Phylogenetic analysis of HA and NA genes of influenza H1N1 viruses from 1918 to 2017

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Summary. – The 1918 "Spanish" pandemic is the earliest known influenza H1N1 virus. Since then H1N1 viruses circulated between humans and animals continuously. With the increased amount of samples of H1N1 viruses and technology development, researchers have been studying how the viruses evolved. Here, we analyzed HA and NA genes of H1N1 viruses from three aspects: host distribution, geographical distribution and phylogenetic analysis. The data showed hosts were predominantly human, swine and poultry, and other hosts were mainly cat, ferret, wild bear, canine, cheetah and seal. In terms of geographical distribution, the North America and Eurasia were the main H1N1 influenza pandemic areas. Of them, the United States, China, Japan, Canada, the United Kingdom, India and Singapore were the most affected. The phylogenetic analysis of surface genes of influenza H1N1 viruses from 1918 to 2017 worldwide revealed the distribution of all avian influenza viruses (AIVs) showed a clear geographical difference, mainly concentrated in Eurasia and America. American and Eurasian swine viruses might be the ancestors of the 2009 pandemic virus' HA and NA genes. Swine influenza viruses played an important role in the spread of influenza viruses across species. To our knowledge, this is the first large-scale phylogenetic analysis of HA and NA genes of influenza H1N1 viruses worldwide until now. Our findings further emphasize the importance of surveillance of the genetic diversity of influenza H1N1 viruses in different hosts and raised more concerns about the long-time monitoring.

Keywords: influenza H1N1 viruses; HA genes; NA genes; phylogenetic analysis; evolution

Introduction

Influenza A viruses are the most numerous epidemiological pathogens that continuously circulate in birds, pigs and humans (Turner *et al*., 2003; Medina and García-Sastre, 2011). In addition, they have great potential to generate genetic variation for producing novel viruses that can cause human epidemics or pandemics (Webster *et al*., 1992). Their 8 gene segments encode 17 proteins (PB2, PB1, PB1-F2, PB1-N40, PA, PA-X, PA-N155, PA-N182, HA, NP, NA, M1, M2, M42, NS1, NS2, and NS3) (Vasin *et al*., 2014). The influenza H1N1 viruses transmit to humans with large-scale morbidity and mortality causing widespread concern (Russier *et al*., 2017).

In 1918, the pandemic "Spanish" influenza H1N1 virus spread and killed at least 50 million people and pigs due to respiratory illnesses. This virus is thought to have originated from avian population (Gorman *et al*., 1991; Reid and Taubenberger, 2003; Tumpey *et al*., 2004). From 1918 to 1956, influenza H1N1 viruses underwent substantial antigenic drift and continued to circulate in humans. In 1957, influenza H1N1 viruses were replaced by H2N2 influenza viruses, which caused the outbreak of "Asian" pandemics (Scholtissek *et al*., 1978). However, in 1977 an H1N1 influenza virus reemerged in humans that had close genetic and antigenic similarity to the H1N1 viruses isolated in 1950 (Kendal *et al*., 1978; Nakajima *et al*., 1978). Until now, A (H1N1), A (H3N2) and type B influenza viruses co-circulated causing seasonal human epidemics (Finkelman *et al*., 2007). Due to

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Abbreviations: AIVs = avian influenza viruses; SIVs = swine influenza viruses

the occurrence of antigenic drift, there were some seasonal influenza H1N1 epidemic events in history, especially a total of 9.67 million people died in years 1928–1929 and about 5.2 million people died in years 1934–1936 (Morens *et al*., 2009). In 1979, a novel lineage of avian-like influenza H1N1 viruses emerged in Eurasia in swine and had been co-circulating with the classical swine viruses ever since (Donatelli *et al*., 1991; Brown *et al*., 1997). Most of the avian influenza viruses (AIVs) transmit to human accidentally. It was highly possible that pig played an important role in the spread of influenza viruses across species, which caused major respiratory outbreaks or even pandemics in humans (Ito *et al*., 1998; Yu *et al*., 2009).

Particularly, in April 2009 a novel swine-origin influenza H1N1 virus was isolated from human in Mexico, which has been derived from the reassortment between North American and Eurasian swine lineages (MMWR, 2009). The Pandemic H1N1 virus spread to numerous regions and caused many human deaths. The antigenicity of this virus was similar to that of "Spanish" influenza H1N1 virus but differed from seasonal human viruses. This outbreak was defined as "Pandemic (H1N1) 2009" by the World Health Organization (WHO, http://www.who.int/en/) on June 11, 2009. The influenza A (H1N1) pdm09 virus contained NA and M genes from Eurasian avian-like swine viruses (Pensaert *et al*., 1981); HA, NP and NS genes from classical swine viruses; PB1, PB2 and PA genes from the swine triple reassortant viruses (Zhou *et al*., 1999; Garten *et al*., 2009). Based on the influenza pandemic experience, the H1N1 viruses are likely to adopt the behavior of seasonal influenza viruses and continue to circulate for years.

There were many studies on influenza A (H1N1) pdm09 virus. In recent years, there was no evolutionary analysis of all known H1N1 surface genes. In the experience, influenza H1N1 viruses would occur a large antigenic variation every ten years, which leads to the emergence of new subtypes. Both humans and animals lack immunity to the viruses of a new subtype and it may cause an influenza pandemic. To better predict and prepare for future pandemics, our study made preliminary phylogenetic analyses of HA and NA genes worldwide. We analyzed the evolutionary path of different hosts (mainly humans, poultry and pigs) on large time and spatial scales. We discovered that hosts were predominantly human, pig and poultry, and other hosts were mainly cat, ferret, wild bear, canine and seal. In terms of geographical distribution, the number of viruses by country decreased in the following order: the United States, China, Japan, Canada, the United Kingdom, India and Singapore. We also classified the HA genes into four clades and summarized the evolution of NA genes. Strengthening the influenza virus detection in countries and regions around the world will help us describe the more complete evolutionary possibilities. This is the most basic study of the influenza viruses.

Materials and Methods

Sequence data. The search set was defined using type A, any host, any country and region, H1N1 subtype, during 1918 to 2017, collapse identical sequences. All 25365 HA and 16985 NA nucleotide sequences of H1N1 influenza viruses were downloaded from the National Center for Biotechnology Information (NCBI https://www.ncbi.nlm.nih.gov/). Of these, 1085 HA and NA nucleotide sequences were selected for phylogenetic analysis, respectively.

Phylogenetic analysis. The HA nucleotide sequences corresponded to 25365 isolates and the same branch of the phylogenetic tree contained many strains from the same country, the same year and the same host. We wanted to construct a meaningful phylogenetic tree with the relatively small number of HA nucleotide sequences. Therefore, we divided the HA nucleotide sequences into 29 groups according to different years to establish 29 small phylogenetic trees. In every small phylogenetic tree, we selected some strains under the premise that the topological structure of each small phylogenetic tree was not broken, then selected different years, different hosts, different countries and regions of the strains. Finally, we manually inspected 4962 strains in the 29 small HA phylogenetic trees. The method used to establish an NA phylogenetic tree was the same as that for the HA phylogenetic tree. We built 18 small NA phylogenetic trees and selected 1463 strains. We used MATLAB software to retrieve 1079 strains of the same name from 4962 HA nucleotide sequences and 1463 NA nucleotide sequences as the big HA and NA phylogenetic strains. Before 1940, we retrieved fewer HA and NA nucleotide sequences, and few strains with the same name, so we added these strains to ensure the integrity of each phylogenetic trees. In the end, HA and NA phylogenetic trees contained 1085 separate nucleotide sequences. We used ClustalW in BioEdit software to align the downloaded sequences, and then the phylogenetic trees of H1N1 HA and NA segments were constructed by MEGA7.0 using Neighbor-Joining (NJ) method under p-distance model (Kumar *et al*., 2016). When analyzing a large number of closely related sequences, the use of p-distance can produce a reliable phylogenetic tree. The reliability of HA and NA phylogenetic trees was evaluated by the bootstrap method with 1000 replications. Some virus strains with high homology were in the same branch, represented by a large taxon. We used the largest number of hosts in every taxon, the separation sites and years of the earliest strains of the branch represented the characteristics of the cluster. Due to the large amount of data, we also used MATLAB programming for technical support in our study.

Results

Host distribution of influenza H1N1 viruses

The host distribution of influenza H1N1 viruses is shown in Fig. 1. We counted the number of HA and NA nucleotide sequences of influenza H1N1 viruses from different

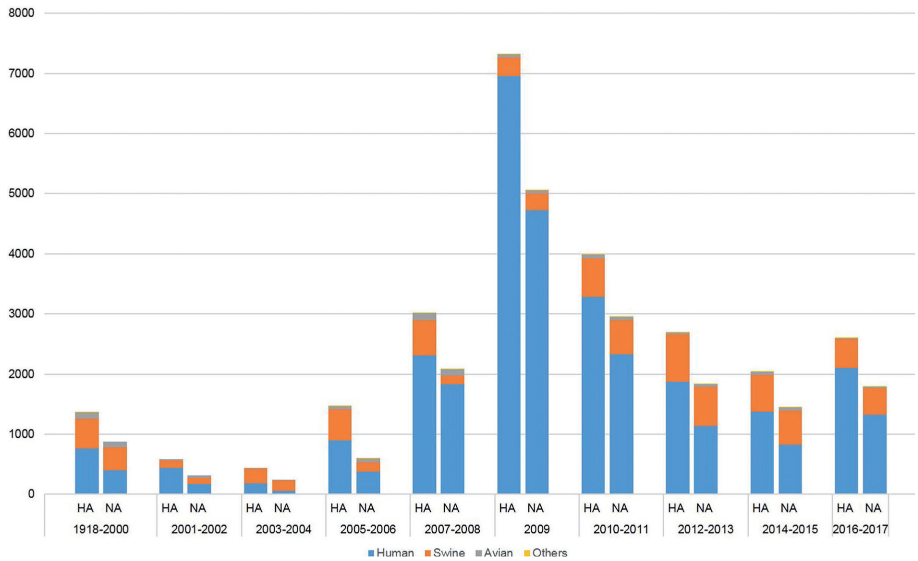


Fig. 1

HA and NA genes of influenza H1N1 viruses from 1918 to 2017 in the NCBI

The number of HA and NA genes of influenza H1N1 viruses from different periods is available from NCBI and the hosts are represented by different colors, blue represents the host humans, orange represents the host pig, the gray represents the host birds, and the yellow represents the others.

hosts in a certain period. A total of 25365 HA and 16985 NA nucleotide sequences were analyzed, representing the range of genetic diversity of influenza H1N1 viruses. As shown in Fig. 1, the number of HA nucleotide sequences was slightly higher than NA gene sequences in the same period. Notably, the percentage of human influenza viruses was the largest every year and the predominant hosts were humans, pigs and birds. From 1918 to 2000, the amount of HA and NA nucleotide sequences was 1363 and 871, respectively, compared with the following years, they were relatively few although the time span was larger. Because of limited research on influenza H1N1 viruses, the number of surface gene sequences was lower before 2000. In 2009, the H1N1 influenza outbreak in North America spread quickly to other places. The cases of human influenza increased obviously, which showed the main target of influenza H1N1 viruses was human. During this time, the incidence of swine influenza decreased, resulting in the percentage of HA nucleotide sequences decreasing from 55.6% to 4.2% and NA nucleotide sequences decreasing from 69.5% to 5.6%. In addition, a small number of influenza H1N1 viruses was detected in the environment, cat, ferret, wild boar, canine, cheetah, seal, camel, mink, sloth bear, giant anteater and panda. Between 2009 and 2013, the number of both HA and NA nucleotide sequences decreased. However, from 2014 to 2017, the number of HA and NA gene sequences of H1N1 viruses tended to be stable. The proportion of H1N1 human influenza was large every year. Therefore, to better predict and prepare for future pandemics, we need to track, detect and analyze the dynamic process of influenza virus prevalence at the gene level.

Geographical distribution of influenza H1N1 viruses

Geographical distribution of influenza H1N1 viruses is shown in Fig. 2. The data was collected from NCBI and included sequences from six continents covering 124 countries and regions. There were seven countries with more than 1000 nucleotide sequences and the number of sequences in increasing order was Singapore, India, the United Kingdom, Canada, Japan, China and the United States. Among them the United States provided more than ten thousand sequences and are not included in the map. In addition, some countries and regions in Africa, Middle East and South Asia lacked H1N1 monitoring data. As shown in Fig. 2, North America had the largest quantity of influenza H1N1 viruses, including the ancestor A/South Carolina/1/1918 (H1N1). In North America, the United States, Canada, Mexico, Nicaragua and Cuba had detected more influenza viruses. Moreover, Asia reported the second largest quantity of influenza H1N1 viruses. There were 26 countries and regions with more than 200 sequences in the world, among them 10 were in Asia, accounting for 38.46%, indicating that Asia was the main area of influenza pandemic. In Asia, viruses were mainly collected in China including Hong Kong and Taiwan, Japan, India, Singapore, Thailand, South Korea and Vietnam. Among them, the number of H1N1 viruses from China was the highest and mainly concentrated in 2009 to

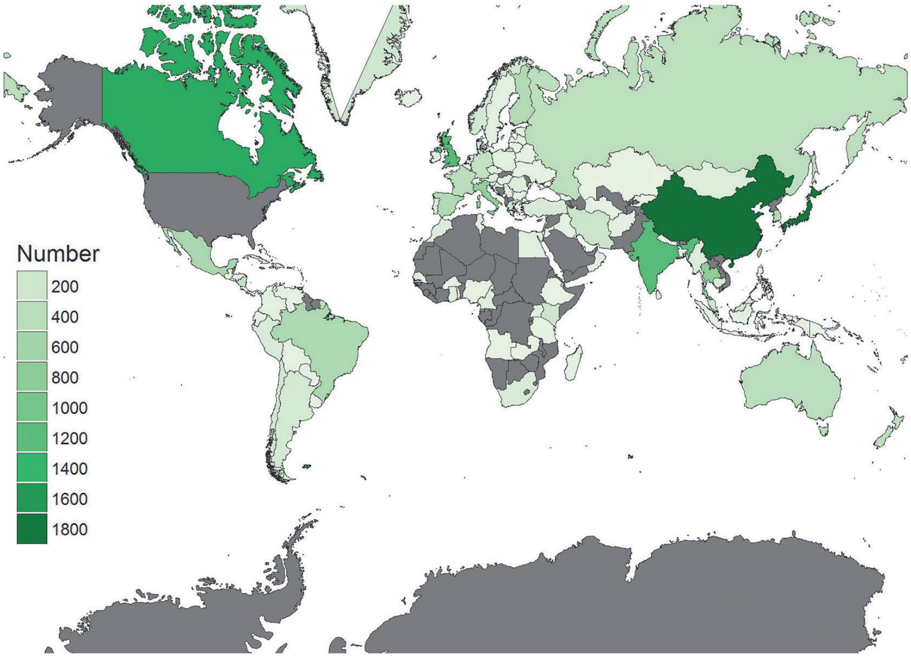


Fig. 2

The worldwide geographical distribution of influenza H1N1 viruses from 1918 to 2017

For clarity, the data from the United States is not shown in this map. The color levels indicate the number of H1N1 influenza viruses in each country or region.

