Swine influenza activities in China

Hualan Chen

Harbin Veterinary Research Institute, CAAS, China

Current situation

- 1.3 billion pigs: 43% of the total in the world
- Different breeding styles: backyard to large scale farms
- Closely contact with poultry
- Vaccines are not used
- Systemic surveillance is not in place

Virus isolated during 2002-2008

Year	Subtypes
2002	H1N1, H3N2, H9N2
2003	H1N1, H3N2, H9N2, H5N1 （also isolated one in 2001）
2004	H1N1, H1N2, H3N2, H9N2
2005	H1N1, H3N2, H9N2
2006	H1N1, H1N2, H3N2,H9N2
2007	H1N1, H1N2, H3N2, H9N2
2008	H1N1, H1N2, H3N2, H9N2

Serologic Surveillance in 2008

Place	Samples	Positive rate(%)			
		H1 subtype	H3 subtype	H5 subtype	H9 subtype
Henan	4150	23.7	50.8	0.1	0.2
Shandong	785	5.6	55.5	0.1	0.1
Jiangsu	590	19.3	58.8	0	0
Shanghai	394	34.4	54.7	0	0
Hubei	178	0	64.6	0	0
Hunan	105	2.86	77.1	0	0
Chongqing	176	15.8	76.3	0	0
Heilongjiang	175	22.7	62.7	0	0
Hebei	412	12.5	45.5	0	0
Guangdong	238	3.0	75.8	0	0
Total	7203	14.0	62.2	0.02	0.03

