



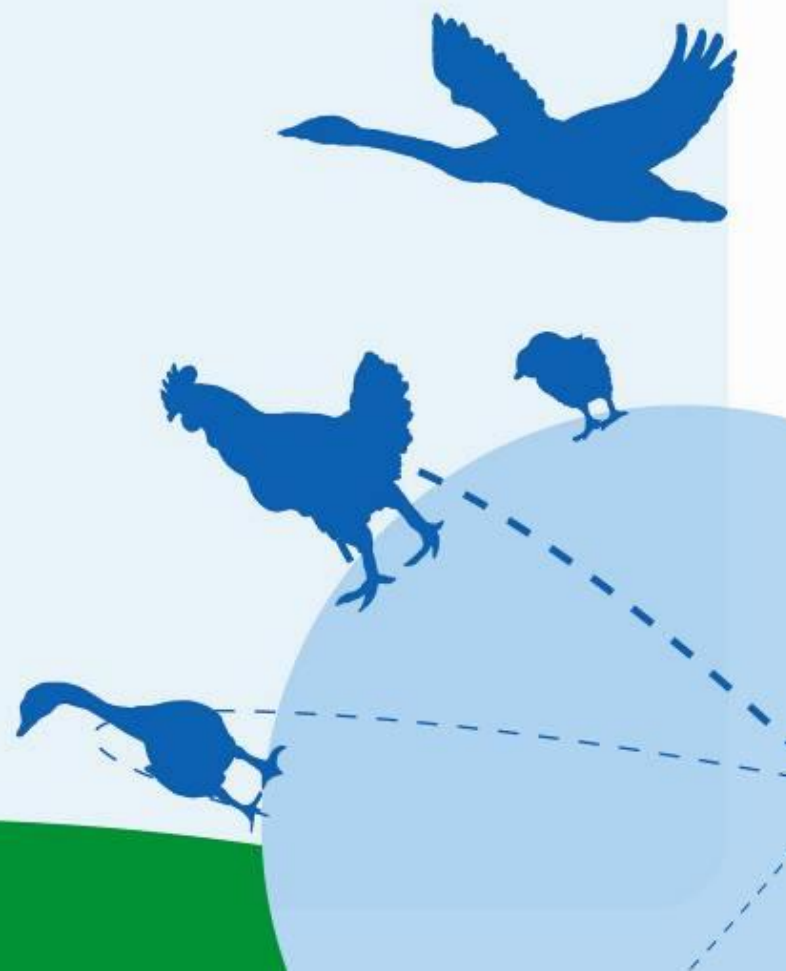
OFFLU virtual SIV group meeting
9 December 2020

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CDC, Atlanta, GA USA

IAV-S data for WHO

VCM



Swine influenza A virus infections in 2020

Human infections with A(H1)v

Country	Subtype	State	Age (yrs)	Sex	Onset date	Outcome	Exposure	Confirmed/ Reported	Strain name
Netherlands	H1N1v (1C.2.2)				Sept 2019	Recovered	Exposure to swine	NIC in Netherlands	A/Netherlands/Gent-193/2019
Germany	H1N1v (1C.2.2)	Hessen	2	M	06/15/2020	Recovered	Exposure to swine	NIC in Germany	A/Hessen/47/2020
Brazil	H1N2v (1B.2)	Parana	22	F	04/13/2020	Recovered	Possible exposure to swine	IHR National Focal Point, Brazil	A/Parana/3625/2020
Canada	H1N2v (1A.1.1)	Alberta			October 2020	Recovered	Exposure to swine	Public Health Agency of Canada	A/Alberta/1/2020

Investigation indicted swine exposure; no onward transmission among family members

- **One additional CVV recommended by WHO to cover the H1N1v (1C.2.2) viruses**
- **A/Hessen/47/2020**