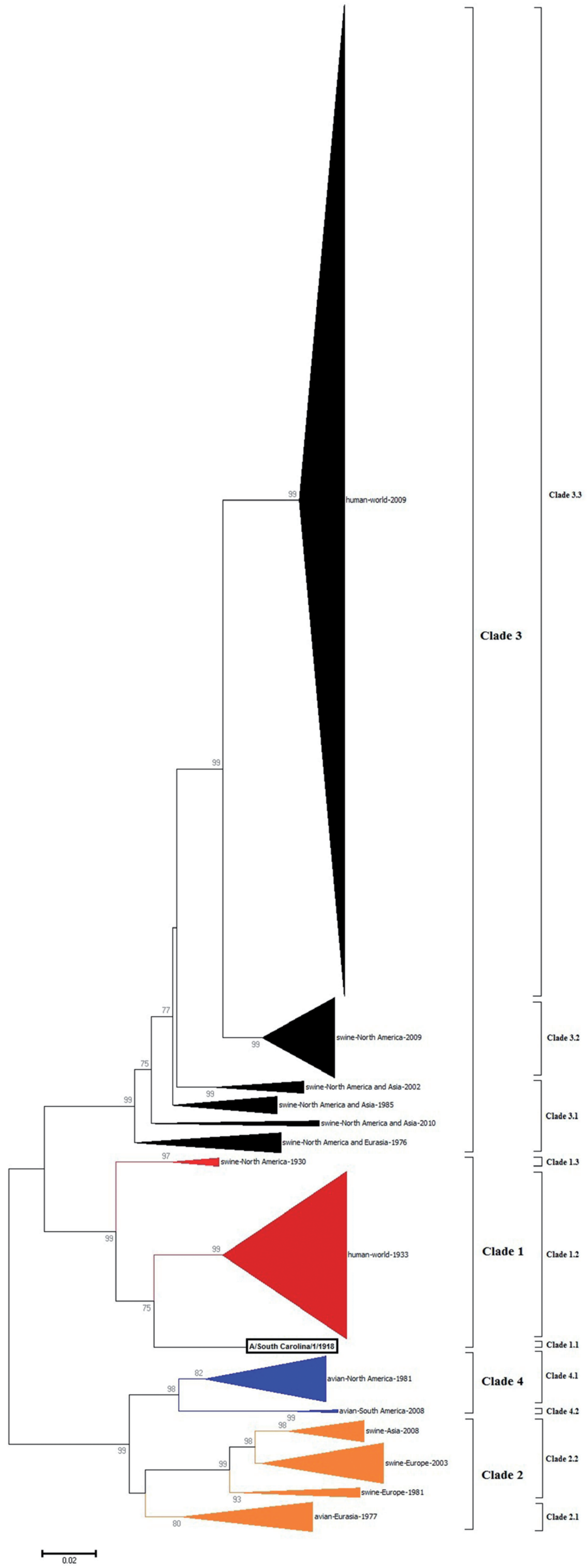
2017. In Europe, countries with more H1N1 influenza viruses were the United Kingdom, Italy, Spain, Finland, France, Russia, Germany and Greece. According to historical records, the pandemic (H1N1) 1918 was the earliest known H1N1 influenza virus in Europe. In South America, Oceania and Africa, the number of influenza H1N1 viruses was small. No Antarctic virus information was retrieved from the NCBI. In Fig. 2, we found that North America and Eurasia were the main H1N1 influenza pandemic area.

Phylogenetic analysis for HA genes of influenza H1N1 viruses

To better understand the evolution of influenza H1N1 viruses, we first performed a comprehensive phylogenetic analysis of HA genes of H1N1 viruses from various hosts and geographic regions (Fig. S1 and Fig. 3). The results showed that HA genes clustered into four clades. The first clade contained North American swine isolates from 1930 and human isolates from 1933 from all over the world. This clade contains three subclades as follows: clade 1.1 contained the H1N1 ancestor virus (A/South Carolina/1/1918), which was the earliest isolated H1N1 strain. It had been proposed that the Pandemic 1918 was caused by a purely avian H1N1 virus. Clade 1.2 contained worldwide human isolates from 1933 to 2009. Clade 1.3 clustered the earliest swine virus strains (A/swine/Iowa/15/1930) and a small number of swine isolates from 1930 to 1935 detected in USA. The human H1N1 HA genes were most relevant to classical swine isolates, because they were within the same clade diverged in the early 1930s.

The second clade contained Eurasian avian and Eurasian avian-like swine viruses. Clade 2.1 contains the earliest avian isolate (A/duck/Miyagi/66/1977), which clustered in its own branch. In clade 2.2, HA genes of swine influenza viruses (SIVs) had obvious geographical distribution. The swine isolates from China were concentrated in 2008 to 2014. When Eurasian avian-like SIVs appeared in Europe, the new viruses gradually replaced the classical SIVs and eventually seeded the 2009 pandemic virus.

The third clade clustered classical swine viruses, human strains and the 2009 pandemic virus. In every small taxon of clade 3.1, North American swine viruses occupied a large proportion. From 2009 to 2017, swine isolates from North America generated a separate branch of clade 3.2. Clade 3.3 contains a large taxon consisting of human isolates (represented by A/California/07/2009) from 2009 to 2017 from around the world. Their antigenicity was homogeneous and similar to North American swine H1N1 viruses and they soon spread rapidly around the world in the following years. The homology of the HA genes of viruses from different countries and regions was 99%, indicating that these viruses were of the same origin and had not yet been mutated. Now H1N1 influenza viruses are in the post-pandemic period and localized outbreaks of various magnitudes are likely to con-



tinue. However, there is a small proportion of swine strains cross distribution with human strains that did not produce a separate branch. Clade 1 and Clade 3 showed that the swine and human strains had a common ancestor.

The fourth clade clustered American avian-like viruses and divided into two large subclades, which showed a clear geographical distribution. One subclade consisted of North American wild birds and domestic birds from 1981 to 2014; the other contained South American avian strains. Clade 2 and Clade 4 contained both North American and Eurasian avian and Eurasian avian-like swine viruses that showed they shared a common ancestor. Moreover, the geographic origin of avian-like genes was coincident with the two major clades, suggesting little-to-no intercontinental exchange of avian HA genes. In contrast, classical swine isolated from both geographic regions were present in both clades, indicating broad intercontinental exchange.

Phylogenetic analysis for NA genes of influenza H1N1 viruses

As we can observe in Fig. 4, there are two big clades (Fig. S2 and Fig. 4) in the phylogenetic tree based on NA sequences. The first clade clustered South American avian, human and classical swine H1N1 viruses; in which it was worth noting that the ancestor virus (A/Brevig Mission/1/1918) belonging to the clade 1.1 had a close relationship with North American swine isolates from 1930 to 1935. Clade 1.2 contained world-wide human seasonal H1N1 influenza viruses from 1933 to 2009. The clade 1.3 contained swine influenza viruses isolated from North America and Eurasia between 1976 and 2013 as well as swine isolates from North America from 2003 to 2017. The clade 1.4 contained two wild bird influenza viruses.

The second clade consisted of North American and Eurasian avian, Eurasian avian-like swine and human viruses (represented by the influenza A (H1N1) pdm09 virus). Clade 2.1 and clade 2.2 contained wild bird influenza viruses, which were isolated in North America between 1981 and 2015 and in Eurasia between 1999 and 2015, respectively. The Eurasian avian-like SIVs isolated from 1981 to 2009 concentrate on the clade 2.3. The swine isolates possessing high homology detected in Europe from 2010 to 2016 and

Fig. 3

Phylogenetic tree for HA genes of representative influenza H1N1 viruses

Analysis was based on nucleotides 67 to 1648 of the HA gene. The tree was generated by the Neighbor-Joining method in the MEGA 7.0 program. Bootstrap values >70% are shown at the branch nodes. Scale bar represents approximately 2% nucleotide difference between close relatives. A/South Carolina/1/1918 is marked with a black frame. The taxa are colored based on their clade: red represents clade 1, orange represents clade 2, blue represents clade 3 and blue represents clade 4.

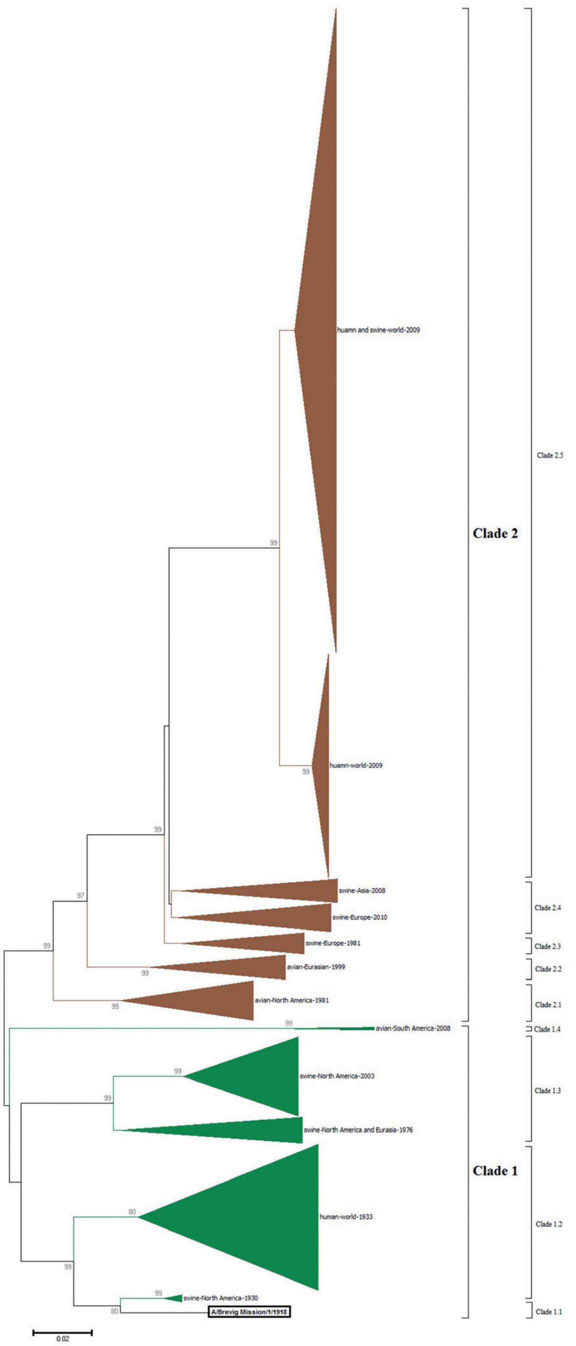


Fig. 4

Phylogenetic tree for NA genes of representative influenza H1N1 viruses

The tree was generated by the Neighbor-Joining method in the MEGA 7.0 program. Analysis was based on nucleotides 97 to 1351 of the HA gene. Bootstrap values >70% are shown at the branch nodes. Scale bar represents approximately 2% nucleotide difference between close relatives. A/Brevig Mission/1/1918 is marked with a black frame. The taxa are colored based on their clade: green represents clade 1 and brown represents clade 2.

avian-like swine influenza viruses detected in Asia after 2008 clustered in the clade 2.4. In the clade 2.5, the biggest taxon was composed of human and swine influenza viruses isolated from six continents except Antarctica between 2009 and 2017, demonstrating that human influenza viruses had a close relation with SIVs. There were obvious small cross branches between adjacent years, indicating that the strain was evolving continuously after 2009, and no obvious antigenic variation occurs. Swine-origin 2009 H1N1 influenza virus isolated from human had spread to most parts of the world and showed a strong specificity. In Fig. 4, every taxon had a strong regional distribution. In summary, avian influenza H1N1 viruses evolved according to geographical separation and there were intercontinental interactions with the classical swine and human viruses.

Discussion

To characterize the evolution of influenza H1N1 viruses, we performed a comprehensive analysis of the surface genes of H1N1 viruses from different hosts between 1918 and 2017. To our knowledge, it is the first large-scale phylogenetic analysis of HA and NA genes of H1N1 influenza virus worldwide until now. A better knowledge of the circulating strains might provide useful information for understanding the evolution of influenza H1N1 viruses and predicting the following season strains.

In terms of the host distribution, the predominant hosts were human, avian and pig. The other mammalian hosts included cat, ferret, wild bear, canine and seal etc. The sudden emergence of influenza H1N1 pdm09 virus lead to its frequent occurrence in many countries and the detection rate reached the peak. After 2009, the number of detected H1N1 influenza viruses showed a gradual downward trend and no global pandemic, but the H1N1 viruses possibly continued to circulate in the following years. Many studies showed (Vijaykrishna *et al.*, 2010; Pasma and Joseph, 2010) that the influenza H1N1 pdm09 virus was a new swine-origin virus and the reassortment events frequently occurred in pigs, which led to the genetic diversity of influenza H1N1 viruses in swine population. Earlier studies (Scholtissek, 1990) have shown that swine were middle host and mixing vessel of influenza A virus, which also played an important role in the evolution of A (H1N1) pdm09 virus. More attention should be paid to the role of swine in the prevention and control of novel virus epidemics in the future. We summarized the geographical separation of avian influenza H1N1 viruses and there were intercontinental interactions between the classical swine and human viruses. At the same time, wild birds played important roles in the spread at long distance (Webby, 2011). In terms of geographical distribution, we found that the North America and Eurasia were the main epidemic areas of H1N1 viruses. The prevalence of influenza H1N1 viruses was very extensive, especially in 2009 the H1N1 virus quickly spread worldwide through human-to-human transmission. However, it is necessary to point out that as the detection system was not perfect, there were some countries and regions that lacked monitoring data of influenza H1N1 viruses. Therefore, we should strengthen the large-scale surveillance to better understand the evolution of the H1N1 viruses.

The phylogenetic analysis results of HA genes indicated that the homology of A/South Carolina/1/1918 and human isolates during 1933 and 2009 (before the pandemic) was 75%. However, the HA genes of A/South Carolina/1/1918 and human isolates after 2009 shared low homology, so the HA gene of 2009 H1N1 appeared by genetic recombination. Many studies (Ding *et al*., 2009; Garten *et al*., 2009) have also shown that influenza H1N1 pdm09 virus not only accomplished the cross-species transmission from swine to human but also gained the ability to spread among humans efficiently. Continued reassortment of H1N1 pdm09 virus and SIVs may produce some variants that can spread and alter virulence for humans. In clade 1 and clade 3, HA genes of human and swine isolates all exhibited high homology (99%). This showed that the 1918 influenza virus had been circulating in pigs at least partially conserved for 91 years. In clade 3.1, North American and Asian SIVs were clustered in the same branch in a co-evolutionary trend, indicating SIVs affected closely between 1976 and 2014 with no obvious geographical separation. AIVs concentrated on Eurasia and America, which showed a clear geographical distribution. The Eurasian avian-like swine viruses appeared in 1981 and continued to date. Each small subclade showed a high homology. It explained swine was the intermediate container and played a key role in the spread of influenza viruses across species (Webster *et al*., 1992). Therefore, global systematic surveillance of SIVs was necessary. From the HA phylogenetic tree, the viruses isolated from 2016 and 2017 have higher homology with H1N1 viruses after 2009. There was no separate branch of those viruses, indicating that no obvious mutation occurred until now.