Contents lists available at ScienceDirect

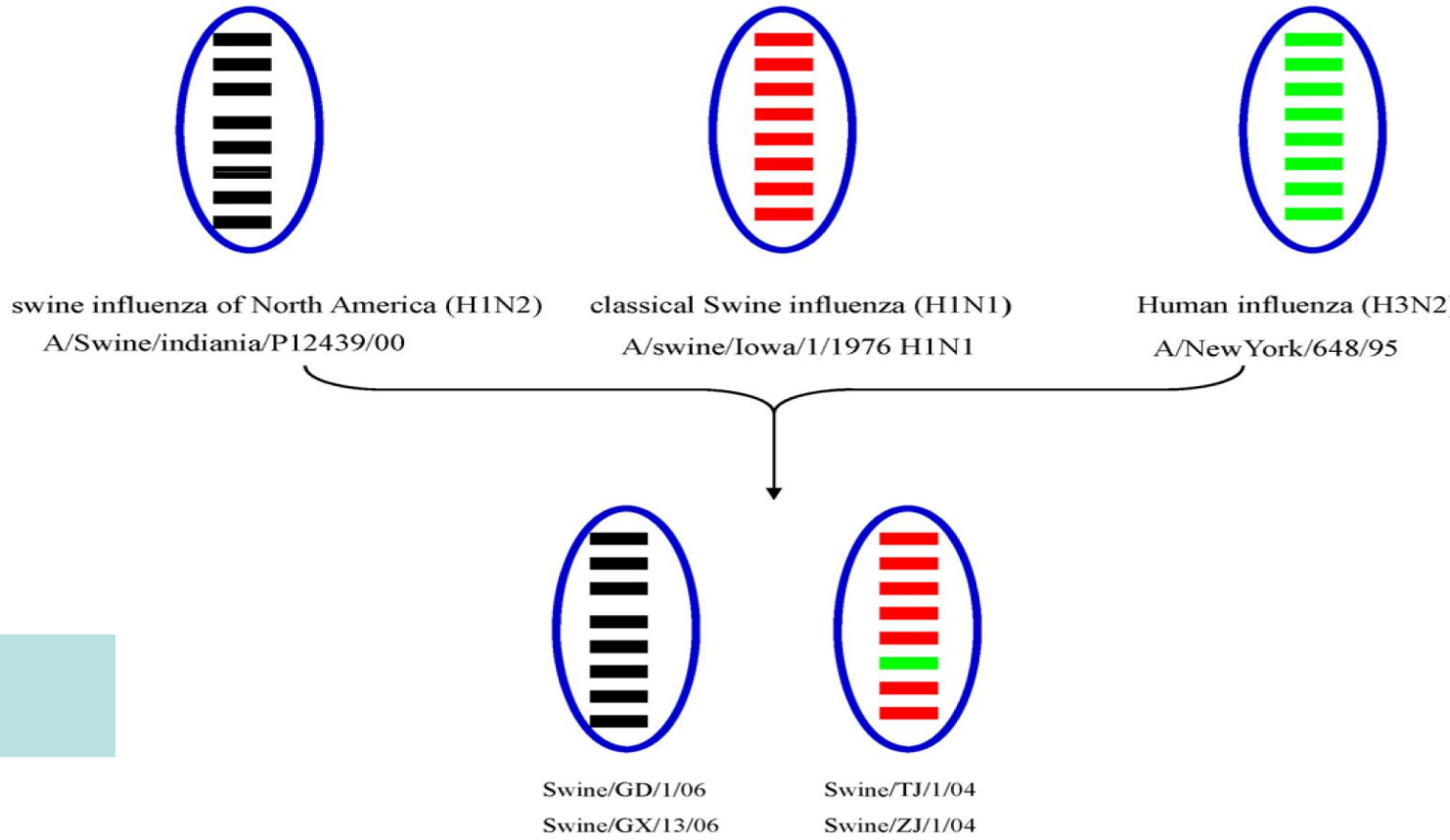
Journal of Clinical Virology

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

Short communication

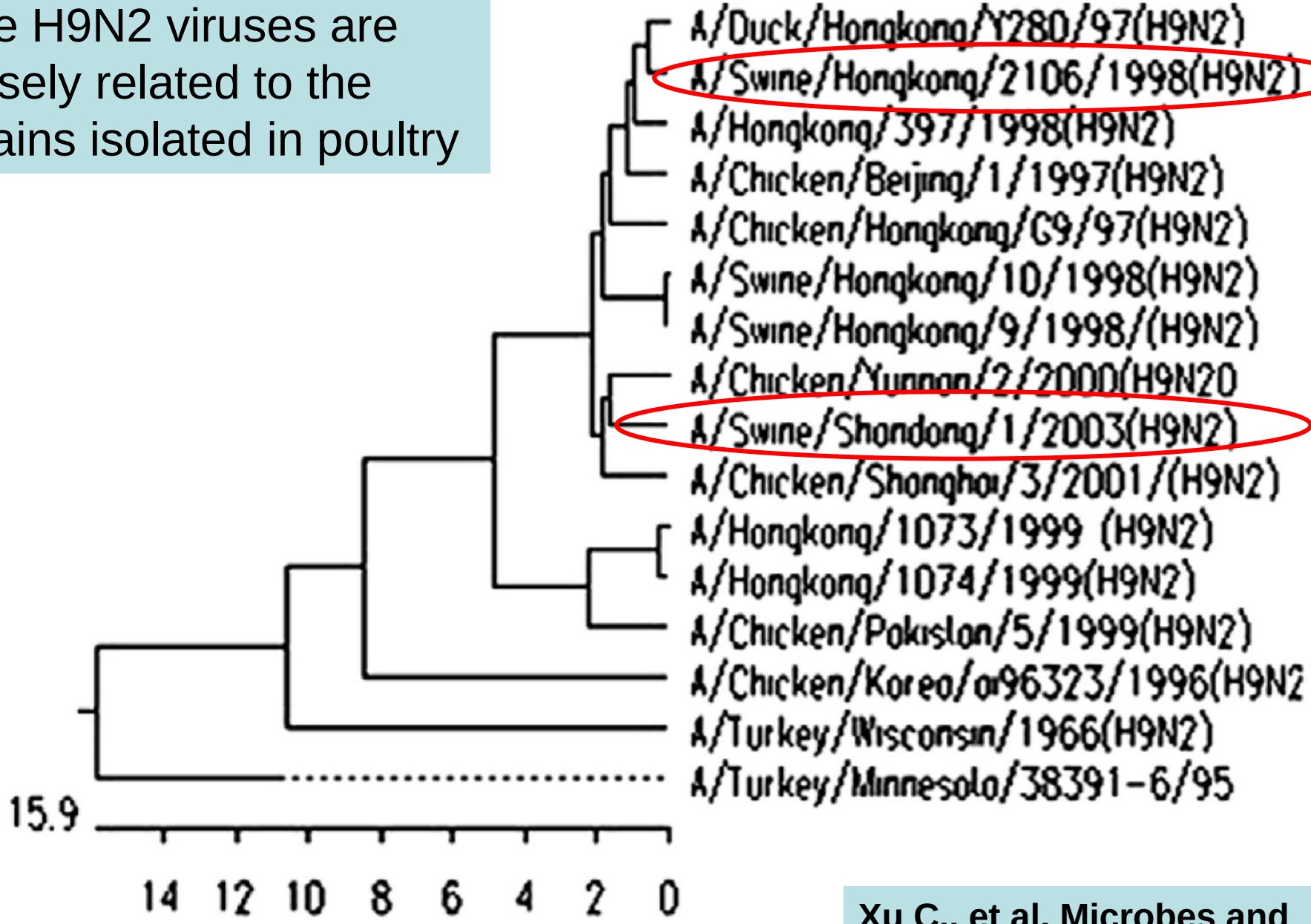
Two genotypes of H1N2 swine influenza viruses appeared among pigs in China