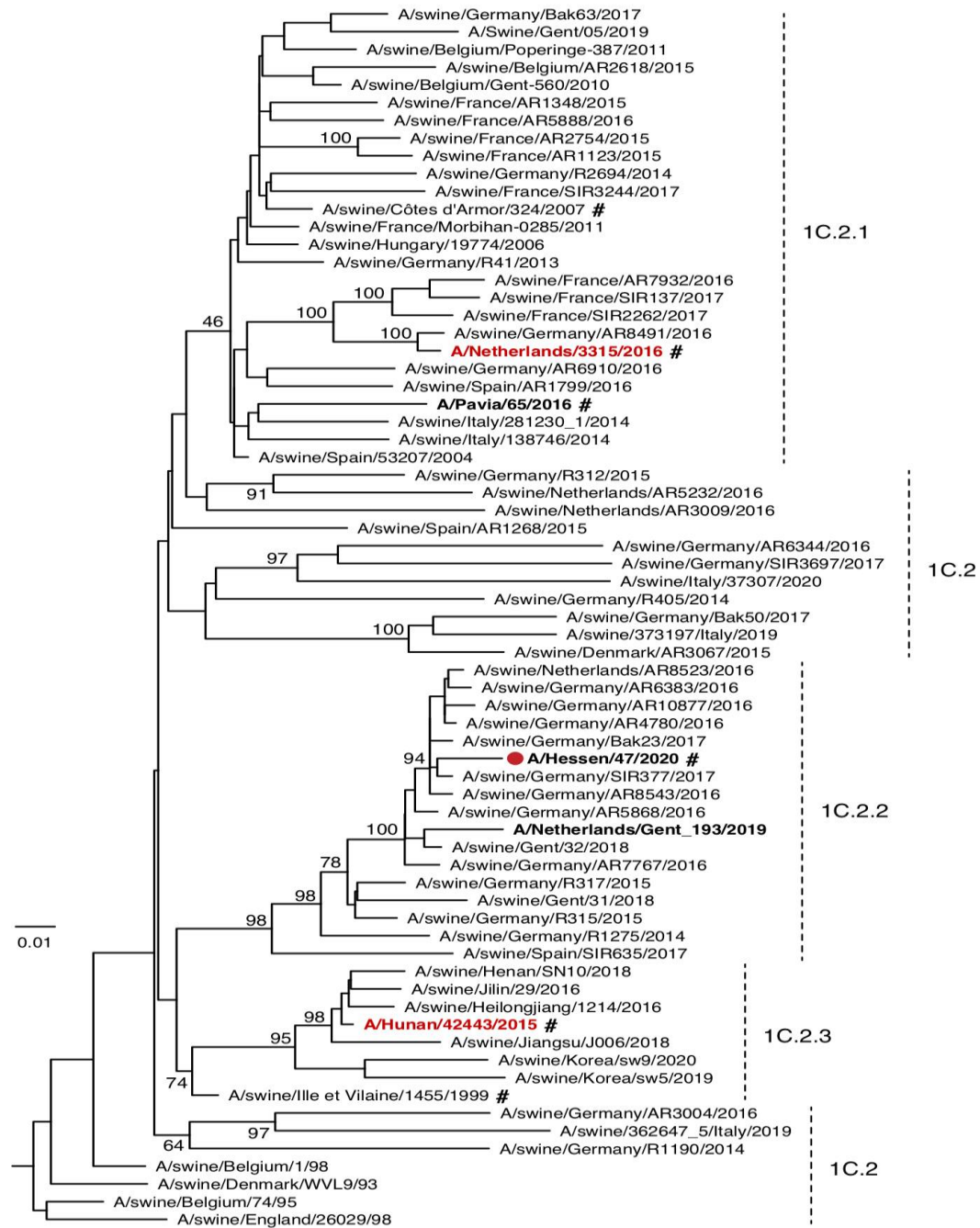


Figure 3. Phylogenetic relationships of Eurasian avian-like influenza A(H1N1)v HA genes. CVVs that are available or in

Haemagglutination inhibition assay of recent clade 1C.2 influenza A(H1N1)v viruses

Reference Antigens	Clade	A/Neth/ 3315	A/Pavia/ 65	sw/Cd'A 324	sw/IV/ 1455	CNIC-1601
A/Netherlands/3315/2016	1C.2.1	320	40	40	<40	<40
A/Pavia/65/2016	1C.2.1	<40	320	<40	80	<40
A/swine/Côtes d'Armor/324/2007	1C.2.2	80	<40	320	40	80
A/swine/Ille et Vilaine/1455/99	1C.2.3	<40	40	<40	160	80
CNIC-1601 (A/Hunan/42443/2015)	1C.2.3	40	<40	160	160	320
Test Antigens						
A/Hessen/47/2020	1C.2.2	40	<40	160	160	320

- A/Hessen/47/2020 was recognized poorly by ferret antisera raised against A/Netherlands/3315/2016
- A/Hessen/47/2020 differed from that of A/Hunan/42443/2020 by 30 amino acids.

Based on the current antigenic, genetic and epidemiologic data, a new clade 1C.2.2 CVV antigenically like A/Hessen/47/2020 was proposed.

