1123–1130
DOI 10.1007/s00705-012-1260-8

BRIEF REPORT

Genetic characterization of influenza A virus subtype H12N1 isolated from a watercock and lesser whistling ducks in Thailand

Manoosak Wongphatcharachai · Trong Wisedchanwet · Jiradej Lapkuntod · Nutthawan Nonthabenjawan · Waleemas Jairak · Alongkorn Amonsin

Multi-year avian influenza surveillance

Influenza surveillance in Free Grazing Ducks in Thailand

10 years surveillance
> 10,000 samples tested

Why surveillance FGD?

Free Grazing Ducks & Wild Birds

Open bill stork

Google images

Multi-year avian influenza surveillance

Influenza surveillance in Free Grazing Ducks

Surveillance program Free Grazing ducks (2004-2019)	Influenza A subtypes
2015-18	H4N6, H3N8
2014	H4N6, H4N9, H3N8, HxN7
2013	H4N6, H6N1, H11N6, H11N9
2012	H1N3, H1N9, H3N6, H4N6, H11N2
2011	H3N8, H7N4, H9N7
2010	H11N3, H7N4
2009	H7N4
2004-2008	H5N1

Multi-year avian influenza surveillance

Influenza surveillance in Live Bird Markets in Thailand

10 years surveillance
- **10,000 samples tested**
- **Cross sectional survey**
- **Longitudinal survey**

Why surveillance LBM?

Backyard & Free Grazing ducks & Live Bird Markets

10 years surveillance
- **10,000 samples tested**
- **Cross sectional survey**
- **Longitudinal survey**

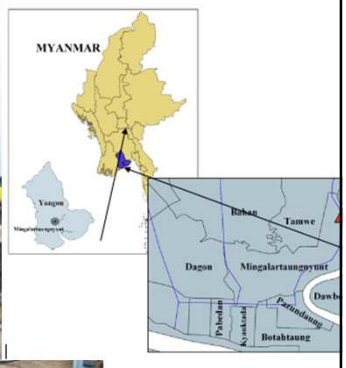
Multi-year avian influenza surveillance

Influenza surveillance in Live Bird Markets

Surveillance program LBMs (2004-2019)	Influenza A subtypes
2016-18	H4N6 (ducks)
2014-15	H4N6, H3N8 (ducks)
2008-12	H4N6, H4N9, H7N4, H10N3 (ducks)
2008	H5N1
Wild-birds:	H12N1 (water cock, ducks)

Multi-year avian influenza surveillance

Influenza surveillance in Live Bird Markets in Myanmar



- 1 year surveillance
- ➢ 455 samples tested
- ➢ Longitudinal survey in 16 vendors

Multi-year avian influenza surveillance

Influenza surveillance in Live Bird Markets in Myanmar

Influenza A positive: 12/455 (2.63%)
Subtyping: H5N1
Clade: 2.3.2.1c

Surveillance program LBMs (2018-2019)	Influenza A subtypes
2016-18	H5N1 (layers)

Multi-year avian influenza surveillance

Influenza surveillance in Wild Birds in Thailand

2010-2012 surveillance
> 2,000 samples tested

2017-2019 surveillance
Department of Natural resource

- 776 pooled samples
- 24 provinces
- > 25 wild bird species


Genetic characterization of influenza A virus subtype H12N1 isolated from a watercock and lesser whistling ducks in Thailand

Manoosak Wongphatcharachai, Trong Wisetchanwet, Jiradej Lapkuntod, Nutthawan Nonthabenjawan, Waleemas Jairak & Alongkorn Amonsin

Archives of Virology
Official Journal of the Virology Division of the International Union of Microbiological Societies

ISSN 0304-8608
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Number 6

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DOI 10.1007/s00705-012-1260-8

Archives of Virology
Official Journal of the Virology Division of the International Union of Microbiological Societies

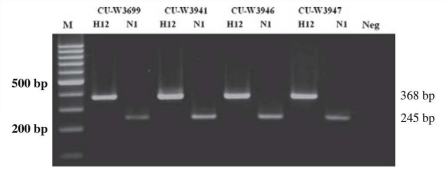
Multi-year avian influenza surveillance

Influenza surveillance in Wild Birds

Order	No. of birds	No. of samples	rRT-PCR	
			No. positive/ samples tested	% positive
Anseriformes*	88	176	9/176*	5.11
Charadriiformes	172	344	7/344	2.03
Columbiformes	327	654	10/654	1.53
Coraciiformes	11	22	0/22	0
Cuculiformes	3	6	0/6	0
Gruiformes**	192	384	21/384**	5.47
Passeriformes	452	904	14/904	1.55
Strigiformes	8	16	0/16	0
Ciconiiformes	39	78	1/78	1.28
Total	**1,292**	**2,584**	**62/2,584**	**2.40**