Chuantian Xu[a,b], Qiyun Zhu[a], Huanliang Yang[a], Xiumei Zhang[b], Chuanling Qiao[a], Yan Chen[a], Xiaoguang Xin[a], Hualan Chen[a,*]



H1N2 viruses

The H9N2 viruses are closely related to the strains isolated in poultry



Xu C., et al. Microbes and infections, 2004

The H5N1 viruses isolated from pigs are genetically similar to the viruses isolated in ducks in China

Zhu Q et al.,

Journal of Virology, 2008

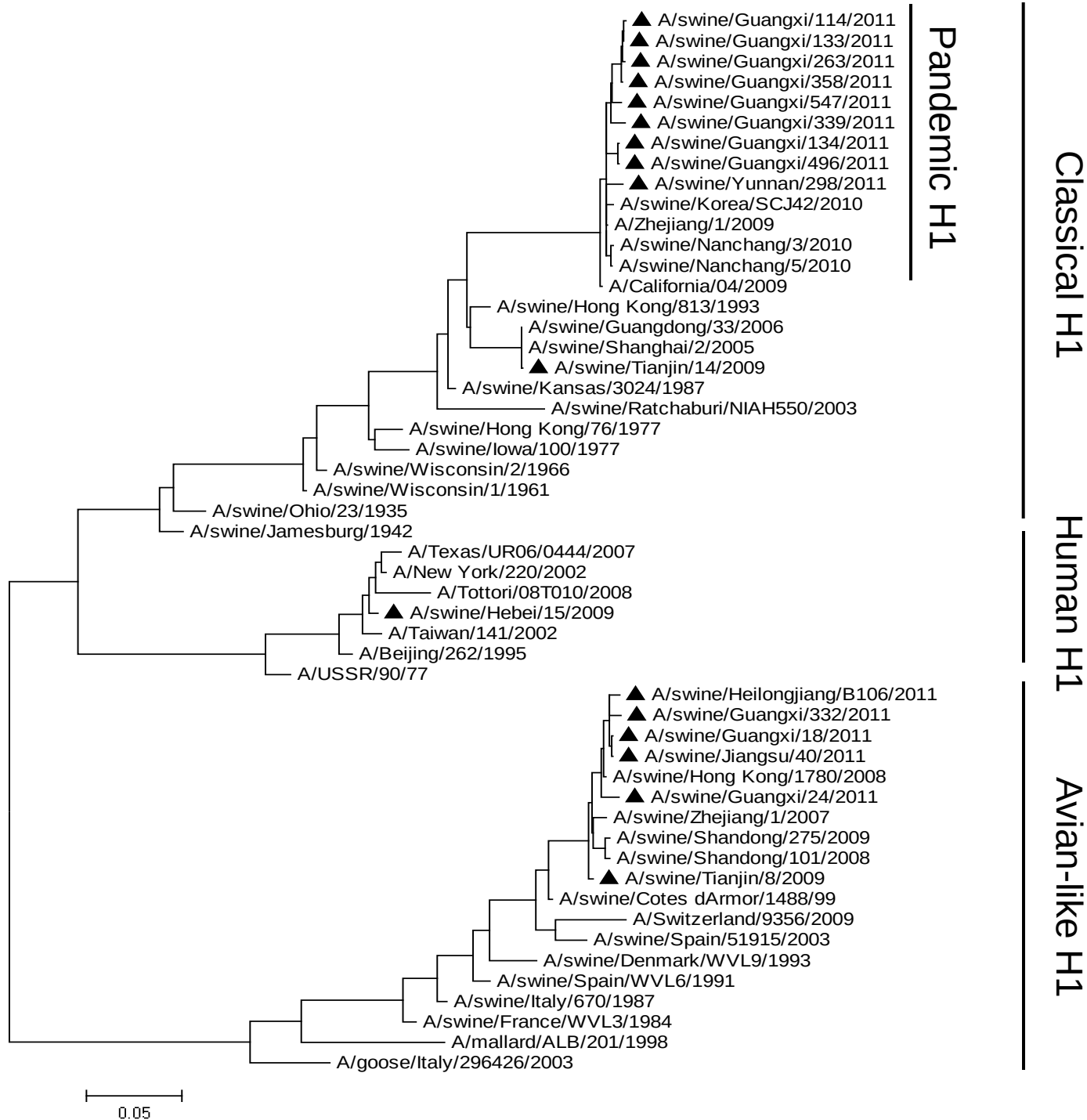
TABLE 2. Amino acid differences between two H5N1 swine influenza viruses and the duck virus DK/ZJ/00

