Update on SIV activity - Australia and Asia-Pacific

OFFLU Swine Influenza group technical meeting
27 March 2012, OIE Paris

CSIRO Australian Animal Health Laboratory

Reported pH1N1 outbreaks in Australian pigs

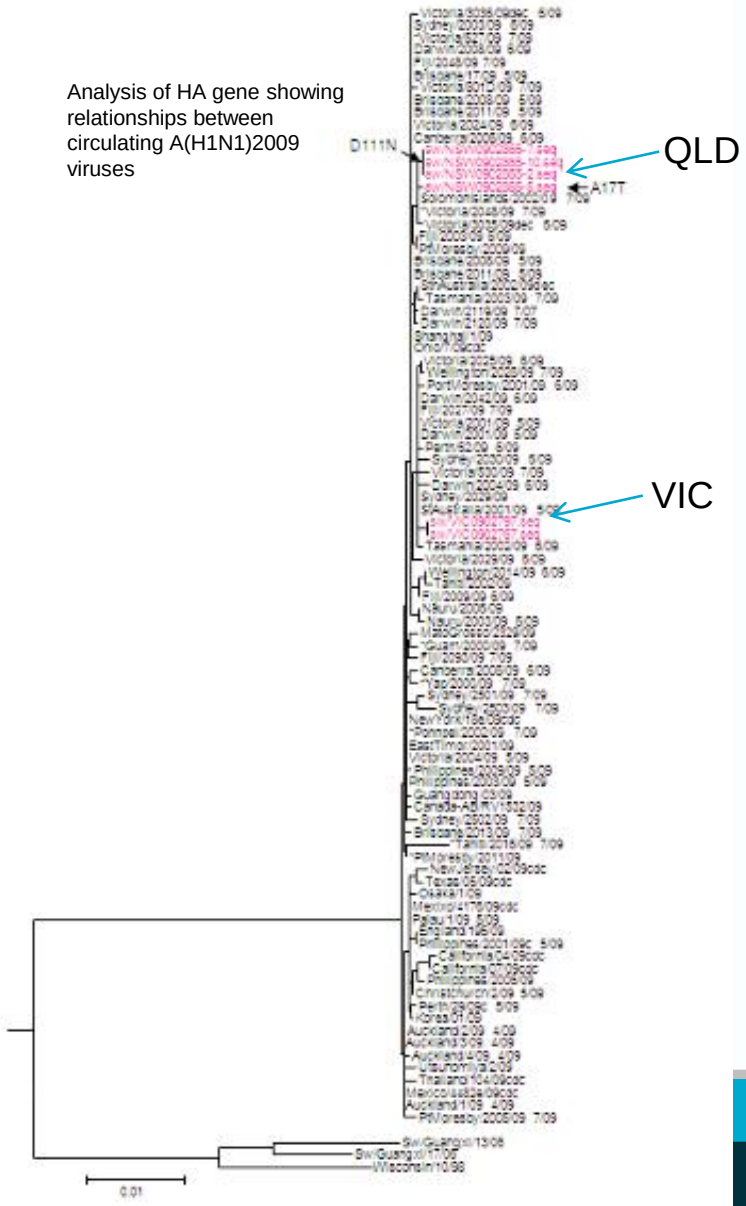
- Australian piggery outbreaks:
1. 24 Jul 2009; central-western NSW
2. 18 Aug 2009; northern VIC
3. 23 Aug 2009; southeast QLD
4. 06 July 2011; southwest WA

- Infections in pigs clinically mild and self limiting

- SIV considered exotic and reportable to national AH agencies.

Ref: Holyoake PK, Kirkland PD, Davis RJ, Arzey KE, Watson J, Lunt RA, Wang J, Wong F, Maloney BJ, and Dunn SE. 2011. The first identified case of pandemic H1N1 influenza in pigs in Australia. Aust. Vet. J. 89: 427-431.