HEMAGGLUTINATION INHIBITION REACTIONS OF NORTH AMERICAN AND EURASIAN INFLUENZA A(H1)v

Tested: 12/2/2020

REFERENCE ANTIGENS		Subtype	Ferret antisera					Child #	Adult *	
			ID/7	OH/24	RG59	NL/3315	HN/42443 CNIC-1601			
ID	A/Idaho/7/2018	pdm09	<u>2560</u>	80	40	40	640	320	1280	1280
OH	A/Ohio/24/2017	H1N2v (alpha)	320	<u>2560</u>	640	10	320	160	ND	20
OH	IDCDC-RG59 (A/OH/24/2017-like)	H1N2v (alpha)	160	2560	<u>1280</u>	10	320	320	40	20
NL	A/Netherlands/3315/2016	H1N1v 1C.2.1	<10	<10	<10	<u>320</u>	<10	10	10	160
CN	A/Hunan/42443/2015	H1N1v 1C.2.3	320	20	20	20	<u>640</u>	640	80	160
CN	A/Hunan/42443/2015 RG (CNIC 1601)	H1N1v 1C.2.3	640	40	40	40	1280	<u>1280</u>	80	160
TEST ANTIGENS										
CA	A/Alberta/1/2020	H1N2v (alpha)	<10	<10	<10	<10	<10	<10	<10	20

Eurasian avian-like A(H1N1)v cases identified in China

Country	Subtype	Clade / Genotype	Strain name
China	H1N1v (EA avian-like)	1C 2.3 / G1	<ol style="list-style-type: none"> 1. A/Jiangsu/1/2011 2. A/Fujian-Xiangcheng/SWL1207/2011 3. A/Hebei-Yuhua/SWL1250/2012 4. A/Gansu-Liangzhou/SWL1232/2012 5. A/Shandong-Lanshan/SWL1898/2014 6. A/Hangzhou/568/2014 7. A/Zhejiang/KLED-568/2013 8. A/Jiangsu/1/2011
		1C 2.3 / G5	<ol style="list-style-type: none"> 1. A/Hunan/42443/2015 CVV 2. A/Yunnan-Longyang/SWL1982/2015 3. A/Yunnan-Wuhua/SWL1869/2015 4. A/Yunnan-Simai/SWL135/2015 5. A/Sichuan/51407/2016
		1C 2.3 / G4	<ol style="list-style-type: none"> 1. A/Fujian-cangshan/SWL624/2016 2. A/Tianjin-baodi/1606/2018 (not reported to WHO) 3. A/Hebei-haigang/SWL1572/2019

Haemagglutination inhibition assay of Eurasian avian-like clade 1C.2.3 influenza A(H1N1)v viruses (including G4 genotype)

REFERENCE ANTIGENS	Lineage or clade	pdm09	pdm09	1C.2.3	1C.2	1C.2.3	1C.2.3	1C.2.1	ADULT*	CHILD#
		CA/7	ID/7	sw/HK / 2010	sw/Bg/ 98	Hunan/ 42443	CNIC 1601	Neth/ 3315		
1 A/California/7/2009	pdm09	5120	5120	2560	1280	1280	1280	40	640	1280
2 A/Idaho/7/18	pdm09	5120	5120	5120	2560	5120	2560	160	1280	1280
3 A/swine/HongKong/201/2010	1C.2.3	2560	2560	2560	640	1280	640	80	160	80
4 A/swine/Belgium/1/1998	1C.2	1280	640	1280	5120	160	160	80	160	320
5 A/Hunan/42443/2015	1C.2.3	1280	1280	2560	1280	1280	640	40	160	160
6 A/Hunan/42443/2015 RG (CNIC 1601)	1C.2.3	640	1280	2560	640	1280	640	40	160	80
7 A/Netherlands/3315/2016	1C.2.1	<10	<10	40	80	10	10	1280	160	40
TEST ANTIGENS										
8 A/Fujian-cangshan/SWL624/2016 (VPT20-V236)	1C.2.3	5120	5120	5120	2560	5120	2560	160	320	320
9 A/Tianjin-baodi/1606/2018 (VPT20-V237)	1C.2.3	5120	5120	5120	2560	5120	2560	80	160	160
10 A/Hebei-haigang/SWL1572/2019 (VPT20-V238)	1C.2.3	5120	5120	5120	2560	2560	1280	80	160	160
11 A/swine/Shandong/1207/2016 (VPT20-V239)	1C.2.3	5120	5120	5120	2560	5120	1280	80	160	320
12 A/swine/Henan/SN13/2018 (VPT20-V240)	1C.2.3	2560	5120	2560	2560	2560	1280	80	160	160
13 A/swine/Jiangsu/J004/2018 (VPT20-V241)	1C.2.3	640	1280	1280	640	1280	640	80	80	80