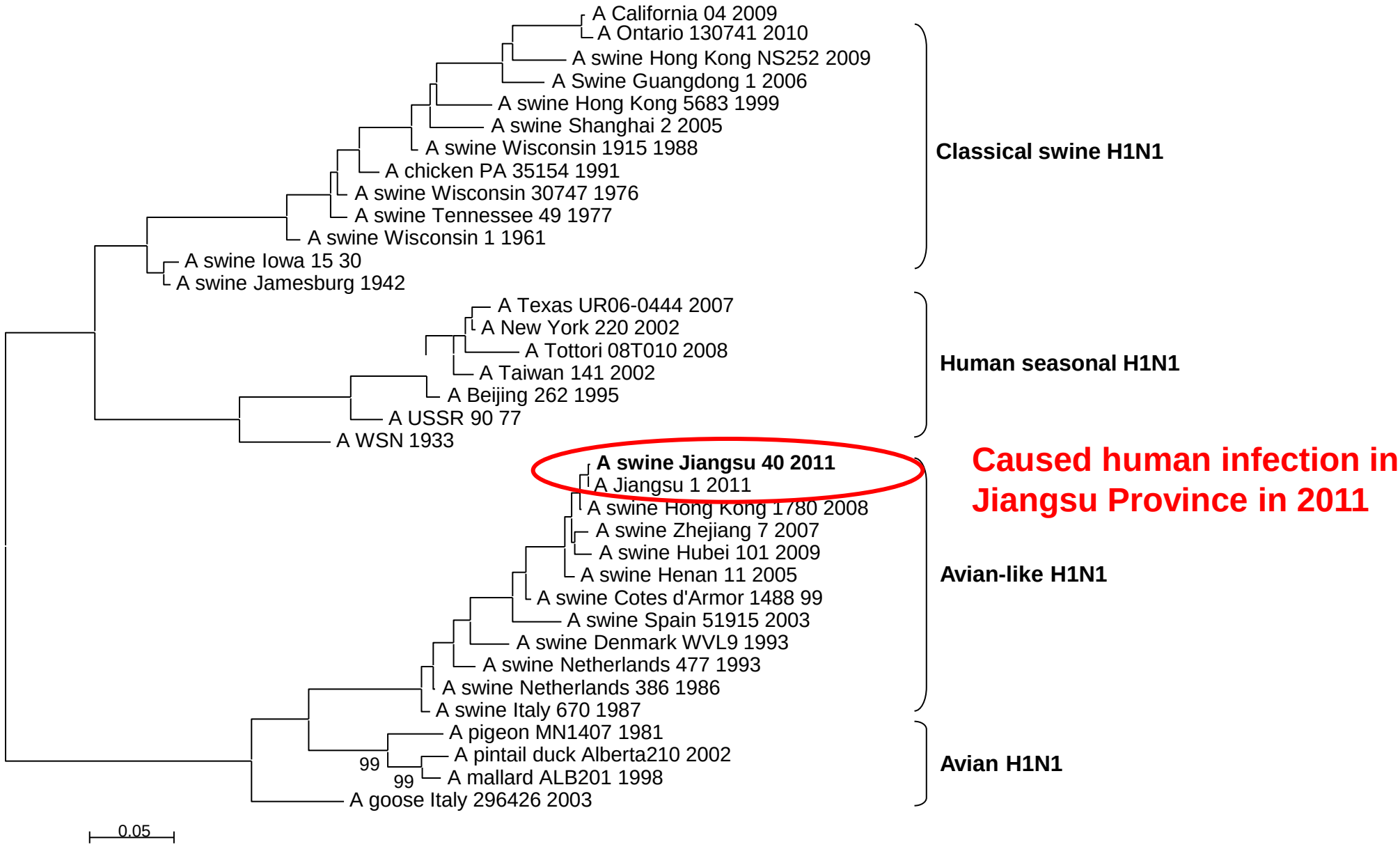
Protein	Amino acid position	Amino acid in virus[a]		
		DK/ZJ/00	SW/FJ/01	SW/FJ/03
PB2	51	V	M	M
	92	P	S	S
	164	L	M	M
	562	I	*I*	*S*
	679	L	P	P
	725	P	L	L
PB1	456	L	H	H
	486	L	R	R
PA	54	V	I	I
	330	I	V	V
	384	Y	C	C
	459	V	I	I
HA	16	S	G	G
	100	N	S	S
	168	K	*K*	*E*
	254	S	A	A
	444	L	*I*	*L*
NP	65	S	R	R
	257	T	I	I
	284	V	A	A
NA	34	V	I	I
M2	26	L	*S*	*L*
	65	T	*T*	*A*
NS1	18	V	I	I
	69	P	L	L
	88	I	M	M
	191–195	EALQR	*EALQR*	
NS2	39–43	KLYRD	*KLYRD*	