Compared to the HA phylogenetic tree, NA genes was slightly different. The homology of A/Brevig Mission/1/1918 and North American swine viruses from 1930 and 1935 was 80%. Human isolates from 1933 to 2009 were concentrated in a subclade with a homology of 99% with SIVs, so SIVs played an important role in the spread of the H1N1 influenza virus to humans. The distribution of AIVs showed a clear geographical difference, mainly appearing in North America, South America and Eurasia. Between 2009 and 2017, most of the human influenza viruses and SIVs were clustered in a subclade, indicating influenza H1N1 pdm09 virus (NA genes) has the origin in SIVs. Moreover, compared with HA phylogenetic analysis, they were more related to Eurasian swine viruses than to the North American swine viruses. It also suggested that American and Eurasian swine viruses might be the ancestors of pdm09 virus' HA and NA genes, respectively. There have been studies showing that influenza H1N1 pdm09 virus contained a new combination of genes (Smith *et al*., 2009; Mak *et al*., 2011), which implied that HA and NA genes may provide the ability to spread from human to human after animal to human transmission. Our results indicated that the H1N1 influenza viruses gradually evolved among different hosts. As the interspecies transmission of influenza virus became blurred, interspecies barriers gradually broke.

Now humans are facing serious threats and challenges, it is necessary to explore the evolution of H1N1 influenza viruses. When we explore the evolution of influenza virus over a long period of time, a more comprehensive collection of data and analysis at the gene level are critical needs. Our results highlighted the need for systematic surveillance of influenza H1N1 viruses in diverse hosts worldwide and suggested the continued circulation of multiple H1N1 viruses throughout the world in different hosts had the potential to cause future influenza outbreaks in poultry and pandemics in humans.

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Supplementary information is available in the online version of the paper.

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Supplementary information

Phylogenetic analysis of HA and NA genes of influenza H1N1 viruses from 1918 to 2017

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Table S1. Accession numbers of HA and NA genes from influenza H1N1 viruses in NCBI

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
swine/Argentina/CIP051-A178/2010	KR863408	KR863409	Argentina	swine	2010
swine/Argentina/CIP051-C14-A3/2013	KR863470	KR863471	Argentina	swine	2013
swine/Argentina/CIP051-ElTrebol/2011	KT873335	KT873336	Argentina	swine	2011
swine/Argentina/CIP112-C35-25176/2014	KR863440	KR863441	Argentina	swine	2014
swine/Argentina/CIP112-C40.P6/2014	KT873326	KT873327	Argentina	swine	2014
swine/Argentina/CIP112-C59-B6/2014	KR863458	KR863459	Argentina	swine	2014
red-winged tinamou/Argentina/MP1/2008	GQ168615	GQ143810	Argentina	red-winged tinamou	2008
Australia/11/2009	CY055558	CY056245	Australia	human	2009
Australia/26/2009	CY055645	CY055647	Australia	human	2009
Australia/4/2009	CY055067	CY055069	Australia	human	2009
Australia/58/2009	CY055820	CY055822	Australia	human	2009
Australia/59/2009	CY055828	CY055830	Australia	human	2009
Brisbane/2015/2009	HQ712183	HQ712182	Australia	human	2009
Brisbane/59/2007	CY030230	CY030231	Australia	human	2007
Melbourne/1935	CY009324	none	Australia	human	1935
Melbourne/INS471/2010	CY096242	CY096244	Australia	human	2010
South Australia/1/2008	FJ743466	FJ743465	Australia	human	2008
South Australia/40/2000	CY018933	CY018935	Australia	human	2000
Sydney/DD3-04/2010	CY092454	CY092456	Australia	human	2010
Sydney/DD3-08/2010	CY092486	CY092488	Australia	human	2010
Sydney/DD3-24/2010	CY092816	CY092818	Australia	human	2010
Sydney/DD3-25/2010	CY092582	CY092584	Australia	human	2010
Sydney/DD3-27/2010	CY093101	CY093103	Australia	human	2010
Sydney/DD3-37/2010	CY092638	CY092640	Australia	human	2010
Sydney/DD3-52/2010	CY092718	CY092720	Australia	human	2010
Sydney/DD3-58/2011	CY092856	CY092858	Australia	human	2011
Belgium/G257/2008	FJ654300	FJ403562	Belgium	human	2008
Brussels/INS243/2009	CY066983	CY066985	Belgium	human	2009
swine/Belgium/Maldegem-553/2010	KR699884	KR699886	Belgium	swine	2010
swine/Belgium/Neerpelt-37/2011	KR700028	KR700030	Belgium	swine	2011

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Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
pink-footed goose/Belgium/EMC-1/2007	KR862369	KR862390	Belgium	pink-footed goose	2007
Santa Cruz/7941/2011	KF612082	KF612122	Bolivia	human	2011
Brazil/74200/2000	CY125116	CY125118	Brazil	human	2000
Brazil/AVS03/2009	CY120715	CY120717	Brazil	human	2009
Brazil/AVS06/2009	CY120731	CY120733	Brazil	human	2009
Brazil/AVS08/2011	CY120747	CY120749	Brazil	human	2011
swine/Brazil/107-3A/2010	KF683614	KF683616	Brazil	swine	2010
swine/Brazil/12A/2010	JF421756	KM507542	Brazil	swine	2010
swine/Brazil/15/2009	JQ666859	JQ666880	Brazil	swine	2009
swine/Brazil/18/2010	JQ666862	JQ666883	Brazil	swine	2009
swine/Brazil/18/2012	KM496987	KM496989	Brazil	swine	2011
swine/Brazil/263/2012	KM497003	KM497005	Brazil	swine	2012
swine/Brazil/66/2011	KM496995	KM496997	Brazil	swine	2011
Cambodia/V0721310/2011	KC020365	KC118557	Cambodia	human	2011
Cambodia/W1023346/2012	KU299944	KU299946	Cambodia	human	2012
Canada-AB/RV2810/2009	HQ239544	HQ239958	Canada	human	2009
Canada-AB/RV2811/2009	HQ239545	HQ239959	Canada	human	2009
Canada-MB/RV2138/2009	HQ239511	HQ239925	Canada	human	2009
Canada-MB/RV2661/2009	HQ239541	HQ239955	Canada	human	2009
Canada-NB/RV0005-10/2009	HQ239414	HQ239828	Canada	human	2009
Canada-NB/RV2475/2009	HQ239522	HQ239936	Canada	human	2009
Canada-NFL/RV2510/2009	HQ239535	HQ239949	Canada	human	2009
Canada-NS/RV1572/2009	HQ239423	HQ239837	Canada	human	2009
Canada-NWT/RV2852/2009	HQ239562	HQ239976	Canada	human	2009
Canada-NWT/RV2869/2009	HQ239565	HQ239979	Canada	human	2009
Canada-ON/RV1590/2009	HQ239425	HQ239839	Canada	human	2009
Canada-ON/RV2889/2009	HQ239568	HQ239982	Canada	human	2009
Canada-ON/RV2913/2009	HQ239580	HQ239994	Canada	human	2009
Canada-SK/RV1683/2009	HQ239427	HQ239841	Canada	human	2009
Canada-SK/RV2927/2009	HQ239585	HQ239999	Canada	human	2009
Canada-SK/RV2929/2009	HQ239587	HQ240001	Canada	human	2009
Ontario/720545/2010	CY081077	CY081079	Canada	human	2010
swine/Manitoba/02947/2010	CY158761	CY158763	Canada	swine	2010
swine/Ontario/16-24/2012	KM489564	KM489570	Canada	swine	2012
swine/Ontario/53518/03	DQ280219	DQ280218	Canada	swine	2003
swine/Ontario/6/1981	CY026451	CY026453	Canada	swine	1981
swine/QC/1196903-1/2009	JF714137	JF714138	Canada	swine	2009
swine/Saskatchewan/SD0017/2013	CY195110	CY195112	Canada	swine	2013
swine/Saskatchewan/SD0053/2014	CY195431	CY195433	Canada	swine	2014
Toronto/3141/2009	FJ974026	GQ373263	Canada	human	2009
Toronto/R8557/2009	GQ502906	GQ502908	Canada	human	2009
Toronto/R8564/2009	CY045511	CY045513	Canada	human	2009
Toronto/T0106/2009	CY045954	CY045956	Canada	human	2009
American black duck/New Brunswick/00385/2010	CY138817	CY138819	Canada	American black duck	2010
blue winged teal/Alberta/212/1984	KF424234	KF424236	Canada	blue winged teal	1984
pintail/Alberta/140/1996	CY136936	CY136938	Canada	pintail	1996
pintail/Alberta/207/2000	CY137040	CY137042	Canada	pintail	2000
pintail/Alberta/21/2006	CY045391	CY045393	Canada	pintail	2006
turkey/Manitoba/FAV-0009-3/2016	KX232509	KX232511	Canada	turkey	2016
turkey/Ontario/FAV110/2009	HM370960	HM370962	Canada	turkey	2009
Chile/1586/2009	CY075171	CY075173	Chile	human	2009
Chile/3375/2009	CY075355	CY075357	Chile	human	2009
Chile/4795/2000	CY125132	CY125134	Chile	human	2000

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
Chile/54/2010	CY093008	CY093010	Chile	human	2010
Chile/58/2010	CY093024	CY093026	Chile	human	2010
Chile/6/2010	CY092944	CY092946	Chile	human	2010
Chile/70/2010	CY098170	CY098172	Chile	human	2010
Santiago/p12d1/2011	KJ943500	KJ943502	Chile	human	2011
Santiago/p13d1/2011	KJ943448	KJ943450	Chile	human	2010
Santiago/p13d1/2013	KJ943050	KJ943052	Chile	human	2012
Santiago/p18d0/2013	KJ942967	KJ942969	Chile	human	2013
Santiago/p9d1/2011	KJ943412	KJ943414	Chile	human	2011
yellow-billed pintail/Chile/1/2012	CY207197	CY207199	Chile	yellow-billed pintail	2012
Beijing/3907/2010	CY081591	CY081592	China	human	2010
FuZhou/SWL11554/2010	KP019847	KP019741	China	human	2010
FuZhou/SWL1172/2013	KP019877	KP019771	China	human	2013
FuZhou/SWL12025/2009	KP019834	KP019728	China	human	2009
FuZhou/SWL1216/2011	KP019861	KP019755	China	human	2011
FuZhou/SWL1494/2010	KP019843	KP019737	China	human	2010
FuZhou/SWL1549/2010	KP019844	KP019738	China	human	2010
Guangdong/001/2011	JF929762	JF929811	China	human	2011
Guangdong/010/2011	JF929766	JF929815	China	human	2011
Guangdong/036/2011	JF929774	JF929823	China	human	2011
Guangdong/067/2011	JF929779	JF929828	China	human	2011
Guangdong/1271/2009	CY064452	CY064453	China	human	2009
Guangdong/2315/2010	JF929780	JF929788	China	human	2010
Guangdong/378/2010	JF929754	JF929798	China	human	2010
Guangdong/410/2010	JF929756	JF929800	China	human	2010
Guangdong/sz2/2011	JF929744	JF929830	China	human	2011
Hangzhou/125/2010	JQ365009	JN006491	China	human	2010
Hangzhou/A10/2011	JQ365016	JN006499	China	human	2011
Hangzhou/B19/2011	JQ365023	JN006506	China	human	2011
LongYan/SWL1597/2013	KP019905	KP019799	China	human	2013
Nanchang/8/1996	CY016228	CY016230	China	human	1996
Qingdao/F158/2011	KF411171	KF411192	China	human	2011
Qingdao/F166/2011	KF411174	KF411195	China	human	2011
Qingdao/F204/2011	KF411178	KF411199	China	human	2011
Shanghai/2167T/2010	JN631052	JN631040	China	human	2010
swine/Beijing/156/1991	KF057117	KF057131	China	swine	1991
swine/Beijing/21/2008	FJ536762	FJ536763	China	swine	2008
swine/Guangdong/103/2002	GQ422385	GQ422387	China	swine	2002
swine/Guangdong/176/2009	JN375105	JN375177	China	swine	2009
swine/Guangdong/2403/2010	KM027431	KM027433	China	swine	2010
swine/Guangdong/6/2010	HQ541680	HQ541682	China	swine	2010
swine/Guangdong/NS2433/2012	KM029671	KM029673	China	swine	2012
swine/Guangdong/NS3694/2011	KM027671	KM027673	China	swine	2011
swine/Guangxi/2504/2011	KM028039	KM028041	China	swine	2011
swine/Guangxi/NS1585/2011	KM028007	KM028009	China	swine	2011
swine/Hubei/01/2009	CY091737	CY091739	China	swine	2009
swine/Hubei/101/2009	CY083008	CY083010	China	swine	2009
swine/Jangsu/285/2010	HQ695970	HQ695964	China	swine	2010
swine/Jiangsu/S14/2011	KF057113	KF057127	China	swine	2011
swine/Nanchang/3/2010	JF275917	JF275919	China	swine	2010
swine/Shaanxi/s3/2012	JX963591	JX963612	China	swine	2012
swine/Shandong/N1/2009	JF275949	JF275950	China	swine	2009
swine/Shanghai/3/2014	KM594561	KM594558	China	swine	2014