*post-vaccine (2019-2020) immune serum pool from adult (19-49 yrs) vaccinees

#post-vaccine (2019-2020) immune serum pool from child (0-3 yrs) vaccinees

Status of influenza A(H1)v candidate vaccine virus development

Candidate vaccine viruses in preparation	Clade	Type	Institution	Availability
A/Iowa/32/2016-like (H1N2)	1B.2.2.1	Reverse genetics	CDC	Pending
A/Netherlands/3315/2016-like (H1N1)	1C.2.1	Conventional	NIBSC	Pending
A/Ohio/35/2017-like (H1N2)	1B.2.1	Conventional	NIBSC	Pending
A/Hessen/47/2020-like (H1N1)	1C.2.2	Conventional	NIBSC	Pending

Swine influenza A virus infections in 2020

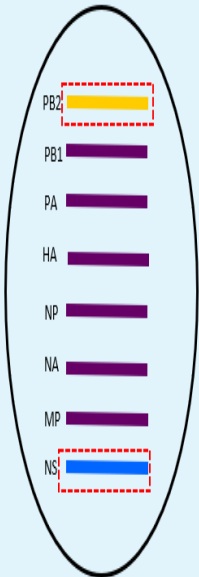
Human infection with A(H3N2)v

Country	Subtype	State	Age	Sex	Onset Date	Exposure	Confirmed/ reported	Strain Designation
USA	H3N2v	HI	18	M	6/30/20	unknown	CDC, USA	A/Hawaii/28/2020

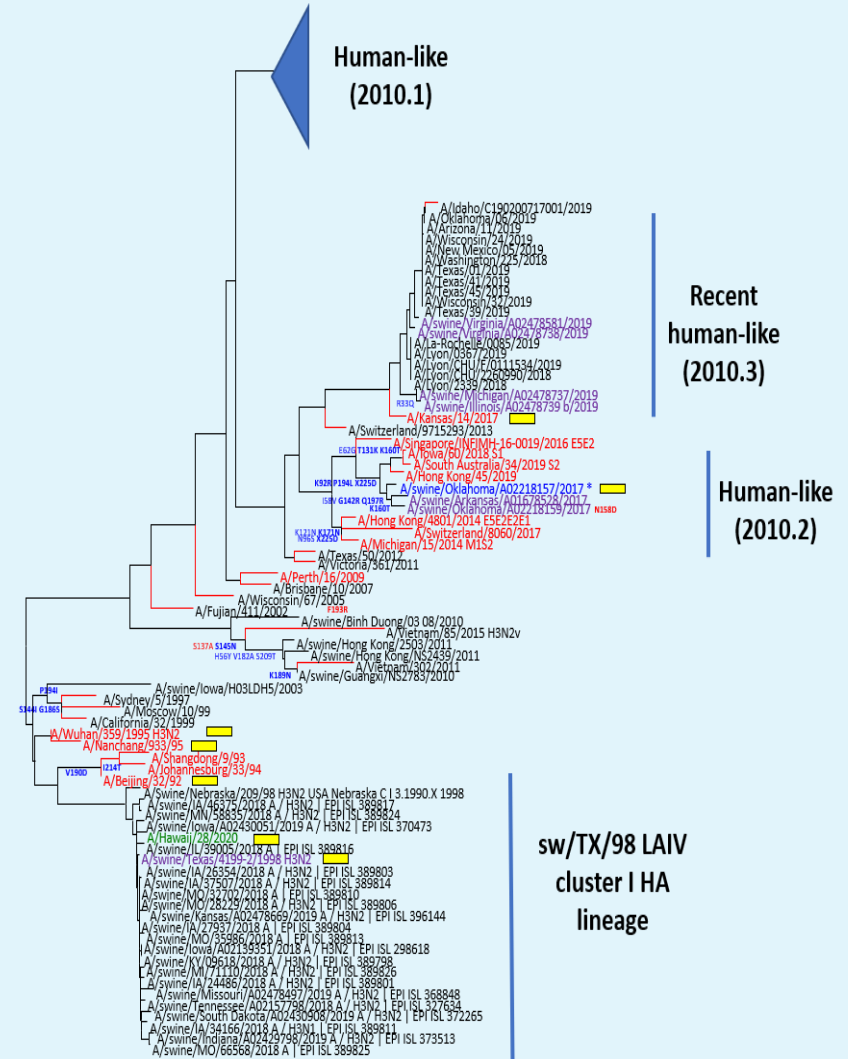
Investigation unable to confirm swine exposure; no onward transmission among family members