About 15,000 nasal swabs were collected from pigs in 22 provinces during 2010-2011

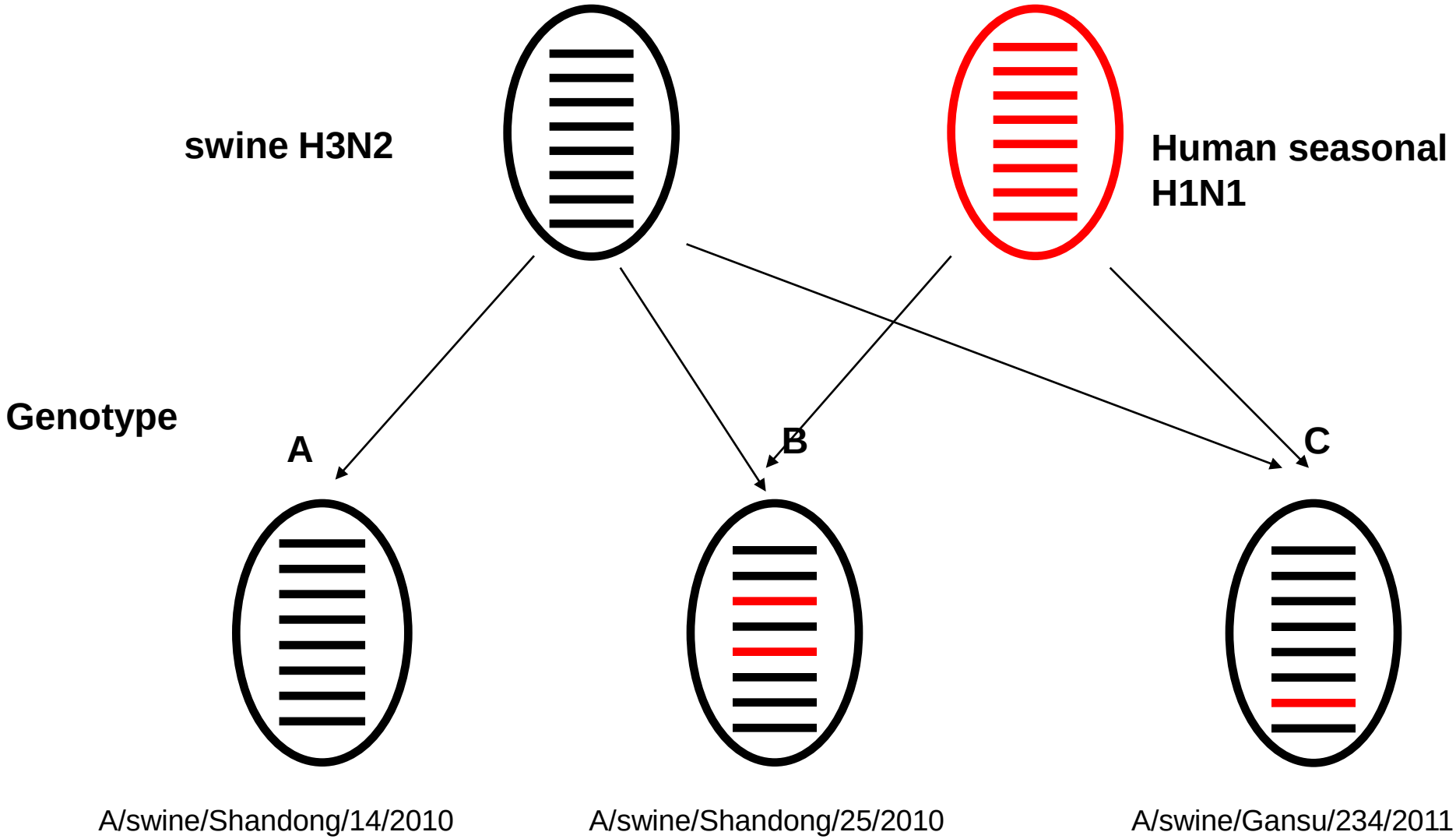
Total 55 SIVs were isolated from these samples, including 40 H1N1 SIVs, 11 H1N2 SIVs, and 4 H3N2 SIVs.