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
Tientsin/78/1977	CY020573	CY020575	China	human	1977
XiaMen/SWL34/2013	KP019885	KP019779	China	human	2013
XiaMen/SWL53/2014	KP019918	KP019812	China	human	2014
Zhejiang/3/2009	CY095763	CY095765	China	human	2009
Zhejiang/86/2009	CY095955	CY095957	China	human	2009
Zhejiang/96/2009	CY096023	CY096025	China	human	2009
Zhejiang/HuZ1/2012	KC524500	KC524497	China	human	2012
Zhejiang/TZ11/2013	KC524501	KC524499	China	human	2013
Zhoushan/52/2009	HM230701	HM230703	China	human	2009
quail/Nanchang/12-340/2000	AY180460	CY005429	China	quail	2000
wild bird/Wuhan/WHHN16/2014	KU143251	KU143337	China	wild bird	2014
Medellin/WRAIR1297P/2008	CY100876	CY100878	Colombia	human	2008
swine/Colombia/2/2011	KC703349	KC703346	Colombia	swine	2011
swine/Colombia/4/2011	KC703314	KC703311	Colombia	swine	2011
swine/Colombia/M1445/2015	CY207053	CY207055	Colombia	swine	2015
swine/Costa Rica/000125-15/2010	JF279891	JF279892	Costa Rica	swine	2010
Habana/10291/2010	HQ190939	HQ190933	Cuba	human	2010
Czech Republic/15/2016	KX014858	KX014859	Czech Republic	human	2016
Czech Republic/201/2013	KJ561762	KJ561764	Czech Republic	human	2013
Czech Republic/5/2016	KU761513	KU761514	Czech Republic	human	2016
Czech Republic/81/2016	KX254950	KX254951	Czech Republic	human	2016
Czech Republic/90/2016	KX254959	KX254960	Czech Republic	human	2016
Aarhus/INS251/2009	CY067031	CY067033	Denmark	human	2009
Copenhagen/INS96/2009	CY056971	CY056973	Denmark	human	2009
Denmark/11/2001	EU097936	EU097708	Denmark	human	2001
Denmark/129/2010	HQ897936	HQ897944	Denmark	human	2010
Denmark/14/2001	EU097937	EU097709	Denmark	human	2001
Denmark/16/2001	EU097938	EU097710	Denmark	human	2001
Denmark/20/2011	JF327364	JF327367	Denmark	human	2011
Denmark/27/2011	JF327375	JF327377	Denmark	human	2011
Denmark/40/2000	EU097942	AJ518095	Denmark	human	2000
Hvidovre/INS288/2009	CY066679	CY066681	Denmark	human	2009
Odense/INS176/2009	CY088621	CY088623	Denmark	human	2009
swine/Denmark/101048-2/2011	KR066573	KR066576	Denmark	swine	2011
swine/Denmark/101538-2/2011	KR066575	KR066618	Denmark	swine	2011
swine/Denmark/101875-1/2010	KR066567	KR066613	Denmark	swine	2010
swine/Denmark/101899-1/2009	KR066542	KR066582	Denmark	swine	2009
swine/Denmark/102881-1/2006	KR066538	KR066606	Denmark	swine	2006
swine/Denmark/10746-2/2010	KR066571	KR066610	Denmark	swine	2010
swine/Denmark/14348-3/2003	KC900275	KC900277	Denmark	swine	2003
swine/Denmark/16241-2/2008	KR066549	KR066588	Denmark	swine	2008
swine/Denmark/16448-1/2008	KR066557	KR066598	Denmark	swine	2008
Quito/WRAIR0617N/2009	CY083112	CY083114	Ecuador	human	2009
Egypt/42/2014	KP702181	KP702183	Egypt	human	2014
northern pintail/Egypt/EMC-2/2012	KR862370	KR862392	Egypt	northern pintail	2012
Tallinn/INS183/2010	CY063011	CY063013	Estonia	human	2010
Tallinn/INS372/2009	CY071063	CY071065	Estonia	human	2009
Tallinn/INS618/2011	CY129958	CY129960	Estonia	human	2011
Finland/581/2009	HQ228037	HQ247620	Finland	human	2009
Finland/608/2009	HQ228058	HQ247641	Finland	human	2009
Finland/635/2009	HQ228084	HQ247668	Finland	human	2009
Finland/688/2009	HQ228127	HQ247715	Finland	human	2009
Helsinki/147/2013	KF559414	KF559416	Finland	human	2013
Helsinki/1492/2013	KM366495	KM366497	Finland	human	2013

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
Helsinki/1973/2012	KF560286	KF560288	Finland	human	2012
Helsinki/220M/2014	KM219143	KM219145	Finland	human	2014
Helsinki/2429/2012	KM366567	KM366569	Finland	human	2012
Helsinki/490/2013	KF559686	KF559688	Finland	human	2013
Helsinki/606/2013	KF559846	KF559848	Finland	human	2013
Helsinki/754M/2014	KM366703	KM366705	Finland	human	2014
Helsinki/77/2013	KF559374	KF559376	Finland	human	2013
Helsinki/808M/2014	KM366735	KM366737	Finland	human	2014
Helsinki/922/2012	KF560174	KF560176	Finland	human	2012
Helsinki/956/2013	KF560190	KF560192	Finland	human	2013
France/3619-3T/2010	KX651840	KX651658	France	human	2010
France/376-3T/2011	KX651974	KX651796	France	human	2011
France/929-1T/2010	KX651806	KX651623	France	human	2010
Lyon/47.431/2009	JF429394	JF429399	France	human	2009
swine/France/18-120158/2012	KC345616	KC345617	France	swine	2012
swine/France/18-120333/2012	KC345646	KC345647	France	swine	2012
swine/France/50-120350/2012	KM267919	KR700924	France	swine	2012
swine/France/71-130116/2013	KF229766	KF229771	France	swine	2013
swine/France/CotesdArmor-0275/2010	KR699734	KR699736	France	swine	2010
swine/France/Haute-Loire-0578/2011	KR700302	KR700304	France	swine	2011
swine/France/IIIeetVilaine-0266/2011	KR700232	KR700234	France	swine	2011
swine/France/WVL13/1995	CY037929	CY037931	France	swine	1995
Berlin/INS171/2009	CY062931	CY062933	Germany	human	2009
Berlin/INS361/2009	CY069210	CY069212	Germany	human	2009
Berlin/INS362/2009	CY083797	CY083799	Germany	human	2009
Berlin/INS430/2010	CY071375	CY071377	Germany	human	2010
Bochum/INS248/2009	CY073481	CY073483	Germany	human	2009
Bochum/INS250/2009	CY067023	CY067025	Germany	human	2009
Cologne/INS537/2011	CY129606	CY129608	Germany	human	2011
Cologne/INS538/2011	CY129614	CY129616	Germany	human	2011
Munich/INS364/2009	CY069226	CY069228	Germany	human	2009
Munich/INS539/2011	CY129622	CY129624	Germany	human	2011
swine/Germany/SIV04/2008	FN429078	FN429079	Germany	swine	2008
swine/Germany/Wunnenberg-IDT13220/2011	KR699726	KR699728	Germany	swine	2011
swine/Neumarkt/IDT14179/2011	KC222588	KC222590	Germany	swine	2011
swine/Potsdam/1/1981	KJ889379	KJ889381	Germany	swine	1981
Athens/INS165/2009	CY062907	CY062909	Greece	human	2009
Athens/INS259/2009	CY067071	CY067073	Greece	human	2009
Athens/INS264/2009	CY067111	CY067113	Greece	human	2009
Athens/INS3 697/2011	CY176802	CY176804	Greece	human	2011
Athens/INS335/2009	CY072414	CY072416	Greece	human	2009
Athens/INS346/2009	CY072494	CY072496	Greece	human	2009
Athens/INS398/2010	CY071183	CY071185	Greece	human	2010
Athens/INS552/2011	CY129670	CY129672	Greece	human	2011
Athens/INS569/2011	CY129718	CY129720	Greece	human	2011
Guam/NHRC0009/2009	CY068954	CY068956	Guam	human	2009
Guam/NHRC0021/2009	CY069050	CY069052	Guam	human	2009
Guam/NHRC0025/2009	CY069082	CY069084	Guam	human	2009
Guam/NHRC0029/2009	CY070991	CY070993	Guam	human	2009
Guam/NHRC0032/2009	CY071015	CY071017	Guam	human	2009
swine/Guatemala/CIP049-IP070165/2010	KJ175115	KJ175117	Guatemala	swine	2010
Kowloon/INS3_689/2011	CY176770	CY176772	Hong Kong	human	2011
swine/Hong Kong/101/1979	CY084881	CY084883	Hong Kong	swine	1979
swine/Hong Kong/1105/2009	CY061637	CY061639	Hong Kong	swine	2009

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
swine/Hong Kong/1559/2008	CY085878	CY085880	Hong Kong	swine	2008
swine/Hong Kong/189/2010	CY061805	CY061807	Hong Kong	swine	2010
swine/Hong Kong/2032/2011	KM028543	KM028545	Hong Kong	swine	2011
swine/Hong Kong/2433/2009	CY061821	CY061823	Hong Kong	swine	2009
swine/Hong Kong/25/1977	CY084489	CY084491	Hong Kong	swine	1977
swine/Hong Kong/2592/1994	CY087112	CY087114	Hong Kong	swine	1994
swine/Hong Kong/330/2011	KM028503	KM028505	Hong Kong	swine	2011
swine/Hong Kong/6301/2000	CY085310	CY085312	Hong Kong	swine	2000
swine/Hong Kong/814/2010	KM029495	KM029497	Hong Kong	swine	2010
swine/Hong Kong/830/2011	KM028527	KM028529	Hong Kong	swine	2011
swine/Hong Kong/NS2761/2010	KM029551	KM029553	Hong Kong	swine	2010
swine/Hong Kong/NS4846/2011	KM029055	KM029057	Hong Kong	swine	2011
swine/Hong Kong/NS5/2012	KM029119	KM029121	Hong Kong	swine	2012
Hong Kong/H090-661-V10/2009	CY111611	CY111613	HongKong	human	2009
Hong Kong/H090-704-V10/2009	CY120205	CY111757	HongKong	human	2009
Budapest/WRAIR2393N/2009	CY083543	CY083545	Hungary	human	2009
swine/Hungary/7380/2010	JQ612491	JQ612493	Hungary	swine	2010
Bangalore/12220-18/2009	KR861663	KR870140	India	human	2009
Bangalore/1326-52/2011	KR861680	KR870157	India	human	2011
Bangalore/2285-44/2012	KR861692	KR870169	India	human	2012
Bangalore/2629-37/2012	KR861693	KR870170	India	human	2012
Bangalore/2813-36/2012	KR861694	KR870171	India	human	2012
Bangalore/3432-40/2012	KR861696	KR870173	India	human	2012
Bangalore/5674-21/2010	KR861675	KR870152	India	human	2010
Bangalore/8330-09/2009	KR861653	KR870130	India	human	2009
India/GWL DSC/2010	JF293315	JF265671	India	human	2010
Mumbai/157/2009	KM219043	KJ958951	India	human	2009
Mumbai/3011/2009	KM219027	KJ958935	India	human	2009
Mumbai/4066/2009	KM219064	KJ958972	India	human	2009
Mumbai/4923/2010	KM219060	KJ958968	India	human	2010
Pune/NIV10278/2009	GU292344	CY088640	India	human	2009
Pune/NIV759/2009	CY075923	CY088696	India	human	2009
Pune/NIV9355/2009	GU292355	CY088703	India	human	2009
Alborz/99/2011	KC842140	KC842141	Iran	human	2011
Ghom/1550/2009	GU226570	GU071974	Iran	human	2009
Ghom/169/2010	JF500426	JF500427	Iran	human	2010
Ghom/5027/2011	KC842152	KC842153	Iran	human	2011
Ghom/90240/2014	KY328764	KY328802	Iran	human	2014
Hamedan/117/2007	HM144120	GU112215	Iran	human	2007
Iran/1519/2009	HM581925	HM581924	Iran	human	2009
Iran/15583/2009	HM581919	HM581918	Iran	human	2009
Khozestan/380/2006	HM144126	GU112232	Iran	human	2006
Kordestan/5258/2011	KC842154	KC842155	Iran	human	2011
Shiraz/125/2013	KM047671	KJ755336	Iran	human	2013
Tehran/250/2007	HM144133	GU112226	Iran	human	2007
Tehran/35070/2013	KC842185	KC842186	Iran	human	2013
Tehran/371/2006	HM144137	GU112231	Iran	human	2006
Tehran/4060/2011	KC842148	KC842149	Iran	human	2011
Tehran/82992/2014	KY328753	KY328792	Iran	human	2014
Zanjan/42975/2014	KY328757	KY328798	Iran	human	2014
Israel/276/2009	CY041968	CY041970	Israel	human	2009
Israel/70/2009	CY041976	CY041977	Israel	human	2009
Palermo/04/2011	JN017180	JN990573	Italy	human	2011
Palermo/05/2011	JN017181	JN990574	Italy	human	2011

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Pavia/113/2011	JN017168	JN990560	Italy	human	2011
Pavia/115/2011	JN017169	JN990561	Italy	human	2011
Pavia/124/2011	JN017118	JN990513	Italy	human	2011
Pavia/170/2011	JN017143	JN990537	Italy	human	2011
Pavia/189/2011	JN017177	JN990569	Italy	human	2011
Pavia/44/2011	JN017108	JN990504	Italy	human	2011
Pavia/65/2016	KY368150	KY368152	Italy	human	2016
Roma/1949	CY019971	CY019973	Italy	human	1949
Roma/ISS9825/2009	HQ917103	JF513113	Italy	human	2009
Siena/14/1995	CY036839	CY036841	Italy	human	1995
Siena/4/1987	CY045852	CY045854	Italy	human	1987
swine/Italy/233405/2012	KR700544	KR700546	Italy	swine	2012
swine/Italy/267505/2010	JX569009	JX569019	Italy	swine	2010
swine/Italy/285959-3/2016	KY368158	KY368160	Italy	swine	2016
swine/Italy/290271/2009	CY053619	CY053621	Italy	swine	2009
swine/Italy/50814/2012	KJ847576	KJ847578	Italy	swine	2012
goose/Italy/296426/2003	FJ432778	FJ432780	Italy	goose	2003
Aichi/198/2009	GU014772	GU014773	Japan	human	2009
Gunma/08G006/2009	KP457679	CY043523	Japan	human	2009
Gunma/13G024/2014	LC032921	LC032923	Japan	human	2014
Gunma/263/2009	AB704430	AB704432	Japan	human	2009
Japan/4916/2016	CY208149	CY209928	Japan	human	2016
Japan/NHRC0004/2009	CY068946	CY068948	Japan	human	2009
Kyoto/07K316/2008	KP456789	CY043451	Japan	human	2008
Kyoto/13K003/2014	LC032849	LC032851	Japan	human	2014
Kyoto/13K017/2014	LC032857	LC032859	Japan	human	2014
Nagasaki/13N058/2014	LC033249	LC033251	Japan	human	2014
Nagasaki/13N094/2014	LC033289	LC033291	Japan	human	2014
swine/Japan/KU-YG5/2013	KM596715	KM596716	Japan	swine	2013
swine/Kyoto/3/1979	AB434384	AB434386	Japan	swine	1979
swine/Osaka/1/2009	AB531444	AB531445	Japan	swine	2009
swine/Yamagata/11/2010	AB740972	AB740973	Japan	swine	2010
duck/Hokkaido/W9/2015	LC148833	LC148834	Japan	duck	2015
duck/Miyagi/66/1977	AB271114	none	Japan	duck	1977
duck/Shimane/188/1999	CY091592	CY091594	Japan	duck	1999
Amman/WR1335T/2009	CY071586	CY071588	Jordan	human	2009
Amman/WRAIR3448N/2010	CY097948	CY097950	Jordan	human	2010
Jordan/C2631/2012	KU933845	KU933877	Jordan	human	2012
Jordan/D3626/2012	KU933846	KU933879	Jordan	human	2012
Kenya/004/2015	KX223760	KX223775	Kenya	human	2015
Kenya/265/2013	KF451903	KF451911	Kenya	human	2013
swine/Kenya/9455/2011	KJ680527	KJ680535	Kenya	swine	2011
mallard/Korea/KNU YP09/2009	HQ897965	HQ897966	Korea	mallard	2009
Kuwait/WRAIR1119P/2009	CY100820	CY100822	Kuwait	human	2009
Malaysia/9343/2009	CY055262	CY055263	Malaysia	human	2009
Mexico City/WRAIR1773T/2010	CY073126	CY073128	Mexico	human	2010
Mexico/199741/2013	KR271551	KR271553	Mexico	human	2013
Mexico/200102/2014	KR271567	KR271569	Mexico	human	2014
Mexico/24005/2009	CY147595	CY147597	Mexico	human	2009
Mexico/24006/2009	CY147603	CY147605	Mexico	human	2009
Mexico/InDRE1946/2011	CY089389	CY089390	Mexico	human	2011
Mexico/InDRE6023/2012	CY120058	CY120059	Mexico	human	2012
Mexico/InDRECTRLA/2010	CY120024	CY120026	Mexico	human	2010
Mexico/UASLP-005/2008	CY073927	CY073929	Mexico	human	2008