Phylogenetic relationships of the HA gene of A(H3N2)v viruses

A/Hawaii/28/2020 (cluster I)



- Classical Swine – North American lineage
- Avian – North American lineage
- Seasonal H3N2 (Cluster IV; 1997/1998 lineage)
- Seasonal H3N2 (human-like; 2010/2011 lineage)
- Eurasian swine lineage (from H1N1 pdm09 virus)
- Gene originally derived from H1N1 pdm09 virus
- A/swine/TX/1998 LAIV lineage



Haemagglutination inhibition assay of recent influenza A(H3N2)v viruses

REFERENCE ANTIGENS	Lineage	Seas	Seas	Seas	Seas	Cluster I	IV-A	IV-A	2010.1	2010.1	2010.2	Adult*	Child#
		KS/14	NCH/933	WU/359	BEI/32	sw/TX/98	MI/11	MN/11 X-203	OH/27	OH/28 RG55C	sw/OK/1 7		
A/Kansas/14/2017 X-327	Seas	5120	40	20	20	80	20	20	20	<20	160	1280	2560
A/Nanchang/933/95	Seas	<20	5120	2560	320	80	20	<20	40	<20	80	640	<20
A/Wuhan/359/95	Seas	20	2560	2560	160	80	40	20	20	<20	80	320	<20
A/Beijing/32/92	Seas	20	20	<20	2560	40	80	<20	<20	<20	40	320	<20
A/swine/Texas/4199-2/98 (RG LAIV)	TX98 cluster I	20	320	160	640	160	80	20	20	<20	160	320	<20
A/Minnesota/11/2010	IV-A	40	80	20	160	80	> 10240	5120	20	<20	160	640	80
A/Minnesota/11/2010 X-203	IV-A	20	20	<20	<20	40	2560	2560	20	<20	160	320	40
A/Ohio/27/2016	2010.1	20	40	20	<20	<20	20	<20	> 10240	2560	160	1280	320
A/Ohio/28/2016 (IDCDC-RG55C)	2010.1	40	40	40	<20	<20	20	20	>10240	1280	320	640	320
A/swine/Oklahoma/A02218 157/2017	2010.2	160	<20	<20	<20	<20	40	<20	320	1280	2560	2560	1280
TEST ANTIGENS													
A/Hawaii/28/2020	TX98 cluster I	20	640	160	640	320	80	<20	20	<20	80	320	<20

*post-vaccine (2019-2020) immune serum pool from adult (19-49 yrs) vaccinees

#post-vaccine (2019-2020) immune serum pool from child (0-3 yrs) vaccinees

Haemagglutination inhibition assay of recent influenza A(H3N2)v viruses

			Ferret								
			Seas	Seas	Seas	Cluster I	IV-A	Human	Human	Human	Human
			KS/14								
REFERENCE ANTIGENS	Lineage		X-327	KS/14	BEI/32	sw/TX/98	MI/11	19-49 years*	9-17 years^	3-8 years#	0-3 years+
1	A/Kansas/14/2017 X-327	Seasonal vax	1280	160	<20	<20	<20	640	640	160	<20
2	A/Kansas/14/2017	Seasonal wt	160	160	<20	<20	<20	640	320	160	ND
3	A/Beijing/32/92	Seasonal wt	<20	<20	640	20	40	80	<20	<20	<20
4	A/swine/Texas/4199-2/98 (RG LAIV)	Cluster I	<20	<20	320	320	40	160	<20	<20	<20
5	A/Minnesota/11/2010	Cluster IV-A	<20	<20	40	20	1280	160	80	<20	<20
TEST ANTIGENS											
6	A/Hawaii/28/2020	Cluster I	<20	<20	320	320	40	160	<20	<20	<20

*post-vaccine (2019-2020) immune serum pool from adult (19-49 yrs) vaccinees

^post-vaccine (2019-2020) immune serum pool from adult (9-17 yrs) vaccinees

#post-vaccine (2019-2020) immune serum pool from child (3-8 yrs) vaccinees

+post-vaccine (2019-2020) immune serum pool from child (6 months -3 yrs) vaccinees

Status of influenza A(H3N2)v candidate vaccine virus development

Candidate vaccine viruses in preparation		Type	Institution	Availability
A/Ohio/13/2017-like	2010.1	Reverse Genetics	CDC	Pending
A/Ohio/28/2016-like	2010.1	Conventional	NIBSC	Pending