H1N1 HA genes




A California 04 2009
A Ontario 130741 2010
A swine Hong Kong NS252 2009
A Swine Guangdong 1 2006
A swine Hong Kong 5683 1999
A swine Shanghai 2 2005
A swine Wisconsin 1915 1988
A chicken PA 35154 1991
A swine Wisconsin 30747 1976
A swine Tennessee 49 1977
A swine Wisconsin 1 1961
A swine Iowa 15 30
A swine Jamesburg 1942
Classical swine H1N1
A Texas UR06-0444 2007
A New York 220 2002
A Tottori 08T010 2008
A Taiwan 141 2002
A Beijing 262 1995
A USSR 90 77
A WSN 1933
Human seasonal H1N1
A swine Jiangsu 40 2011
A Jiangsu 1 2011
A swine Hong Kong 1780 2008
A swine Zhejiang 7 2007
A swine Hubei 101 2009
A swine Henan 11 2005
A swine Cotes d'Armor 1488 99
A swine Spain 51915 2003
A swine Denmark WVL9 1993
A swine Netherlands 477 1993
A swine Netherlands 386 1986
A swine Italy 670 1987
Avian-like H1N1
A pigeon MN1407 1981
A pintail duck Alberta210 2002
99
99
A mallard ALB201 1998
A goose Italy 296426 2003
Avian H1N1
0.05
Caused human infection in Jiangsu Province in 2011

Different genotypes of H3N2 SIVs were detected in China



H1N1 swine influenza vaccine

Development of an inactivated vaccine (SC/PR8) against the infection of pandemic 2009 H1N1 viruses and endemic swine H1N1 or H1N2 influenza viruses in pigs.