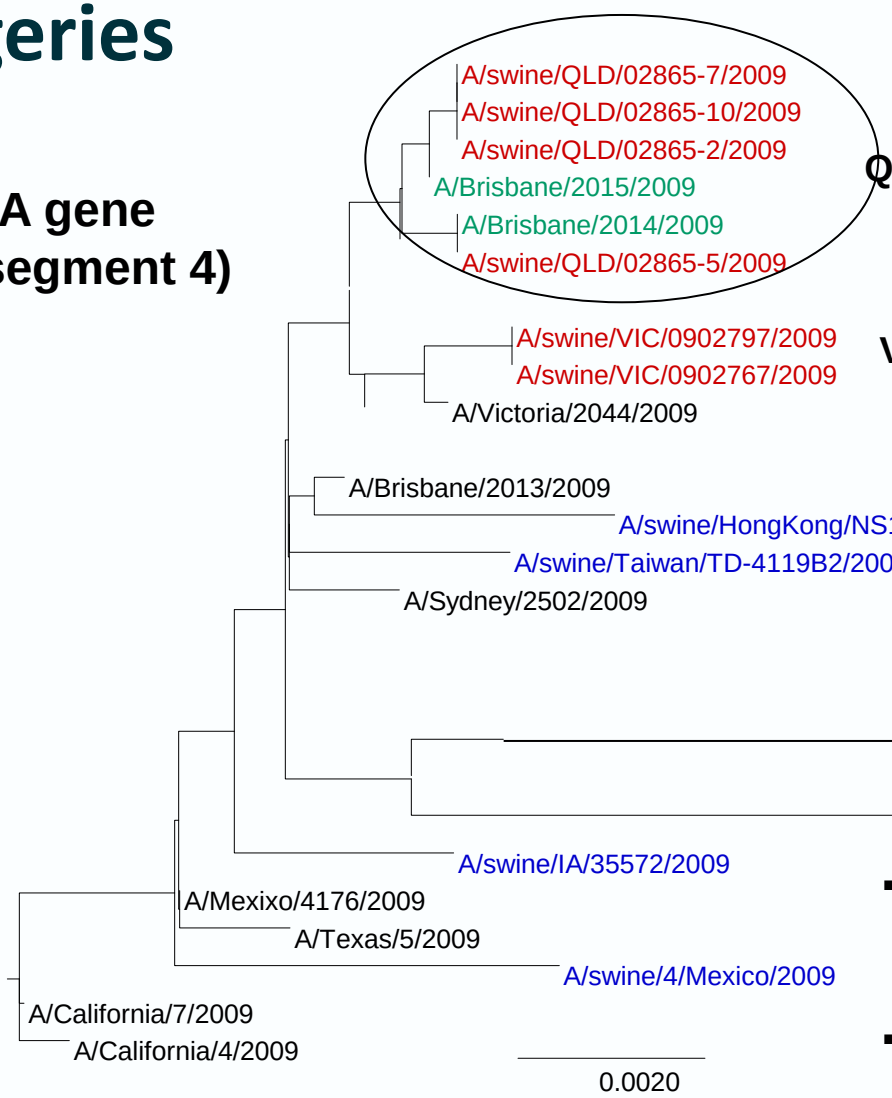
Reported pH1N1 outbreaks in Australian pigs



- Viruses from the separate piggery outbreaks distinguishable, with closest identity to viruses circulating in the human population in the same region at the time; evidence supporting separate spill-over transmissions

Phylogenetic analysis of pH1N1 in Australian piggeries

HA gene (segment 4)



- Viruses from the separate piggery outbreaks distinguishable, with closest identity to viruses circulating in the human population in the same region at the time
- Evidence supporting separate spill-over transmissions

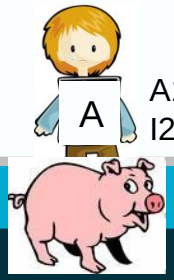
Ref: Deng YM, Iannello P, Smith I, Watson J, Barr I, Daniels P, Komadina N, Harrower B, and Wong F. 2011. Transmission of influenza A(H1N1) 2009 pandemic viruses in Australian swine. Infl. Other Resp. Vir. DOI: 10.1111/j.1750-2659.2012.00337.x.