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swine/Mexico/AVX11/2012	KU976570	KU976673	Mexico	swine	2012
swine/Mexico/AVX25/2012	KU976655	KU976743	Mexico	swine	2012
swine/Mexico/AVX29/2012	KU976948	KU976707	Mexico	swine	2012
swine/Mexico/AVX30/2012	KU976536	KU976917	Mexico	swine	2012
swine/Mexico/AVX51/2013	KU976844	KU976898	Mexico	swine	2013
swine/Mexico/AVX54/2013	KU976934	KU976755	Mexico	swine	2013
swine/Mexico/AVX58/2013	KU976541	KU976512	Mexico	swine	2013
swine/Mexico/AVX62/2014	KU976943	KU976753	Mexico	swine	2014
swine/Mexico/AVX9/2010	KU976624	KU976499	Mexico	swine	2010
Ulaanbaatar/190/2011	CY080420	CY080574	Mongolia	human	2011
tufted duck/Mongolia/1409/2010	KF501056	KF667704	Mongolia	tufted duck	2010
Naypyitaw/M783/2008	GQ396630	GQ396632	Myanmar	human	2008
Yangon/M195/2008	GQ396598	GQ396600	Myanmar	human	2008
Netherlands/002K1/1949	CY077763	CY077765	Netherlands	human	1949
Netherlands/2631c/2010	CY090861	CY090863	Netherlands	human	2010
barnacle goose/Netherlands/1/2006	KR862409	KR862540	Netherlands	barnacle goose	2006
greater white-fronted goose/ Netherlands/1/2007	KX977711	KX977666	Netherlands	greater white-fronted goose	2006
greater white-fronted goose/ Netherlands/1/2012	KX978558	KX978251	Netherlands	greater white-fronted goose	2011
greater white-fronted goose/ Netherlands/4/2011	KX978591	KX978181	Netherlands	greater white-fronted goose	2011
mallard duck/Netherlands/16/2009	KX978081	KX977672	Netherlands	mallard duck	2009
mallard duck/Netherlands/28/2009	KX977807	KX978631	Netherlands	mallard duck	2009
mallard duck/Netherlands/37/2011	KX977882	KX979536	Netherlands	mallard duck	2011
mallard duck/Netherlands/8/2012	KX979169	KX977770	Netherlands	mallard duck	2012
mallard/Netherlands/51/2010	KR862427	KR862595	Netherlands	mallard	2010
white-fronted goose/Netherlands/1/2007	KR862410	KR862542	Netherlands	white-fronted goose	2007
white-fronted goose/Netherlands/4/2011	KR862419	KR862558	Netherlands	white-fronted goose	2011
South Canterbury/31/2000	KP459300	CY009774	New Zealand	human	2000
Waikato/4/2005	KP458382	CY017317	New Zealand	human	2005
Wellington/4/2000	CY021629	CY021631	New Zealand	human	2000
Wellington/9/2001	KP457410	CY011218	New Zealand	human	2001
Managua/07193_09/2010	CY072998	CY073000	Nicaragua	human	2010
Managua/1077.04/2009	CY072598	CY072600	Nicaragua	human	2009
Managua/1409.01/2008	CY039135	CY039137	Nicaragua	human	2008
Managua/1985.01/2008	CY045860	CY045862	Nicaragua	human	2008
Managua/4017.02/2008	CY044421	CY044423	Nicaragua	human	2008
Managua/4537.03/2008	CY038927	CY038929	Nicaragua	human	2008
Managua/521.01/2008	CY039127	CY039129	Nicaragua	human	2008
Managua/WRAIR1689P/2009	CY083471	CY083473	Nicaragua	human	2009
Nicaragua/30238_01_TR2/2013	CY189679	CY189681	Nicaragua	human	2013
Nicaragua/5035 05/2013	CY188513	CY188515	Nicaragua	human	2013
Nicaragua/6820 09/2013	CY188105	CY188107	Nicaragua	human	2013
Nicaragua/AGA2-52/2011	CY181929	CY181931	Nicaragua	human	2011
NWS/1934	CY120984	none	Norway	human	1934
Oman/SQUH-31/2009	KM213265	KM213304	Oman	human	2009
Oman/SQUH-33/2010	KM213267	KM213306	Oman	human	2010
Oman/SQUH-77/2013	KM213290	KM213331	Oman	human	2013
Paraguay/20HBO/2009	JX625229	JX625242	Paraguay	human	2009
Paraguay/85HCl/2009	JX625230	JX625243	Paraguay	human	2009
Cusco/WRAIR1730P/2008	CY100972	CY100974	Peru	human	2008
Lima/070674913/2013	KJ147487	KJ147489	Peru	human	2013

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Lima/INS3 671/2012	CY176682	CY176684	Peru	human	2012
Lima/INS3_677/2012	CY176722	CY176724	Peru	human	2012
Lima/WRAIR0519F/2009	CY083096	CY083098	Peru	human	2009
Lima/WRAIR1687P/2009	CY083455	CY083457	Peru	human	2009
Peru/2010731296/2009	KM289092	KM289090	Peru	human	2009
Piura/WRAIR1708P/2009	CY100948	CY100950	Peru	human	2009
Philippines/TMC10-41/2010	JN603276	JN566150	Philippines	human	2010
swine/Poland/16315/2011	KR700584	KR700586	Poland	swine	2011
swine/Poland/18275/2012	KR701009	KR701011	Poland	swine	2012
swine/Poland/1889614/2014	KU245747	KU245749	Poland	swine	2014
Warsaw/INS149/2009	CY083934	CY083936	Poland	human	2009
Warsaw/INS3_657/2011	CY176594	CY176596	Poland	human	2011
Warsaw/INS310/2009	CY072262	CY072264	Poland	human	2009
Warsaw/INS311/2009	CY072270	CY072272	Poland	human	2009
Puerto Rico/8/1934	J02144	none	Puerto Rico	human	1934
Puerto Rico/8/34/Mount Sinai	none	K01031	Puerto Rico	human	1934
Puerto Rico/8-1/1934	none	CY045766	Puerto Rico	human	1934
Puerto Rico/8-WG/1934	none	CY084008	Puerto Rico	human	1934
Bucuresti/229/2008	FJ654323	FJ403548	Romania	human	2008
Barnaul/04/2009	GU592889	GU592891	Russia	human	2009
Moscow/CRIE-11/2013	KF746626	KF746679	Russia	human	2013
Moscow/CRIE-288/2016	KX775415	KX775417	Russia	human	2016
Moscow/CRIE-29/2013	KF746632	KF746681	Russia	human	2013
Moscow/CRIE-30/2013	KF746633	KF746682	Russia	human	2013
Moscow/CRIE-31/2013	KF746634	KF746683	Russia	human	2013
Moscow/CRIE-BVA/2009	HM189373	HM189336	Russia	human	2009
Moscow/IIV03/2009	GQ330645	GQ330646	Russia	human	2009
Moscow/IIV04/2009	GQ392022	GQ392023	Russia	human	2009
Moscow/IIV05/2009	GQ494354	GQ494353	Russia	human	2009
Moscow/IIV-33/2010	HQ834746	HQ834748	Russia	human	2010
Moscow/WRAIR1627T/2009	CY083248	CY083250	Russia	human	2009
Moscow/WRAIR1929P/2011	CY097892	CY097894	Russia	human	2011
Moscow/WRAIR1965P/2011	CY097916	CY097918	Russia	human	2011
Moscow/WRAIR1967P/2011	CY097932	CY097934	Russia	human	2011
Moscow/WRAIR4316N/2011	CY098052	CY098054	Russia	human	2011
Nizhnii Novgorod/CRIE-BLM/2011	JN714492	JN714494	Russia	human	2011
Novosibirsk/01/2011	JN120761	JN120762	Russia	human	2011
Novosibirsk/3/2009	CY053658	CY053659	Russia	human	2009
Novosibirsk/653/2009	CY053668	CY053669	Russia	human	2009
Rostov/CRIE-162/2016	KX775367	KX775369	Russia	human	2016
Russia/01/2009	GU211227	GU211229	Russia	human	2009
Russia/100/2009	CY054662	CY054664	Russia	human	2009
Russia/171/2009	CY054670	CY054672	Russia	human	2009
Russia/2187/2002	CY125164	CY125166	Russia	human	2002
swine/Moscow/KF/2009	JX879778	JX879785	Russia	swine	2009
swine/Tatarstan/KB/2009	JX879782	JX879789	Russia	swine	2009
Tver/IIV2969/2009	GU451254	GU451256	Russia	human	2009
Jeddah/3647/2010	KC297142	KC297152	Saudi Arabia	human	2010
Singapore/14/2001	CY125148	CY125150	Singapore	human	2001
Singapore/20J/2007	KF856946	KF856948	Singapore	human	2007
Singapore/CC01/2010	JX309309	JX309310	Singapore	human	2010
Singapore/CGH01/2011	CY124503	CY124504	Singapore	human	2011
Singapore/DMS113/2010	KT180993	KT181421	Singapore	human	2010
Singapore/DMS1173/2011	KT181012	KT181440	Singapore	human	2011

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Singapore/DMS1184/2011	KT181017	KT181445	Singapore	human	2011
Singapore/DMS1200/2011	KT181029	KT181457	Singapore	human	2011
Singapore/DMS1216/2011	KT181040	KT181468	Singapore	human	2011
Singapore/DMS1229/2011	KT181052	KT181480	Singapore	human	2011
Singapore/DMS1230/2011	KT181053	KT181481	Singapore	human	2011
Singapore/DMS1235/2012	KT181058	KT181486	Singapore	human	2012
Singapore/DMS1312/2013	KT181073	KT181501	Singapore	human	2013
Singapore/DMS1315/2013	KT181074	KT181502	Singapore	human	2013
Singapore/DMS1316/2013	KT181075	KT181503	Singapore	human	2013
Singapore/DMS161/2010	KT181091	KT181519	Singapore	human	2010
Singapore/DMS68/2010	KT181150	KT181578	Singapore	human	2010
Singapore/DMS93/2010	KT181180	KT181608	Singapore	human	2010
Singapore/DMS946/2009	KT181181	KT181609	Singapore	human	2009
Singapore/GP101/2009	CY068676	CY068677	Singapore	human	2009
Singapore/GP1035/2010	JX309223	JX309225	Singapore	human	2010
Singapore/GP256/2010	JX309017	JX309019	Singapore	human	2010
Singapore/GP2709/2009	CY122951	CY122953	Singapore	human	2009
Singapore/GP293/2010	JX309114	JX309115	Singapore	human	2010
Singapore/GP3178/2009	CY123075	CY123077	Singapore	human	2009
Singapore/GP3395/2010	JX309623	JX309624	Singapore	human	2010
Singapore/GP3621/2009	CY123165	CY123166	Singapore	human	2009
Singapore/GP4049/2009	CY123223	CY123224	Singapore	human	2009
Singapore/GP4247/2009	CY063763	CY063764	Singapore	human	2009
Singapore/GP4275/2009	CY123245	CY123246	Singapore	human	2009
Singapore/GP4523/2010	JX309932	JX309934	Singapore	human	2010
Singapore/GP4539/2009	CY123286	CY123288	Singapore	human	2009
Singapore/GP46/2011	CY091690	CY091691	Singapore	human	2011
Singapore/GP489/2010	JX309065	JX309067	Singapore	human	2010
Singapore/GP627/2011	CY124585	CY124586	Singapore	human	2011
Singapore/GP690/2010	JX309205	JX309206	Singapore	human	2010
Singapore/GP758/2010	JX309175	JX309176	Singapore	human	2010
Singapore/GP834/2011	CY124634	CY124636	Singapore	human	2011
Singapore/GP903/2010	JX309274	JX309275	Singapore	human	2010
Singapore/KK103/2010	JX309250	JX309251	Singapore	human	2010
Singapore/KK80/2010	JX309208	JX309209	Singapore	human	2010
Singapore/KK90/2010	JX309271	JX309272	Singapore	human	2010
Singapore/ON1609/2009	CY123479	CY123480	Singapore	human	2009
Singapore/ON1999/2009	CY123696	CY123697	Singapore	human	2009
Singapore/ON2035/2009	CY123728	CY123729	Singapore	human	2009
Singapore/ON2125/2009	CY123760	CY123761	Singapore	human	2009
Singapore/ON2250/2009	CY123817	CY123819	Singapore	human	2009
Singapore/ON2274/2009	CY123836	CY123837	Singapore	human	2009
Singapore/ON2344/2009	CY123862	CY123863	Singapore	human	2009
Singapore/ON901/2009	CY049252	CY049254	Singapore	human	2009
Singapore/ON980/2009	CY049276	CY049278	Singapore	human	2009
Singapore/SS05/2010	JX309417	JX309418	Singapore	human	2010
Singapore/SS34/2010	JX309532	JX309534	Singapore	human	2010
Singapore/SS36/2010	JX309517	JX309518	Singapore	human	2010
Singapore/TT017/2010	CY063855	CY063856	Singapore	human	2010
Solomon Islands/3/2006	EU124137	EU124136	Solomon Islands	human	2006
Korea/CJ04/2009	HM189480	HM189491	South korea	human	2009
Korea/CJ09/2009	HM189481	HM189492	South korea	human	2009
Korea/CJ112/2009	HM189489	HM189500	South korea	human	2009
Korea/CJ24/2009	HM189484	HM189495	South korea	human	2009