Veterinary Microbiology 152 (2011) 229–234

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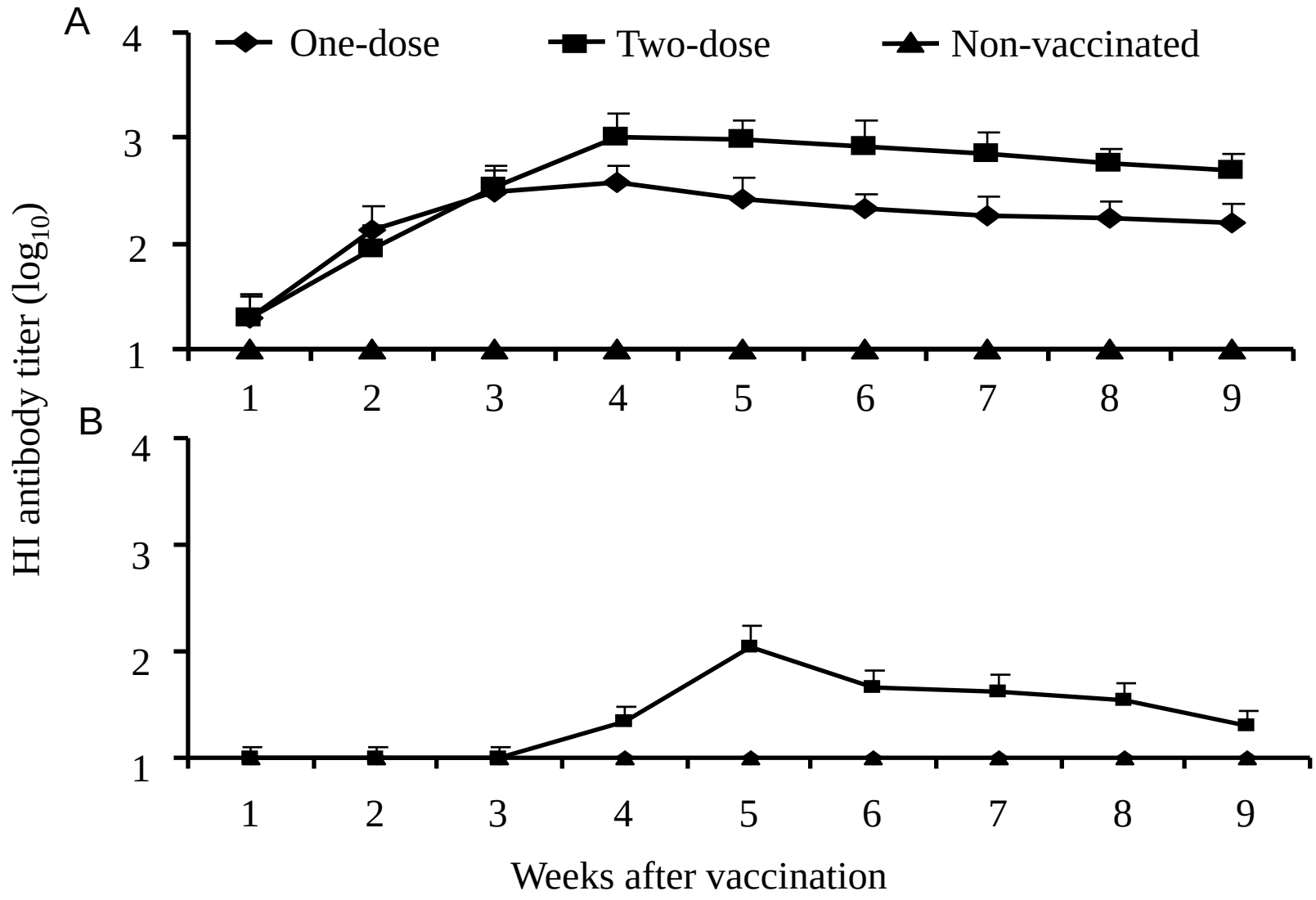
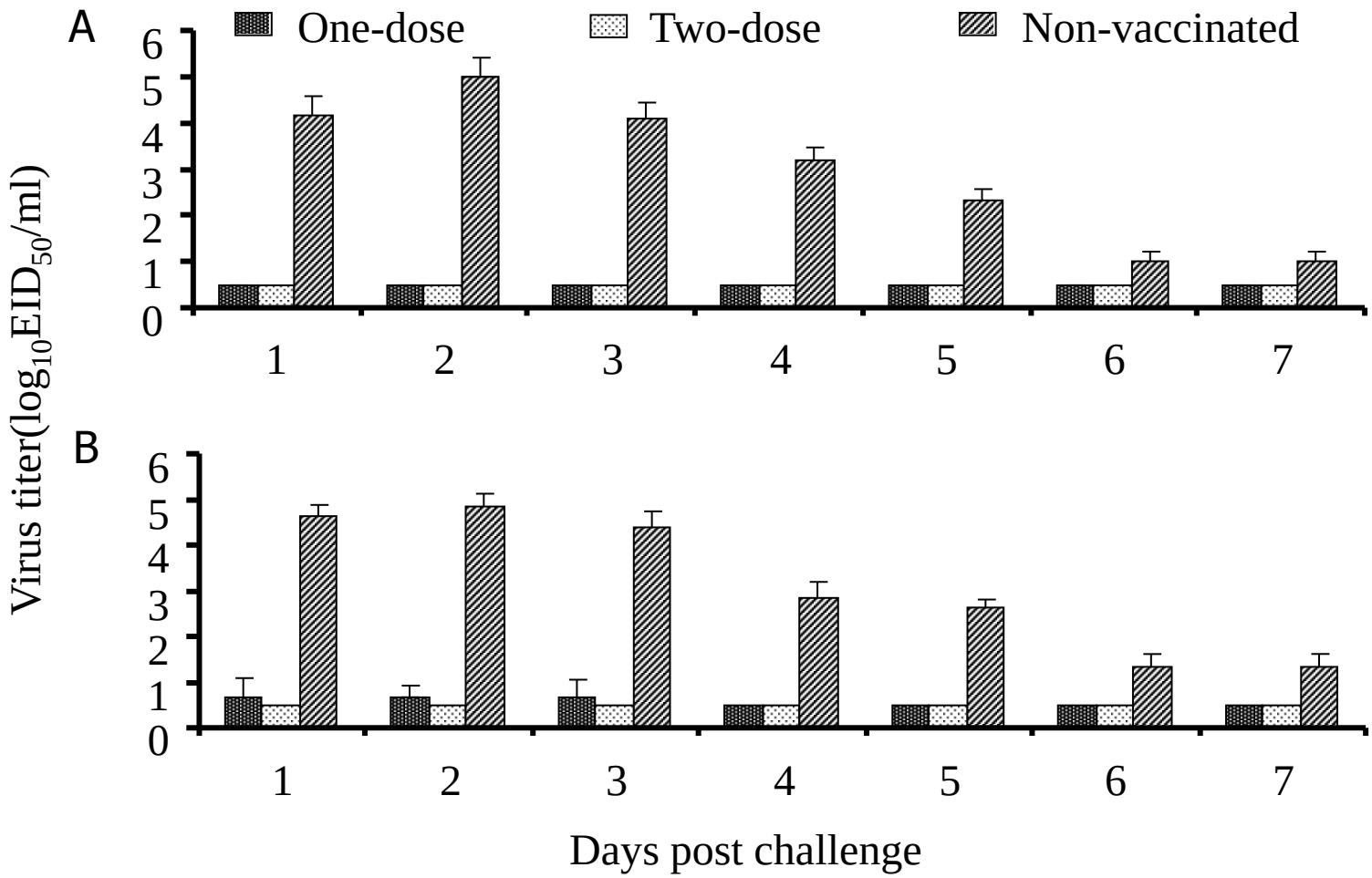
Reassortant H1N1 influenza virus vaccines protect pigs against pandemic H1N1 influenza virus and H1N2 swine influenza virus challenge