Evidence of human-pig-human transmission in QLD piggery outbreak

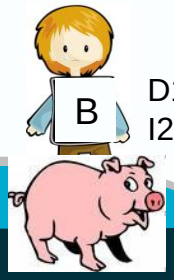
Substitutions in HA protein of pH1N1 2009 influenza viruses from humans and swine

Virus strain	Sample date	Substitution at indicated amino acid position (H3 numbering)								
A/California/07/2009	**04/2009**	**10**	**93**	**104**	**207**	**213**	**215**	**276**	**331**	**421**
		A	**P**	**D**	**T**	**S**	**R**	**I**	**I**	**V**
A/Auckland/1/2009	04/2009		S		A				V	
A/QLD/2011/2009	05/2009		S		A	T			V	I
A/swine/QLD/02865-5/2009	**08/2009**	**T**	**S**		**A**	**T**		**V**	**V**	**I**
A/swine/QLD/02865-7/2009	**08/2009**		**S**	**N**	**A**	**T**		**V**	**V**	**I**
A/QLD/2014/2009	**08/2009**	**T**	**S**		**A**	**T**		**V**	**V**	**I**
A/QLD/2015/2009	**08/2009**		**S**	**N**	**A**	**T**		**V**	**V**	**I**
A/VIC/2025/2009	06/2009		S		A	T	K		V	I
A/swine/VIC/02797/2009	08/2009		S		A	T	K		V	I

- QLD piggery viruses from pigs and humans share unique I276V substitution
- Respective viruses from the two subsequently infected farm contact persons link to two distinct strains zoonotically transmitted from pigs to humans:
  - Strain A with unique A10T substitution
  - Strain B with unique D104N substitution