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Korea/CJ63/2009	HM189486	HM189497	South korea	human	2009
Korea/CJ68/2009	HM189487	HM189498	South korea	human	2009
Seoul/00013/2016	KY509992	KY509994	South korea	human	2016
Seoul/1870/2009	CY060490	CY060491	South korea	human	2009
Seoul/224/2016	KY509809	KY509817	South korea	human	2016
Seoul/Y-01/2009	HM776031	HM776032	South korea	human	2009
South Korea/AF10/2008	CY044349	CY044351	South Korea	human	2008
swine/Korea/251-1/2008	KJ764724	KJ764726	South korea	swine	2008
swine/Korea/GBCG01/2010	KJ764748	KJ764750	South korea	swine	2010
swine/Korea/SCJ28/2010	HM189557	HM189445	South korea	swine	2010
Barcelona/00083/2008	FJ654312	FJ403560	Spain	human	2008
Barcelona/INS190/2009	CY064780	CY064782	Spain	human	2009
Barcelona/INS378/2009	CY073765	CY073767	Spain	human	2009
swine/Spain/02/2010	JX908057	JX908059	Spain	swine	2010
swine/Spain/03/2008	JX908073	JX908075	Spain	swine	2008
swine/Spain/04/2011	JX908089	JX908091	Spain	swine	2011
swine/Spain/06/2011	JX908097	JX908099	Spain	swine	2011
swine/Spain/11/2009	JQ301926	JF960182	Spain	swine	2009
swine/Spain/50047/2003	CY009892	CY009894	Spain	swine	2003
swine/Spain/53207/2004	KR700597	CY010582	Spain	swine	2004
swine/Spain/WVL6/1991	CY037999	CY038001	Spain	swine	1991
Terrassa/INS94/2009	CY083690	CY083692	Spain	human	2009
Sri Lanka/20703/2010	KJ856098	KJ856100	Sri Lanka	human	2010
Sri Lanka/21386/2010	KJ856152	KJ856154	Sri Lanka	human	2010
mallard/Sweden/57/2003	CY060329	CY060330	Sweden	mallard	2003
mallard/Sweden/99769/2009	JX565989	JX566173	Sweden	mallard	2009
Keelung/0011/2015	KY487251	KY487437	Taiwan	human	2015
Keelung/0053/2016	KY487727	KY487181	Taiwan	human	2016
Keelung/0056/2016	KY487617	KY487416	Taiwan	human	2016
swine/Taiwan/NPUST0013/2013	KM276920	KM276921	Taiwan	swine	2013
swine/Taiwan/TD-2542/2010	HQ393493	HQ393495	Taiwan	swine	2010
Taipei/0018/2016	KY487725	KY487501	Taiwan	human	2016
Taipei/0050/2016	KY487591	KY487102	Taiwan	human	2016
Taipei/0067/2016	KY487709	KY487675	Taiwan	human	2016
Taiwan/10103/2008	HQ291892	HQ291917	Taiwan	human	2008
Taiwan/2253/2009	HM072423	HM072411	Taiwan	human	2009
Taiwan/2823/2008	HQ291880	HQ291907	Taiwan	human	2008
Taiwan/2904/2010	JN381280	JN381420	Taiwan	human	2010
Taiwan/3002/2010	JN381283	JN381423	Taiwan	human	2010
Taiwan/3516/2010	JN381297	JN381437	Taiwan	human	2010
Taiwan/4696/2011	JQ693693	JQ693713	Taiwan	human	2011
Taiwan/4909/2009	JN187130	JN187188	Taiwan	human	2009
Taiwan/526/2009	CY047744	CY047746	Taiwan	human	2009
Taiwan/65151/2011	JN381309	JN381449	Taiwan	human	2011
Taiwan/65229/2010	JN381265	JN381405	Taiwan	human	2010
Taiwan/65241/2011	JN381314	JN381454	Taiwan	human	2011
Taiwan/65337/2010	JN381268	JN381408	Taiwan	human	2010
Taiwan/65387/2011	JN381326	JN381466	Taiwan	human	2011
Taiwan/65895/2010	JN381276	JN381416	Taiwan	human	2010
Taiwan/66259/2010	JN381302	JN381442	Taiwan	human	2010
Taiwan/70167/2008	KP456974	CY040116	Taiwan	human	2008
Taiwan/71720/2007	KP457638	CY040060	Taiwan	human	2007
Taiwan/7418/2009	JN187132	JN187190	Taiwan	human	2009
Taiwan/7855/2009	HM072418	HM072406	Taiwan	human	2009

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Taiwan/90019/2010	JN381263	JN381403	Taiwan	human	2010
Taiwan/90036/2011	JN381305	JN381445	Taiwan	human	2011
Taiwan/90050/2011	JN381308	JN381448	Taiwan	human	2011
Taiwan/90060/2010	JN381269	JN381409	Taiwan	human	2010
Taiwan/90149/2010	JN381279	JN381419	Taiwan	human	2010
Taiwan/90153/2011	JN381320	JN381460	Taiwan	human	2011
Taiwan/937/2009	JN187127	JN187185	Taiwan	human	2009
Taiwan/97565/2009	JN381219	JN381359	Taiwan	human	2009
Taiwan/98229/2009	JN381224	JN381364	Taiwan	human	2009
Taiwan/98584/2009	JN381225	JN381365	Taiwan	human	2009
Bangkok/INS428/2010	CY071359	CY071361	Thailand	human	2010
Bangkok/INS499/2010	CY096418	CY096420	Thailand	human	2010
Bangkok/INS505/2010	CY096458	CY096460	Thailand	human	2010
Bangkok/INS513/2010	CY096506	CY096508	Thailand	human	2010
Bangkok/INS584/2010	CY129790	CY129792	Thailand	human	2010
swine/Chachoengsao/NIAH107037-21/2011	AB704815	AB704817	Thailand	swine	2011
swine/Thailand/CS210/2010	KC859174	KC859176	Thailand	swine	2010
swine/Thailand/CS211/2010	KC859182	KC859184	Thailand	swine	2010
swine/Thailand/CU-PS73/2010	CY089803	CY089804	Thailand	swine	2010
swine/Thailand/CU-RA15/2010	CY062276	CY062278	Thailand	swine	2010
swine/Thailand/CU-RA204/2010	CY062292	CY062294	Thailand	swine	2010
swine/Thailand/CU-RP1/2010	CY089810	CY089812	Thailand	swine	2010
swine/Thailand/CU-S3334N/2012	KJ162030	KJ162046	Thailand	swine	2012
swine/Thailand/CU-SPN47/2010	KC610056	KC610058	Thailand	swine	2010
swine/Thailand/HF6/2005	FJ688266	FJ688267	Thailand	swine	2005
swine/Thailand/NS393/2009	KC833441	KC833443	Thailand	swine	2009
Thailand/1035/2008	KP459274	GQ423407	Thailand	human	2008
Thailand/2429-3T/2010	KX651891	KX651711	Thailand	human	2010
Thailand/3426-1T/2010	KX651897	KX651717	Thailand	human	2010
Thailand/CU-H1786/2010	CY080323	CY080325	Thailand	human	2010
Thailand/CU-H2389/2010	CY088823	CY082967	Thailand	human	2010
Thailand/CU-H9/2009	GQ866959	GQ866961	Thailand	human	2009
Thailand/H1818/2010	CY080331	CY080333	Thailand	human	2010
Thailand/IY07086/2009	KP637846	KP637848	Thailand	human	2009
Thailand/IY07093/2009	KP637278	KP637280	Thailand	human	2009
Thailand/MR07060/2007	KP637382	KP637384	Thailand	human	2007
Thailand/MR08303/2009	KP637406	KP637408	Thailand	human	2009
Thailand/NHRC430218/2014	KJ889262	KJ889263	Thailand	human	2014
Thailand/SirirajICRC CBI 8/2009	KF849771	KF849742	Thailand	human	2009
Thailand/SN07106/2008	KP637510	KP637512	Thailand	human	2008
Thailand/SN08205/2009	KP637518	KP637520	Thailand	human	2009
Thailand/SN10560/2011	KP637566	KP637568	Thailand	human	2011
Thailand/SN11618/2011	KP637574	KP637576	Thailand	human	2011
Thailand/SP07102/2007	KP637614	KP637616	Thailand	human	2007
Thailand/SP10502/2011	KP637694	KP637696	Thailand	human	2011
Thailand/SP11686/2012	KP637702	KP637704	Thailand	human	2012
Thailand/SP11755/2012	KP637710	KP637712	Thailand	human	2012
Thailand/SR10340/2012	KP637742	KP637744	Thailand	human	2012
Thailand/SS07080/2007	KP637766	KP637768	Thailand	human	2007
Tonga/14/1984	CY020485	CY020487	Tonga	human	1984
Uganda/MUWRP-067/2009	KJ690503	KJ690505	Uganda	human	2009
Kiev/245/2008	FJ654330	FJ403578	Ukraine	human	2008
Kiev/313/2008	FJ654315	FJ403561	Ukraine	human	2008
Canterbury/19/2001	CY010156	CY010158	United Kingdom	human	2001

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Canterbury/72/2001	KP456713	CY010294	United Kingdom	human	2001
England/01180016/2010	LN846510	LN846512	United Kingdom	human	2010
England/01180017/2010	LN867486	LN867488	United Kingdom	human	2010
England/01220740/2010	LN867804	LN867806	United Kingdom	human	2010
England/01580005/2010	LN867389	LN867391	United Kingdom	human	2010
England/03380426/2010	JX625646	JX625648	United Kingdom	human	2010
England/05000088/2010	JX625790	JX625792	United Kingdom	human	2010
England/10740561/2010	LN867454	LN850729	United Kingdom	human	2010
England/12/2010	LN845774	LN845776	United Kingdom	human	2010
England/12240614/2011	LN867668	LN867670	United Kingdom	human	2011
England/21680633/2010	LN850133	LN850135	United Kingdom	human	2010
England/217/2009	HM567560	HM567562	United Kingdom	human	2009
England/280/2010	JX625822	JX625824	United Kingdom	human	2010
England/287/2010	JX625846	JX625848	United Kingdom	human	2010
England/493/2006	KP458857	FJ445052	United Kingdom	human	2006
England/633/2009	CY069757	CY069759	United Kingdom	human	2009
England/67/2010	JX625630	JX625632	United Kingdom	human	2010
England/854/2009	HM568008	HM568010	United Kingdom	human	2009
England/869/2009	HM567984	HM567986	United Kingdom	human	2009
England/93520038/2009	CY070360	JX625492	United Kingdom	human	2009
England/94200009/2009	CY070457	JX625507	United Kingdom	human	2009
England/H093900113/2009	HM568152	HM568154	United Kingdom	human	2009
England/WTSI2067/2010	LN867676	LN867678	United Kingdom	human	2010
NWS/1933	none	J02141	United Kingdom	human	1933
swine/England/060969/2013	KR700807	KR700809	United Kingdom	swine	2013
swine/England/11582/2012	KR700767	KR700769	United Kingdom	swine	2012
swine/England/117316/1986	U72666	KF840462	United Kingdom	swine	1986
swine/England/1251/2011	KR700679	KR700681	United Kingdom	swine	2011
swine/England/1458/2010	CY115983	CY115985	United Kingdom	swine	2010
swine/England/17787/2000	CY116012	CY116014	United Kingdom	swine	2000
swine/England/252411/1992	CY116058	CY116060	United Kingdom	swine	1992
swine/England/373/2010	CY116127	CY116129	United Kingdom	swine	2010
swine/England/453/2006	CY116206	CY116208	United Kingdom	swine	2006
swine/Scotland/24678/2011	KR700719	KR700721	United Kingdom	swine	2011
United Kingdom/1/1933	CY045756	CY045758	United Kingdom	human	1933
United Kingdom/1-MA/1933	CY090845	none	United Kingdom	human	1933
United Kingdom/2571-1T/2010	KX651880	KX651700	United Kingdom	human	2010
Wilson-Smith/1933	HQ008259	HQ008258	United Kingdom	human	1933
WS/1933	U08904	L25816	United Kingdom	human	1933
WSN/1933	none	L25817	United Kingdom	human	1933
swine/England/063414/2011	KR699852	KR699854	UnitedKingdom	swine	2011
swine/England/080012/2011	KR699868	KR699870	UnitedKingdom	swine	2011
bh/1935	CY096811	none	Unknown	human	1935
BH/JY2/1935	CY147326	none	Unknown	human	1935
swine/1931	CY009628	CY009630	Unknown	swine	1931
swine/JY2/1931	CY147406	CY147408	Unknown	swine	1931
Alabama/06/2012	KC891425	KC891347	USA	human	2012
Alabama/13/2015	KU589370	KU589372	USA	human	2015
Alaska/03/2016	KX406251	KX406253	USA	human	2016
Alaska/18/2017	CY239577	CY239579	USA	human	2017
Alaska/1935	none	CY019957	USA	human	1935
Alaska/37/2014	KT836727	KT836734	USA	human	2014
Alaska/39/2009	KC780899	KC780898	USA	human	2009
Alaska/43/2009	KC781688	KC781686	USA	human	2009

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Arizona/06/2010	KC782232	KC782231	USA	human	2010
Arizona/11/2013	KT274471	KT274466	USA	human	2013
Arizona/26/2017	CY236214	CY236216	USA	human	2017
Arizona/29/2016	KX408795	KX408797	USA	human	2016
Arizona/42/2016	KY045180	KX407805	USA	human	2016
Baltimore/0008/2016	KY487698	KY487604	USA	human	2016
Baltimore/0097/2016	KY487190	KY487587	USA	human	2016
Bellamy/JY2/1942	CY146769	CY146771	USA	human	1942
Boston/49/2008	CY044660	CY044662	USA	human	2008
Boston/633/2009	CY089235	CY089237	USA	human	2009
Boston/DOA22/2011	CY111262	CY111264	USA	human	2011
Boston/DOA53/2011	CY134585	CY134587	USA	human	2011
Boston/DOA90/2012	CY125775	CY125777	USA	human	2012
Boston/YGA 00087/2013	CY168423	CY168425	USA	human	2013
Boston/YGA 01217/2013	CY170079	CY170081	USA	human	2013
Boston/YGA_01220/2013	CY170095	CY170097	USA	human	2013
Brevig Mission/1/1918	none	AF250356	USA	human	1918
Brownsville/40OS/2009	CY053285	CY053287	USA	human	2009
California/01/2010	KC782067	KC782066	USA	human	2010
California/07/2009	none	HM138502	USA	human	2009
California/09/2006	EU199348	EU516124	USA	human	2006
California/105/2015	KY044902	KY044904	USA	human	2015
California/113/2016	KX919260	KX919262	USA	human	2016
California/193/2016	CY214282	CY214284	USA	human	2016
California/21/2012	KC891516	KC891515	USA	human	2012
California/25/2013	KT274326	KT274307	USA	human	2013
California/29/2016	KX406475	KX406477	USA	human	2016
California/33/2015	KT836845	KT836872	USA	human	2015
California/44/2016	KX407371	KX407373	USA	human	2016
California/55/2017	CY236198	CY236200	USA	human	2017
California/59/2016	KX407507	KX407509	USA	human	2016
California/71/2016	KX409851	KX409853	USA	human	2016
California/NHRC BRD41291N/2016	KX523708	KX523755	USA	human	2016
California/NHRC417074/2013	KJ635896	KJ635897	USA	human	2013
California/NHRC419631/2014	KJ889264	KJ889265	USA	human	2014
California/UR06-0564/2007	CY027355	CY027357	USA	human	2007
California/VRDL107/2009	CY066231	CY066233	USA	human	2009
California/VRDL124/2009	CY066367	CY066369	USA	human	2009
California/VRDL379/2009	CY074651	CY074653	USA	human	2009
Chicago/YGA_04019/2012	CY171159	CY171161	USA	human	2012
Colorado/27/2007	EU516248	EU516269	USA	human	2007
Colorado/UR06-0110/2007	CY026579	CY026581	USA	human	2007
Delaware/01/2012	KC891455	KC891456	USA	human	2012
Delaware/08/2011	KC882398	KC882409	USA	human	2011
Delaware/19/2016	KX411331	KX411333	USA	human	2016
Florida/02/2010	KC780537	KC780539	USA	human	2010
Florida/03/2010	KC781124	KC781123	USA	human	2010
Florida/10/2007	EU516250	EU516271	USA	human	2007
Florida/15/2012	KC891395	KC891441	USA	human	2012
Florida/17/2014	KM409262	KM409263	USA	human	2014
Florida/19/2011	KC881596	KC881595	USA	human	2010
Florida/19/2013	KF647957	KF647955	USA	human	2012
Florida/21/2008	FJ687013	FJ687014	USA	human	2008
Florida/26/2016	KX407059	KX407061	USA	human	2016