Water cock
(นกอีลุ้ม)

Lesser whistling ducks
(นกเป็ดแดง)



Low Pathogenic Avian Influenza
Subtype H12 N1
(n=4)

Google images

Multi-year avian influenza surveillance

Influenza surveillance in Wild Birds

2017-2019 surveillance
Department of Natural resource

- **776 pooled samples tested**
- **24 provinces**
- **> 25 wild bird species**

No. of pooled swab samples	rRT-PCR (screening test)			Egg inoc.	HA test		rRT-PCR (p.1)			Subtype
	Tested	Pos	Sus	Tested	Tested	Pos	Tested	Pos	Sus	
776	776	21	91	55	55	4	4	1	1	? (n=1)

Positive: 21/776 (2.7%)
Virus isolation: 1/55 (1.8%)
Subtyping: In-process

Multi-year avian influenza surveillance

Influenza surveillance in wild birds

Surveillance program LBMs (2004-2018)	**Influenza A subtypes**
Wild-birds:	**H12N1 (water cock, ducks)**

Multi-year avian influenza surveillance

Summary & Lessen learn

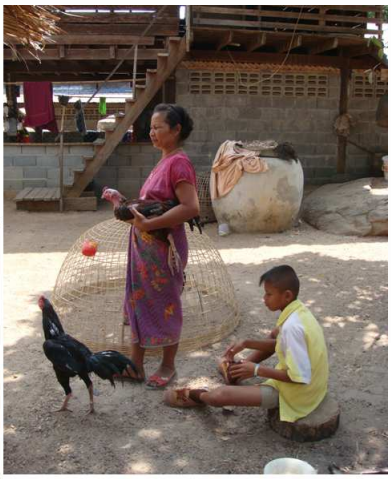
Influenza subtypes:	**Predominant subtypes**
	H7N4, H4N6, H3N8
	H4N6, H3N8 (LBMs)
Species at risk:	**Free grazing ducks**
	Ducks (LBMs)
	Watercock (Wild-birds)
	Whistling duck (wild birds)
Genetic monitoring:	**LPAI**
	Eurasian lineage

On-going & future activities

- **Virus**
  - **Surveillance and Monitoring influenza viruses in animal in Thailand**
  - **Influenza subtype/clade identification in animals**
- **Host**
  - **Reservoirs, high risk species**
  - **Animal experiment systems**
- **Environment & Educations & Public awareness**
  - **Risk assessment of influenza in animals poultry meats, products and environments**
  - **Human-animal interface**
  - **Policies**

Surveillance and Monitoring influenza in animals

Unique setting (Backyard) (SEA regions)



Surveillance and Monitoring influenza in animals

Unique setting (Backyard) (SEA regions)

Surveillance and Monitoring influenza in animals

Unique setting (Free grazing duck) (SEA regions)

Free grazing ducks

Surveillance and Monitoring influenza in animals

Unique setting (Live bird markets)

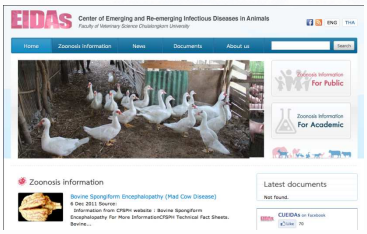
Local Food Markets

Public awareness

Public education

Book & Posters

www.eidas.vet.chula.ac.th



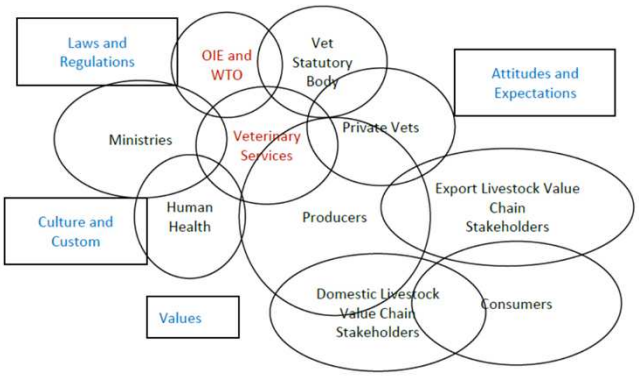
www.facebook.com/cueidas

Take Home Message

One Health & Zoonoses EIDs in wild birds

Surveillance & information sharing

Excellence model: H5N1



?

H5N6
H5Nx

Thank you
Q & A