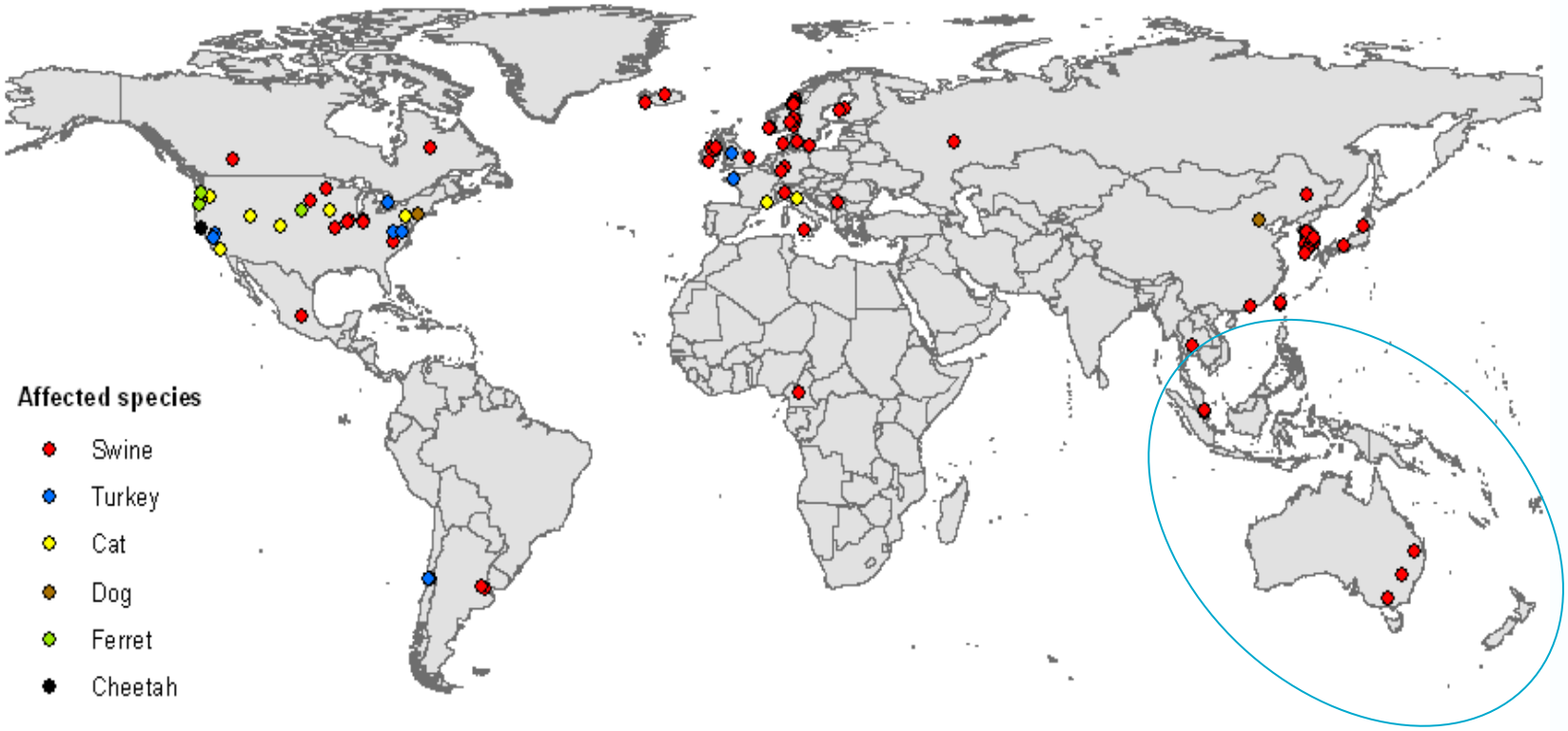
A10T
I276V



D104N
I276V

Ref: Deng YM, et al. 2011. Transmission of influenza A(H1N1) 2009 pandemic viruses in Australian swine. Infl. Other