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Florida/33/2017	CY233896	CY233898	USA	human	2017
Florida/38/2013	KJ136249	KJ136250	USA	human	2013
Florida/5197/2016	CY208430	CY209987	USA	human	2016
Florida/74/2013	KT274524	KT274515	USA	human	2013
Gainesville/08/2013	KJ645761	KJ645763	USA	human	2013
Georgia/02/2013	KF648201	KF648191	USA	human	2013
Georgia/11/2016	KX408587	KX408589	USA	human	2016
Georgia/21/2010	KC882151	KC882152	USA	human	2010
Georgia/32/2016	KX918844	KX918846	USA	human	2016
Georgia/NHRC417050/2013	KJ635892	KJ635893	USA	human	2013
Hawaii/01/2008	EU851979	EU851980	USA	human	2008
Hawaii/03/2009	GQ475913	GQ475914	USA	human	2009
Hawaii/19/2010	KC882179	KC882180	USA	human	2010
Hawaii/24/2017	CY236251	CY236253	USA	human	2017
Hawaii/42/2007	EU716603	EU716602	USA	human	2007
Hawaii/43/2016	KX915972	KX915974	USA	human	2016
Hawaii/57/2016	KY115734	KX919198	USA	human	2016
Hawaii/59/2015	KU509711	KU509713	USA	human	2015
Henry/1936	CY020445	CY020447	USA	human	1936
Hickox/1940	CY013271	CY013273	USA	human	1940
Hickox/JY2/1940	CY146777	CY146779	USA	human	1940
Houston/JMM 163/2013	CY186131	CY186133	USA	human	2013
Illinois/5010/2016	CY208243	CY209956	USA	human	2016
Illinois/NHRC0001/2011	CY092872	CY092874	USA	human	2011
India/Kol-T15/2015	KU695613	KU695623	USA	human	2015
India/Nag132467/2013	KR052538	KF280737	USA	human	2013
India/NIV29386/2010	CY084239	CY084241	USA	human	2010
India/P121773/2012	KF280695	KF280697	USA	human	2012
India/P131027/2013	KF270582	KF270584	USA	human	2013
India/P131845/2013	KF280743	KF280745	USA	human	2013
India/Pun151399/2015	KR052629	KR052682	USA	human	2015
Indiana/01/2010	KC780419	KC780420	USA	human	2010
Indiana/02/2010	KC780625	KC780626	USA	human	2009
Indiana/02/2011	KC881848	KC881847	USA	human	2010
Indiana/03/2009	GQ476136	GQ476137	USA	human	2008
Indiana/03/2017	CY217089	CY217091	USA	human	2016
Indiana/04/2014	KM409265	KM409266	USA	human	2013
Indiana/04/2017	CY217081	CY217083	USA	human	2016
Indiana/05/2010	KC882067	KC882024	USA	human	2010
Indiana/06/2010	KC882026	KC882027	USA	human	2009
Indiana/06/2014	KT274286	KT274291	USA	human	2013
Indiana/07/2009	GQ475933	GQ475934	USA	human	2008
Indiana/07/2011	KC882362	KC882363	USA	human	2010
Indiana/09/2009	GQ117097	GQ117094	USA	human	2009
Indiana/11/2009	GQ475981	GQ475982	USA	human	2009
Indiana/19/2009	KC780807	KC780808	USA	human	2009
Indiana/22/2013	KF648170	KF648167	USA	human	2013
Indiana/33/2016	KX409931	KX409933	USA	human	2016
Indiana/42/2016	KX411851	KX411853	USA	human	2016
Iowa/04/2010	KC781355	KC781350	USA	human	2010
Iowa/19/2014	KT836520	KT836506	USA	human	2014
Kentucky/08/2010	KC882029	KC882030	USA	human	2010
Kentucky/80/2009	JX875011	JX875008	USA	human	2009
Kentucky/UR06-0034/2007	CY025923	CY025925	USA	human	2007

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Kentucky/UR06-0097/2007	CY025509	CY025511	USA	human	2007
Kentucky/UR06-0154/2007	CY027051	CY027053	USA	human	2007
Lackland/7/1978	CY020173	CY020175	USA	human	1978
Louisiana/06/2013	KM408916	KM408917	USA	human	2013
Louisiana/23/2013	KM409018	KM409019	USA	human	2013
Maine/02/2014	KT274250	KT274213	USA	human	2014
Maine/05/2016	KX409163	KX409165	USA	human	2016
Maine/10/2016	KX409867	KX409869	USA	human	2016
Maryland/09/2014	KM409394	KM409395	USA	human	2014
Maryland/12/2014	KT274424	KT274444	USA	human	2014
Massachusetts/10/2013	KF647947	KF647950	USA	human	2013
Massachusetts/20/2016	KX919116	KX919118	USA	human	2016
Massachusetts/46/2016	CY215178	CY215180	USA	human	2016
Memphis/51/1983	CY019093	CY019095	USA	human	1983
Michigan/01/2010	KC781448	KC781449	USA	human	2010
Michigan/34/2016	KX408819	KX408821	USA	human	2016
Michigan/52/2016	KX918868	KX918870	USA	human	2016
Michigan/57/2015	KU509574	KX005108	USA	human	2015
Michigan/65/2015	KX949356	KX949358	USA	human	2015
Minnesota/06/2014	KM409409	KM409410	USA	human	2014
Minnesota/07/2016	KX408659	KX408661	USA	human	2016
Minnesota/29/2016	KX407939	KX407941	USA	human	2016
Minnesota/58/2016	KY045303	KY045305	USA	human	2016
Mississippi/27/2013	KT274516	KT274506	USA	human	2013
Missouri/NHRC 36878/2016	KX523736	KX523783	USA	human	2016
Montana/02/2009	GQ476128	GQ476129	USA	human	2009
Montana/16/2016	KX406755	KX406757	USA	human	2016
Nevada/12/2016	KX406531	KX406533	USA	human	2016
Nevada/28/2016	KX410563	KX410565	USA	human	2016
New Jersey/04/2013	KF648036	KF648040	USA	human	2013
New Jersey/11/2012	KF648063	KF648055	USA	human	2012
New Jersey/15/2007	EU516083	EU516148	USA	human	2007
New Mexico/02/2006	EU100708	EU199402	USA	human	2006
New York/01/2011	KC881791	KC881761	USA	human	2011
New York/02/2010	KC780310	KC780312	USA	human	2010
New York/03/2011	KC882039	KC882008	USA	human	2011
New York/04/2010	KC781915	KC781914	USA	human	2009
New York/04/2011	KC881931	KC881930	USA	human	2010
New York/0461/2009	CY062058	CY062060	USA	human	2009
New York/07/2013	KF647905	KF647904	USA	human	2013
New York/1049/2006	CY172535	CY172537	USA	human	2006
New York/11/2010	KC882160	KC882149	USA	human	2010
New York/1112/2008	CY172967	CY172969	USA	human	2008
New York/1183/2009	CY173479	CY173481	USA	human	2009
New York/1796/2010	CY062074	CY062076	USA	human	2010
New York/1998/2010	CY062082	CY062084	USA	human	2010
New York/223/2003	KP457956	CY002690	USA	human	2003
New York/26/2017	CY233928	CY233930	USA	human	2017
New York/2876/2010	CY062130	CY062132	USA	human	2010
New York/33/2016	KX409531	KX409533	USA	human	2016
New York/36/2012	KF648206	KF648208	USA	human	2012
New York/37/2016	KX409547	KX409549	USA	human	2016
New York/4095/2009	CY050158	CY050160	USA	human	2009
New York/4100/2009	CY047382	CY047384	USA	human	2009

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New York/445/2001	KP458872	CY003835	USA	human	2001
New York/4620/2009	CY051631	CY051633	USA	human	2009
New York/4662/2010	CY065051	CY065053	USA	human	2010
New York/4780/2009	CY051703	CY051705	USA	human	2009
New York/4823/2009	CY051759	CY051761	USA	human	2009
New York/49/2016	KX410851	KX410853	USA	human	2016
New York/4925/2009	CY056395	CY056397	USA	human	2009
New York/645/1995	CY011272	CY011274	USA	human	1995
New York/7107/2009	CY062010	CY062012	USA	human	2009
New York/7216/2009	CY062018	CY062020	USA	human	2009
New York/79/2016	KX915804	KX915806	USA	human	2016
New York/WC-LVD-13-007/2013	CY188865	CY188867	USA	human	2013
New York/WC-LVD-14-029/2014	CY189273	CY189275	USA	human	2014
New York/WC-LVD-14-037/2014	CY189337	CY189339	USA	human	2014
New York/WC-LVD-14-048/2014	CY189417	CY189419	USA	human	2014
North Carolina/13/2013	KM409003	KM409004	USA	human	2013
North Dakota/01/2012	KC891096	KC891097	USA	human	2012
North Dakota/06/2016	KX005550	KX005552	USA	human	2016
Ohio/06/2009	GQ475964	GQ475965	USA	human	2009
Oklahoma/02/2014	KT274367	KT274343	USA	human	2014
Oklahoma/21/2017	CY233920	CY233922	USA	human	2017
Oregon/02/2009	GQ475976	GQ475977	USA	human	2008
Oregon/02/2014	KM409125	KM409126	USA	human	2013
Oregon/UR06-0230/2007	CY027083	CY027085	USA	human	2007
Pennsylvania/12/2009	GQ476103	GQ476104	USA	human	2009
Pennsylvania/16/2007	EU716556	EU716583	USA	human	2007
Pennsylvania/22/2016	KY044543	KY044545	USA	human	2016
Pennsylvania/38/2016	KX410163	KX410165	USA	human	2016
Pennsylvania/55/2015	KX408291	KX005324	USA	human	2015
Phila/1935	CY020469	CY020471	USA	human	1935
Rhode Island/19/2009	KC780689	KC780687	USA	human	2009
San Diego/INS34/2009	CY056132	CY056134	USA	human	2009
South Carolina/01/2010	KC780661	KC780659	USA	human	2010
South Carolina/1/1918	AF117241	none	USA	human	1918
South Carolina/10/2012	KC891126	KC891125	USA	human	2012
South Dakota/01/2009	GQ475855	GQ475856	USA	human	2009
swine/Arkansas/D0386/2013	CY194605	CY194607	USA	swine	2013
swine/Arkansas/SG1321/2009	CY158257	CY158259	USA	swine	2009
swine/Arkansas/SG1327/2009	CY159931	CY159933	USA	swine	2009
swine/Arkansas/SG1347/2010	CY159966	CY159968	USA	swine	2010
swine/Arkansas/SG1499/2010	CY159457	CY159459	USA	swine	2010
swine/Illinois/A01047796/2010	CY114674	CY114675	USA	swine	2010
swine/Illinois/A01049981/2011	JX080637	JN863548	USA	swine	2011
swine/Illinois/A01076194/2010	JQ809727	JQ809764	USA	swine	2010
swine/Illinois/A01076203/2010	JQ809728	JQ809765	USA	swine	2010
swine/Illinois/A01076907/2010	JQ809729	JQ809766	USA	swine	2010
swine/Illinois/A01134201/2011	JQ809730	JQ809767	USA	swine	2011
swine/Illinois/A01134329/2011	CY114982	CY114983	USA	swine	2011
swine/Illinois/A01134671/2011	CY115057	CY115058	USA	swine	2011
swine/Illinois/A01244964/2013	KF569208	KF569209	USA	swine	2013
swine/Illinois/A01270986/2012	KC139729	KC139728	USA	swine	2012
swine/Illinois/A01327221/2012	JX422356	JX422355	USA	swine	2012
swine/Illinois/A01397807/2013	KF495196	KF495197	USA	swine	2013
swine/Illinois/A01410235/2014	KJ493377	KJ493378	USA	swine	2014

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
swine/Illinois/A01411204/2013	KJ130132	KJ130133	USA	swine	2013
swine/Illinois/A01444394/2013	KC511531	KC511530	USA	swine	2013
swine/Illinois/A01478780/2015	KP901342	KP901343	USA	swine	2015
swine/Illinois/A01728214/2015	KU558794	KU558795	USA	swine	2015
swine/Illinois/A01730208/2016	KU695681	KU695682	USA	swine	2016
swine/Illinois/A01749912/2016	KX230395	KX230397	USA	swine	2016
swine/Illinois/A01775937/2016	KX433140	KX433145	USA	swine	2016
swine/Illinois/A01777039/2016	KX618892	KX618893	USA	swine	2016
swine/Illinois/A01798143/2015	KU357002	KU357003	USA	swine	2015
swine/Illinois/A01894949/2016	KX185849	KX185850	USA	swine	2016
swine/Illinois/A02024646/2015	KT198651	KT198652	USA	swine	2015
swine/Indiana/13/2011	CY103857	CY103858	USA	swine	2011
Swine/Indiana/1726/1988	M81707	GU052269	USA	swine	1988
swine/Indiana/A00968333/2011	KP892971	KP892973	USA	swine	2011
swine/Indiana/A01260027/2012	KC571603	KC571604	USA	swine	2012
swine/Indiana/A01260209/2013	KC676310	KC676311	USA	swine	2013
swine/Indiana/A01260588/2014	KM361414	KM361415	USA	swine	2014
swine/Indiana/A01260601/2014	KM503166	KM503167	USA	swine	2014
swine/Indiana/A01260802/2015	KR052692	KR052693	USA	swine	2015
swine/Indiana/A01290415/2013	KF715180	KF715181	USA	swine	2013
swine/Indiana/A01327233/2010	JX463281	JX463280	USA	swine	2010
swine/Indiana/A01555282/2014	KP701517	KP701518	USA	swine	2014
swine/Indiana/A01671620/2016	KY486465	KY486466	USA	swine	2016
swine/Indiana/A01812000/2015	KU160792	KU160794	USA	swine	2015
swine/Iowa/1/1976	CY022069	CY022071	USA	swine	1976
swine/Iowa/15/1930	X57492	AF250364	USA	swine	1930
swine/Iowa/2/1985	CY027507	CY027509	USA	swine	1985
swine/Iowa/A01049003/2010	JF812271	JF812294	USA	swine	2010
swine/Iowa/A01049195/2010	JX080620	JX080646	USA	swine	2010
swine/Iowa/A01049773/2011	JN652424	JN652454	USA	swine	2011
swine/Iowa/A01076215/2010	JQ809737	JQ809774	USA	swine	2010
swine/Iowa/A01202511/2011	JX092296	JX092345	USA	swine	2011
swine/Iowa/A01203544/2012	JX267173	JX267181	USA	swine	2012
swine/Iowa/A01290691/2013	KF922780	KF922781	USA	swine	2013
swine/Iowa/A01410104/2014	KJ437539	KJ437540	USA	swine	2014
swine/Iowa/A01410297/2014	KJ605042	KJ605043	USA	swine	2014
swine/Iowa/A01432066/2012	KC171948	KC171947	USA	swine	2012
swine/Iowa/A01432085/2012	KC171957	KC171956	USA	swine	2012
swine/Iowa/A01432823/2013	KF382714	KF382715	USA	swine	2013
swine/Iowa/A01476019/2014	KM245311	KM245312	USA	swine	2014
swine/Iowa/A01476268/2014	KM821579	KM821580	USA	swine	2014
swine/Iowa/A01668800/2016	KY412992	KY412993	USA	swine	2016
swine/Iowa/A01671478/2016	KY465573	KY465574	USA	swine	2016
swine/Iowa/A01671568/2016	KY486457	KY486458	USA	swine	2016
swine/Iowa/A01671941/2016	KY499585	KY499586	USA	swine	2016
swine/Iowa/A01732314/2016	KU925689	KU925690	USA	swine	2016
swine/Iowa/A01778707/2016	KX830958	KX830959	USA	swine	2016
swine/Iowa/A01782237/2016	KY120250	KY120251	USA	swine	2016
swine/Iowa/A01795087/2015	KT889339	KT889340	USA	swine	2015
swine/Kansas/A01377172/2013	KJ484601	KJ484602	USA	swine	2013
swine/Maryland/23239/1991	CY022477	CY022479	USA	swine	1991
swine/Minnesota/02976/2010	CY158993	CY158995	USA	swine	2010
swine/Minnesota/0432/2010	JQ023770	JQ023772	USA	swine	2010
swine/Minnesota/A01049347/2010	JN162055	JN162017	USA	swine	2010