Huanliang Yang [a,1], Yan Chen [a,1], Jianzhong Shi [a], Jing Guo [a], Xiaoguang Xin [a], Jian Zhang [a], Dayan Wang [b], Yuelong Shu [b], Chuanling Qiao [a,*], Hualan Chen [a,*]

[a] *Animal Influenza Laboratory of the Ministry of Agriculture, State Key Laboratory of Veterinary Biotechnology, Harbin Veterinary Research Institute, Chinese Academy of Agricultural Sciences, 427 Maduan Street, Nangang District, Harbin 150001, PR China*



Antibody responses induced by SC/PR8 inactivated vaccines in the pigs. (A) Antibody titers against SC/09 virus. (B)Antibody titers against GD/06 virus.



Virus shedding in pigs after challenge with different swine influenza viruses.
(A) SC/09 virus. (B) GD/06 virus.

Summary

- Multiple subtypes of influenza viruses have been detected in pigs in China.

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- The co-existing of 2009 pandemic H1N1 influenza virus and other subtypes viruses (e.g. avian like H1N1, H9N2 and H5N1) in the animals may produce new reassotants with pandemic potential.

Summary

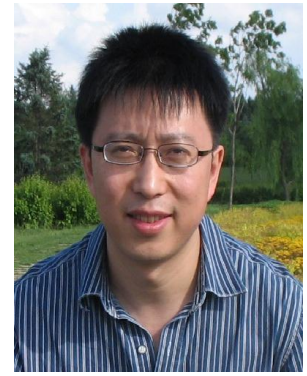
- Multiple subtypes of influenza viruses have been detected in pigs in China.

- The co-existing of 2009 pandemic H1N1 influenza virus and other subtypes viruses (e.g. avian like H1N1, H9N2 and H5N1) in the animals may produce new reassotants with pandemic potential.

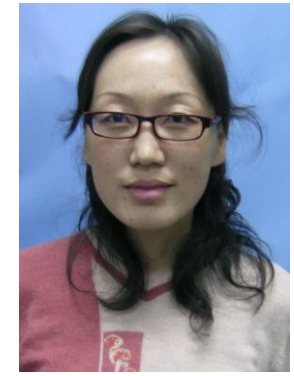
- Systemic surveillance and analysis of SIVs are now high priorities in our research activities.

Acknowledgments

Dr. Chuanling Qiao



Dr. Huanliang Yang



Dr. Yan Chen

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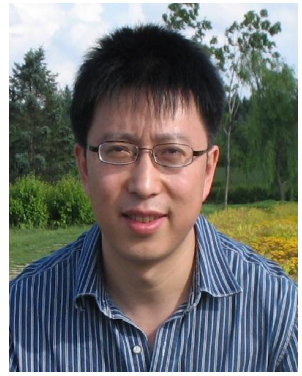
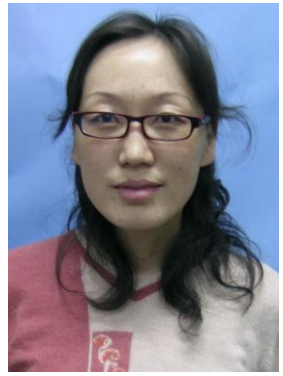


Dr. Huanliang Yang



Dr. Yan Chen

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