Resp. Vir. DOI: 10.1111/j.1750-2659.2012.00337.x.

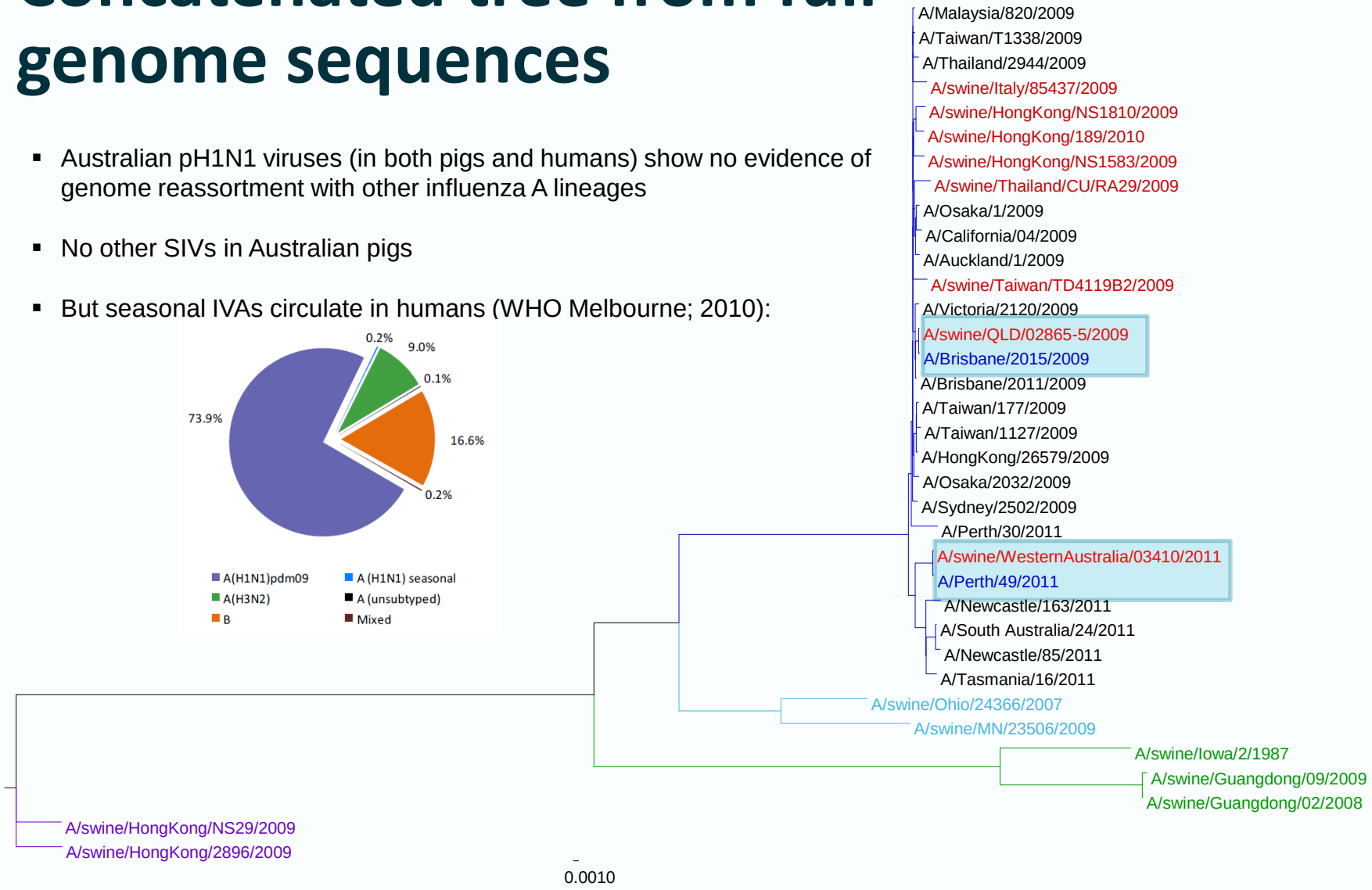
Confirmed animal cases with Pandemic H1N1 2009 Influenza virus
Situation as of 09 February 2011