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
swine/Minnesota/A01116330/2011	JQ809736	JQ809773	USA	swine	2011
swine/Minnesota/A01134836/2011	CY115087	CY115088	USA	swine	2011
swine/Minnesota/A01201202/2011	CY114815	CY114816	USA	swine	2011
swine/Minnesota/A01381276/2013	KF251047	KF251048	USA	swine	2013
swine/Minnesota/A01469970/2015	KP972097	KP972099	USA	swine	2015
swine/Minnesota/A01482140/2014	KM222717	KM222719	USA	swine	2014
swine/Minnesota/A01678488/2017	KY970160	KY970161	USA	swine	2017
swine/Minnesota/A01781754/2016	KY014457	KY014458	USA	swine	2016
swine/Minnesota/A02076858/2015	KT000073	KT000074	USA	swine	2015
swine/Minnesota/D09-19906-4/2009	KR701839	KR701841	USA	swine	2009
swine/Missouri/A01509467/2014	KJ801499	KJ801500	USA	swine	2014
swine/Missouri/A01567015/2014	KP412364	KP412365	USA	swine	2014
swine/Missouri/A01894530/2016	KX150753	KX150754	USA	swine	2016
swine/Nebraska/A01116986/2010	CY114597	CY114598	USA	swine	2010
swine/Nebraska/A01240348/2011	JX657786	JX657785	USA	swine	2011
swine/Nebraska/A01270926/2012	KC149920	KC149919	USA	swine	2012
swine/Nebraska/A01366774/2014	KJ206223	KJ206225	USA	swine	2014
swine/Nebraska/A01490524/2014	KJ162078	KJ162079	USA	swine	2014
swine/Nebraska/A01774481/2016	KX351168	KX351169	USA	swine	2016
swine/Nebraska/A01894804/2016	KX150780	KX150781	USA	swine	2016
swine/Nebraska/A01943456/2016	KX356676	KX356677	USA	swine	2016
swine/New Jersey/11/1976	K00992	AF250363	USA	swine	1976
swine/North Carolina/36883/2002	EU139829	EU139839	USA	swine	2002
swine/North Carolina/A01076198/2010	JX042533	JX048044	USA	swine	2010
swine/North Carolina/A01202450/2011	JX092286	JX092335	USA	swine	2011
swine/North Carolina/A01290908/2013	KJ130096	KJ130097	USA	swine	2013
swine/North Carolina/A01432568/2013	KC841836	KC841835	USA	swine	2013
swine/North Carolina/A01444883/2013	KC592049	KC592048	USA	swine	2013
swine/North Carolina/A01476086/2014	KM402849	KM402850	USA	swine	2014
swine/North Carolina/A01476197/2014	KM409530	KM409531	USA	swine	2014
swine/North Carolina/A01477163/2014	KM409524	KM409525	USA	swine	2014
swine/North Carolina/A01668400/2016	KY348360	KY348361	USA	swine	2016
swine/North Carolina/A01668530/2016	KY413024	KY413025	USA	swine	2016
swine/North Carolina/A01778870/2016	KX960200	KX960201	USA	swine	2016
swine/North Carolina/A01781497/2016	KX960192	KX960193	USA	swine	2016
swine/North Carolina/A01944413/2015	KT965408	KT965409	USA	swine	2015
swine/Ohio/13TOSU0735/2013	KJ640828	KJ640830	USA	swine	2013
swine/Ohio/23/1935	CY027291	CY027293	USA	swine	1935
swine/Ohio/A01349888/2013	KF013671	KF013673	USA	swine	2013
swine/Ohio/A01729721/2016	KU695696	KU695697	USA	swine	2016
swine/Ohio/A01894607/2016	KX185831	KX185832	USA	swine	2016
swine/Oklahoma/02989/2010	CY159991	CY159993	USA	swine	2010
swine/Oklahoma/A01290693/2013	KF922786	KF922787	USA	swine	2013
swine/Oklahoma/A01476227/2014	KM821600	KM821601	USA	swine	2014
swine/Oklahoma/SG1244/2006	CY157903	CY157905	USA	swine	2006
swine/Oklahoma/SG1251/2010	CY158385	CY158387	USA	swine	2010
swine/Pennsylvania/A01134526/2011	CY114996	CY114997	USA	swine	2011
swine/Pennsylvania/A01776397/2016	KX518669	KX518680	USA	swine	2016
swine/South Dakota/11/2012	JX303917	JX303919	USA	swine	2012
swine/South Dakota/A01201469/2011	JQ809751	JQ809788	USA	swine	2011
swine/South Dakota/A01471016/2015	KR812459	KR812461	USA	swine	2015
swine/Tennessee/10/1976	CY026459	CY026461	USA	swine	1976
swine/Texas/13TOSU0050/2013	KJ640836	KJ640838	USA	swine	2013
swine/USA/1976/1931	CY045740	CY045742	USA	swine	1931

Viruses name	HA accession number	NA accession number	Country/region	Host	Isolation year
swine/USA/1976-MA/1931	CY045748	CY045750	USA	swine	1931
Tennessee/F1035/2010	CY167772	CY167774	USA	human	2010
Tennessee/F2005A/2010	CY167468	CY167470	USA	human	2010
Tennessee/F2041/2011	CY167580	CY167582	USA	human	2011
Tennessee/UR06-0234/2007	KP456224	CY027477	USA	human	2007
Texas/04/2012	KC891358	KC891379	USA	human	2012
Texas/117/2013	KM409178	KM409179	USA	human	2013
Texas/24/2016	KX406835	KX406837	USA	human	2016
Texas/29/2008	FJ686988	FJ686989	USA	human	2008
Texas/37/2012	KC891020	KC891434	USA	human	2012
Texas/44312415/2009	CY052338	CY052340	USA	human	2009
Texas/45024243/2009	CY052879	CY052881	USA	human	2009
Texas/45072273/2009	CY052791	CY052793	USA	human	2009
Texas/45113882/2009	CY052535	CY052537	USA	human	2009
Texas/45122036/2009	CY052487	CY052489	USA	human	2009
Texas/64/2009	KC782087	KC782089	USA	human	2009
Texas/72/2009	KC781631	KC781633	USA	human	2009
Texas/JMS389/2009	CY061027	CY061029	USA	human	2009
Texas/JMS390/2009	CY061035	CY061037	USA	human	2009
Texas/JMS394/2009	CY061067	CY061069	USA	human	2009
Utah/01/2014	KM409196	KM409197	USA	human	2014
Vermont/01/2010	KC782022	KC782021	USA	human	2010
Virginia/29/2017	CY236243	CY236245	USA	human	2017
Virginia/59/2016	KX949211	KY044870	USA	human	2016
Virginia/UR06-0254/2007	CY026907	CY026909	USA	human	2007
Virginia/UR06-0266/2007	CY027971	CY027973	USA	human	2007
Washington/23/2015	KT836759	KT836810	USA	human	2015
Washington/24/2012	KC891401	KC891403	USA	human	2012
Washington/27/2007	EU516089	EU887017	USA	human	2007
Washington/33/2007	EU516253	EU516274	USA	human	2007
Washington/44/2012	KC891445	KC891053	USA	human	2012
Wisconsin/03/2014	KM409355	KM409356	USA	human	2014
Wisconsin/08/2010	KC781281	KC781279	USA	human	2010
Wisconsin/10/2010	KC882054	KC882060	USA	human	2010
Wisconsin/11/2012	KC891049	KC891120	USA	human	2012
Wisconsin/16/2011	KC881643	KC881645	USA	human	2011
Wisconsin/45/2017	CY231202	CY231204	USA	human	2017
Wisconsin/629-D00151/2009	CY057742	CY057744	USA	human	2009
Wisconsin/629-D01369/2009	CY057790	CY057792	USA	human	2009
Wisconsin/629-D01570/2009	CY057750	CY057752	USA	human	2009
Wisconsin/629-D02361/2009	CY046843	CY046845	USA	human	2009
Wisconsin/629-S1252/2009	CY057574	CY057576	USA	human	2009
Wisconsin/629-S1407/2009	CY057710	CY057712	USA	human	2009
Wisconsin/79/2016	KY045365	KY045400	USA	human	2016
Wisconsin/94/2016	CY211082	CY211084	USA	human	2016
Wyoming/01/2011	KC882259	KC882260	USA	human	2011
Wyoming/06/2011	KC882127	KC882126	USA	human	2011
American black duck/Wisconsin/11OS3016/2011	CY166565	CY166567	USA	American black duck	2011
American green-winged teal/Alaska/137884/2009	KX714426	KX714428	USA	American green-winged teal	2009
American green-winged teal/Alaska/386/2014	KT338357	KT338359	USA	American green-winged teal	2014
American green-winged teal/Wisconsin/10OS2847/2010	CY133085	CY133087	USA	American green-winged teal	2010

Viruses name	**HA accession number**	**NA accession number**	**Country/region**	**Host**	**Isolation year**
American green-winged teal/Wisconsin/12OS2994/2012	CY187152	CY187154	USA	American green-winged teal	2012
blue-winged teal/Missouri/15OS6536/2015	KY561169	KY561129	USA	blue-winged teal	2015
blue-winged teal/North Dakota/Sg-00735/2008	CY140358	CY140360	USA	blue-winged teal	2008
blue-winged teal/Texas/AI12-4549/2012	CY206300	CY206302	USA	blue-winged teal	2012
blue-winged teal/Wisconsin/11OS3020/2011	CY166573	CY166575	USA	blue-winged teal	2011
ferret/Washington/WADDL13230/2009	CY076717	CY076718	USA	ferret	2009
glaucous-winged gull/Alaska/800/2014	KT338529	KT338531	USA	glaucous-winged gull	2014
greater white-fronted goose/California/10936/2008	CY093973	CY093975	USA	greater white-fronted goose	2008
green winged teal/Louisiana/Sg-00090/2007	KF424090	KF424092	USA	green winged teal	2007
green-winged teal/California/96/2012	CY134343	CY134345	USA	green-winged teal	2012
green-winged teal/Wisconsin/585/1983	CY181369	CY181371	USA	green-winged teal	1983
harlequin duck/Alaska/46/2014	KP896491	KP896493	USA	harlequin duck	2014
mallard/Maryland/08OS1347/2008	CY190035	CY190037	USA	mallard	2008
mallard/Maryland/12OS619/2012	CY202946	CY202948	USA	mallard	2012
mallard/Mississippi/413/2010	CY097762	CY097764	USA	mallard	2010
mallard/Ohio/11OS1993/2011	CY132205	CY132207	USA	mallard	2011
mallard/Southcentral Alaska/12ML01055/2014	CY206789	CY206791	USA	mallard	2014
mallard/Wisconsin/4194/2009	CY097390	CY097392	USA	mallard	2009
mink/South Dakota/A01279427/2012	KC435060	KC435062	USA	mink	2012
northern pintail/California/183/2012	CY134367	CY134369	USA	northern pintail	2012
northern pintail/Interior Alaska/7MP0278/2007	CY077310	CY077312	USA	northern pintail	2007
northern shoveler/Illinois/12OS5138/2012	CY186691	CY186693	USA	northern shoveler	2012
pigeon/MN/1407/1981	CY005866	CY005868	USA	pigeon	1981
red-necked grebe/Minnesota/AI10-1948/2010	CY141081	CY141083	USA	red-necked grebe	2010
ruddy turnstone/Delaware Bay/123/1994	CY101934	CY101936	USA	ruddy turnstone	1994
ruddy turnstone/Delaware/650656/2002	CY144300	CY144302	USA	ruddy turnstone	2002
shorebird/Delaware/246/2006	CY043904	CY043906	USA	shorebird	2006
snow goose/Delaware/12OS3766/2012	CY202769	CY202771	USA	snow goose	2012
turkey/Kansas/4880/1980	EF679201	EU742638	USA	turkey	1980
Maracay/WRAIR1729P/2008	CY100964	CY100966	Venezuela	human	2008
HaNoi/BT241/2008	CY104870	CY104872	Viet Nam	human	2008
Ho Chi Minh/1096.2/2011	KJ955507	KJ955556	Viet Nam	human	2011
HoChiMinh/HCM526/2006	CY105166	CY105168	Viet Nam	human	2006
Hue/H433/2008	CY104579	CY104581	Viet Nam	human	2008
Viet Nam/11032002/2009	CY128049	CY128050	Viet Nam	human	2009
Viet Nam/11032006/2009	CY128379	CY128381	Viet Nam	human	2009
Viet Nam/11032010/2009	CY128387	CY128389	Viet Nam	human	2009
Viet Nam/11032017/2009	CY128403	CY128405	Viet Nam	human	2009
Viet Nam/13032015/2009	CY128171	CY128173	Viet Nam	human	2009
Viet Nam/13032035/2009	CY128203	CY128205	Viet Nam	human	2009
Viet Nam/13032036/2009	CY128211	CY128213	Viet Nam	human	2009
Viet Nam/13032071/2009	CY128283	CY128285	Viet Nam	human	2009
Viet Nam/13032074/2009	CY128291	CY128293	Viet Nam	human	2009
Viet Nam/13032093/2009	CY128323	CY128325	Viet Nam	human	2009
Viet Nam/13032100/2009	CY128347	CY128349	Viet Nam	human	2009
Viet Nam/817/2009	CY128075	CY128077	Viet Nam	human	2009

Fig. S1

The original phylogenetic tree of HA genes

The HA phylogenetic tree consisted of 1085 strains, which were selected from 25365 strains downloaded from NCBI. The tree was generated by the Neighbor-Joining method in the MEGA 7.0 program.

Fig. S2

The original phylogenetic tree of NA genes

After screening from 25365 HA genes, 1085 sequences were involved in the phylogenetic analysis. The tree was generated by the Neighbor-Joining method in the MEGA 7.0 program.