- pH1N1 considered globally endemic in swine
- Cases in swine not been reported to OIE since Feb 2011 (EMPRES-i)

Concatenated tree from full genome sequences

- Australian pH1N1 viruses (in both pigs and humans) show no evidence of genome reassortment with other influenza A lineages
- No other SIVs in Australian pigs
- But seasonal IVAs circulate in humans (WHO Melbourne; 2010):



Conclusions – SIV in Australia

- Four independent pH1N1 virus outbreaks examined in Australian piggeries (2009 & 2011)
- Molecular epidemiological evidence of human and pig bi-directional transmissions
- No reassortment found with pH1N1 in Australia to date (pigs or humans)
- Australia still considered free of SIVs that circulate endemically in other countries, including in SE Asia (H1N1, H1N2, H3N2)
- pH1N1 in Australian pigs to 2011 but no support for active surveillance from industry due to need for maintaining freedom from disease reputation

Distribution of SIV in East and SE Asia

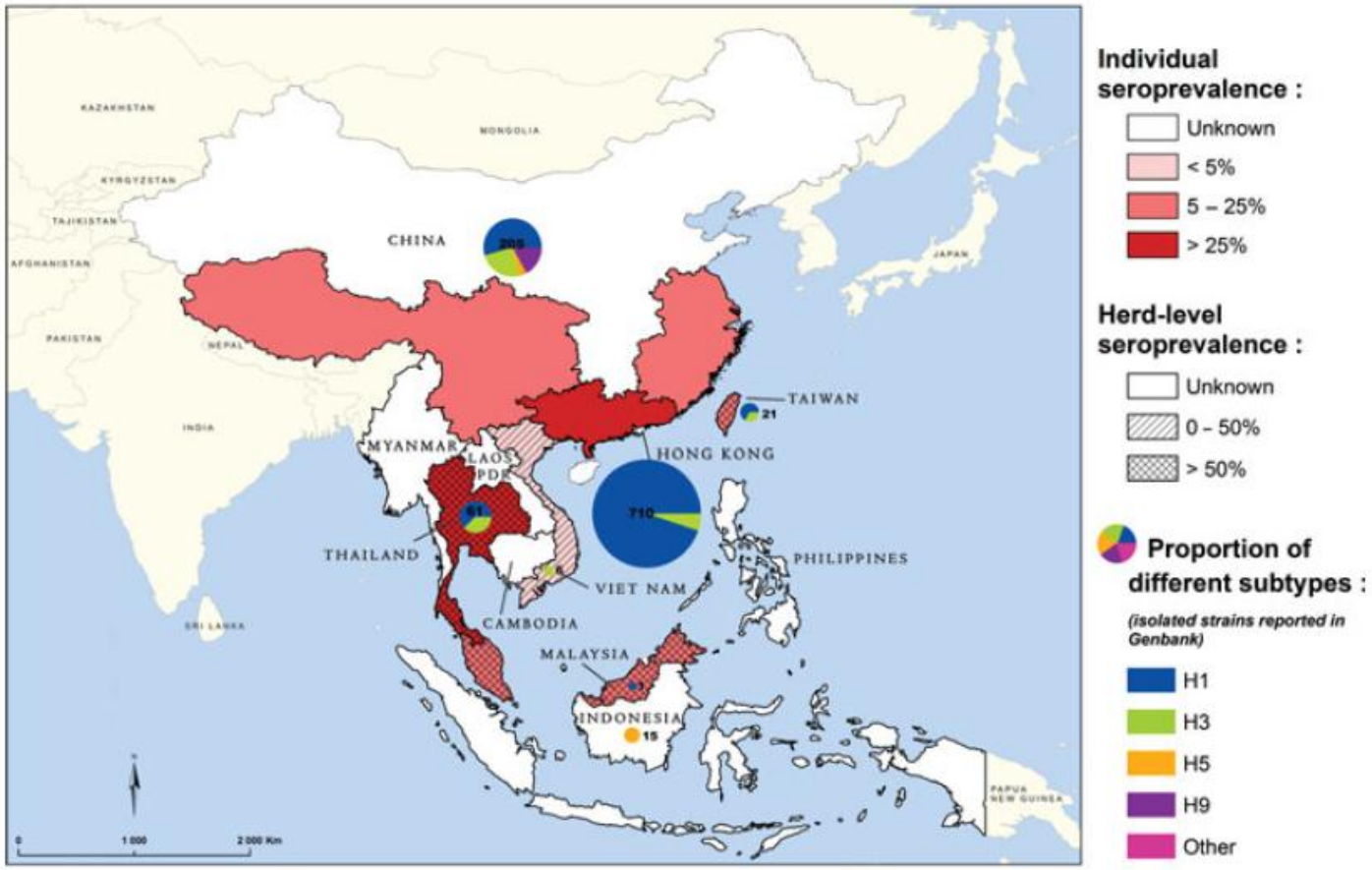


Fig. 2. Swine influenza in East and Southeast Asia. Isolated subtypes (GenBank), herd-level and individual seroprevalence of swine influenza type A last published in China (Liu *et al.*, 2011), Taiwan (Shieh *et al.*, 2008), Malaysia (Suriya *et al.*, 2008), Thailand (Parchariyanon, 2006) and Vietnam (Trevennec *et al.*, 2011).

Indonesia serosurvey – 2010

HI screening of ~1040 sera from commercial pigs

H1N1 (SIV) (A/NJ/8/76)	H1N1 (SIV) (A/swine/Ratchaburi/NIAH 1481/2000)	H3N2 (SIV) (A/swine/Nakhon Pathom//2002)	pH1N1 (SIV) (A/California/4/2009)	H9N2 (AIV) (A/ckn/Malacca /905/03)	H5N1 (AIV) (A/ckn/Wates/1/2005)
POS n=117	POS n=159	POS n=632	POS n=4	POS n=0	POS n=0
11.3%	15.3%	61.1%	0.4%	nil	nil

- Serum samples plus inactivated so no chance for VI; less useful for characterisation
- However some useful data on which IVA subtypes Indonesian pigs exposed to
- There may be associated swab samples; investigating this with national research lab
- Basis of further study collaboration with Indonesian MoA

ACIAR Laos HepE pig study - 2012

Some opportunity to co-collect nasal swabs for SIV detection (local village pigs)

Conclusions: SIV surveillance in SE Asia-APAC Region

- Recently lit-reviewed by Trevennec et al. 2011. Anim. Health Res. Rev. 12:213-223
- Data mainly from Thailand and Vietnam, with minor seroprevalence data from Malaysia
- No published studies for Cambodia, Indonesia, Lao PDR, Myanmar, Philippines
- Opportunities for surveillance studies in some of these countries; further discussion with OFFLU SIV Group (eg. under new FAO programs)

Thank you

Australian Animal Health Laboratory
Frank Wong

t +61 3 52275056
e frank.wong@csiro.au
w www.csiro.au/